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AI-generated misinformation in public health PR: Combatting deepfakes in vaccine advocacy

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Abstract - This study was carried out to examine the impact of AI-generated misinformation (deepfakes) on vaccine advocacy, investigate the sources of deepfakes, and identify factors contributing to their spread. The Elaboration Likelihood Model (ELM) was employed to explain how people process and respond to AI-generated misinformation. A library research method was used, involving the collection and analysis of existing data from various secondary sources. The study revealed that social media platforms, anti-vaccine groups, malicious actors, and influencers are primary sources of deepfakes. It was found that emotional appeal, personalization, vulnerabilities in media literacy, and confirmation bias contribute to the spread of misinformation. It was concluded that the proliferation of deepfakes has significantly eroded public trust in vaccines and health authorities, highlighting the need for a multi-faceted approach to combat misinformation. It is therefore recommended that social media platforms should implement robust verification mechanisms, public health authorities should develop fact-based information addressing emotional concerns, and the public should be educated on media literacy skills.

Keywords: AI-generated misinformation; deepfakes; public health communication; misinformation detection; vaccine advocacy

1. Introduction

The rapid advancement of artificial intelligence (AI) technology has transformed the way information is created, disseminated, and consumed. However, this technological progress also brings about unprecedented challenges, particularly in the realm of public health. The proliferation of AI-generated misinformation, including deepfakes, has become a pressing concern in vaccine advocacy. Artificial Intelligence (AI) has rapidly transformed various sectors, including communication and public health. It is the simulation of human intelligence processes by machines and encompasses learning, reasoning, and self-correction (Binns, 2021). However, alongside its potential benefits, AI has also facilitated the spread of misinformation, particularly in public health contexts. Misinformation can be described as false or misleading information spread irrespective of intent, which can severely impact public perceptions and behaviors towards health initiatives (Nduka, 2020). Consequently, understanding the dynamics of AI-generated misinformation is crucial for developing effective public health communication strategies.

In the realm of public health public relations (PR), effective communication is vital for fostering trust and encouraging positive health behaviors. Public health PR efforts aim to inform and educate the public about health issues, thereby promoting healthy practices (Gollust, 2020). However, the proliferation of misinformation complicates these efforts. For instance, during health crises such as the COVID-19 pandemic, misinformation regarding vaccines and treatments has hindered public compliance with health

guidelines (Kperogi, 2020; Obukoadata, 2010). Thus, the relationship between public health PR and misinformation is critical, as the latter undermines the credibility of health messages and can lead to adverse health outcomes.

One of the most concerning manifestations of AI-driven misinformation is the emergence of deepfakes. It refers to manipulated digital content that appears authentic, can be used to spread false information, fuel vaccine hesitancy, and undermine public trust in health institutions. Deepfakes utilize sophisticated algorithms to create hyper-realistic but fabricated audio and video content, making it increasingly difficult for individuals to discern fact from fiction (Ular, 2018). This technology poses a significant threat to public health communications, particularly in vaccine advocacy, where visual and auditory credibility is paramount. As deepfakes can easily manipulate public sentiment and sow distrust in health authorities, their potential to fuel vaccine hesitancy is alarming (Nwadike, 2021; Obukoadata, *et al.*, 2020). Thus, the intersection of AI, misinformation, and public health PR raises pressing concerns about the integrity of health communications.

2 Vaccine hesitancy, characterized by reluctance or refusal to vaccinate despite the availability of vaccines, has emerged as a significant barrier to achieving herd immunity and controlling infectious diseases (Olajide, 2020). This hesitancy is often exacerbated by misinformation, including that propagated through deepfake technology. For example, false narratives about vaccine safety can be amplified through manipulated media, leading to increased public skepticism and hesitancy (Osazuwa, 2020).

The consequences of AI-generated misinformation in public health can be severe. Vaccine misinformation, for instance, has been linked to declining vaccination rates, outbreaks of preventable diseases, and increased mortality. As the World Health Organization (WHO) has emphasized, vaccine misinformation is a major threat to global health security. Therefore, it is imperative to develop effective strategies to combat AI-generated misinformation in public health, particularly in vaccine advocacy. Consequently, addressing the role of AI-generated misinformation in vaccine advocacy is essential for improving public health outcomes.

