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EDITED BY

Yi Luo,
Montclair State University, United States

REVIEWED BY

Dušan Mladenović,
Masaryk University, Czechia
Romate John,
Central University of Karnataka, India

*CORRESPONDENCE

Ojonimi Godwin Alfred
✉ oalfred@hum.uc3m.es

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Drivers of vaccine mis/ disinformation in the media: from personal beliefs to cultural dimensions

Ojonimi Godwin Alfred*, Daniel Catalan-Matamoros and
Carlos Elias

MediaLab Research Group, Department of Communication, Universidad Carlos III de Madrid, Getafe,
Spain

Introduction: The unabated spread of vaccine mis/disinformation poses a great challenge to the achievement of the SDG 3 and Universal Health Coverage (UHC) goals. This systematic review synthesizes the drivers of vaccine mis/disinformation in the media and how geography shapes these drivers through the lens of Hofstede's cultural dimensions theory.

Methods: A search was conducted in Scopus, Web of Science, and PubMed for studies between 2011 and 2024, arriving at a final sample of 27 studies. Emerging drivers of vaccine mis/disinformation identified were categorized into four levels—individual, message, platform, and societal levels with the individual-level (personal-related) drivers dominating the spread of vaccine mis/disinformation.

Results: Results reveal that though individual-level drivers such as being right-wing authoritarian, religious, or being an older male drive the spread of vaccine mis/disinformation on the demand side, message-level drivers including emotional framing and introduction of expert cues in messages also significantly drive the spread of vaccine mis/disinformation from the supply side. Further findings revealed that the prevalent cultural dimension in different climes played significant roles in the prevalence of drivers across certain geographies.

Discussion: The high-power distance culture of developed societies such as North America reflected the prevalence of the message-level driver given the mature and robust research and media ecosystem. Conversely, African and Asian societies which are tilted to the collectivism dimensions of Hofstede's dimensions theory showed a higher propensity for individual-level drivers, given that the social identity in a collectivist society shapes the behaviors of individuals. The study concluded that cultural theories predict the dominance of how vaccine mis/disinformation spreads in different geographies. Further findings revealed an overlapping complementary relationship between drivers. It was thus recommended that future reviews and studies should deeply explore these relationships and how they shape vaccine mis/disinformation discourse across geographies.

Systematic review registration: <https://www.crd.york.ac.uk/PROSPERO/recorddashboard>, CRD42024601978.

KEYWORDS

vaccine mis/disinformation drivers, vaccine hesitancy, cultural dimension, systematic review, media

Introduction

Vaccines are among the safest preventive medical interventions in human history, averting an estimated 3.5 to 5 million deaths annually, markedly improving global health outcomes (WHO, 2024). Despite this, immunization rates continue to decline in many regions of the world, partly driven by vaccine hesitancy- the delay or outright refusal of vaccines despite availability (WHO SAGE Working Group on Vaccine Hesitancy, 2014). This continuously undermines global public health and immunization efforts (WHO, 2019) at achieving universal health coverage and the sustainable development Goal 3 (SDG3) targets. Declining immunization uptake due to vaccine hesitancy has dire implications for global health, evidenced by the recent resurgences of Measles in developed regions of the world, with a global mortality of over 140,000 in 2018 alone (Carrieri et al., 2019; CDC, 2024).

A key contributor to vaccine hesitancy is the twin problem of vaccine misinformation and disinformation -the spread (intentionally and unintentionally) of false information about vaccines. Recent studies (Nwachukwu et al., 2024; Serge Andigema and Tania Cyrielle, 2024; Morejón- Llamas, 2023) have linked vaccine hesitancy to widespread mis/disinformation and conspiracy theories about vaccines. Although this circulation of falsehoods about vaccines, with its far-reaching consequences has always existed (Eddy et al., 2023; Eichman and Bichianu, 2024; Schwartz, 2012), the recent COVID-19 pandemic marked a new era, an all-time high of widespread circulation of misleading vaccine narratives and aggressive anti-vaccine messaging. This proliferation has led to a distorted understanding of immunization facts among the public, prompting public skepticism toward vaccines (Posetti and Bontcheva, 2020), a critical challenge that negatively influences public health decision-making.

Public health practitioners, policymakers as well as researchers have advanced varying interventions- including fact-checking and debunking mechanisms - to combat vaccine mis/disinformation. Although the deployment of these interventions and efforts have yielded significant positive results as recorded in literature (Whitehead et al., 2023; Schmid and Betsch, 2022; Xue et al., 2022), vaccine mis/disinformation continues to spread, necessitating the quest for impactful interventions to combat this spread (Schmid and Betsch, 2022). Understanding how these messages circulate, particularly the factors that motivate widespread circulation becomes crucial for designing effective interventions that directly respond to these drivers.

The propagation of vaccine mis/disinformation is prompted by different influences including- contextual, individual/group, and vaccine-specific across different parts of the world (World Health Organization SAGE Working Group, 2014). Studies have increasingly focused on a diverse range of drivers behind the spread of vaccine mis/disinformation- ranging from the quest for financial gain (Tokojima Machado et al., 2020), to the emotional triggers, low media literacy, religious beliefs, right-wing authoritarian attitudes, and affordances of social media platforms through echo chambers (Dunn et al., 2015; Lundy, 2023; Moran et al., 2022). Even though these studies have explored drivers individually across different contexts, with different study designs, and studying different vaccine types, they have mainly created a fragmented view of these drivers in literature. In the quest for an all-encompassing intervention that provides broad-level view across all vaccine types, media types, and contexts, it becomes critical to synthesize available evidence regarding the drivers of vaccine mis/information. In the same development, the complex interplay of these drivers and regional/cultural orientation using established cultural theories additionally

remains underexplored. Our review, therefore, addresses this gap in literature by synthesizing the existing studies while also evaluating the global and geography-specific prominence of the drivers of vaccine mis/disinformation, guided by the lens of the cultural dimensions theory.

Existing reviews have also provided different focus in literature, with some focusing on the broad health misinformation landscape (Wang et al., 2019), others narrowly focusing on the COVID-19 pandemic and vaccines (Malik et al., 2023; Skafle et al., 2022), focusing on single media types (social media) and specific vaccines, limiting their relevance to the vaccine mis/disinformation discourse in general. While these research efforts exist, none has holistically analyzed vaccine mis/disinformation drivers across all vaccine types, media types, disaggregated by geographical contexts. Based on the foregoing, this review, following PRISMA guidelines, systematically synthesizes published studies (between 2011 and 2024) to examine drivers of vaccine mis/disinformation across traditional and digital media, while examining the cultural dimensions of these drivers across geographic contexts.

Literature review

Key concepts

Misinformation and disinformation are key concepts in this review that guide the extraction of relevant data. Whereas Misinformation and disinformation both point to the dissemination of false and/or inaccurate information to the public by different actors (Praveenkumar, 2024), there is a difference in the intent. Misinformation is oftentimes not deliberate, and hence not intended to deceive or achieve preconceived sinister goals, while disinformation refers to the deliberate creation, presentation dissemination of verifiably false information to deceive the public intentionally, cause public harm, or for economic gain (European Commission, 2018). Equally, a UNESCO report (Posetti and Bontcheva, 2020) has broadly defined disinformation as “content that is false and has potentially negative impacts” (P.1). Further, they aver that the goal of the person producing or sharing such inaccurate content differentiates disinformation from misinformation.

