Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature: Date _____

_____

Nicholas Kyeremeh

Health Communication Frameworks Used In Interventions to Mitigate Online Vaccine Misinformation and Disinformation: A Critical Narrative Review

By

Nicholas Kyeremeh
MPH

Hubert Department of Global Health

Lavanya Vasudevan

Committee Chair

Health Communication Frameworks Used in Interventions to Mitigate Online Vaccine Misinformation and Disinformation: A Critical Narrative Review

By

Nicholas Kyeremeh

MBChB, MPH

University of Ghana

2018

Thesis Committee Chair: Lavanya Vasudevan, PhD

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Hubert Department of Global Health
2025

Abstract

Health Communication Frameworks Used in Interventions to Mitigate Online Vaccine Misinformation and Disinformation: A Critical Narrative Review

By Nicholas Kyeremeh

This thesis presents a critical evaluation of health communication frameworks employed to mitigate vaccine misinformation and disinformation, with a focus on their implementation across digital platforms. Using a narrative literature review approach, the study synthesizes findings from twenty-two peer-reviewed studies published between 2010 and 2023. It examines how core models—including the Health Belief Model, Social Cognitive Theory, and the Elaboration Likelihood Model—have informed interventions aimed at reducing vaccine hesitancy driven by false or misleading information.

Three thematic categories emerged across existing literature: Action-Directed Communication, Engagement Communication, and Risk Communication Frameworks. These frameworks shaped the design and delivery of targeted interventions. Despite promising applications, several critical gaps remain. These include a lack of adaptability to platform-specific dynamics, overrepresentation of interventions in high-income country settings, absence of standardized metrics to assess effectiveness, and limited integration of psychological, cultural, and technological considerations.

The research underscores the influence of misinformation in eroding public trust in vaccines and highlights how tailored communication strategies can help counter this threat. Each of the evaluated frameworks offers unique mechanisms for influencing public perception and behavior—ranging from increasing awareness of disease risk, to leveraging peer networks and promoting critical evaluation of online content.

Effective interventions identified in the literature include the strategic use of social media, educational outreach, and community engagement through trusted health professionals. These approaches have proven successful in improving vaccine uptake and curbing the spread of misinformation by delivering credible content, fostering empathy, and aligning messages with cultural values and contexts.

This thesis contributes actionable insights for public health professionals and policymakers engaged in designing evidence-based communication strategies. It emphasizes the importance of inclusion, diversity, and equity in public health messaging and advocates for future research into the role of emerging technologies in combating digital misinformation.

Health Communication Frameworks Used in Interventions to Mitigate Online Vaccine Misinformation and Disinformation: A Critical Narrative Review

By

Nicholas Kyeremeh
MBChB, MPH
University of Ghana
2018

Thesis Committee Chair: Lavanya Vasudevan, PhD

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Hubert Department of Global Health
2025

Acknowledgement

This study could not have been completed without the assistance and co-operation of many individuals. I therefore wish to acknowledge with sincere gratitude my indebtedness to them.

First and foremost, I express my profound gratitude to Almighty God for seeing me through this program successfully.

I am deeply grateful to my supervisor, Dr. Lavanya Vasudevan, for her invaluable guidance, encouragement, and support throughout the course of this study. Her expertise and dedication were instrumental in shaping this work.

I dedicate this work to my family, especially my wife, Lydia Abankwah, for her unwavering support, love, and encouragement, which have been a source of strength and motivation throughout this journey.

LIST OF TABLES AND FIGURES

TABLES

FIGURES

CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

1.1.1 Vaccination: A highly effective public health strategy for preventing infectious diseases.

For centuries, vaccination has been pivotal in the prevention of infectious diseases. Communication has been a major booster to the acceptance of vaccines and the ability of vaccination programs to overcome cultural barriers (Kayser & Ramzan, 2021). Vaccination is mostly recognized as one of the most effective and cost-efficient public health strategies for preventing infectious diseases. This is done by inducing immunization; vaccines also protect individuals and communities from various potentially severe diseases such as measles, polio, and influenza. Vaccination significantly reduces disease-related morbidity and mortality across the globe (Remy et al.,2015). Despite these successes, approximately 20 million children globally remain unvaccinated or under-vaccinated each year due to barriers such as limited access in lowincome regions and vaccine hesitancy contributing to this gap. Strengthening immunization programs, improving global vaccine equity, and addressing misinformation are key strategies to increase vaccination coverage (Bernstein et al.,2017).

Nonetheless, progress in increasing vaccination coverage has been undermined by aspects such as public distrust and propaganda (Lalani et al., 2023). These historical challenges mirror today's issues where misinformation, especially through digital platforms, undermines public trust and vaccine uptake (Clark et al. 2022). Trust in the safety and efficacy of vaccines has eroded because of the growing popularity of anti-vaccine movements and the spreading of misleading information on social media networks (Clark et al., 2022). Misinformation can erode confidence in vaccines in the areas of their effectiveness and safety, confidence in their delivery systems, and how effective the health services and its professionals are, leading to demotivation of policymakers to develop the needed vaccine. (Whitehead et al.,2023) Misinformation is incorrect information, however, created not deliberately to produce a negative result. At the same time, disinformation is information that is untrue and created intentionally to cause harm or damage to an individual,

group of people, or organization (Wardle et a,2017). Increased and indiscriminate use of the internet and social media has exacerbated proliferation and exposure to misinformation and disinformation (Whitehead et al.,2023). The World Health Organization indicated that vaccine hesitancy is one of the major causes of global health. This is because vaccines are one of the most effective health-preventing measures, leading to a surge in infectious diseases (Koning et al.,2024). Increasing uptake and trust toward vaccination necessitates viable systems and approaches that dispel fake information. These include enhancing the capacity of healthcare systems, ensuring adequate funding and monitoring and evaluation for early intervention (Hardt al,2016; Piot et al., 2019). An example of a successful, viable system to help increase vaccine uptake and Trust is the Vaccinate with Confidence framework adopted by the U.S. Centers for Disease Control and Prevention (CDC). The framework involved the adoption of a multi-communication strategy as well as multiple stakeholders such as healthcare providers, community leaders, and digital platforms to counter vaccine misinformation. It includes localized outreach through tailored campaigns and town hall meetings to improve vaccination intakes in underrepresented communities (Abad et al.,2024). Additionally, promoting COVID-19 preventive actions with vaccination programs when engaging with various local communities helps people understand the role vaccines play and increase confidence (Hygiene Hub, 2021). To improve vaccine confidence, there are factors to consider, such as involving the public by providing benefits and risks of vaccines, instilling Trust in immunization programs, and collaborating with all other health sector partners.

1.1.2 Online Mis/Disinformation

In the online sphere, the dissemination of unverified data, with or without an intention to cause harm, proliferates mistrust toward vaccination (Tomljenovic et al., 2020). Anti-vaccine movements and third parties spread misleading and false data to cause paranoia and harm (Polioeradication.org, 2021). Published studies emphasize the significance of social media in strengthening misinformation. However, a gap exists in the literature on the most effective ways to design interventions to counter vaccine mis- and disinformation. There is a literature gap on limited evaluation of framework efficacy as few studies assess the long-term effectiveness of the health communication framework in reducing misinformation and its impact on vaccine uptake.

The majority of evaluations focus on immediate or short-term changes in knowledge or attitudes rather than sustained behavior change (Shalbazi et al.,2024). There is also a gap in framework adaptability to platform dynamics where online platforms differ significantly in the way misinformation spreads and is consumed, for instance, between Facebook and Tictok. Most frameworks lack adaptability to these platform-specific dynamics and fail to address the rapid evolution of digital ecosystems (Warsame et al.,2020). There is a need for transparency in the decision-making process about vaccine policy; this is necessary to prevent allegations by antivaccine websites questioning the decision to approve vaccines for licensure, funding, and safety assessment after vaccine licensing (Connolly et al., 2012). vaccine safety and surveillance that support pharmacovigilance throughout the vaccine's life cycle, from preclinical evaluation to clinical development and licensure, are monitored indefinitely through the immunization program (Taylor et al., 2013).

1.1.3 Health Communication Frameworks

Health communication frameworks help communicators address questions about health messages on what, how, and who to communicate to. Health communication frameworks are useful for informed choices, adherence to public health standards, and positive behavioral change across communities. Examples of health communication frameworks include the WHO Strategic Communication Framework, Persuasive Health Message Framework, and Assess Do and Describe framework.

The Strategic Communication Framework, for instance, involves the use of information purposely to fulfil its long-term goals and objectives (Goldberg et al., 2021). The components of a Strategic Communication Framework are comprised of driving and restraining forces; driving forces aim at advancing the communication goal through efforts, contexts, and systems, while restraining forces are made up of efforts, contexts, and systems that compete with or restrict the communication goal. Restraining forces inherently have an advantage, such as people having limited memory, individuals being unpredictable with competing goals, fewer available resources to dispose of and mostly controlled by law and institutions (Goldberg et al., 2021).

The Persuasive Health Message Framework states that two different factors, the constant and transient factors, must be addressed before developing a communication message. It contains threat messages and efficacy messages, cues, and targets to specific audiences irrespective of topic message type and environment. The threat message makes the audience feel susceptible to severe threats, while the efficacy message convinces the audience to perform a recommendation response. The recommended response effectively averts the danger. Evidence suggests that when individuals perceive a high level of threat and high level of efficacy, then they are motivated to protect themselves against the threat (Witte et al., 2015).