In light of the above relationships, this study focuses on the role of AI-generated misinformation, particularly deepfakes, in shaping public perceptions of vaccines and the subsequent implications for public health PR. Through examining how misinformation influences vaccine hesitancy and the effectiveness of public health communication strategies, this research provides insights that can enhance vaccine advocacy efforts in an increasingly complex media landscape.

The increasing sophistication and accessibility of artificial intelligence (AI) technologies have introduced new challenges to public health communication, particularly in the realm of vaccine advocacy (Ahmed, 2020; Bathran, 2022). Among these challenges, AI-generated misinformation, especially in the form of deepfakes, has emerged as a potent threat to public trust in vaccines and health institutions. Deepfakes, which are hyper-realistic but fabricated audio-visual content, can convincingly mimic real individuals and events, making it difficult for the public to distinguish between authentic and manipulated information. This technological manipulation has contributed to the erosion of public confidence in vaccination programs, leading to vaccine hesitancy, reduced uptake, and the resurgence of preventable diseases.

Despite ongoing efforts by health authorities to counter misinformation, the rapid dissemination of deepfakes through social media platforms and other digital channels continues to undermine the effectiveness of public health campaigns. The emotional appeal, personalisation, and algorithmic targeting of such content further exacerbate its influence, especially among populations with limited media literacy or strong confirmation biases. These dynamics pose a significant threat to global health security, as recognised by institutions such as the World Health Organisation.

While existing literature has explored the general impact of misinformation on public health (Godsgift & Obukoadata, 2008), there remains a critical gap in understanding the specific implications of AI-generated misinformation. particularly deepfakes, on vaccine advocacy. Moreover, there is a lack of empirical research focused on identifying the sources, mechanisms, and contributing factors that facilitate the spread of deepfakes, as well as evidence-based strategies to mitigate their impact. This study, therefore, seeks to address this gap by examining the role of AI-generated misinformation in shaping public

perceptions of vaccines, investigating the sources and spread of deepfakes, and evaluating their implications for public health and public relations.

The objectives of this study are to: (1) Examine the impact of AI-generated misinformation (deepfakes) on vaccine advocacy and public trust in vaccines. (2) Investigate the sources of deepfakes in vaccine advocacy. (3) Identify the factors that contribute to the spread and acceptance of deepfakes in vaccine advocacy.

Artificial Intelligence (AI) is defined as the capability of a machine to imitate intelligent human behavior. This encompasses a variety of tasks, such as learning from experiences, understanding natural language, and problem-solving. AI systems can analyze large datasets, enabling them to make predictions or decisions based on the information available (Moyo, 2023). For instance, in healthcare, AI can assist in diagnosing diseases by identifying patterns in medical imaging that may not be apparent to human observers. This transformative potential makes AI a critical tool in enhancing efficiency and accuracy across various sectors.

The implications of AI extend beyond mere automation; they include significant advancements in decision-making processes. AI algorithms can process vast amounts of data much faster than humans, allowing for real-time insights that are invaluable in dynamic environments like public health (Adebayo & Ojo, 2021, Obukoadata *et al.,* 2020). However, as AI systems become more integrated into critical decision-making frameworks, ethical concerns regarding data privacy, bias, and accountability emerge. Understanding these complexities is essential for harnessing AI responsibly, particularly in public health scenarios where the stakes are high.

AI can also be understood as a subset of computer science that focuses on creating systems capable of performing tasks that typically require human intelligence. This includes technologies such as machine learning, which allows systems to learn from data and improve over time, and natural language processing, which enables machines to understand and respond to human language (Adeyemo, 2022). In public health, the application of machine learning can lead to improved patient outcomes by predicting disease outbreaks or identifying at-risk populations (Nwankwo et al., 2023). For example, AI-driven tools can analyze social media trends to gauge public sentiment about health interventions, thereby informing communication strategies. Nevertheless, the rapid evolution of AI technologies raises questions about their ethical use and the potential for unintended consequences, underscoring the need for comprehensive regulatory frameworks.