Despite these stated differences in the use of both terms, the distinction appears to be more plausible theoretically, because it is difficult to differentiate in practice (Wang et al., 2019). Similarly, it has been shown that there exists an issue of conceptual clarity and distinction among and between these terms (Broda and Strömbäck, 2024), hence some studies explore these terms and conduct a general analysis without making major distinctions among them (Skafle et al., 2022). The incumbent study is not aimed at establishing the different ways the terms have been studied distinctly rather, it adopts all-encompassing approach to view the subject matter. Consequently, our review categorizes both terms in the same block of information disorder while not differentiating between both concepts as the impact of false content is potentially the same, irrespective of the intentions (Posetti and Bontcheva, 2020). Whereas drivers of false vaccine content could be outcomes of misinformation or disinformation, our goal in this review is to provide a broad perspective about the dissemination of misinformation and disinformation, the agent, the message, and the interpreter (Wardle and Derakhshan, 2017).

Other key concepts we have used in this review include drivers, and media. ‘Drivers’ has been used in previous research (Wang et al., 2019) to refer to the facilitators of the spread of misinformation across the media. Drivers in this study would range from message content to

characteristics of individuals, to platform characteristics, that enable the diffusion of vaccine mis/disinformation in the media. The media includes studies about the social media and traditional media. Existing reviews have significantly focused on social media in health and vaccine mis/disinformation discourses (Malik et al., 2023; Skafle et al., 2022), however, the circulation of vaccine misinformation predates the widespread use of the social media. It is based on this that we have deemed it fit to include studies from both media types.

Theoretical underpinning

This review is anchored on Hofstede’s (2011) cultural dimensions theory and Wardle and Derakhshan’s (2017) framework of information disorder. The Cultural dimensions theory explains the relationship between culture and the behaviour of the members of that culture. It describes the “effects of culture on the values of its members and how these values relate to the behaviour of people who live within a culture” (Nickerson, 2023). The theory goes beyond the collective nature of culture to espousing the idea that this phenomenon is connected to different collectives called dimensions. Hofstede initially identified four dimensions in his seminal work, namely; individualism and collectivism, power distance, uncertainty avoidance, and masculinity and femininity. Two more dimensions emerged as products of validation studies- long-term or short-term orientation (see Hofstede and Bond, 1988); and Indulgence versus Restraint (see Hofstede et al., 2010). A critical objective of our review is to examine the interplay of vaccine mis/disinformation drivers across different cultures marked by geographies, hence the adoption of this theory. Through the lens of these dimensions, we analyze and advance reasons for geographical variations in the drivers of vaccine mis/disinformation, showing why some drivers are more dominant in some cultures than others. Although the studies that led to the theory examined national cultures as the units of analysis, our review takes a broader geographical standpoint at the continental level.

In their elements of information disorder, Wardle and Derakhshan provide a lens through which disinformation and misinformation -both are components of information disorder- can spread (see Figure 1). They provide three major elements- the agent, the message, and the interpreter- to explain how the process of creating, producing, and reproducing mis/disinformation works. The agent for our study is like the interpreter who disseminates the message, however, our focus is on the characteristics and motivations of these actors as developed by Wardle and Derakhshan (2017), which could be financial, political, social, and psychological. These motivations provide a framework to clearly conceptualize the human characteristics and motivations that drive vaccine mis/disinformation. The message element in the framework provides an avenue to examine the framing and construction of vaccine mis/disinformation content and how the message is shaped to induce a certain kind of reaction by the spreaders- agents and interpreters. The framework guides our view of the major factors that drive vaccine mis/disinformation.

The cultural dimensions theory enables us to interpret how geographical/cultural variations affect the spread of vaccine mis/disinformation in different contexts, explaining why certain drivers are more dominant in a context than others. The *agent-message-interpreter* model provides a narrower lens, focusing on how individuals (not national cultures) and message characteristics drive the spread of vaccine mis/disinformation.

Existing evidence

Vaccine mis/disinformation, as major contributors to vaccine hesitancy has long been a subject of discourse among scholars, policymakers, and public health workers alike, given its continued influence on immunization programs across the world, limiting the potentials of achieving the SDG3 goal of universal health coverage (UHC). While the WHO has noted that vaccine hesitancy is a continuum between acceptance and outright refusal of vaccines



FIGURE 1
Agent-message-interpreter framework of information disorder. Source: Wardle and Derakhshan (2017).

(WHO SAGE Working Group on Vaccine Hesitancy, 2014), the proliferation of vaccine mis/disinformation contribute to each phase of the hesitancy spectrum.

Reviews have explored issues around misinformation and disinformation in health with limited focus on vaccines in general. While some of these reviews have a narrow focus, if they are about vaccines, others treat broader issues around health misinformation. The closest review to the current study (Zhao et al., 2023), in our opinion focused on misinformation evidence related to COVID-19 vaccines alone, without geographical insights explained through the lenses of a cultural theory. The review synthesized evidence on the prevalence, features, influencing factors, impacts, and solutions as regards COVID-19 misinformation from January 2020 to August 2022. In the same vein, a similar study (Skafle et al., 2022) - a rapid review of COVID-19 misinformation on the social media was conducted in 2021, with strict focus on COVID-19 as a pandemic and disease, not a specific focus on vaccines. On one hand, these reviews were narrow in scope, given that they were limited to the COVID-19 pandemic or vaccines, leaving out evidence about studies that focused on other vaccines, while on the other hand they omitted studies that were published before 2020 and beyond 2022. It has been noted that the spread of vaccine misinformation did not commence with the COVID-19 vaccines (Eddy et al., 2023; Schwartz, 2012), and such, there is a critical need to explore earlier studies about other vaccines before the start of the COVID pandemic.

Another review (Malik et al., 2023) recently explored the factors related to the sharing of COVID-19 misinformation on social media. The researchers discovered five major factors associated with COVID-19 misinformation sharing on social media, including socio-demographic characteristics, financial considerations, political affiliation or interest, conspiracy ideation, and religious factors. This review provided a blueprint for creating categories from the drivers of misinformation in the media; however, the review was significantly targeted at the COVID-19 pandemic in general, with less emphasis on vaccines, which is the focus of the current study. While this review focused on the disease, it provides a concrete blueprint for separating drivers or factors into varying categories.

Other studies have researched the spread of health misinformation generally. A review (Moran et al., 2022) explored the drivers of health-related misinformation between 2012 and 2018. The review revealed how immunization and infectious diseases were prevalent in health misinformation discourses, with a significant number of studies from the social media. This study, however, paid little attention to the drivers of vaccine misinformation in the media.

Current literature about the drivers of mis/disinformation, illustrated by the identified systematic and rapid reviews, falls short of proffering solutions to the continued spread of vaccine mis/disinformation across the media. These studies have either generally focused on COVID-19 vaccines alone, focused on only social media, focused on shorter timeframes, focused on the broad health misinformation spectrum, or laid emphasis on the interventions advanced against the spread. This reveals a gap, which this current study fills by synthesizing evidence about all vaccines, with a geographical nuanced perspective, across both traditional and social media, and as well as an extended timeframe which stretches from the decade of vaccines (World Health Organization, 2019) to the aftermath of the COVID-19 pandemic. This is with the aim of providing a single, concise evidence.