There is limited literature regarding the effectiveness of different frameworks in leveraging the vast data available through digital and social media analytics to understand audience behavior, misinformation trends, and the virality of anti-vaccine content (Spitale et al., 2020). This narrative will strengthen evaluation metrics such as tracking of engagement rates, behavioral changes stemming through post-vaccine uptake social media campaigns and increased fact-checking reports on online platforms that help in reducing misinformation, all these, working to find out whether evaluation methods for intervention are consistently using standard metrics. The study will establish clear standard criteria for measuring the success of communication strategies in the form of engagement rates, misinformation reduction, and change in vaccine-related behaviors.

1.1.4 Interventions to Mitigate Online Mis/Disinformation

The development of effective interventions to counter misinformation and disinformation is vital for achieving optimal benefits in vaccination programs (Honora et al., 2022). Among interventions used to mitigate the dissemination of false information via digital platforms are print medium interventions by serving as a gatekeeper and a process where information is verified before publishing, video and multimedia, in-person interactive interventions, news articles, social media, message manipulations, and visual communications. Japan, for instance, noted to be one of the least vaccine-confident countries in the world, they realized that leveraging social media through interactive small-scale webinars that feature a live Q & session with medical professionals is an effective medium to address public concerns on vaccines and also increase overall public vaccine confidence (Kobayashi, T., et al., 2023). Additionally, in the Riggle-van Schagen S., et al. (2024)

studies, they discovered that when healthcare influencers share personal testimonies and engaging content through Instagram and Facebook on the efficacy of vaccines they have taken, it influences public perceptions and thereby increasing overall intake and confidence. Also, a rumour-tracking system was proposed by Sundelson et al. (2023) sought to assess the authenticity and authority of diverse information across social media and news platforms. Claflin et al. (2022) highlighted partnerships across national leaders, public health systems, and community organizations in addressing misleading and false data. In creating approaches, public health officials consider cultural aspects, family and community contexts, level of education, environment, and sociodemographic information (Whitehead et al., 2023; Schmid & Betsch, 2022). Current literature produced diverse information and effects and a lack of systematic analysis and description of health communication interventions to mitigate vaccine mis and disinformation. There is a wide variety of approaches, yet few rigorously assessed behavior outcomes such as quantum vaccine uptake and also interventions often focus on specific populations, especially high-income countries, leaving gaps in understanding its application across diverse socioeconomic and cultural contexts (Ruggeri et al., 2024).

1.1.5 Evaluating the Effectiveness of Health Communication Interventions

High-value objectives entail the following aspects: (1) capacity to address trends and changes in vaccination uptake and trust toward public health programs, and (2) reduction of systemic limitations in vaccination initiatives (Claffin et al., 2022; Head et al., 2020: Liu et al., 2020). Public health approaches such as developing ready-to-deploy communication strategies for responding to misinformation during health emergencies such as pandemics, consistent messaging to sustain efforts to communicate the safety and efficacy of vaccines using evidence-based approaches and tailoring the message to address specific concerns of vaccine hesitance groups and using trained and trusted messengers from within communities can improve vaccine acceptance. For example, studies emphasize the importance of balancing risk communication with empathy to avoid the "backfire effect" where direct refutation of beliefs increases resistance influenced high rates of adherence to vaccination standards and community practices. Continued research and

advancements are needed to develop more robust interventions that can guarantee the complete elimination of online mis-and-dis-information.

1.2 Public Health Problem

Exposure to vaccine mis- and dis-information is correlated with lower vaccine uptake. For instance, a study published in Nature Human Behavior found that exposure to mis- and disinformation about COVID-19 vaccines led to a decline in vaccination intent by 6.2 percentage points in the UK and 6.4 percentage points in the US among those who initially indicated they would accept a vaccine (Loomba et al., 2021). Also, a BMJ Global Health publication revealed that vaccine misinformation on social media has a strong effect on the behaviour of people, however, there are fewer evidence-based interventions to reduce the militating effects (Ruggeri et al., 2024). Adding to these, an analysis on ArXiv, looking at the negative impact of anti-vaccine tweets on COVID-19 vaccinations, realized that between February and August 2021, approximately 750,000 people in the USA refused vaccination, which resulted in a whopping 29,000 additional vaccine cases and 430 additional deaths (Bollenbacher, Menczer, & Bryden, 2024). These findings suggest the need for appropriate interventions to reduce mis-and-disinformation via social media to increase vaccine-intake confidence and promote overall public health globally.

1.3 Significance of the Study

Maintaining high coverage of vaccines is critical for preventing the recurrence of disease outbreaks. As a result, this study will help in addressing the public health problem as well as contributing to the general body of knowledge in health in increasing vaccine intake via the following:

- **Synthesizing Frameworks**: Providing a comparative analysis for using health communication to understand their application in countering vaccine misinformation on various offline and online platforms.

- **Filling Research Gaps**: Highlighting underexplored areas, such as the long-term impact of interventions and how the various platforms should be adopted to aid in promoting health via fact-checking, promoting vaccine confidence-related content and others.
- **Guiding Policy and Practice**: Offering evidence-based strategies for designing tailored interventions, with recommendations for integrating cultural and social contexts into public health communication across all online and electronic platforms.
- **Shaping Future Research**: Identifying opportunities for leveraging innovative technologies and mediums such as chatbots, webinars and other mediums to combat vaccine misinformation and increase general vaccine intake.

1.4 Problem Statement

Communication strategies that counter mis- and disinformation may be needed to promote vaccine uptake and maintain high vaccine coverage. Countering mis- and disinformation may not always be effective. It is not known how many communication interventions to counter mis- and disinformation are theory-based and if theory versus non-theory-based interventions differ in effectiveness. The paper conducts a review of published literature, which will contribute immensely to public health efforts by identifying gaps in current research and practices, synthesizing evidence-based strategies, and guiding policy and program development This literature review focuses on the health communication framework needed to deal with vaccine misinformation and disinformation. By combining insight from different studies to analyze communication framework, intervention for addressing online misinformation, and social and psychological factors influencing vaccine perceptions, this review is expected to inform future designs of interventions to mitigate vaccine mis and disinformation.

1.5 Scope of the Study

This study aims to synthesize new evidence in the practical application of health communication frameworks. The scope of this research includes examining various health communication frameworks used in interventions and their effectiveness in mitigating online misinformation and disinformation about vaccines.

1.6 Research Objectives

- To summarize health communication frameworks used in interventions to mitigate online mis- and disinformation about vaccines by intervention types, geographical locations, and vaccine types.
- To summarize health communication framework-based interventions to mitigate online vaccine mis- and disinformation.
- To examine the effectiveness of these interventions in mitigating online misinformation, changing health communication determinants, and vaccination-related outcomes.

CHAPTER 2

METHODS

2.1 Research Design

2.1.1 Overview of methodology

A narrative review of the published literature was undertaken. The narrative review allows for a more in-depth exploration of the varied health communication frameworks, providing context and background for the effectiveness of interventions. Unlike a systematic review, which focuses on quantifying evidence and comparing studies, a narrative review can offer richer insight into the nuances of different communication approaches, including their success, limitations, and cultural context.

This approach helps the reviewer to highlight the diverse nature of vaccine misinformation, ranging from conspiracy theories to misconceptions, and how different frameworks address these varying levels of complexity.

2.1.2 Inclusion Criteria

- The review utilized peer-reviewed articles published up to 2023.
- The study describes a (1) communication framework, (2) model, or (3) theory used in intervention design.
- The intervention addresses online vaccine mis- and dis-information
- Published in English

2.1.3 Exclusion criteria

The following research articles were excluded:

 Studies that focus on misinformation and disinformation, for example, word-of-mouth other than what is encountered online.

2.2 Search Strategy and Data Extraction

2.2.1 Search Strategy

The narrative literature review utilized a comprehensive search strategy implemented across three databases.

Table 1: Keywords used in database search

Search Terms and Keywords
PubMed: ("Health Communication"[Mesh] OR "health communicat*"[tw]) AND ("Vaccines"[Mesh] OR vaccine*[tw]) AND (twitter[tw] OR online[tw] OR "social media"[tw] OR "Social Media"[Mesh]) AND (misinformation[tw] OR disinformation[tw] OR false[tw] OR misleading[tw] OR inaccurate[tw])
Web of Science: "health communicate*" AND vaccine* AND online AND (misinformation OR disinformation OR false OR misleading OR inaccurate)
Scopus: "health communicate*" AND vaccine* AND online AND (misinformation OR disinformation OR false OR misleading OR inaccurate)

2.2.2 Data Extraction and Synthesis Methods

2.2.3 Data Extraction

Data extraction involves the systematic identification, collection, and organization of relevant information from selected studies. Specific data points extracted from studies included study information such as title, authors, year of publication, and journal. In the context of country or state, study population. The intervention-type type and health communication framework used.

Excel data extraction form was developed to extract data. All included studies met the inclusion criteria; studies were all peer-reviewed articles with publication dates not more than 10 years.

2.2.4 Data Synthesis

Data was synthesized by grouping all studies with similar characteristics and outcomes. Clinical analysis was done based on strengths, weaknesses, and inconsistencies in the use of the Framework, and thematic analysis was done by identifying recurrent themes.

2.2.5 Data Analysis

A coding process called Inductive Thematic Analysis was utilized to extract relevant information regarding the Communication Framework, Model, and Theory (Parnell et al., 2018). Inductive thematic coding extracts data without a pre-existing theory or assumption. The method strengthens analysis, ensures connection to significant information, and highlights critical understandings. Given the large scope of research on vaccination hesitancy, inductive thematic coding ensures adaptability to identify evolving arguments and key information. Coded data were allowed to develop into themes during the synthesis stage, which followed the Thematic Synthesis Method (Carolan et al., 2018). In data coding, the following phases were utilized: (1) line-per-line coding of obtained information, (2) organization of codes into relevant areas to create graphic themes, and (3) creation of systematic themes.