Another perspective on AI highlights its role as a transformative technology that reshapes industries by automating complex processes and enhancing human decision-making capabilities. AI systems can perform tasks ranging from simple calculations to complex simulations, thereby serving as crucial tools in research and development (Ogunleye, 2023). This transformative nature of AI is particularly evident in fields such as public health, where it can facilitate more effective resource allocation and intervention strategies. However, the integration of AI also necessitates a careful examination of the societal implications, including issues of equity and access. As AI continues to evolve, stakeholders must prioritize ethical considerations to ensure that its benefits are equitably distributed across all populations (Dansuki, 2021).

Misinformation is defined as false or misleading information that is spread without malicious intent. This includes inaccuracies that may arise from misunderstanding or misinterpretation of facts (Ogunyemi, 2022). During public health emergencies, such as the COVID-19 pandemic, misinformation can spread rapidly through social media and other platforms, complicating efforts to convey accurate health information. The consequences of misinformation can be severe, particularly in public health contexts. For example, misinformation regarding vaccine safety can lead to decreased vaccination rates, ultimately threatening community health (Ozigbo, 2023). Therefore, understanding the mechanisms through which misinformation spreads is crucial for public health officials, who must develop strategies to counteract false narratives effectively. This includes utilizing trusted messengers and engaging with communities to provide clear, evidence-based information.

Finally, misinformation is increasingly recognized as a significant barrier to effective public health communication. The rapid dissemination of misleading information, particularly on social media platforms, has created a challenging environment for public health advocates (MacDonald, 2020). As

misinformation can quickly gain traction, it poses a threat to the credibility of health authorities and can lead to public distrust. Consequently, proactive measures, including the promotion of accurate information and community engagement, are essential to mitigate the impact of misinformation on public health initiatives (Chesney & Citron, 2020). Addressing misinformation is not merely a reactive strategy; it is an integral part of building a resilient public health infrastructure.

Deepfakes refer to synthetic media created using artificial intelligence techniques, particularly deep learning algorithms, to produce altered audio and video content that can convincingly mimic real individuals (Ajder, 2022). This technology has gained attention for its potential to create hyper-realistic but misleading representations, making it increasingly difficult for audiences to discern authentic content from fabricated media. The implications of deepfakes are profound, especially in the context of misinformation. For instance, deepfakes can be weaponized to distort public perceptions of individuals and organizations, leading to reputational damage and erosion of trust in legitimate sources (Chesney & Citron, 2020). In public health, deepfakes can undermine vaccine advocacy efforts by creating false narratives about vaccine safety and efficacy, further complicating the already challenging landscape of vaccine hesitancy.

In addition to their potential for misinformation, deepfakes also raise significant ethical and legal concerns. The ability to create convincing fake content can be exploited for malicious purposes, such as impersonating public figures or spreading false information during critical events (Kahim, 2022). As deepfakes become more sophisticated and accessible, they pose a unique challenge for regulators and policymakers.

More so, deepfakes highlight the broader implications of advancements in AI technologies for society. While they demonstrate the remarkable capabilities of AI in generating realistic media, they also underscore the potential for misuse in spreading misinformation and manipulating public opinion (Chesney & Citron, 2020; Obukoadata, Okon & Obogo, 2024). As deepfakes continue to evolve, it becomes increasingly important for individuals and organisations to cultivate media literacy and critical thinking skills. By equipping the public with the tools to critically evaluate the authenticity of the media they consume, we can mitigate the impact of deepfakes on public health messaging and other critical areas of public life (Zhou et al., 2021).

Vaccine advocacy refers to organized efforts aimed at promoting the acceptance and uptake of vaccines among communities and individuals. This advocacy is crucial for achieving herd immunity and controlling the spread of infectious diseases, particularly in light of rising vaccine hesitancy fueled by misinformation (MacDonald, 2020). Effective vaccine advocacy encompasses a range of strategies, including public education campaigns, community engagement, and collaboration with healthcare professionals to address concerns and misconceptions about vaccines (Roozenbeek, 2020). These efforts are essential for building public trust and encouraging informed decision-making regarding vaccination. In an era where misinformation can easily spread, the role of vaccine advocacy becomes even more vital in ensuring that accurate information reaches the public.