Methods

We conducted a systematic literature review of peer-reviewed published articles on three major public health databases- Web of Science (WoS), Scopus, and PubMed to retrieve relevant articles following PRISMA guidelines. The research team unanimously developed and agreed on a protocol and search strategy for the review, pre-registered on Prospero with reference number CRD42024601978.

Database search

Our team searched the databases in September 2024 to retrieve relevant articles for the study. These databases have been employed in a range of previous reviews encompassing vaccination misinformation (Skafle et al., 2022; Zhao et al., 2023). The search included articles published in 14 years (01/01/2011 to 30/06/2024) at the intersection of vaccines, mis/disinformation, media, and drivers. The study period was decided upon to ensure that our review covers a crucial period in global immunization that witnessed an increased relevance of the new media in health communication dynamics (Huo and Turner, 2019; Putri et al., 2023; Yao, 2024). This period witnessed a surge in vaccine discourses with 2010–2020 being labeled as the decade of vaccines (World Health Organization, 2019). Studies related to the pandemic, the Ebola epidemic, as well as the development and adoption of a wide range of vaccines in different countries are targeted. The researchers also retrospectively extended the timeframe to be able to ascertain trends beyond the immediate COVID-19 pandemic, which resulted in an *infodemic* as cautioned by the WHO Director General (WHO, 2020). Search languages were limited to English language and Spanish since the research team has a combination of proficiency in both languages.

Search strategy

Studies were included regardless of their methodological quality and risk of bias. The focus on describing and synthesizing patterns rather than establishing causation influenced the decision to include studies despite their Risk of Bias. Our searches included MeSH terms as well as keywords and synonyms relevant to the study objectives which bother on the media, vaccines, drivers (or influencers), as well as mis/disinformation. The search keywords/terms were generated from previous similar studies as well as from initial pilot searches conducted by the study team members (Table 1).

The study included original observational and intervention studies published in peer-reviewed journals. Other inclusion criteria were:

- i Articles with a focus on vaccination (all types of vaccines) and dis-misinformation spread.
- ii Studies that have any objective(s) that deal with drivers (implicitly or explicitly) of vaccine mis/disinformation.
- iii Articles written in English or Spanish languages.
- iv Studies from all fields of knowledge. Not limited to health or communication sectors.

TABLE 1 Search strategy.

Search theme	Keywords used	Boolean operators	Combined search string
Driver	Driver*, factor*, cause*, influencer*, determinant*, *facilitator*	OR	Driver* OR factor* OR cause* OR influencer* OR determinant* OR *facilitator*
Vaccines	Vaccin*, immuni*	OR	Vaccin* OR immuni*
Mis/disinformation	Misinformation, “fake news”, disinformation, “false information”	OR	Misinformation OR “fake news” OR disinformation OR “false information”
Media platform	Media, “mass media”, “social media”, Facebook, Twitter, Instagram, TikTok, YouTube, radio, newspaper, television	OR	Media OR “mass media” OR “social media” OR Facebook OR Twitter OR Instagram OR TikTok OR YouTube OR radio OR newspaper OR television
Final string		AND	Combine the above using ‘AND’

Bolded terms indicate the final search string, which is a combination of all the keywords using the ‘and’ boolean operator for database queries.

Our strategy excluded review articles of all types as well as opinion papers, position, conceptual, or argumentative papers without original empirical evidence, book chapters, theses, clinical trials, conference papers, reports, letters, editorials, comments, and textbooks. We also excluded studies with no objective focused on drivers of mis/disinformation in the media or those that were not related to vaccine misinformation, disinformation, fake news, or conspiracy theories. All the authors agreed on the inclusion and exclusion criteria applied in the studies and two actively participated in the entire article selection process.

First, searches were conducted on individual strings concerning the four major components of the study (vaccine, media, mis/disinformation, and drivers). After these four initial searches were conducted using the ‘or’ Boolean operator and the ‘*’ truncator operator, a fifth search combining these four initial searches using the ‘and’ Boolean operator was conducted to arrive at the results.

Data screening and extraction

Generated search results from the different databases were exported in Zotero-compatible file types for further reference management. We used Zotero reference management software to process the generated results and automatically detect duplicates. A

researcher conducted abstract and title screening by applying the stated eligibility criteria to identify potentially relevant studies with active guidance from a second researcher. The full texts of these potentially eligible articles were retrieved and initially reviewed by one of the research team members. This was followed by another phase where this was discussed by a second team member, going over any potential concerns to arrive at full consensus. A plan was in place to resolve any emerging disagreements over the eligibility of studies through discussion with the third team member (see Figure 2).

Synthesis and analysis

The included articles were inductively coded using Microsoft Excel data management and cleaning software. These codes were eventually categorized into different themes based on the level of society to provide a manageable list for discussion of drivers of vaccine misinformation in the media. The major categories for this theme were the drivers, while other categories focused on geography of study, methods employed, the media analyzed, as well as types of vaccines studied.

Data was extracted from the objectives, methods, results, and discussion sections of included studies. The Microsoft Excel data management application was used to organize, systematize, and code studies. Table 2 shows a summary of extracted data grouped according to study, relevant objective, study method, country/continent, media/population group analyzed, sample size, vaccine studied, and conclusion. Qualitative narrative synthesis was employed to discuss the key findings and results. After data extraction, summaries in the form of narrative answers were developed with the review objectives in mind. Qualitative narrative synthesis has been used in previous studies (Catalán-Matamoros et al., 2019) and has proven to provide an effective means of producing an actionable knowledge base to inform further policy and practice (Denyer and Tranfield, 2006).