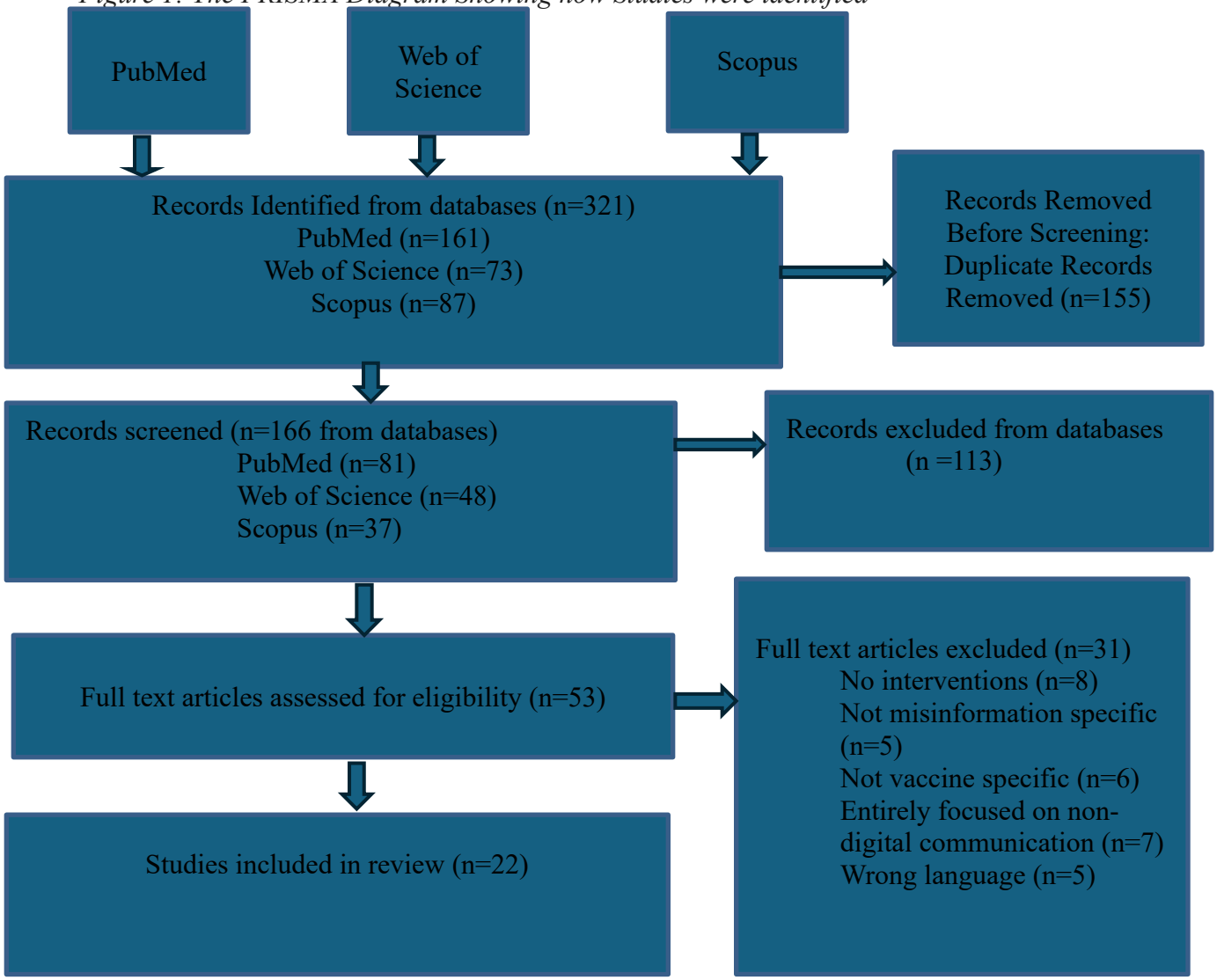
RESULTS

3.1 Overview

The search strategy used yielded results in the research process. Table 2 provides a detailed analysis of the studies used in the review.

Figure 1: The PRISMA Diagram Showing how Studies were Identified

Figure 1: The PRISMA Diagram Showing how Studies were identified



(Source: Kroke & Ruthig, 2022)

In Figure 1 above, 321 records emerged from the database search in the identification stage. One hundred fifty-five records were then removed from the list due to duplication. At the screening stage, the remaining 166 records were scrutinized. After this exercise, 113 records were excluded from consideration. Since 31 articles failed to meet the eligibility criteria, they were excluded from the review process. A total of 22 articles (studies from 2010 to 2023) were included in the review.

Table 2: Characteristics of Included Studies in a Narrative Review of Literature

Author	Year	Country/ State	Participants	Design Methods	Health Communication Framework	Key Findings and Intervention
Zhang et al.	2021	Wuhan	outbreak numbers from the National Health Commission of China and the Wuhan Health Commission	messagecentered approach	Government –Expert– Public Risk Communication model.	Universities and health institutions incurred the highest ratings during fact-checking and positive social media behavior regarding vaccines.
Scales et al.	2022	USA	Community stakeholders	Motivational interview	Identity process theory	-Behavioral motivations are associated with community-level resources. -Community-designated leaders and networks prevent online conflict and misinformation. -Community leaders disseminate high-quality information.

Yoneoka et al.	2022	Japan	Online participant	Survey	Novel Framework	hesitancy is addressed by optimization of online media campaigns via the type of attitude among viewers
Wilson & Wiyson ge	2020	globally	Online participant	Large-n crosscounty regression	a large crosscountry regression framework	The negative attitudes regarding vaccines on digital networking platforms are linked to poor vaccination rates. **Intervention** Social media companies taking down anti-vaccine content Foreign disinformation campaigns should be addressed at source
Edinger et al,2023	2023	USA	Tweeter users	Bidirectional Encoder representatio ns	Framework of S-BERT	Deep Learning highlighted cynicism, COVID-19, and vaccination. Real-time monitoring of social media responses, hashtags, downloads, and discourses can counter misleading information. **Intervention** Social media monitoring Counter disinformation with timely public health information

Characteristics of Included Studies in a Narrative Review of Literature Cont.

Author	Year	Country / State	Participants	Design/ Methods	Communication Framework used	Key Findings and Intervention
Wiliams et al, 2020	2020	United Kingdom	Patients with chronic respiratory disease	Qualitative Research Design - Interviews -Focus groups	Uniform manifold approximation projection (UMAP)	The study highlighted the importance of mass media in propagating vaccination during lockdown.
Schmid & Bets, 2022	2022	Global social media user	Participants who utilized social media to obtain information	Experimental design	Religiosity and spirituality models	Text-based refutations address the spread of misinformation. Spiritual background and preconceived notions must be addressed during online campaigns. **intervention** Text-based debunking Prebunking refutation

.Omisakin et al, 2023	2023	United State	Adult residents of Utah	Qualitative research - Interviews -Focus groups	Social cognitive theory	Integration of vaccine myths, drivers of vaccination uptake, and public c health measures in social media education and campaign. **Intervention** Understanding the role of belief in the emerging vaccine myth
Yang et al.	2023	United States of America	-Rural communities in the United States -Clinicians and community leaders	Experimental Design	Conditional model experimental manipulation	Community-based approach in social media campaigns, rhetoric, and information dissemination. Vaccine promotional media campaign **Intervention** Community-engaged approach

Paul et al.	2021	United Kingdom	-Adults from diverse sociodemographic backgrounds	Cross-sectional design	Social cognitive theory	**Intervention** Public health messaging among low socio-economic

Table 1: Characteristics of Included Studies in a Narrative Review of Literature Cont:

Author	**Year**	**Country / State**	**Participant**	**Design/ Methods**	**Communication Framework used**	**Key Findings and Intervention**
Schäfer et al.	2022	Germany	University students	Qualitative research - Interviews -Focus groups	Behavioral model	The sentiments of their peers shape the institution of college students to get vaccinated. **Intervention:** Trust Use of media information channel

Trümmler et al.	2022	Germany	University students	Crosssectional study	Behavioral model	University students avoid vaccines when they are exposed to inaccurate information. **Intervention** Evidence base information related to vaccine safety and benefit
Schneider et al.	2021	United States of America	R3STEP Approach	Quantitative research method	Behavioral change model	The data recommended the integration of scientific and cultural leaders in online education and vaccination campaigns. **Intervention**: Rigor and approval process of vaccines Scientific and cultural leaders endorsement of vaccination
Ennab et al.	2022	Africa	Pregnant women	Case study	Social cognitive theory	As per recommendation: -Global collaboration -Online health awareness campaign

						-Gender-focused messaging and reporting **Intervention** Government surveillance protected by law Development of a health communication program Social media chat box for pregnant women
Karafillakis et al.	2016	Europe	Healthcare workers - Vaccine providers in Croatia, France, Greece, and Romania	Qualitative (semistructured interview)	Likelihood model	-Mistrust toward pharmaceutical groups is due to financial aspects and low communication about side effects. **intervention** -Strategies require country-specific and context-specific to improve vaccination uptake. Education and improving information on vaccine safety .