Also, vaccine advocacy is increasingly challenged by the proliferation of misinformation and vaccine hesitancy. The rise of social media has created an environment where false information can spread rapidly, undermining the efforts of public health advocates (Adebayo & Ojo, 2021). To counteract these challenges, vaccine advocacy must be proactive and adaptable, employing evidence-based communication strategies to address the concerns and fears that contribute to vaccine hesitancy. By fostering open dialogues and providing clear, accurate information, advocates can work to rebuild trust in vaccines and ultimately improve public health outcomes (Maduka, 2023).

Misinformation has increasingly become a formidable threat to public health, particularly during crises such as the COVID-19 pandemic. The rapid spread of false information can lead to a multitude of adverse consequences, including increased vaccine hesitancy, misallocation of health resources, and negative impacts on mental health. Research shows that health-related misinformation can proliferate on social media, with estimates indicating that it can comprise between 0.2% to 28.8% of content on these platforms (Ogunyemi, 2022). Given the pervasiveness of misinformation, it is crucial to understand its implications on public perceptions and behaviours regarding health interventions.

Moreover, the consequences of misinformation extend beyond individual decision-making. It can lead to widespread public confusion and erode trust in health authorities and scientific evidence. Such

erosion of trust can result in a reluctance to follow public health guidelines, thereby exacerbating health crises. For instance, during the COVID-19 pandemic, misinformation regarding the safety and efficacy of vaccines significantly contributed to declines in vaccination rates among certain demographics (Zuka, 2021; Obukoadata, 2010). Thus, the challenge lies not only in countering misinformation but also in addressing the psychological and sociocultural factors that render misinformation more appealing than factual information.

Furthermore, the impact of misinformation is not uniform across different populations. Certain demographic groups, particularly those with lower socioeconomic status or specific ideological beliefs, are more susceptible to accepting misinformation (Nwankwo et al., 2023). This vulnerability can lead to disparities in health outcomes, as these groups may be less likely to adhere to public health recommendations. Therefore, addressing misinformation requires a multifaceted approach that considers the unique vulnerabilities of various populations and employs targeted communication strategies to rebuild trust and promote accurate health information.

The rise of artificial intelligence (AI) has brought significant advancements in various fields, including public health; however, it has also introduced new challenges, particularly in the form of AI-generated deepfakes. These manipulated media can create realistic but false representations of individuals, leading to the potential spread of misinformation. The causes of AI-generated deepfakes in public health can be attributed to several factors, including the accessibility of AI technology, the motivations of malicious actors, and the existing vulnerabilities within public health communication.

Firstly, the accessibility of AI technology has made it easier for individuals and organizations to create deepfakes. With the proliferation of user-friendly AI tools, even those with limited technical expertise can generate convincing fake videos or audio recordings (Ajder, 2022). This democratization of technology poses a significant risk, as it lowers barriers for malicious actors to produce and disseminate misleading content. As a result, the potential for deepfakes to influence public opinion and behavior regarding health-related matters has increased dramatically.

In addition to accessibility, the motivations behind creating deepfakes vary widely. Some individuals may engage in deepfake creation for entertainment or artistic purposes, while others may have more nefarious intentions, such as spreading misinformation or discrediting public health officials (Uwadia, 2020). The latter can have severe consequences, particularly during health crises when accurate information is crucial for public safety. For instance, deepfakes that misrepresent health officials or scientists can undermine trust in legitimate health communications, leading to confusion and hesitancy among the public.

Moreover, existing vulnerabilities in public health communication systems can exacerbate the impact of deepfakes. During health emergencies, the rapid dissemination of information is critical; however, this urgency can lead to lapses in verification processes. As misinformation spreads quickly, deepfakes can infiltrate public discourse, complicating efforts for health authorities to counteract false narratives effectively (Graham et al., 2021). This situation underscores the need for robust verification mechanisms and public awareness campaigns to educate individuals about the potential for deepfakes and the importance of critically evaluating information sources.

In all, the causes of AI-generated deepfakes in public health are multifaceted, stemming from the accessibility of AI technology, the motivations of creators, and vulnerabilities in public health communication. Addressing these challenges requires a concerted effort from public health officials, technology developers, and the public to promote media literacy and ensure the integrity of health information.