Results

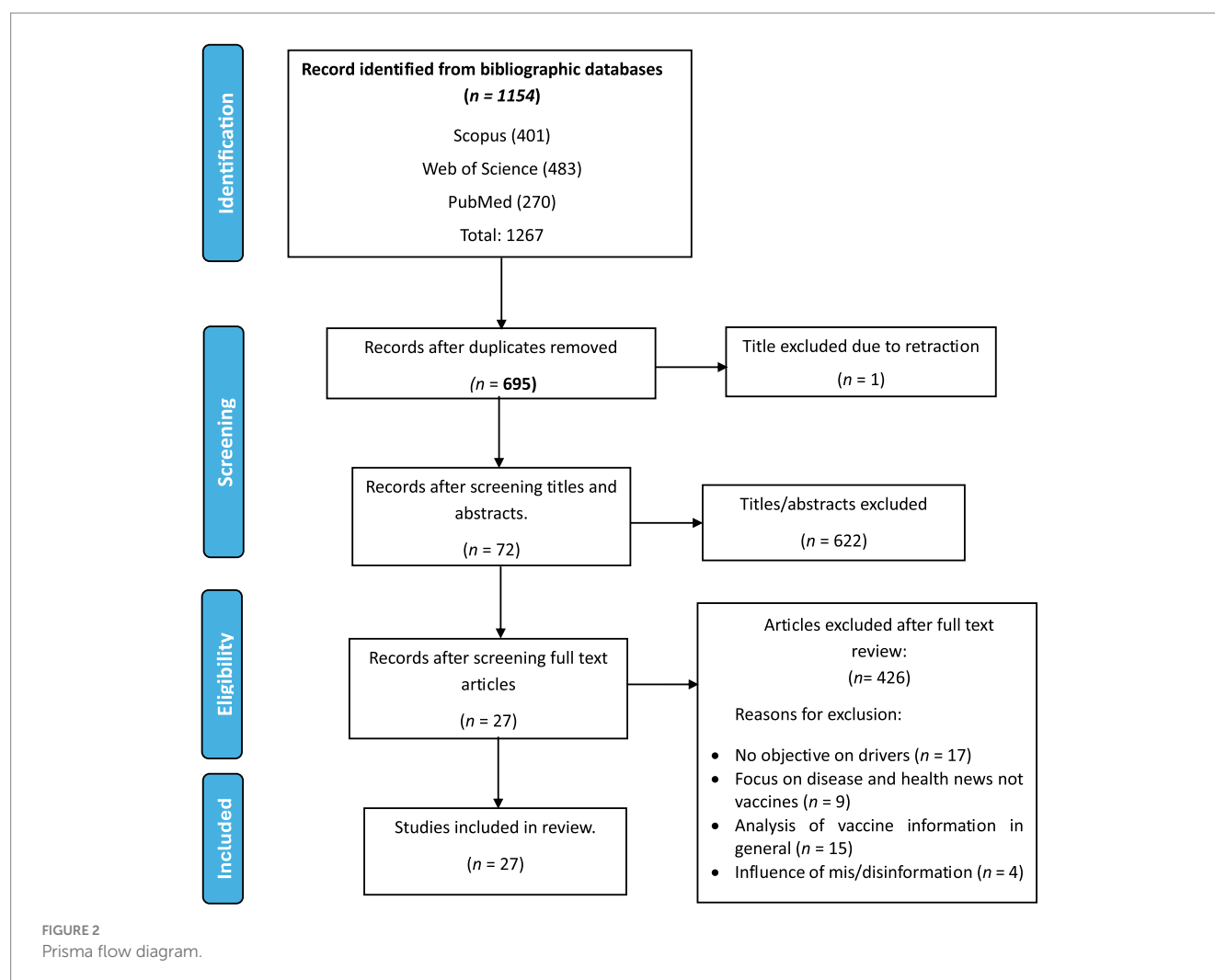
The search included 27 studies which were fully analyzed, with data inductively extracted using an Excel-based code sheet.

General description of the study sample (analyzed studies)

Our sample reveals an almost stable trend in the number of studies from 2011 with a significant dramatic upward shift in publication from 2022. The majority of the studies ($n = 24$) were after the pandemic started in 2020, while three were conducted before the COVID-19 (see Table 2, Figure 3).

Types of media studied

The most studied mass medium is the social media ($n = 18$). No study analyzed strategies or drivers employed in traditional media, including their online versions, which suggests that the traditional media has minimum to no contribution to the diffusion of vaccine mis/disinformation. The most analyzed social media platform in exploring the drivers of mis/disinformation in our sample was Twitter



(now X) (*n* = 12) out of the 18. Other social media platforms studied were Instagram (*n* = 3), TikTok (*n* = 1), YouTube (*n* = 1), and Facebook (*n* = 1). A study (Okuhara et al., 2018) analyzed the contents of Japanese anti-vax campaigners' websites. No study in our sample analyzed content from multiple social media platforms.

Geographies studied

In the total sample, roughly 75% (*n* = 18) were linked to a country or geographic region, while three articles (Hoffman et al., 2019; Schulte-Cloos and Anghel, 2024; Unfried and Priebe, 2024) out of these focused on more than one country. These three included a survey (Unfried and Priebe, 2024) conducted among participants from six African countries- Ghana, Kenya, Nigeria, South Africa, Tanzania, and Uganda. From Europe, Schulte-Cloos and Anghel (2024) conducted an online experiment with participants from Hungary and Romania, while Hoffman et al. (2019) analyzed localized American Facebook content that included data contributions from the US and eight other unnamed countries. Other countries studied included the US (*n* = 6), while a few other countries appeared once – Iran, France, China, Jordan, Japan, Bangladesh, Finland, Brazil, and Spain.

At the continental level, North America was studied most (*n* = 7). Other continents studied included Europe (*n* = 4), Asia (*n* = 5), South America (*n* = 1), and Africa (*n* = 1).

Figure 4 illustrates an uneven distribution of studies across continents, pointing to the dominating power of individual countries in regional/continental discourse. For example, the North American data is dominated by the US, leading to a regional perspective shaped by US-originated research orientation, media system, methods, as well as politics. In contrast, even though only one study was included from Africa - (Unfried and Priebe, 2024) - five countries were represented, underscoring the value of multi-country studies in presenting representative insights from one region. This further offers a broader policy and cultural context, serving as an example of how to amplify underrepresented voices.

Methodological characteristics of included studies

Most of the studies (*n* = 19) adopted content analysis as the major design while other studies employed surveys (*n* = 3), and quasi-experiments (*n* = 5). We categorized modeling and linguistic analysis, as well as analyses of websites as content analytical studies seeing that

TABLE 2 Characteristics of selected studies

Study	Design	Continent/ Country	Relevant objective	Platform/ population group	Sample size	Vaccine studied	Conclusion
Unlu et al. (2024)	Content analysis	Europe- Finland	To investigate the stance on COVID-19 vaccines and the spread of misinformation on Twitter in Finland	Twitter	1,683,700 tweets	Covid-19 vaccine	The emergence of highly interconnected misinformation and anti-vaccine networks towards the pandemic's latter stages poses significant challenges for public health communication. This polarisation reveals that simply providing facts is insufficient to counter misinformation
Unfried and Priebe (2024)	Online survey	Africa- Ghana, Kenya, Nigeria, South Africa, Tanzania, and Uganda	To estimate the magnitude and determinants of deliberate and accidental sharing of misinformation related to three vaccines (HPV, polio, and COVID-19).	Humans (>17 year old from 6 countries)	5307 respondents	HPV, Polio, and Covid vaccines	Deliberate sharing of vaccine misinformation content is related to being older and risk-loving, accidental sharing is associated with being older, male, and high levels of trust in institutions. The results shed light on the detection and sharing of health misinformation in a realistic online setting, providing novel insights on who is susceptible to fall for and more likely to disseminate fake news
Tokojima Machado et al. (2020)	Content analysis- case study	South America- Brazil	To understand how M&D about vaccines circulate on YouTube in Portuguese	YouTube	52 videos containing Mis/disinformation about vaccines	Not mentioned	The study concluded that vaccine-related misinformation and disinformation on YouTube in Portuguese is driven by themes that exploit public fears, economic incentives for content creators, and distrust in traditional institutions, with YouTube's recommendation algorithm potentially amplifying the reach of this harmful content.
Sharevski et al. (2022)	Experiment	Not mentioned	To analyse how Twitter users engage with tweets containing both valid information and misleading information about COVID-19 vaccines	Humans (>18 twitter users)	606 participants	Covid-19 vaccine	One's hesitancy to personally receiving a vaccine or administering them to children sees the rumours more "accurate" and had more of an appetite to engage with them on Twitter, confirming the past evidence on engagement with misinformation.