Table 1: Characteristics of Included Studies in a Narrative Review of Literature

Author	Year	Country / State	Participant	Design/ Methods	Communication Framework used	Key findings and interventions
Vyas et al.	2018	Pacific	Students - of University the Pacific	Experimental (pre and post-assessment)	Behavioral change model	Post-test showed: -knowledge about vaccination contents -child/patient engagement -enhanced background regarding the effects of vaccines and the immune system -dispel the myth **Intervention:** Use of interpersonal communication skills

Giambi et al.	2018	Italy	Parents -Children aged 16 to 36 months	Cross-sectional research	Health belief model	-Parents reported safety and efficacy as the topmost concern. -Negative perceptions and advice from healthcare workers become factors to hesitate. **Intervention** Provision of univocal messages by healthcare providers

Table 1: Characteristics of Included Studies in a Narrative Review of Literature

Author	**Year**	**Country / State**	**Participant**	**Design / Method**	**Communication Framework Used**	**Key Findings and Intervention**

Nowak et al.	2016	United States of America	Review	Case Study	Tailoring Immunization Programs (TIP)	Hesitancy could be addressed through the following: -marketing and communication practices -special considerations -social media advocacy, stories, ambassadors, and intrapersonal communication -social media approaches are based on positive behaviors and determinants of health. **Intervention** Social marketing

Stahl et al.	2016	France	French mothers	Mixed Method (Qualitative and Quantitative Research	Health believe model	Utilizing web monitoring and Vaccinoscopie study results, the study highlighted the following: -social networks play a critical role in information dissemination and education -Controversy issues affect Trust and adherence among parents.
						Intervention Patient-provider relationship *Go big and go fast* on large digital plan

Bocquier et al.	2018	France	Parents	Cross-Sectional Research	Peretti-Watel et al. framework	-educational level affected vaccination hesitancy but income displayed insignificant findings. -parents who have higher education either delay or refuse vaccination. -commitment and Trust varied in vaccination hesitancy **Intervention** Educational intervention Healthcare professionals to communicate with vaccine-hesitant parents

Table 1: Characteristics of Included Studies in a Narrative Review of Literature

Author	Year	Country/State	Participant	Design / Methods	Communication framework used	Key findings and interventions
Butler et al.	2014	Europe	Vaccine hesitant subgroup	Descriptive study	Behavioral insight framework	Social determinants include parental priority, experience of healthcare workers, information accuracy, identification of vulnerability, and encounters between patients and healthcare workers. I**ntervention** Involvement of experts in sociologists, anthropologists, social marketers and disease-specific communicators

3.2 Objective 1: Health Communication Framework

The studies showed the following research aspects: (1) Intervention utilizes fact-checking to monitor information, (2) the theoretical models are based on health belief, social-cognitive, and elaboration likelihood, (3) assessments and outcomes highlighted increased vaccination, adherence to vaccination, and behavioral change in information consumption, and (4) potential biases pertained to responders from social media, limited sample size, and requirement for further studies.

3.2.1 The Health Belief Model

1. Williams et al. (2020) enumerated barriers to increased uptake of COVID-19 vaccinations. The behavior change framework informs medical professionals regarding appropriate strategies to eliminate misinformation and minimize its impact across diverse populations.
2. Giambi et al. (2018) conducted nationwide research to identify the causes and factors behind adherence, hesitation, and interruption. Utilizing social and behavioral models, the study led to the creation of policies and preparation for web information, online education, and telehealth services.
3. Stahl et al. (2016) examined internet usage and information consumption through the lens of the behavioral model. Findings showed that internet users require proper information dissemination and education regarding misleading content. Examining internet behaviors enables the construction of online communication methods to ward off fake news, conflicting data, and questionable information.
4. Butler et al. (2015) utilized a behavioral insight framework. The findings highlighted that prioritization, experience, accuracy, and engagement prevent families from hesitating and delaying vaccination. Integrating the Tailoring Immunization Program and research findings lead to the creation of online communication and education against misinformation.

3.2.2 The Social Cognitive Theory

1. Omisakin et al. (2023) highlighted that sociopolitical background, vaccine myth, and drivers of vaccination uptake must be considered when creating public health campaigns. A deep understanding of factors leads to efficient public awareness and online programs. Interventions recommended are Understanding the role of belief in the emerging vaccine myth

2. Paul et al. (2021) identified barriers to vaccination reliance and the disconnect between healthcare providers and communities among lower socioeconomic strata. The findings are connected to the first research question regarding the health communication framework to develop appropriate strategies against misinformation. The intervention is to carry out public health messaging among low socio-economic

Ennab et al. (2022) highlighted case reports regarding the plight of women in marginalized sectors that led to vaccination fear, especially among pregnant populations. Poverty, pregnancy, and gender are critical factors that affect vaccination uptake. The mentioned aspects corroborate the first research question that leads to the creation of interventions that are gender-focused. interventions such as Government surveillance protected by law and the development of a health communication program

3. Social media chat box for pregnant women

Bocquier et al. (2018) utilized a social model of health to identify sociocultural aspects, environmental factors, and economic standing among individuals and families. Vaccination commitment and delay are connected to educational level. The framework and findings enable healthcare professionals to communicate with vaccine-hesitant parents by creating communication systems and online education for parents to utilize.

3.2.3 The Elaboration Likelihood Model

1. Edinger et al. (2023) utilized deep Learning to explore and assess social media discourses utilized by the public regarding vaccination information. Integration of texts, discourses, case reports, and monitoring of online community activity refers to the health communication framework that leads to the creation of intervention.

2. Karafillakis et al. (2016) emphasized the need to identify critical factors regarding vaccination hesitancy and adherence among families. Health and behavioral models highlighted the creation of modern strategies that are country and context-specific to avoid confusion and disconnection. Strategies ranged from social media to online videos.
3. Nowak et al. (2016) highlighted the need for social engagement through a core health communication model. Identifying client perception, the core health communication model highlighted the following aspects: (1) target population, (2) program value, (3) campaign specifics, (4) 4Ps of marketing, and (5) research.
4. Nowak et al. (2015) utilized the core health communication model to strengthen marketing campaigns and dispel vaccination hesitancy. Social media behavior requires healthcare workers to integrate stories, advocacies, representations, and interpersonal commitment.

3.3. Objective 2: Interventions Developed Based on Health Communication Framework

The studies showed the following research aspects: (1) intervention utilized educational campaign, social media education, and the interrelationship between healthcare providers and communities; (2) theoretical models are based on health belief, social-cognitive, and elaboration likelihood; (3) assessments and outcomes emphasized vaccination uptake, behavioral change, sustained communication with healthcare providers, and information dissemination, and (4) potential biases include limited sample sizes, specific locations, and countries, and populations came from developed nations.

3.3.1 Behavioral Change

1. Vyas et al. (2018) explained that patient simulation (powered by technology) enabled healthcare workers to understand the attitudes of patients and enhance knowledge among healthcare workers. Disconnect between healthcare workers and patients increases vaccination hesitancy. Patient simulation fortifies communication skills and processing among healthcare workers.

- **Interrelationship Between Communities and Healthcare Workers**

1. Scales et al. (2022) highlighted the integration of community leaders to disseminate appropriate information, vaccination programs, and health objectives through online

platforms. In online discourses, community leaders address conflict and fake news that are spreading across neighborhoods.

2. Schneider et al. (2021) recommended collaboration with models and educators as part of an online campaign against vaccine misinformation. Models and educators address myths and misconceptions, belief systems, and political and peer influence, which affect the vaccination drive.

Educational and Social Media Campaign

1. Zhang et al. (2021) recommended fact-checking approaches, misinformation control, news media content management, and user algorithms to analyze public attitudes regarding COVID-19 vaccinations. Fact-checking provides an intensive approach to eliminating the spread of fear and mistrust among the public.
2. Schmid & Betsc et al. (2022) analyzed the merits and demerits of debunking techniques in confronting vaccine misinformation. They found that the dissemination of accurate information to the target audience can lead to improved usage of vaccines. These findings inform the second research question on interventions guided by the communication frameworks.

3.4 Objective 3: Efficacy of Interventions

The studies showed the following research aspects: (1) verified information and information dissemination, educational programs, social media campaigns, and online coordination with healthcare workers serve as effective approaches, (2) theoretical models are based on health belief and social-cognitive, (3) assessments and outcomes emphasized vaccination uptake, behavioral change, and information verification, and (4) potential biases include limited sample sizes, specific locations, and countries, and populations came from developed nations.

- **Increased Vaccination**

1. Wilson and Wiysonge (2020) found that engagement with negative online reviews about vaccines contributes to the low usage of vaccines, underscoring the role of the internet in shaping the success of public health initiatives. The inquiry provides insights that are useful

in addressing the third research question on the effectiveness of interventions created to combat vaccine misinformation and disinformation.

2. Trümmler et al. (2022) found that increased exposure to false claims about vaccines dissuades university students from receiving life-saving interventions. These findings provide insights into the third research question on the effectiveness of measures created to address vaccine misinformation and disinformation.

- **Adherence to Vaccination**

1. Schäfer et al. (2022) investigated the factors that influenced university students to participate in vaccination programs during the COVID-19 health crisis. Their results showed that peer attitudes considerably shape the intention to get vaccinated. The study's findings inform the third research question on health communication determinants.
2. Yang et al. (2023) assessed the effectiveness of social engagement and programs between clinicians and community leaders. Findings revealed that clinicians provide positive outcomes and persuasive capacities. Online testimonials utilized by clinicians encourage community members to partake in vaccination programs.

- **Behavioral Change in Information Consumption**

1. Yoneoka et al. (2022) explained that optimization of online media campaigns decreases hesitation, paranoia, and misconception regarding COVID-19 vaccinations. Systematic campaign messages provide effective messages to persuade people from various age groups.