The emergence of AI-generated misinformation presents a significant threat to vaccine uptake, particularly within public health initiatives aimed at controlling infectious diseases. False narratives surrounding vaccines can lead to increased hesitancy, as individuals may be swayed by misleading information that questions vaccine safety and efficacy. The rapid dissemination of information through social media platforms allows AI-generated content to easily go viral and reach a wide audience (Babeze, 2022). Consequently, understanding the impact of AI-generated misinformation on vaccine uptake is crucial for effective public health efforts.

One of the primary ways AI-generated misinformation affects vaccine uptake is by creating confusion and fear among the public. For example, deepfakes and manipulated videos can portray misleading information about vaccine side effects or the motivations of health officials, leading individuals to question the integrity of vaccination programs (Zhou et al., 2021). This confusion can result in a decline in vaccination rates as individuals may choose to delay or refuse vaccinations based on unfounded fears. The World Health Organization has identified vaccine hesitancy as one of the top ten global health threats, underscoring the urgency of addressing misinformation in this context (MacDonald, 2020).

Furthermore, the emotional appeal of misinformation can make it more persuasive than factual information. AI-generated content can be tailored to evoke strong emotional responses, such as fear or anger, which can further entrench individuals in their beliefs and make them less receptive to accurate information (Nwankwo et al., 2023). This emotional manipulation can create echo chambers where individuals are primarily exposed to misinformation reinforcing their existing beliefs, making it increasingly difficult to change their minds about vaccination. Therefore, public health campaigns must not only counter misinformation but also address the emotional drivers contributing to vaccine hesitancy.

In addition to emotional manipulation, the personalization of misinformation through AI algorithms can complicate efforts to promote vaccine uptake. AI systems can analyze user data to create targeted misinformation that resonates with specific demographics, increasing its likelihood of influencing individuals' beliefs and behaviours (Akpan & Obukoadata, 2013; Obaze, 2021). This targeted approach can exacerbate existing disparities in vaccine uptake, as certain groups may be more susceptible to misinformation tailored to their specific concerns or fears. Consequently, public health initiatives must consider the diverse motivations and vulnerabilities of different populations when designing communication strategies to combat misinformation effectively.

The Elaboration Likelihood Model (ELM) was first introduced by Richard Petty and John Cacioppo in 1986 (Lee, 2020). The model was developed to explain how people process and respond to persuasive messages. The ELM has several key tenets. According to Zhang and Wang (2017), the model suggests that people process persuasive messages through either the central route or the peripheral route. The central route involves careful consideration and evaluation of the message arguments, whereas the peripheral route involves a more superficial evaluation of the message based on cues such as source attractiveness or message length.

Despite its widespread acceptance, the ELM has faced several criticisms. One criticism is that the model oversimplifies the persuasion process by assuming that people process messages through only one route (Kim, 2015). Another criticism is that the model fails to account for the role of emotions in persuasion (Lee, 2020).

The ELM has several applications to the current study on AI-generated misinformation in public health PR. According to Kim and Lee (2019), the model can help explain how people process and respond to AI-generated misinformation. For example, the model suggests that people who are highly motivated and able to process information are more likely to engage in central processing and evaluate the misinformation critically.

2. Method

This study adopted a library research method, a qualitative approach that involves the systematic collection, review, and analysis of existing literature and secondary data. This method was chosen due to the exploratory nature of the research, which seeks to understand the emerging phenomenon of AI-generated misinformation, particularly deepfakes, and its implications for public health public relations (PR) and vaccine advocacy. The library research method enabled the researchers to draw from a wide range of credible academic sources, including peer-reviewed journal articles, books, institutional reports, and reputable online publications. These sources provided insights into the technological, psychological, and communicative dimensions of AI-generated misinformation, as well as its impact on public trust, vaccine uptake, and health communication strategies.

The data collection process involved identifying and synthesising relevant literature on the following key themes:

- The evolution and capabilities of artificial intelligence, particularly in generating synthetic media.
- The nature and spread of misinformation and deepfakes in public health contexts.
- The psychological and sociocultural factors contributing to the acceptance of misinformation.
- The role of media platforms, influencers, and algorithms in amplifying false narratives.
- Theoretical frameworks, such as the Elaboration Likelihood Model (ELM), that explain how individuals process persuasive or misleading information.