Study	Design	Continent/ Country	Relevant objective	Platform/ population group	Sample size	Vaccine studied	Conclusion
Schulte-Cloos and Anghel (2024)	Experiment	Europe- Hungary and Romania	To investigate how specific contextual factors related to information processing on social media contribute to the spread of vaccine-related fake news	Humans	2848 (1414 Romania, 1434 Hungary)	Covid-19 vaccine	The fast and intuition-reliant nature of decision-making on social media encourages the spread of misinformation that is in line with individuals' ideological beliefs, which could increase social polarisation in societies.
Samya et al. (2023)	Quasi-Experiment	Asia- Bangladesh	To investigate the factors that contribute to the propagation of COVID-19 vaccine misinformation on social media in Bangladesh	Humans (university-level students)	202 participants	Covid-19 vaccine	Trust in the source of information, especially when it involves personal connections, is a significant factor in the rapid sharing of COVID-19 vaccine misinformation on social media in Bangladesh. This trust leads people to share news hastily without verifying its accuracy
Saini et al. (2022)	Content analysis	North America- US	To examine the associations between the characteristics of vaccine stance tweets and the likelihood and number of retweets	Twitter	150,388 English tweets from US	Covid-19 vaccine	The dissemination of antivaccine messages is associated with both content-related and content-unrelated characteristics. Because antivaccine tweets with positive emotions, objective content, and concrete words are more likely to be disseminated, policymakers should pay attention to antivaccine messages with such characteristics
Pierri et al. (2023)	Content analysis	Not mentioned	To investigate the patterns of prevalence and contagion of COVID-19 vaccine misinformation on Twitter	Twitter	294,081,599 tweets shared by 19,581,249 unique users	Covid-19 vaccine	The wide spread of misinformation around COVID-19 vaccines on Twitter during 2021 shows that there was an audience for this type of content. Our findings are also consistent with the hypothesis that superspreaders are driven by financial incentives that allow them to profit from health misinformation

Study	Design	Continent/ Country	Relevant objective	Platform/ population group	Sample size	Vaccine studied	Conclusion
Okuhara et al. (2018)	Content analysis: websites	Asia- Japan	To explore beliefs underlying the messages of anti-influenza vaccination websites	Antivaccine websites	113 websites	Influenza vaccine	Website authors may engage in anti-vaccination activities because they want to feel they are virtuous, saving people from harm caused by vaccination, and to boost their self-esteem, thinking “I am enlightening uninformed people.”
Moran et al. (2024)	Content analysis-digital ethnographic approach	Not mentioned	To examine the role of social media influencers and the parasocial relationships they build with audiences in the spread of vaccine-opposed messaging and how this information is leveraged for profit	Instagram	Purposive sample of three Instagram “wellness” or “alt. health” influencers for over four months	Covid-19 vaccine	The monetisation routes and the normalisation of content sharing for profit afford misinformation sharers numerous ways to financially benefit from the spread of vaccine misinformation, presented as everyday wellness advice
Moran et al. (2022)	Content analysis-thematic analysis	Not mentioned	To analyse how vaccine-opposed users on Instagram share anti-vaccine content despite facing growing moderation attempts by the platform	Instagram	14 days worth of content from 137 accounts of antivaccine promoters	Covid-19 vaccine	Despite visible attempts at content moderation and changes to policy, anti-vaccination messaging is still prevalent on Instagram. Problematic communities, like those sharing anti-vaccination messaging, cultivate tactics to share and amplify vaccine-opposed messaging despite active moderation attempts.
Mønsted and Lehmann (2022)	Content analysis	Not mentioned	To ascertain the analyses on the interplay between strong vaccination stances, social network structure, and online information	Twitter	60 billion tweets	Covid-19 vaccine	Vaccine discourse is highly polarised, with pro- and anti-vaccine users forming distinct, tightly-knit communities, or “epistemic echo chambers,” that amplify specific beliefs and diminish exposure to opposing viewpoints.

Study	Design	Continent/ Country	Relevant objective	Platform/ population group	Sample size	Vaccine studied	Conclusion
Miri et al. (2024)	Quasi-Experiment	Asia- Iran	To investigate the impact of message framing (emotional vs rational) on social media users' ability to accurately detect information and their intention to share messages about the COVID-19 vaccine	Humans (adults)	600 participants	Covid-19 vaccine	While emotional appeals can be an effective tool in health communication, their use needs to be carefully managed, particularly in contexts like vaccine information, where the potential for spreading misinformation is high.
Manuel Noguera-Vivo et al. (2023)	Content analysis	Europe- Spain	To find out if the type of Twitter account influences the behaviour of the disinformation flows of the anti-vaccine discourse	Twitter	36292 tweets	Covid-19 vaccine	Typology of the accounts can be a predictive factor about the behaviour of users who spread disinformation
Lundy (2023)	Content analysis	Not mentioned	To find out how vaccine misinformation spreads on the platform despite the platform's actions to combat misinformation	TikTok videos	100 videos	Covid-19 vaccine	Misinformation spreads in complicated and difficult-to-track ways on microvideo platforms. TikTok's novel reusable audio and interaction features create new avenues for misinformation spread
Lu and Xiao (2024)	Survey	Asia- China	To understand the process of how exposure to COVID-19 information on social media could result in misinformation sharing through individuals' heuristic processing of information.	Humans (18 to 70 year old internet users)	1488 respondents	Covid-19 vaccine	While a low level of trust strengthened the association between exposure to COVID-19 vaccine information on social media and the affect heuristics, a high level of trust strengthened its association with the availability heuristics, both of which were associated with misinformation sharing.
Hoffman et al. (2019)	Content analysis	North America- US and 8 other unmentioned countries	To characterise the spread of antivaccine content on Facebook	Facebook (antivaccine commenter accounts)	197 accounts	Not mentioned	Those opposed to vaccination often misrepresent data and skew risk perception when spreading their messages on Facebook, suggesting that media literacy or entertainment narratives may be effective avenues for intervention

Study	Design	Continent/ Country	Relevant objective	Platform/ population group	Sample size	Vaccine studied	Conclusion
Harris et al. (2024)	Content analysis	Not mentioned	To characterise role of perceived experts acting as potential antivaccine influencers online	Twitter	4.2 million posts	Covid-19 vaccine	Perceived experts are not only some of the most effective voices speaking out against vaccine misinformation; they may be some of its most persuasive sources.
Faccin et al. (2022)	Content analysis (modelling)	Europe- France	To assess how vaccine-critical contents gained ground during the pandemic	Twitter	3m tweets	Covid-19 vaccine	Vaccine-critical activity does not strictly follow the media agenda that in its turn is more strictly connected to the evolution of the pandemic. The share of vaccine-critical contents in these debates remains stable except for a limited number of short periods associated with specific events
Dunn et al. (2015)	Content analysis (machine learning)	Not mentioned	To measure whether exposure to negative opinions about human papillomavirus (HPV) vaccines in Twitter communities is associated with the subsequent expression of negative opinions	Twitter	83,551 tweets; 957,865 social connections among 30,621 users	HPV vaccine	Twitter users who were more often exposed to negative opinions about the safety and value of HPV vaccines were more likely to tweet negative opinions than users who were more often exposed to neutral or positive information
Di Domenico et al. (2022)	Mixed/multi method (coded as survey for study III)	North America - US	To explore the processes through which health misinformation from online marketplaces is legitimised and spread	Humans (US Amazon consumers)	399 participants	Not mentioned	Expert cues drive social media sharing behaviour through legitimacy.
Daradkeh (2022)	Content analysis (Machine learning and Modelling)	Asia- Jordan	To scrutinise topics and sentiments surrounding misinformation about the COVID-19 vaccine on social media	Twitter	40,359 tweets	Covid-19 vaccine	Misinformation with negative sentiment is more likely to be re-posted and shared than misinformation with positive sentiment, with high audience engagement and interaction.