3.5 Thematic Organization

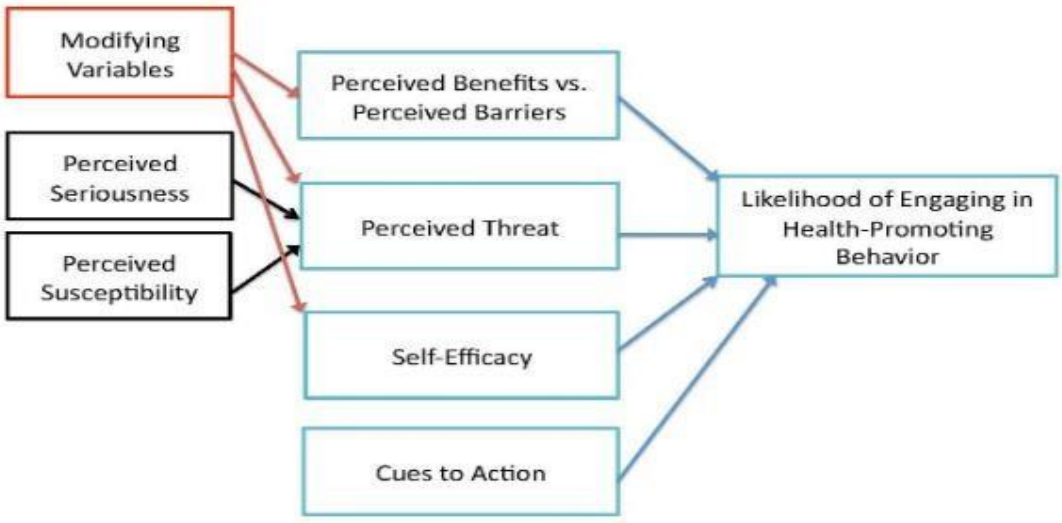
Three themes were obtained from the inductive thematic coding, namely:

1. Action-Directed Communication (ADC) Framework
2. Engagement Communication (EC) Framework
3. Risk Communication (RC) Framework

3.5.1 Theme 1: Action-Directed Communication Frameworks

The health belief model is an action-oriented health communication framework used to illustrate why individuals do not effectively engage in interventions to detect and prevent illnesses (Kroke & Ruthig, 2022). Figure 2 illustrates the core elements of the HBM. The framework is vital in explaining vaccine hesitancy and offering a mechanism to implement immunization programs. Five studies revealed that this framework could increase the uptake of vaccination, adherence to the program, and behavioral change by providing systematic strategies to strengthen public Trust in vaccines. Key roles of the Framework such as monitoring and detecting misinformation, understanding community concerns, and developing targeted communication with the future in mind, building resilience against future misinformation (Scales et al., 2022; Schmid & Betsc et al., 2022; Schneider et al., 2021; Zhang et al., 2021; WHO 2018, Vyas et al., 2018). Regarding online vaccine misinformation and disinformation, healthcare professionals deploying the HBM as a communication tool often emphasize increasing awareness of the possibility of contracting vaccine-preventable health conditions, underscoring the advantages of immunization, and confronting prevalent obstacles and misbeliefs (Carico et al., 2021). Vaccine-preventable conditions such as measles, Yellow Fever, Mumps, Polio, and Hepatitis A and B can be reduced through proactive communication and pre-bunking, improving health literacy, and leveraging social listening tools (Neely et al., 2022).

Figure 2: The Health Belief Model



Source: Kroke & Ruthig, 2022.

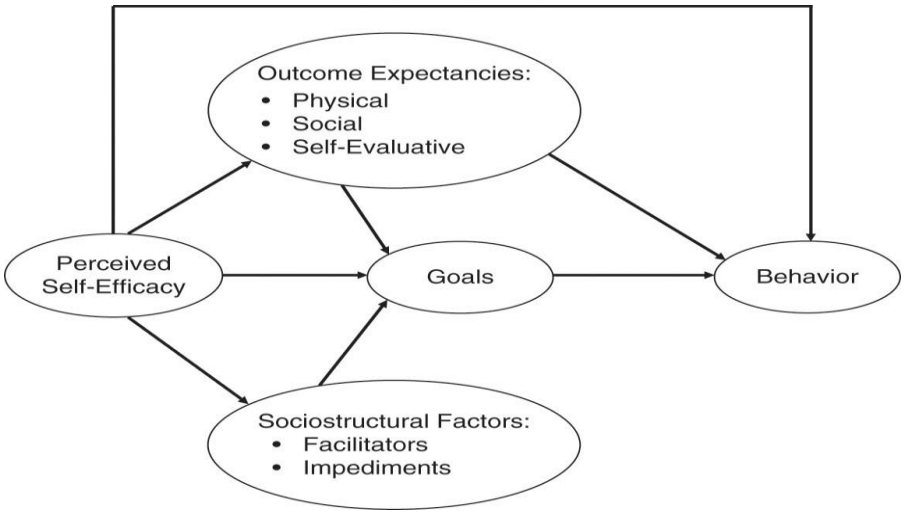
The Health Belief Model underscored the necessity of online verified information and public health statements in eliminating misconceptions and prejudice regarding COVID-19 and vaccination. (Kroke & Ruthig, 2022). News platforms contribute to public health initiatives by promoting verified information and full access to the public. The approach enables motivation among the public to strengthen health initiatives and well-being by highlighting vaccine efficacies. The study was meaningful as it led to a massive adoption of COVID-19 vaccines by lessening the spread of erroneous information.

3.5.2 Theme 2: Engagement Communication Frameworks

The social cognitive theory (SCT) has found application in health promotion. The FrameworkFramework operates on the premise that individuals mostly use observational Learning as a mechanism to acquire behavior (Ramirez et al., 2022). In Figure 2, it is evident that the social cognitive theory can be used to describe how attitudes and behaviors are developed. Yang et al. (2023), Trummler et al. (2023), Schafer et al. (2022), Yoneoka et al. (2022), and Wilson & Wiysongye (2020) revolved around the engagement communication framework. Supporting studies by Sleboda and Lagerkvist (2022) and Wiedermann et al. (2019) show that favorable outcomes are achieved through peer modeling as people naturally imitate the behaviors they see in others. Evidence suggests that social influence is pivotal in encouraging positive behaviors. In

online settings, it becomes vital to use peer networks to inspire health-consciousness among the target population.

Figure 3: The Social Cognitive Theory



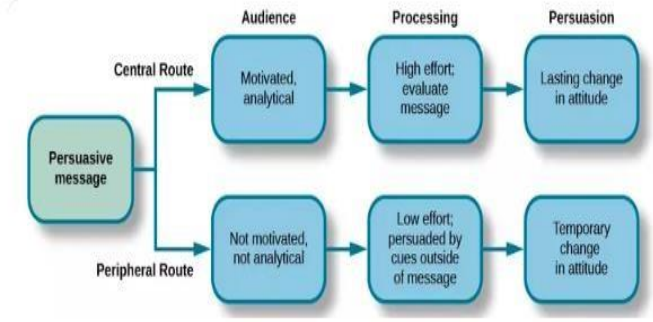
(Source: Ramirez et al., 2022)

The study by Ramirez et al. (2022) disclosed that disseminating health messages from trusted sources can counter fake news about vaccines, boost vaccination uptake, and trigger protective reactions. At the height of the COVID-19 pandemic, the researchers used social media influencers to instigate vaccine action. The content creators engaged with their online communities by sharing their personal experiences on Facebook, Instagram, and TikTok. According to Kroke and Ruthig (2022), using influential personalities legitimizes vaccination programs and increases the intentions that individuals will engage in them. The study highlighted the applicability of SCT in digital platforms. This theme is useful in answering the research question that sought to understand the effectiveness of health communication frameworks and the factors that influence their outcomes. In using the Social Cognitive Theory, sociocultural determinants play a significant role in shaping the impact of health messages. The drivers and barriers interact to influence how effective the health communication frameworks will be in the context of vaccine communication.

3.5.3 Theme 3: Risk Communication Frameworks

Health messaging is more effective when it incorporates persuasion. The Elaboration Likelihood Model (ELM) is a risk communication framework that holds that a person's motivation and ability to respond to a message affects how much they eventually delve into the details (Cheng et al., 2024). Figure 4 shows the different components of the ELM. In Table 3, Edinger et al. (2023), Omisakin et al. (2023), Ennab et al. (2022), Paul et al. (2021), Williams et al. (2020), Giambi et al. (2018), Bocquier et al. (2018), Stahl et al. (2016), Karafillakis et al. (2016), Nowak et al. (2016), Nowak et al. (2016), Nowak et al., (2015), and Butler et al. (2015), showed that risk communication frameworks can aid in improving the uptake of vaccination. The model focuses on the thinking processes involved when healthcare professionals strive to change attitudes and behaviors through communication, persuasion dynamics' impacts, and emerging evaluations' robustness.

Figure 4: The Elaboration Likelihood Model



(Source: Cheng et al., 2024)

Interventions based on the ELM seek to engage participants in a more comprehensive understanding of truthful vaccine information, thus decreasing vulnerability to misinformation and disinformation. Cheng et al. (2024) explored using ELM when developing digital learning materials that needed immersed participation through online discussion boards. With this technique, the practitioners sought to foster in-depth message processing by prompting individuals to evaluate the information they interact with about vaccines critically. The results of this study have been significant because there was a substantial increase in the adoption of information about immunization programs. The risk-based frameworks are linked with the research question that focuses on the interventions that have been established based on the modalities to address false vaccine information. For example, curated social media campaigns were highly effective during the COVID-19 pandemic since they focused on increasing risk perception among the target population.

