

Vaccine Misinformation on Social Media and Public Trust in Immunization

Behavioral & Social Health Sciences

Authors: Roy Kim, Irene Lee, Timmy Zhang, Elva Lee

Editors: William Wen

1. Introduction

In recent decades, a growing amount of vaccine misinformation has circulated on various social media platforms. Inaccurate information has undermined public health to a significant degree. That is, vaccination safety and effectiveness were selectively portrayed in a way that provoked public fear and anxiety. These provocative statements were made for views while rapidly disseminating and amplifying unfounded claims to the public, without much regulation. This social trend has been observed in the Greater Bay Area (GBA), where millions of users engage in Chinese social media and informal online information sources. (Li et al.)

1.1. Root Causes

The key factors that cause vaccine avoidance, aside from vaccine access and affordability, include concerns about vaccine safety, driven by doubts about its effectiveness and efficacy. According to Geoghegan et al, patients fear that adjuvants like aluminum, preservatives like mercury, inactivating agents like formaldehyde, manufacturing residuals like human or animal DNA fragments, and the sheer number of vaccines might overwhelm or weaken the immune system, leading to worries such as that vaccines are causing autism, diabetes, developmental delays, hyperactivity, and attention-deficit disorders. The impact of the “infodemic” on public understanding of immunization on social media and inadequate recommendations by local healthcare professionals significantly contribute to such misperception, and ultimately, vaccine avoidance at the root (Pan and Fan).

1.2. Impact on the GBA

Shortly after the Changchun Changsheng vaccine incident in 2018, when a local Chinese vaccination firm was fined 9.11 billion Chinese yuan (1.3 billion USD) after being found to have illegally produced the human rabies vaccine, a survey of parents in Guangzhou found a significant decline in their trust in the quality of DPT vaccines (BBC News). A year after the incident, a nationwide survey of six provinces found that only 61.26% of parents believed vaccines were safe, and 58.43% believed immunization program vaccines were safe—both lower than the global survey levels during the same period. Such a fast spread was possible with the introduction of the incident on social media. Although there was then no evidence of harm from the vaccine, the news sparked huge commotion all around China, and thousands took to mainstream social media, news platforms, and short video platforms (such as Xiaohongshu, Toutiao, and Douyin) in anger. The rise of online social media has enriched the supply of vaccine science information, but it has also accelerated the rapid spread of negative information and amplified the perception of risk. Compared to science popularization content published by authoritative accounts, negative content on the same platform has a stronger proliferation power. For example, because children are more likely to experience fever and rashes after vaccination, the MMR vaccine is publicly known as the "King of Vaccines" on multiple social media platforms. Content describing adverse reactions after vaccination is more likely to receive a large number of clicks, discussions, and shares, while evidence-based MMR vaccine science popularization receives fewer views and interactions. Due to the large number and diverse types of media platforms, along with algorithm recommendations reinforcing erroneous and biased perceptions through negative feedback loops, the release of information generates massive amounts of data daily and reaches its target audience with incredible speed, making it pragmatically impossible to verify content piece by piece. While machine review using artificial intelligence technology improves efficiency, it suffers from high error rates, with an even higher probability of misjudging medical information. The platforms' special governance of medical content mainly focuses on pseudo-scientific content involving institutional operations and the marketing of illegal medical products, but a systematic screening mechanism has not been established for the spread of vaccine misinformation and disinformation, as well as anti-vaccine content originating from unverified personal accounts.

1.3. Significance of the issue and broader implications

The World Health Organization (WHO) has named vaccine hesitancy as one of the top ten threats to global health in 2019. While best estimates conclude that vaccines have saved more than 150 million lives in the past 50 years, the potential for their impact for future decades is increasingly threatened by misinformation. Potential consequences of such dissemination include reversals of hard-won gains in vaccine coverage and disease control established over these decades. In 2024, 14.5 million infants worldwide missed out on getting even a single dose of vaccine in the essential immunization program, according to the latest WHO-UNICEF estimates. These are “zero-dose” children—many living in fragile settings where access to care is limited, and misinformation contributes an added threat (World Health Organization).

2. Policy Evaluation

2.1. Identify existing policies and initiatives

Existing policies regarding vaccine misinformation on social media, public trust, and immunization uptake have been developed. Several global and regional initiatives have been developed to address this issue, for instance, during COVID-19. The World Health Organization (WHO) identified vaccine hesitancy as one of the top ten threats to global health in 2019, elevating the issue to an international priority and encouraging responses across nations. WHO provided resources for immunization programs, health agencies, the role of communication to address this issue, and guides to sustain and build vaccine trust. Reports from the WHO Strategic Advisory Group of Experts on Immunization (SAGE) were also published on improving vaccination demand and addressing hesitancy (Global Vaccine Data Network). WHO also introduces the concept of an infodemic, providing a conceptual framework for health authorities to combat misinformation regarding vaccines (NIH). Furthermore, major social media platforms like YouTube, Instagram, and Twitter collaborate to limit the overwhelming spread of misinformation by moderating misleading content and organizing contexts (NIH). Regional efforts include the Africa CDC social media toolkit, where the Africa Centres for Disease Control made a toolkit to help countries use social media strategies to encourage vaccination (NIH). Other strategies include debunking, where it's fact-checking false claims after they spread, and prebunking, where it's educating people about misinformation before exposure.