Study	Design	Continent/ Country	Relevant objective	Platform/ population group	Sample size	Vaccine studied	Conclusion
Calac et al. (2022)	Content analysis	North America - US	To assess the spread of misinformation linked to erroneous claims about Hank Aaron's death on Twitter	Twitter	436 tweets	Covid-19 vaccine	Misinformation targeted at minority groups and echoed by other verified Twitter users has the potential to generate unwarranted vaccine hesitancy at the expense of people such as Hank Aaron who sought to promote public health and community immunity.
Baker and Walsh (2023)	Content analysis	North America- US	To examine how the maternal is appealed to, and represented, by anti-vaccine advocates online during the pandemic	Instagram (anti-vaccination dozens' +1 accounts)	9 month worth of content from 8 of the 13 accounts	Covid-19 vaccine	Maternal is strategically invoked in anti-vaccine content by appealing to three interrelated ideal types: the protective mother; the intuitive mother and the doting mother. These portrayals of the maternal are used to encourage vaccine refusal by presenting hegemonic ideals
Argyris et al. (2022)	Content analysis (Machine learning)	Not mentioned	To identify sets of linguistic features that facilitate and inhibit the propagation of vaccine-related content	Twitter	51360 tweets	Not mentioned	Anti-vaccine tweets use quotes more than pro-vaccine tweets, which have significant and positive impact on both retweets and favourites. Anti-vaxxers quote other sources presumably in their attempt to make their content credible and objective
Alieva et al. (2023)	Content analysis	North America- US	To ascertain the strategies used to spread Covid-19 vaccine misinformation stories throughout Pennsylvania	Twitter	6 million tweets	Covid-19 vaccine	Negative messaging often attracts people's attention and encourages them to share it. Anti-vaccination users employ positive network and narrative manoeuvres to promote vaccine hesitancy and anti-vaccination beliefs on Twitter in southwestern Pennsylvania.
Ali et al. (2022)	Quasi-experiment	North America- US	To elucidate the effect of certain cognitive heuristics on the perceived credibility and sharing motivations of fake anti-vaccination news on social media.	Humans (>18 US residents)	813 participants	Not mentioned	The findings reveal consistent evidence that fear motivates anti-vaccine individuals to believe in and share fake news, while anger motivates people who are neutral towards vaccines to do so.

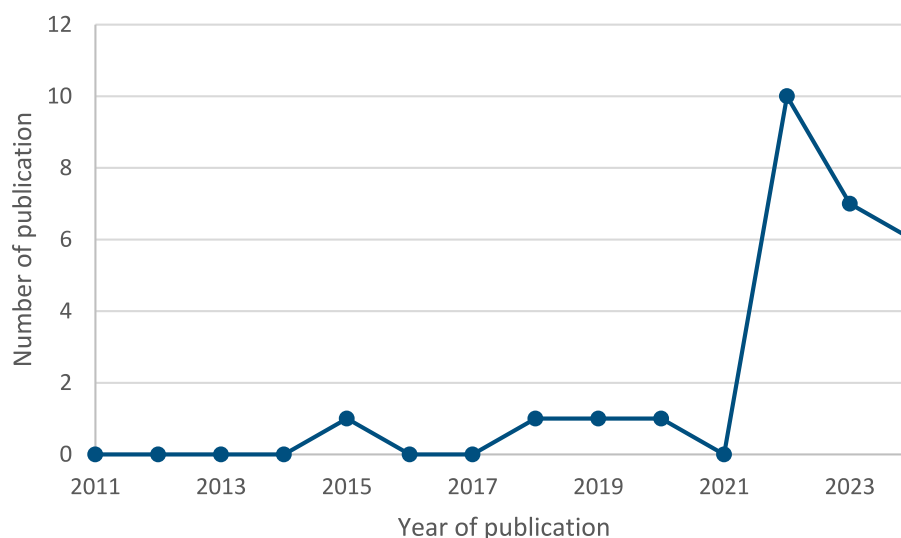


FIGURE 3
Trend in studies conducted by year of publication.

their basic strategy was generating manifest content from social media and/or websites. The content analysis focused significantly on using advanced machine-learning techniques to ascertain the drivers of misinformation in the media. Studies monitored social media content and their diffusion patterns significantly by engagement metrics (comments, shares, tweets, retweets, likes) while also exploring the range of the spread of posted vaccine mis/disinformation messages. It was not stated if the posts in this category were texts or images or videos, however, two studies analyzed video content- one on YouTube (Tokojima Machado et al., 2020), and the other on TikTok (Lundy, 2023). The sample sizes in the selected articles varied according to the research designs adopted. The majority of the content analytical studies analyzed posts ranging from 436 tweets to 6 billion tweets. The studies that analyzed videos had smaller samples- 100 videos on TikTok, and 52 videos on YouTube. The other studies with humans as subjects of study (surveys and experiments) had samples ranging from 202 to 5,307 human participants.

Type of vaccine studied

COVID-19 vaccines ($n = 19$) dominated the discourse, supporting the earlier finding that most of the studies were conducted after the advent of the COVID-19 pandemic. Other vaccines studied included the influenza ($n = 1$) and the HPV ($n = 1$) vaccines. A significant proportion of our sample (5 studies, 19%) did not specify particular vaccines. One study (Unfried and Priebe, 2024) focused on more than one vaccine- HPV, Polio, and COVID-19 vaccines.

Drivers of mis/disinformation in the media

Our sample presented a wide array of drivers and motivators of vaccine mis/disinformation in the media. Our findings show a list of 34 emerging drivers coded from the respective studies. The emerging

drivers were categorized into four distinct levels of drivers for reference. Our taxonomy is based on the emerging factors discovered from the review. These broad drivers include individual-level drivers, message-level drivers, network/platform-level drivers, and structural-level drivers.

We have defined these levels of drivers as:

- Message-level drivers-** The motivators and appeals in the development and crafting of media content that make for easy spread and dissemination of vaccine mis/disinformation in the media.
- Individual-level drivers-** These are factors related to personal characteristics (cognitive, demographic, and psychographic) that render individuals liable to disseminate vaccine mis/disinformation in the media.
- Platform-level drivers-** These drivers are about the characteristics of the media platforms that allow for and are manipulated to spread vaccine mis/disinformation.
- Structural and societal-level drivers-** These are related to broader society and contextual factors that drive vaccine mis/disinformation in the media.