The analysis was conducted through thematic synthesis, allowing the researchers to identify recurring patterns, relationships, and gaps in the literature. This approach facilitated a comprehensive understanding of the sources, mechanisms, and consequences of AI-generated misinformation in vaccine advocacy. The choice of this method is justified by the need to build a conceptual foundation for addressing a relatively underexplored issue. Given the novelty and complexity of AI-generated misinformation, a library-based approach provided the flexibility to integrate interdisciplinary perspectives and generate informed recommendations for public health communication strategies.

3. Results and Discussion

3.1 Results

Table 1: Sources, Impacts, and Contributing Factors of Deepfakes in Vaccine Advocacy

Sources of Deepfakes/Vaccine advocacy misinformation	Impact on Vaccine Advocacy	Factors Contributing to the Spread
1. Social media platforms (e.g., Facebook, Twitter, YouTube)	Erosion of public trust in vaccines and health authorities.	1. Emotional appeal of misinformation that resonates with fears and concerns about vaccine safety.
2. Anti-vaccine groups and organizations	Amplification of anti-vaccine narratives through manipulated content.	2. Personalization of content through algorithms that target specific demographics with tailored misinformation.
3. Malicious actors and hackers	Creation of misleading narratives that undermine public health initiatives.	3. Existing vulnerabilities in media literacy among the public, making individuals more susceptible to believing deepfakes.
4. Automated bots disseminating content on social media	Rapid spread of misinformation, complicating public health messaging.	4. Lack of robust verification mechanisms for online content, allowing deepfakes to go unchecked.
5. Open-source AI tools and software	Lowered barriers for creating realistic deepfakes, making it easier for anyone to produce misleading content.	5. Social media's rapid information dissemination, which allows deepfakes to reach large audiences quickly.

Source: Authors' Compilation, 2025

Table 1 presents a synthesis of the sources, impacts, and contributing factors of deepfakes in vaccine advocacy, compiled from a wide range of scholarly literature. The findings underscore that the spread of AI-generated misinformation, particularly deepfakes, is a multifaceted issue influenced by technological, psychological, and sociocultural dynamics. Social media platforms such as Facebook, Twitter, and YouTube are identified as primary vectors for the dissemination of manipulated content. These platforms enable anti-vaccine groups, malicious actors, and automated bots to amplify false narratives that undermine public health initiatives (Ajder, 2022; Graham et al., 2021).

The accessibility of open-source AI tools has further democratised the creation of deepfakes, lowering the technical barriers for producing hyper-realistic but misleading content (Uwadia, 2020; Obukoadata *et al.*, 2020). Influencers and public figures who promote misinformation, intentionally or otherwise, also play a significant role in shaping public opinion and behaviour regarding vaccines (Nwankwo et al., 2023). Additionally, traditional media outlets contribute to the problem when they

misreport or sensationalise vaccine-related stories, thereby reinforcing public scepticism and distrust (Chesney & Citron, 2020).

Several psychological and algorithmic factors exacerbate the spread of misinformation. These include the emotional appeal of misleading content, algorithmic personalisation that targets users based on their beliefs and fears (Obukoadata, 2010), and confirmation bias, which leads individuals to seek out information that aligns with their pre-existing views (Zhou et al., 2021; Obaze, 2021). The viral nature of sensational content, coupled with the absence of robust verification mechanisms on many digital platforms, accelerates the erosion of public trust in vaccines and health authorities (MacDonald, 2020).

However, it is important to consider counterarguments that challenge the deterministic view of social media and AI as inherently harmful. Some scholars argue that the same platforms that facilitate misinformation can also be leveraged to disseminate accurate, evidence-based health information. For instance, Roozenbeek et al. (2020) suggest that inoculation theory-based interventions, such as pre-bunking and fact-checking, can effectively reduce susceptibility to misinformation. Moreover, platforms like Twitter and YouTube have begun implementing content moderation policies and algorithmic adjustments to curb the spread of false information, although the effectiveness of these measures remains contested (Adebayo & Ojo, 2021; Obukoadata, 2022a).