Additionally, structured resources like the Vaccine Misinformation Management Guide inform and foster practical communications strategies and demand for immunization (UNICEF)

2.2. Assessing effectiveness and limitations

These policies and initiatives have some positive impact but face important limitations. The WHO's classification of vaccine hesitancy as a global health threat successfully raised awareness and showed effectiveness; however, simply identifying the problem did not directly solve or reduce the misinformation nor significantly increase the vaccination rates (NIH). Developing awareness is an important aspect; however, awareness alone is insufficient without constant implementation and behavioral actions. Interventions from major social media platforms, such as removing misleading content and adjusting algorithms, showed some effectiveness in limiting exposure to misinformation. But these measures were temporary and inconsistent as millions of users around the world posted new information. Strict content moderation and adjustments can backfire, as users who got removed from the mainstream and platforms went on to less regulated and private spaces, where misinformation was spread more freely and broadly. Regarding the Africa CDC social media toolkit, it provided guidance for countries in Africa to begin social media strategies for vaccinations, but there wasn't clear evidence that this toolkit has cautiously increased vaccine uptake. Debunking strategies can correct false information, but in some cases, repeating this misinformation, even to refute it, can reinforce the false belief among people. Overall, all these policies and initiatives globally and regionally had several positive effects; however, they still require stronger evaluations and consistency for further improvement regarding this issue.

3. Policy Recommendations

3.1 Improvements to existing approaches

Existing public health communication strategies/policies designated to combat vaccine-related misinformation across the Greater Bay Area are characterized by distinct yet fragmented region-specific approaches.

3.1.1 Mainland China

In Mainland China, current strategies rely heavily on direct engagements with citizens through online social platforms such as Douyin, WeChat, Weibo, and etc. through reels, articles, and advertisement banners that reflect message and clarification sourcing from local and state administrations (Yang and Han). This also encompasses campaigns in public regions such as apartment halls, elevators, malls. Such approaches often come across to citizens as broad and unspecific, with frequent fragmentation and inconsistency across different media outlets. Moreover, this approach often disregards and neglects to address important patterns of misinformation, such as circulating videos or chat histories in private social messaging. This can be partly mitigated through creating an accessible and cohesive source of health-related press that focuses on the publishing of clarifications and information (i.e. through subordinate levels of the Health Commission). Clarification should focus on more specific patterns of concern and anxiety to help the public understand why a rumor is gaining traction instead of dismissing them with generic safety statistics.

3.1.2 Hong Kong and Macau

In Hong Kong and Macau, policies implemented by officials become distinct due to the different political climates in these regions. The most notable measure adopted in Hong Kong over the course of the COVID-19 pandemic is to take reactive measures in clarifying circulating misinformation through official press releases along with other outlets. While this approach has been effective to some extent, increased degrees of mistrust amongst citizens have been reported as the direct result of the reactive nature of published information (“Combating Covid-19 in Hong Kong”). It is therefore advised that alternative proactive measures, such as inoculation and “prebunking”, be utilized to allow citizens recognize emerging misinformation trends. Macau takes a more collaborative, though less geographically representative, route by successfully partnering with NGOs to amplify public health agendas and manage social media misinformation (Li et al.).

3.1.3 Synthesis

Practical measures are in place for both Mainland China, Macau, and Hong Kong. However, a greater degree of distinctive and non-cohesive styles and approaches in regulating vaccine related misinformation overarches the combined effort in the GBA. This may be in part due to

the vast geographic backdrop for the GBA, while differing styles of governing also play an important role. A significant challenge present to all areas is the management of cross-border misinformation and information gaps caused by the different socio-political context present within each region.

3.2 Potential Adaptations

Adapting from the European Union's "Team Europe" approach offers a structural solution for coordinating vaccine messaging across the Greater Bay Area's diverse healthcare and political jurisdictions ("EU Vaccines Strategy"). The EU successfully managed similar cross-border challenges by implementing a unified digital hub that published transparent, multilingual medical data and research ("EU Vaccines Strategy"). A parallel adaptation for the GBA would be the creation of a transparent, cross-jurisdictional medical data provider to unify communication and bridge political sensitivity differences. The University of Hong Kong is currently developing a comparable digital platform for the region, which, upon launch, could serve as this much-needed centralized hub ("Healthy GBA").

The Africa CDC's "prebunking" strategy via their social media toolkit can also be coupled with a centralized platform as a proactive way to dismiss misinformation by building public awareness (NIH). In the GBA context, a preventative framework can further help to address the rapid, hidden spread of rumors in private messaging groups and address the specific anxieties of citizens before false narratives can take root.

3.3 Innovative Solutions

As the public increasingly turns to large language model (LLM) chatbots like Doubao for accessible health-related inquiries, it is beneficial to note that these tools offer a novel way to reduce anxiety, but while they are highly reliant on their training data. With this said, unregulated AI models often carry significant risk to spreading health-related misinformation, with recent evaluations demonstrating that 88% of queried customized chatbots propagated malicious false health information when prompted (Modi et al.). Furthermore, vulnerable populations such as older adults are particularly susceptible to AI hallucinations and can unknowingly spread this generated misinformation under the lack of effective regulation (Zhu et al.). However, while

current AI usage in healthcare categories should be more regulated, tailored AI services can serve as more personal and approachable outlets of clarifying messages for people with less digital literacy and/or awareness of misinformation theories and practices, ultimately serving as a more preferable and empathetic intervention amongst aforementioned groups of vulnerability.

4. Conclusion

Vaccine misinformation continues to influence immunization uptake and undermines the healthcare network in society. Existing approaches primarily exist as regulations on social media content, but regulation itself cannot save people who are indoctrinated by inaccurate information. Increasing communication with the healthcare system, inspired by the EU's "Team Europe" model, Africa CDC's prebunking approach, and AI-based communication, can be a valuable measure to assist addressing the lingering issue in the GBA.

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