The majority ($n = 17$) of the studies showed multiple drivers (more than one driver) while the rest ($n = 10$) had a single driver. We hence coded the occurrence of each driver as single cases under the categories adopted for the review as listed above. We coded a total of 63 cases/observations for the categories. Individual-level drivers had the most cases ($n = 26$). Occurrences of other categories were message-level drivers ($n = 16$), platform-level drivers ($n = 14$), and structural and societal-level drivers ($n = 7$). This reveals a dominance of individual-level considerations in the spread of vaccine mis/disinformation in the media. Interestingly, even though more content analytical studies typically focus on message-level factors, the individual-level drivers dominated the discourse, suggesting a broad tendency to interpret message content through individual psychology lens (see [Supplementary material 1](#) for full list of specific drivers).

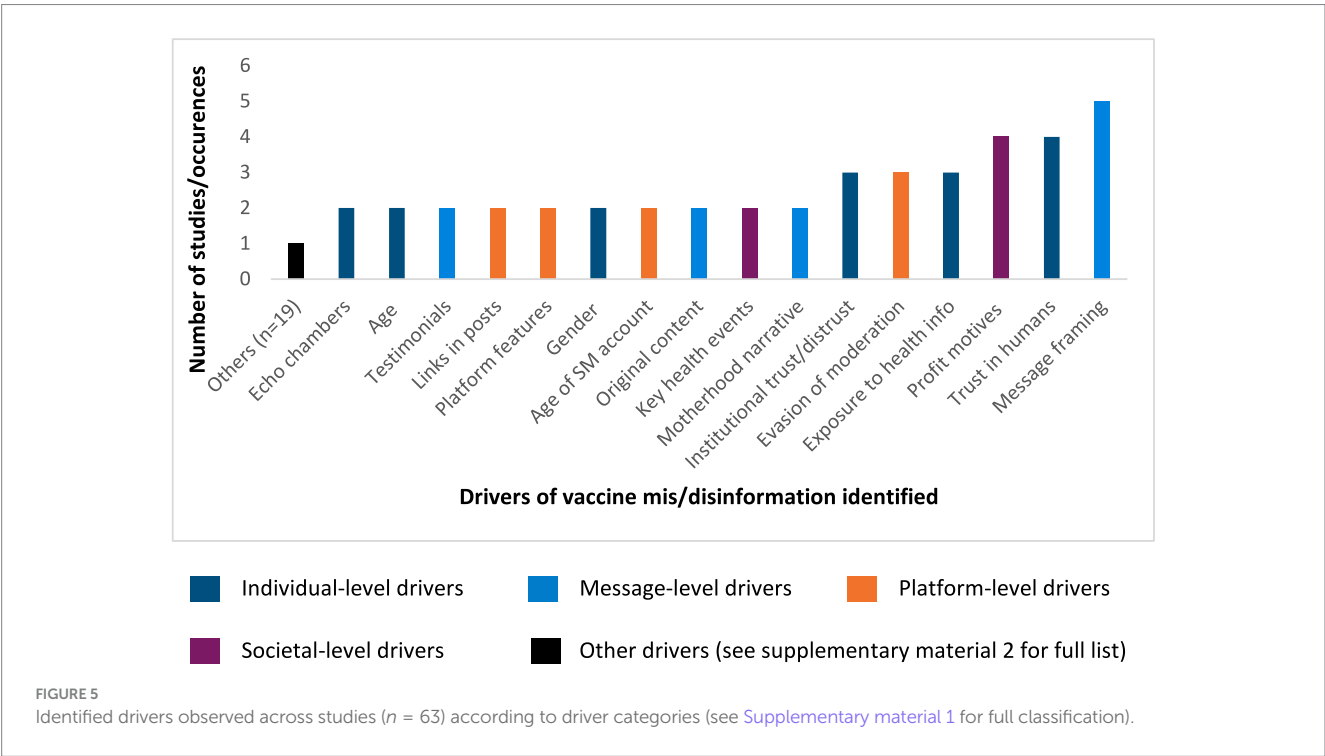
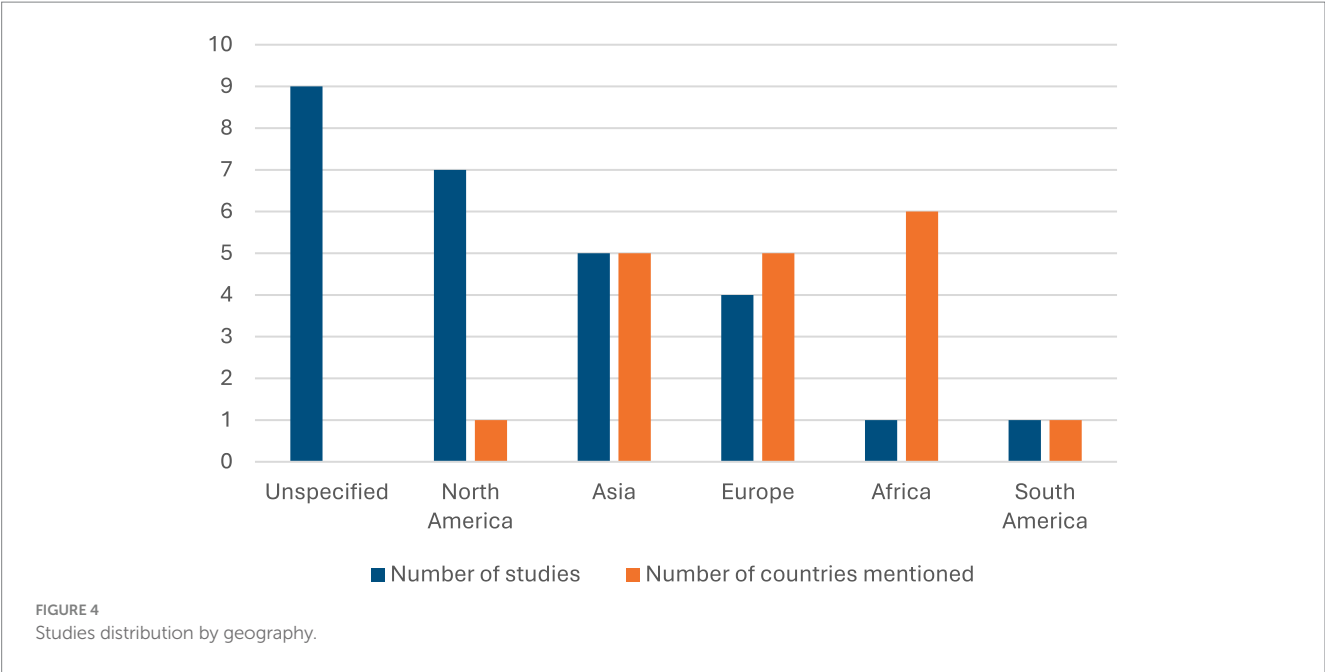