CHAPTER 4

DISCUSSION

4.1 Summary of Findings

The research identified three framework types with significant potential to reduce the spread of inaccurate information about vaccines through online platforms. Synthesized studies found that the Health Belief Model, Social Cognitive Theory, and Elaboration Likelihood Model contain approaches that have contributed to successful vaccination initiatives. Each model has distinctive merits in confronting various elements of falsehoods, from amplifying the perceived risks of vaccine-preventable diseases to harnessing peer networks and nurturing critical thinking. Interventions such as behavioral change, establishing relationships between healthcare professionals and stakeholders, educational programs, and media campaigns address inconsistencies and hesitancies in vaccination uptake. The efficacy of interventions pertained to an increase in vaccination uptake, adherence to health protocols, and behavioral change when consuming online information.

4.2 Similarities and Differences with Published Literature

The diverse findings revealed that online vaccination communication and systematic approaches act as a unit to dispel mis- and disinformation. The findings also highlight the complex interplay of health communication frameworks, gaps in theoretical knowledge and practice, limitations in comparing approaches, and incorporation of psycho-social components of public health behaviors.

Finding 1: Mitigation May Be Approached through Empathic Dialogues

Addressing mistrust, false information, and low vaccination adherence through the following approaches: (1) human-centeredness and community exchange, (2) active listening between public health officials and community stakeholders, and (3) simplifying information and addressing technicality to provide seamless discourse. A concrete example pertains to how public health officials address myths and perceptions embedded in unverified news and data found on social media platforms and blogs. Vaccination discourse and public health counseling entail the utilization of empathy, community connection, and culturally appropriate actions (Maurici et al., 2019). Stakeholders adhere to public health initiatives as they build open communication and trust with medical professionals. Public health officials integrate empathy to understand sociocultural differences, paranoia and fear created by COVID-19, and community beliefs. The 3C (complacency, convenience, and confidence) Model leads to effective vaccination communication, direct service and implementation, and elimination of misleading data. 3C stands for 'complacency, convenience, and confidence' as factors behind parental and familial perceptions regarding vaccination. In educational workshops, healthcare professionals integrated the 3C Model to discuss vaccination rate, herd immunity, and social ability. Tailoring of programs, especially toward groups from lower socioeconomic strata, erased misinformation and disinformation propagated by unknown groups on the internet.

Finding 2: Mitigation May Require an Intervention

Groups that spread disinformation and misinformation may be intentional in their messages for non-health reasons, including politics and financial benefits. These sources may not be susceptible to empathy or evidence-based dialogues because they already know that they lied but still unknown objectives must be achieved. In a longitudinal study, Pierri et al. (2023) highlighted that unverified accounts spread misinformation and disinformation across Twitter, a social media platform,

because of diverse reasons that ranged from provoking fear and satisfying a political agenda. In such cases, a more persuasive approach, using HBM or ELM, may be more effective in converting them to the truth. In the modern landscape, people are dependent on social media platforms that range from Facebook to TikTok. Unverified third-party users take advantage of platforms to spin information in which policymakers need to create robust policies and immediate actions. Public health interventions must integrate frameworks and scientific interventions to address the complex interplay of political influence, sociocultural gap, psychological fear, and technological dependence. Social media platforms do not fully verify accounts and information that impede vaccination uptake and individual health accountability (Zhang et al., 2020). On the positive spectrum, Williams et al. (2023) stated how digitization of information counteracted unverified claims and malicious intent spread by third-party users. Healthcare systems and government leaders utilized Facebook, Twitter, and Instagram to promote vaccination benefits, protection from COVID-19, and community resiliency. Relevant findings revealed how public health officials integrate social cognitive and health belief theories in health communication to amplify individual responsibility, social cohesion, and vaccination acceptance. However, more studies are required to sustain communication approaches and reduce false information. Public health officials consider how circumstances vary and evolve, which requires research advancement and policymaking.

4.3 Implications

4.3.1 To Public Health Practice

The public health system is at the forefront in addressing mis- and misinformation across diverse populations. The relevant literature revealed that public health officials must utilize a multidimensional approach to motivate communities to adhere to vaccination and health standards. In community outreach, public health officials consider diverse sociocultural demographics, economic and health barriers, education level and access to the healthcare system, and social media attitude. Health messages must be integrated into direct discourse, educational programs, and community outreach. Health communication frameworks such as the Health Belief Model (HBM), Social Cognitive Theory, and the Elaboration Likelihood Model (ELM) are integrated into educational initiatives, community discourse, and medical outreach to mitigate false information

and malicious intent. The health models enable public health officials to streamline approaches, create communication systems, and directly address the negative effects of misleading data. Hesitancy and delay are addressed by a thorough understanding of individuals, families, and communities because of how they utilize social media. Social gaps and cultural practices limit vaccination trust and adherence.

4.3.2 To Public Health Policy

Policymaking strengthens the creation and implementation of vaccination education and community literacy. Policies help healthcare systems implement guidelines and approaches to eliminate inaccurate data, unhealthy social media consumption, and unverified theories about vaccination. Policymakers recommend best practices and regulations to social media companies to protect public interest and health information. Through the health frameworks, policies integrate peer-reviewed approaches, best practices, and communication methodologies to reach vulnerable populations. Literature findings highlighted that policies must remain adaptive to change and future occurrences.

4.4 Future Research

Research prospects necessitate an exploration regarding personalized and community-based campaigns to eliminate unverified claims regarding COVID-19 vaccines. Further assessment of health communication frameworks enables public health officials to modify approaches and match the practices to community needs. By gaining more information on how to ensure that the health messages resonate with the population, future research could potentially improve the outcomes of immunization programs. For instance, studies on how to harness the power of sociocultural perspectives could have a significant impact on how upcoming interventions will be delivered. Sinuraya et al. (2024) highlighted that in the past, cultures demanded equity to close the gap between developed and developing economies. In Indonesia, the public demanded equity to improve health outcomes and positive habits in diverse communities. Healthcare providers could utilize equity objectives and calls for social justice to amplify communication, programs, and connectivity. Future research directions entail the following: (1) to address synthesized evidence

on the use of frameworks, future studies could examine topical issues. Healthcare professionals could compare health communication frameworks in selecting appropriate communication strategies in diverse environments, (2) longitudinal studies could be performed to assess the longlasting efficacy of strategies aimed at addressing vaccine hesitancy and vaccine misinformation and disinformation, (3) scholars can explore the incorporation of psychological aspects of vaccination campaigns into the social dynamics, (4) the role of innovative tools, including artificial intelligence (AI) in mitigating inaccurate vaccine information promptly represents a potential area of future research, and (5) researchers can investigate the effects of culturally appropriate communication techniques on the uptake of immunization programs in an increasingly diversified world.

4.5 Strengths and Limitations

The present study examined multiple health communication frameworks to address the research problem. The diverse scholarly perspectives are crucial in enriching the research. The inquiry is also robust because it identified gaps in existing literature, setting the stage for areas of further study. However, some limitations within this review are the inclusion of studies published from 2010 to 2023 only. Also, while the study seeks to find the appropriate interventions, due to a lack of adequate and relevant data, the research used data primarily emanating from high-income countries.

4.6 Conclusion

Significant findings emphasize the critical integration of health communication framework in public health communication and monitoring, online educational programs, and community outreach. Health communication frameworks strengthen policies and implementation boost vaccination rate and support improvement in the quality of information across online channels.

REFERENCES

Abad, N., Bonner, K.E., Kolis, J., Brookmeyer, K.A., Voegeli, C., Lee, J.T., Singleton, J.A., Quartarone, R., Black, C., Yee, D., & Ramakrishnan, A. (2024). Strengthening COVID19 vaccine confidence & demand during the US COVID-19 emergency response. Vaccine.

Aïmeur, E., Amri, S., & Brassard, G. (2023). Fake news, disinformation and misinformation in social media: A review. Social Network Analysis and Mining, 13(1), 30.

Bernstein, H.H., Bocchini, J.A., Byington, C.L., Maldonado, Y.A., Barnett, E.D., Campbell, J.D., Davies, H., et al. (2017). Practical approaches to optimize adolescent immunization. Pediatrics, 139(3).

Bocquier, A., Fressard, L., Cortaredona, S., Zaytseva, A., Ward, J., Gautier, A., Peretti-Watel, P., & Verger, P. (2018). Social differentiation of vaccine hesitancy among French parents and the mediating role of Trust and commitment to health: A nationwide cross-sectional study. Vaccine, 36(50), 7666–7773. https://doi.org/10.1016/j.vaccine.2018.10.085

Bollenbacher, J., Menczer, F., & Bryden, J. (2024). Effects of Anti-vaccine Tweets on COVID-19 Vaccinations, Cases, and Deaths. arXiv. https://arxiv.org/abs/2406.09142

Butler, R., & MacDonald, N.E. (2015). Diagnosing the determinants of vaccine hesitancy in specific subgroups: The Guide to Tailoring Immunization Programmes (TIP). Vaccine, 33(34), 4176–4179. https://doi.org/10.1016/j.vaccine.2015.04.038

Carico, R. Jr., Sheppard, J., & Thomas, C. (2021). Community pharmacists and communication in the time of COVID-19: Applying the health belief model. Research in Social and Administrative Pharmacy, 17, 1984-1987. https://doi.org/10.1016/j.sapharm.2020.03.017

Centers for Disease Control and Prevention (CDC). (2023). Vaccinate with Confidence. Retrieved from https://www.cdc.gov/vaccines/partners/vaccinate-with-confidence.html

Cheng, H.L., Tan, C.M., Chiu, C.M., Huang, H.Y., & Lee, Y.C. (2024). Using the ELM to Explore the Impact of Fake News on Panic Vaccination Intention: Taiwan's COVID-19 Vaccination Phenomenon. Journal of Global Information Management (JGIM, 32(1), 1-39.