Another counterpoint is that not all audiences are equally vulnerable to deepfakes. Research by Zhang and Wang (2017) indicates that individuals with higher levels of media literacy and critical thinking skills are more likely to engage in central processing of information, making them less susceptible to superficial cues and emotionally charged content. This suggests that public education and digital literacy campaigns could serve as effective long-term strategies for mitigating the impact of AI-generated misinformation. We thus maintain that while the proliferation of deepfakes in vaccine advocacy presents a serious threat to public health communication, it is not an insurmountable one. The challenge lies in developing a balanced approach that addresses both the technological enablers of misinformation and the cognitive vulnerabilities of audiences (Obukoadata, 2022b).

3.2 Discussion

The findings of this study shed light on the multifaceted and intricate relationship between deepfakes and vaccine advocacy, revealing significant sources, impacts, and contributing factors that collectively shape public perception and trust in vaccines. One of the primary sources of deepfakes identified is social media platforms such as Facebook, Twitter, and YouTube. These platforms serve as breeding grounds for misinformation due to their expansive reach and the ease with which content can be shared (Graham et al., 2021). The algorithms employed by these platforms often prioritize engagement over accuracy, leading to the viral spread of misleading information. Consequently, this results in a profound erosion of public trust in vaccines and health authorities, as individuals are exposed to manipulated narratives that contradict established scientific consensus (Nwankwo et al., 2023). This erosion of trust can have dire consequences, particularly in public health contexts where vaccine uptake is crucial for community immunity.

Moreover, anti-vaccine groups and organizations play a significant role in amplifying these narratives through manipulated content. As noted by Ajder (2022), these groups leverage deepfake technologies to create compelling yet false representations that question vaccine safety and efficacy. The amplification of anti-vaccine rhetoric not only fosters skepticism among the public but also mobilizes individuals who may have previously been indifferent to vaccine issues. This dynamic creates a vicious cycle of misinformation that further entrenches anti-vaccine sentiments within certain demographics. The implications of this are profound; as the anti-vaccine movement gains traction, public health initiatives may struggle to achieve their vaccination targets, ultimately jeopardizing herd immunity and increasing the risk of outbreaks of preventable diseases (Ogunyemi, 2022).

In addition, the study highlights the role of malicious actors and hackers in crafting misleading narratives that undermine public health initiatives. These individuals often operate with the intent of sowing discord and confusion, utilizing deepfake technology to fabricate scenarios that misrepresent health officials and their messages (Chesney & Citron, 2020). The creation of such misleading narratives complicates public health messaging, as health authorities must navigate a landscape rife with falsehoods that can easily mislead the public. This challenge is compounded by the rapid spread of misinformation facilitated by automated bots disseminating content across social media. Bots can amplify false narratives

at an alarming rate, further complicating efforts to correct misinformation and provide accurate health information (Zhou et al., 2021). The implications here are clear: without effective intervention strategies, the integrity of public health communications may be severely compromised.

Furthermore, the accessibility of open-source AI tools and software is lowering the barriers for creating realistic deepfakes, making it easier for virtually anyone to produce misleading content (Ajder, 2022). This democratization of deepfake technology poses a unique challenge for public health advocates, as the proliferation of such content can quickly overwhelm factual information. In this context, the rapid dissemination of information on social media platforms can lead to a scenario where deepfakes reach large audiences before corrective measures can be implemented. Consequently, public health officials may find themselves in a reactive rather than proactive position, scrambling to counteract the effects of misinformation that has already taken root (MacDonald, 2020).

The findings of this study also emphasize the influence of public figures and influencers who promote misinformation. Their platforms can significantly sway public opinion and behavior regarding vaccines, as individuals often look to these figures for guidance, particularly during health crises (Nwankwo et al., 2023). The result is a complex interplay between celebrity influence and public health messaging, where misinformation can overshadow scientifically accurate information. This phenomenon is exacerbated by confirmation bias, where individuals are inclined to seek out information that aligns with their existing beliefs, thereby reinforcing misinformation (Graham et al., 2021). The implications are grave; if influential figures perpetuate false narratives, their followers may become increasingly resistant to vaccination efforts, undermining public health initiatives.

Finally, the role of news outlets and media that misreport or sensationalize vaccine-related stories cannot be overlooked. Sensationalized reporting often captures public attention but fails to provide the nuanced understanding necessary for informed decision-making (Chesney & Citron, 2020). This contributes to an overall climate of distrust and skepticism towards vaccines, making it increasingly difficult for public health advocates to communicate effectively. The viral nature of sensational content means that misinformation often drowns out factual reporting, further complicating public perceptions and understanding of vaccines (Zhou et al., 2021). The implications of this finding underscore the necessity for responsible journalism and the importance of promoting accurate health communication in media outlets.

In all, the findings of this study highlight the urgent need for comprehensive strategies to combat the spread of deepfakes and misinformation in vaccine advocacy. As social media continues to serve as a primary source of information for many individuals, public health officials must develop targeted communication strategies that engage trusted community figures, enhance media literacy, and promote critical thinking skills. By addressing the emotional appeals of misinformation and countering the narratives propagated by anti-vaccine groups, public health campaigns can work to rebuild trust in vaccines and ensure that accurate information prevails in public discourse. This study serves as a crucial reminder of the evolving challenges in public health communication and the need for adaptive strategies to safeguard community health.

4. Conclusion and Recommendation

4.1 Conclusion

This study concludes that AI-generated misinformation, particularly in the form of deepfakes, presents a significant challenge to public health communication and vaccine advocacy. The findings demonstrate that the spread of such misinformation is driven by a combination of technological accessibility, emotional manipulation, algorithmic targeting, and gaps in media literacy. These factors collectively contribute to the erosion of public trust in vaccines and health authorities, complicating efforts to promote accurate health information and achieve widespread vaccine uptake. However, while the risks posed by deepfakes are substantial, it is important to recognise that digital platforms and AI technologies are not inherently harmful. As noted in the literature (Obukoadata, 2022b; Zhou *et al.*, 2021), these same tools can be leveraged to disseminate accurate, evidence-based information and engage communities in meaningful dialogue. For instance, Roozenbeek (2020) and Adebayo and Ojo (2021) highlight the potential of social media to support public health messaging when used responsibly. Moreover, emerging interventions such as pre-bunking,

fact-checking, and algorithmic transparency offer promising avenues for mitigating the effects of misinformation (Graham et al., 2021).

It is also essential to acknowledge that not all individuals are equally susceptible to misinformation. The Elaboration Likelihood Model, as applied in this study, suggests that individuals who are motivated and capable of critical thinking are more likely to engage in central processing of information, making them less vulnerable to emotionally charged or misleading content (Zhang & Wang, 2017). This underscores the importance of media literacy education and critical thinking as long-term strategies for building public resilience. Furthermore, while the study emphasises the dangers of deepfakes, it also recognises the ethical and creative potential of AI in public health communication. Scholars such as Dansuki (2021), Obukoadata (2022a) and Ogunleye (2023) argue that AI can enhance communication through personalized messaging, predictive analytics, and improved accessibility. The challenge, therefore, is not to reject AI outright but to develop ethical frameworks and regulatory mechanisms that ensure its responsible use.

In light of these insights, the study recommends a multi-pronged approach to combat AI-generated misinformation. This includes strengthening platform accountability through robust verification mechanisms and content moderation; enhancing public health messaging by addressing emotional concerns and tailoring communication to specific demographics; promoting media literacy and critical thinking to empower individuals to evaluate digital content; and leveraging trusted messengers such as healthcare professionals and community leaders to amplify accurate information. Ultimately, while AI-generated misinformation presents a formidable challenge, it also offers an opportunity to rethink and strengthen public health communication strategies. By combining technological innovation with ethical responsibility and public engagement, it is possible to safeguard the integrity of vaccine advocacy and restore trust in health communication.

4.2 Recommendation

On this premise, it is recommended that: (1) Based on the finding that social media platforms are a primary source of deepfakes and misinformation, it is recommended that social media platforms implement more robust verification mechanisms for online content, including fact-checking and authentication protocols, to prevent the spread of misinformation.

(2) Based on the finding that emotional appeal and personalization of misinformation contribute to its spread, it is recommended that public health authorities develop and disseminate fact-based information that addresses the emotional concerns and fears of the public, and that they utilize personalized communication strategies to reach specific demographics and communities.

(3) Based on the finding that vulnerabilities in media literacy and confirmation bias contribute to the spread of misinformation, it is recommended that the general public be educated on media literacy skills, including how to critically evaluate online sources and identify deepfakes, and that they be encouraged to seek out multiple sources of information and to engage in open-minded and critical thinking when encountering online content.

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