Clark, D., Kikut-Stein, A., Jesch, E., & Hornik, R. (2024). Should Communication Campaigns Promoting Vaccination Address Misinformation Beliefs? Implications from a Nationally Representative Longitudinal Survey Study among US Adults. Journal of Health Communication, 29(4), 265-273.

Clark, S.E., Bledsoe, M.C., & Harrison, C.J. (2022). The role of social media in promoting vaccine hesitancy. Current Opinion in Pediatrics, 34(2), 156-162.

Claflin, S.B., Klekociuk, S., Fair, H., Bostock, E., Farrow, M., Doherty, K., & Taylor, B.V. (2022). Assessing the impact of online health education interventions from 2010-2020: A systematic review of the evidence. American Journal of Health Promotion, 36(1), 201224.

Connolly, T., & Reb, J. (2012). Toward interactive, Internet-based decision aid for vaccination decisions: Better information alone is not enough. Vaccine, 30(25), 3813-3818.

de Koning, R., Utrilla, M.G., Spanaus, E., Moore, M., & Lomazzi, M. (2024). Strategies used to improve vaccine uptake among healthcare providers: A systematic review. Vaccine: X, 19, 100519.

Edinger, A., Valdez, D., Walsh-Buhi, E.R., Trueblood, J.S., Lorenzo-Luaces, L., Rutter, L.A., & Bollen, J. (2022). Misinformation and Public Health Messaging in the Early Stages of the Mpox Outbreak: Mapping the Twitter Narrative with Deep Learning (Preprint).

Ennab, F., Babar, M.S., Khan, A.R., Mittal, R.J., Nawaz, F.A., Essar, M.Y., & Fazel, S.S. (2022). Implications of social media misinformation on COVID-19 vaccine confidence among pregnant women in Africa. Clinical Epidemiology and Global Health, 14, 100981.

Excler, J.L., Saville, M., Berkley, S., & Kim, J.H. (2021). Vaccine development for emerging infectious diseases. Nature Medicine, 27(4), 591-600.

Giambi, C., Fabiani, M., D'Ancona, F., Ferrara, L., Fiacchini, D., Gallo, T., Martinelli, D., Pascucci, M.G., Prato, R., Filia, A., Bella, A., Del Manso, M., Rizzo, C., & Rota, M.C. (2018). Parental vaccine hesitancy in Italy – Results from a national survey. Vaccine, 36(6), 779–787. https://doi.org/10.1016/j.vaccine.2017.12.074

Gianfredi, V., Moretti, M., & Lopalco, P.L. (2019). Countering vaccine hesitancy through immunization information systems, a narrative review. Human Vaccines & Immunotherapeutics, 15(11). https://doi.org/10.1080/21645515.2019.1599675

Goldberg, Y., Mandel, M., Bar-On, Y.M., Bodenheimer, O., Freedman, L., Haas, E.J., Milo, R., Alroy-Preis, S., Ash, N., & Huppert, A. (2021). Waning immunity after the BNT162b2 vaccine in Israel. New England Journal of Medicine, 385(24), e85.Head, K. J., Kasting, M. L., Sturm, L. A., Hartsock, J. A., & Zimet, G. D. (2020). A national survey assessing SARS-CoV-2 vaccination intentions: Implications for future public health communication efforts. *Science Communication, 42*(5), 698-723.

Honora, A., Wang, K. Y., & Chih, W. H. (2022). How does information overload about COVID19 vaccines influence individuals' vaccination intentions? The roles of cyberchondria, perceived risk, and vaccine skepticism. *Computers in Human Behavior, 130*, 107176.

Hygiene Hub. (2021). Strategies for Promoting Vaccine Confidence and Uptake: Integration of COVID-19 Preventative Behaviours and Vaccination Programmes. Retrieved from https://resources.hygienehub.info/en/articles/5374253-strategies-for-promoting-vaccineconfidence-and-uptake-integration-of-covid-19-preventative-behaviours-and-vaccinationprogrammes

Karafillakis, E., Dinca, I., Apfel, F., Cecconi, S., Wűrz, A., Takacs, J., Suk, J., Celentano, L. P., Kramarz, P., & Larson, H. J. (2016). Vaccine hesitancy among healthcare workers in Europe: A qualitative study. *Vaccine*, *34*(41), 5013–5020.

https://doi.org/10.1016/j.vaccine.2016.08.029

Kayser, V., & Ramzan, I. (2021). Vaccines and vaccination: History and emerging issues. *Human Vaccines & Immunotherapeutics, 17*(12), 5255-5268.

Krishna, A., & Thompson, T. L. (2021). Misinformation about health: A review of health communication and misinformation scholarship. *American Behavioral Scientist, 65*(2), 316-332.

Kobayashi, T., et al. (2023). Effect of a mobile app chatbot and an interactive small-group webinar on COVID-19 vaccine intention and confidence in Japan: a randomized controlled trial. BMJ

Global Health, 8(5), e010370. https://gh.bmj.com/content/8/5/e010370

Kroke, A. M., & Ruthig, J. C. (2022). Conspiracy beliefs and the impact on health behaviors. *Applied Psychology: Health and Well-Being*, *14*(1), 311-328.

Kumar, D., Chandra, R., Mathur, M., Samdariya, S., & Kapoor, N. (2016). Vaccine hesitan cy: understanding better to address better. *Israel Journal of Health Policy Research*, *5*(1). https://doi.org/10.1186/s13584-016-0062-y

Lalani, H. S., DiResta, R., Baron, R. J., & Scales, D. (2023). Addressing viral medical rumors and false or misleading information. Annals of Internal Medicine, 176(8), 1113-1120.

Lee, S. K., Sun, J., Jang, S., & Connelly, S. (2022). Misinformation of COVID-19 vaccines and vaccine hesitancy. Scientific Reports, 12(1), 1–11.

Liu, C., Wang, D., Liu, C., Jiang, J., Wang, X., Chen, H., ... & Zhang, X. (2020). What is the meaning of health literacy? A systematic review and qualitative synthesis. Family Medicine and Community Health, 8(2).

Loomba, S., de Figueiredo, A., Piatek, S. J., de Graaf, K., & Larson, H. J. (2021). Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. Nature Human Behaviour, 5, 337–348. https://doi.org/10.1038/s41562-021-01056-1 Maurici, M., Arigliani, M., Dugo, V., Leo, C., Pettinicchio, V., Arigliani, R., & Franco, E. (2018). Empathy in vaccination counselling: a survey on the impact of a three-day residential course. Human Vaccines & Immunotherapeutics, 15(3), 631–636.

https://doi.org/10.1080/21645515.2018.1536587

Mende, M., Ubal, V. O., Cozac, M., Vallen, B., & Berry, C. (2024). Fighting Infodemics: Labels as Antidotes to Mis-and Disinformation? Journal of Public Policy & Marketing, 43(1)

Metwally, E. (2021). Vaccine Hesitancy Online: A Rhetorical Analysis Through Postmodern Narratives (Doctoral dissertation, Université d'Ottawa/University of Ottawa).

Morris, L., Mansell, W., Williamson, T., Wray, A., & McEvoy, P. (2021). Communication empowerment framework: An integrative framework to support effective communication and interaction between carers and people living with dementia. Dementia, 19(6), 1739-1757. https://journals.sagepub.com/doi/pdf/10.1177/1471301218805329

Neylan, J. H., Patel, S. S., & Erickson, T. B. (2022). Strategies to counter disinformation for healthcare practitioners and policymakers. World Medical & Health Policy, 14(2), 428436.

Nowak, G. J., Gellin, B. G., MacDonald, N. E., & Butler, R. (2015). Addressing vaccine hesitancy: The potential value of commercial and social marketing principles and practices. Vaccine, 33(34), 4204–4211. https://doi.org/10.1016/j.vaccine.2015.04.039

Nowak, G. J., Shen, A. K., & Schwartz, J. L. (2017). Using campaigns to improve perceptions of the value of adult vaccination in the United States: Health communication considerations and insights. Vaccine, 35(42), 5543–5550. https://doi.org/10.1016/j.vaccine.2017.08.064

Omisakin, O. A., Ulrich-Schad, J. D., Hunt, A., Givens, J. E., & Beacham, M. (2023). Belief in vaccine myths and vaccine uptake in Utah during the COVID-19 pandemic. Preventive Medicine Reports, 36, 102390.

Oxman, A. D., Fretheim, A., Lewin, S., Flottorp, S., Glenton, C., Helleve, A., ... & Rosenbaum, S. E. (2022). Health communication in and out of public health emergencies: to persuade or to inform? Health Research Policy and Systems, 20(1), 28.

Özdemir, V., & Springer, S. (2022). Decolonizing knowledge upstream: New ways to deconstruct and fight disinformation in an era of COVID-19, extreme digital transformation, and climate emergency. OMICS: A Journal of Integrative Biology, 26(5), 247-269.

Paul, E., Steptoe, A., & Fancourt, D. (2020). Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. The Lancet Regional Health - Europe, 1(100012), 100012.

Peretti-Watel, P., Ward, J. K., Schulz, W. S., Verger, P., & Larson, H. J. (2015). Vaccine Hesitancy: Clarifying a Theoretical Framework for an Ambiguous Notion. PLoS Currents, 7. https://doi.org/10.1371/currents.outbreaks.6844c80ff9f5b273f34c91f71b7fc289

Pierri, F., DeVerna, M. R., Yang, K.-C., Axelrod, D., Bryden, J., & Menczer, F. (2023). One Year of COVID-19 Vaccine Misinformation on Twitter: Longitudinal Study. Journal of Medical Internet Research, 25, e42227. https://doi.org/10.2196/42227

Piot, P., Larson, H. J., O'Brien, K. L., N'kengasong, J., Ng, E., Sow, S., & Kampmann, B. (2019). Immunization: Vital progress, unfinished agenda. Nature, 575(7781), 119-129.

Polioeradication.org. (2021). Vaccine misinformation management field guide. https://polioeradication.org/wp-content/uploads/2021/10/VACCINEMISINFORMATION-FIELD-GUIDE-V2B-AT.pdfRamirez, A. G., Despres, C., Chalela,

P., Weis, J., Sukumaran, P., Munoz, E., & McAlister, A. L. (2022). A pilot study of peer modeling with psychological inoculation to promote coronavirus vaccination. *Health education research*, *37*(1), 1-6.

Ramirez, A. G., Despres, C., Chalela, P., Weis, J., Sukumaran, P., Munoz, E., & McAlister, A. L. (2022). A pilot study of peer modeling with psychological inoculation to promote coronavirus vaccination. Health Education Research, 37(1), 1-6.

Riggle-van Schagen, S., et al. (2024). Assessing changes in COVID-19 vaccine uptake and intentions among the Brigada Digital Latino social media audience. BMC Digital Health, 2, Article number: 72. https://bmcdigitalhealth.biomedcentral.com/articles/10.1186/s44247-024-00131-7

Ruggeri, K., Vanderslott, S., Yamada, Y., Argyris, Y. A., Većkalov, B., Boggio, P. S., Fallah, M. P., Stock, F., & Hertwig, R. (2024). Behavioural interventions to reduce vaccine hesitancy driven by misinformation on social media. BMJ, 384, e076542. https://doi.org/10.1136/bmj-2023-076542

Scales, D., Gorman, J. M., DiCaprio, P., Hurth, L., Radhakrishnan, M., Windham, S., Akunne,

A., Florman, J., Leininger, L., & Starks, T. J. (2023). Community-oriented Motivational Interviewing (MI): A novel framework extending MI to address COVID-19 vaccine misinformation in online social media platforms. Computers in Human Behavior, 141, 107609.

Schäfer, M., Stark, B., Werner, A. M., Mülder, L. M., Heller, S., Reichel, J. L., ... & Dietz, P. (2022). Determinants of university students' COVID-19 vaccination intentions and behavior. Scientific Reports, 12(1), 18067.

Schmid, P., & Betsch, C. (2022). Benefits and pitfalls of debunking interventions to counter mRNA vaccination misinformation during the COVID-19 pandemic. Science Communication, 44(5), 531-558.

Schmid, P., & Betsch, C. (2022). Benefits and pitfalls of debunking interventions to counter mRNA vaccination misinformation during the COVID-19 pandemic. Science Communication, 44(5), 531-558.

Schneider, K. E., Dayton, L., Rouhani, S., & Latkin, C. A. (2021). Implications of attitudes and beliefs about COVID-19 vaccines for vaccination campaigns in the United States: A latent class analysis. Preventive Medicine Reports, 24, 101584.

Schuster, M., Eskola, J., & Duclos, P. (2015). Review of vaccine hesitancy: Rationale, remit and methods. Vaccine, 33(34), 4157–4160. https://doi.org/10.1016/j.vaccine.2015.04.035

Sinuraya, R. K., Nuwarda, R. F., Postma, M. J., & Suwantika, A. A. (2024). Vaccine hesitancy and equity: lessons learned from the past and how they affect the COVID-19 countermeasure in Indonesia. Globalization and Health, 20(1). https://doi.org/10.1186/s12992-023-00987-w

Skafle, I., Nordahl-Hansen, A., Quintana, D. S., Wynn, R., & Gabarron, E. (2022). Misinformation about Covid-19 Vaccines on Social Media: Rapid Review. Journal of Medical Internet Research, 24(8).

Sleboda, P., & Lagerkvist, C-J. (2022). Tailored communication changes consumers' attitudes and product preferences for genetically modified food. Food Quality and Preference, 96,

104419. https://doi.org/10.1016/j.foodqual.2021.104419

Spitale, G., Biller-Andorno, N., & Germani, F. (2023). AI model GPT-3 (dis) informs us better than humans. Science Advances, 9(26), p.eadh1850.

Stahl, J.-P., Cohen, R., Denis, F., Gaudelus, J., Martinot, A., Lery, T., & Lepetit, H. (2016). The impact of the web and social networks on vaccination. New challenges and opportunities are offered to fight against vaccine hesitancy. Médecine et Maladies Infectieuses, 46(3), 117–122. https://doi.org/10.1016/j.medmal.2016.02.002

Sundelson, A. E., Jamison, A. M., Huhn, N., Pasquino, S. L., & Sell, T. K. (2023). Fighting the infodemic: the 4 i framework for advancing communication and Trust. BMC Public Health, 23(1), p.1662.

Tomljenovic, H., Bubic, A., & Erceg, N. (2020). It just doesn't feel right–the relevance of emotions and intuition for parental vaccine conspiracy beliefs and vaccination uptake. Psychology & Health, 35(5), 538-554.

Trümmler, J., Heumann, E., Helmer, S. M., Busse, H., Stock, C., Negash, S., & Pischke, C. R. (2022). Determinants of vaccination behavior among university students 20 months after the COVID-19 outbreak: Results of the COVID-19 German Student Well-being Study (C19 GSWS). Human Vaccines & Immunotherapeutics, 18(7), 2141497.

Vyas, D., Galal, S. M., Rogan, E. L., & Boyce, E. G. (2017). Developing Vaccine Advocates: Training Students to Address Vaccine Hesitancy and/or Refusal. American Journal of Pharmaceutical Education, 82(8), ajpe6338. https://doi.org/10.5688/ajpe6338

Wardle, C., & Derakhshan, H. (2017). Information disorder: Toward an interdisciplinary framework for research and policymaking. Vol. 27. Strasbourg: Council of Europe.

Warsame, M. H., & Ireri, E. M. (2022). Fintechs' Future in Kenya: Does Social Influence Matter? Journal of African Business, 23(4), pp.1067-1087.

Whitehead, H. S., French, C. E., Caldwell, D. M., Letley, L., & Mounier-Jack, S. (2023). A systematic review of communication interventions for countering vaccine misinformation. Vaccine, 41(5), pp.1018-1034.

Wiedermann, U., Garner-Spitzer, E., & Wagner, A. (2019). Primary vaccine failure to routine vaccines: Why and what to do? Human Vaccines & Immunotherapeutics, 12(1), 239-243. https://www.tandfonline.com/doi/pdf/10.1080/21645515.2015.1093263

Williams, L., Gallant, A. J., Rasmussen, S., Brown Nicholls, L. A., Cogan, N., Deakin, K., Young, D., & Flowers, P. (2020). Towards intervention development to increase the uptake of COVID-19 vaccination among those at high risk: Outlining evidence-based and theoretically informed future intervention content. British Journal of Health Psychology, 25(4).

Wilson, S. L., & Wiysonge, C. (2020). Social media and vaccine hesitancy. BMJ Global Health, 5(10), e004206.

Xiao, X., Su, Y., & Lee, D. K. L. (2021). Who consumes new media content more wisely? Examining personality factors, SNS use, and new media literacy in the era of misinformation. Social Media + Society, 7(1), 2056305121990635.

Yang, S., Tao, R., Mahima Bhattar, Shen, L., Jones, M., Garbacz, A., & Susan Racine Passmore. (2023). Designing and testing social media campaign messages to promote COVID-19 vaccine confidence among rural adults: A community-engaged approach featuring rural community leader and clinician testimonials. Preventive Medicine Reports, 36, 102508–102508.

Yoneoka, D., Eguchi, A., Nomura, S., Kawashima, T., Tanoue, Y., Murakami, M., Sakamoto, H., Maruyama-Sakurai, K., Gilmour, S., Shi, S., Kunishima, H., Kaneko, S., Adachi, M., Shimada, K., Yamamoto, Y., & Miyata, H. (2022). Identification of optimum combinations of media channels for approaching COVID-19 vaccine unsure and unwilling groups in Japan. The Lancet Regional Health - Western Pacific, 18, 100330.

Zhang, J., Featherstone, J. D., Calabrese, C., & Wojcieszak, M. (2021). Effects of fact-checking social media vaccine misinformation on attitudes toward vaccines. Preventive Medicine, 145, 106408.

Zhang, L., Li, H., & Chen, K. (2020). Effective risk communication for public health emergency: Reflection on the COVID-19 (2019-nCoV) outbreak in Wuhan, China. Healthcare, 8(64), 1-13. http://dx.doi.org/10.3390/healthcare8010064

Zimmerman, T., Shiroma, K., Fleischmann, K. R., Xie, B., Jia, C., Verma, N., & Kyung Lee, M. (2022). Misinformation and COVID-19 Vaccine Hesitancy. Vaccine, 41(1). https://doi.org/10.1016/j.vaccine.2022.11.014.