Figure 5 presents observations for specific drivers across the reviewed studies. The *message-framing narrative*, which discussed the linguistic components of vaccine mis/disinformation content was coded in more studies others (n = 5). These frames included the use of concrete words (Saini et al., 2022); negative emotions and maneuvers (Unlu et al., 2024). Further, *trust in sources* (n = 4) and *profit motives* (n = 4) followed closely. The findings align with results about the methods adopted, where content analysis, typically a message-centered design dominated. The regular citation of trust in sources also points to the continued focus on individuals who would

share vaccine mis/disinformation messages if they trust a source, as against the accuracy of the message especially if the source is an expert (Di Domenico et al., 2022; Harris et al., 2024), or if they are personally connected to the source with the source (Samya et al., 2023). The quest for gain also drove vaccine mis/disinformation across the media, showing that “super spreaders driven by financial incentives that allow them to profit from misinformation” (Pierri et al., 2023). The data also highlight a long list of less-frequently cited drivers that appeared only once or twice, underscoring the need for further empirical observation to capture dynamics that are not widely

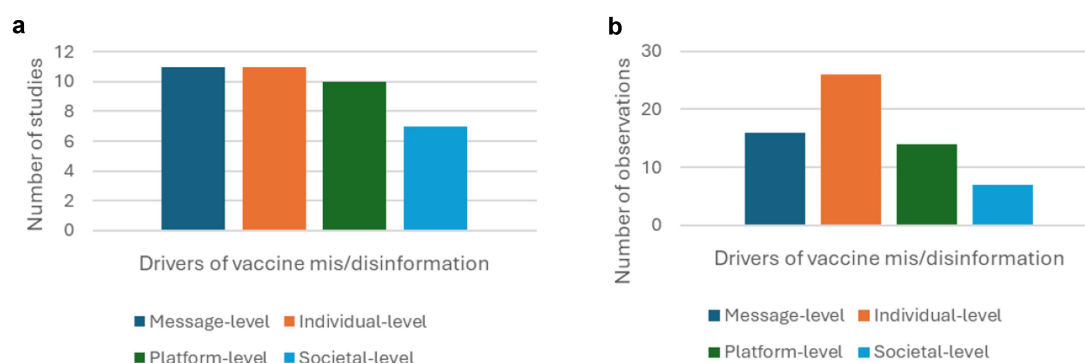


FIGURE 6

(a) Number of studies across driver categories. (b) Number of observations across driver categories.

represented in literature (see [Supplementary material 2](#) for full list of drivers across categories).

Data in [Figures 6a,b](#) show complementary insights into broader vaccine mis/disinformation driver-levels regarding the studies that discovered at least one driver in a category ([Figure 6a](#)) and the frequency of observation ([Figure 6b](#)) across the dataset. The data implies that although categories could be identified by equal number of studies, it does not necessarily imply its dominance or depth in literature. For instance, the case of message-level and individual-level drivers. This suggests that individual-level drivers (such as trust, age, beliefs) may be significantly influential in driving vaccine mis/disinformation and should therefore be a key focus for designing interventions.

Drivers according to geographies studied

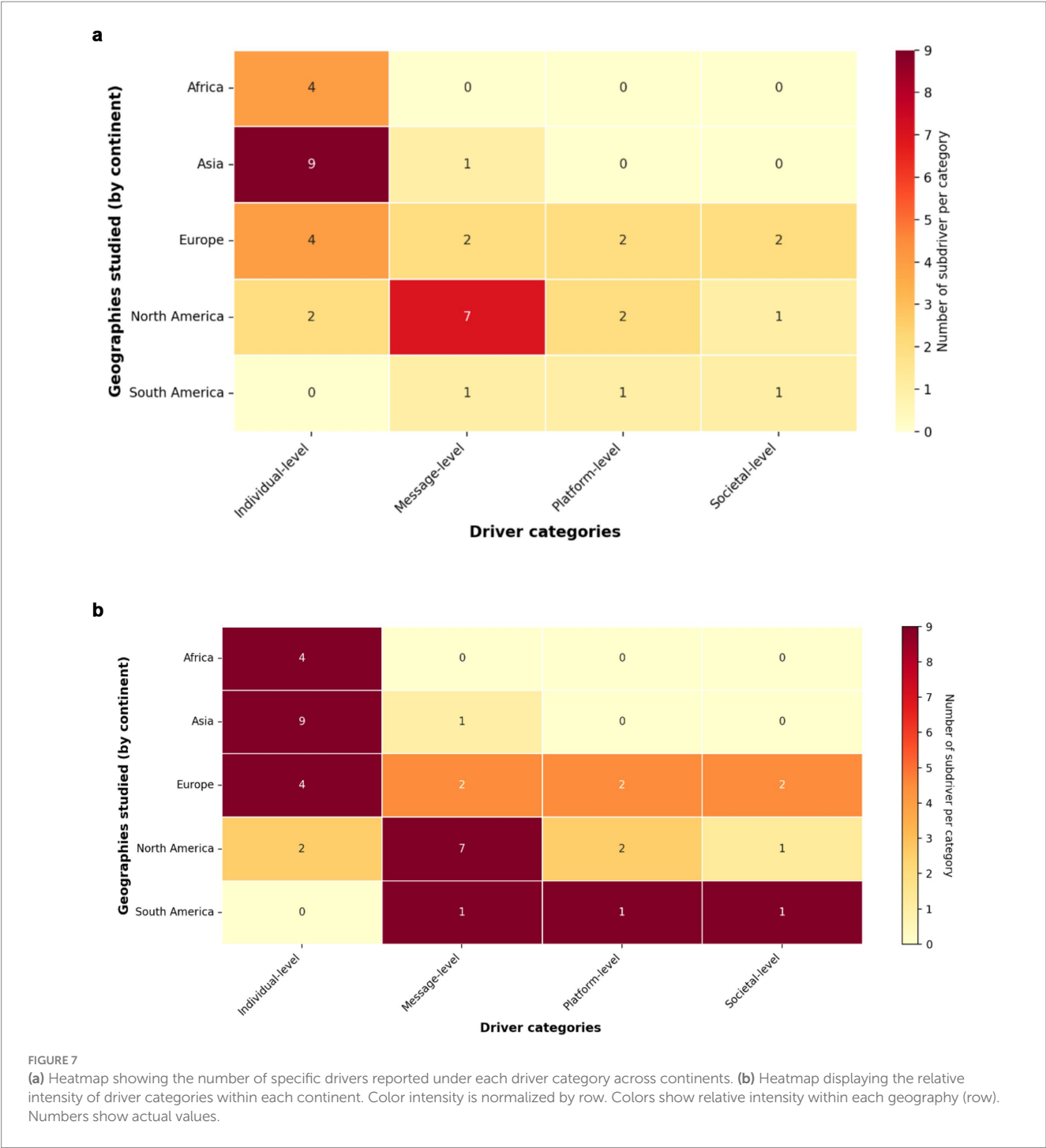
In responding to objective 2, we sought to ascertain the emerging drivers from the different geographies studied. 18 out of the articles included in our review mentioned a focal country, hence our analysis is based on these 18 studies. This analysis was based on the continents represented, rather than individual countries since countries in the same continents most often share similar characteristics that make them amenable to similar experiences and interventions. The continents identified from the studies included Africa, Asia, Europe, North America, and South America. It should be noted that the US was the only country in our sample that was from North America, while Brazil was the only country from South America. Two –North America and Europe– of these five continents had drivers spread across all 4 categories/levels of drivers ([Figures 7a,b](#)).

[Figure 7a](#) illustrates the disparity in thematic diversity in the drivers of vaccine mis/disinformation across continents. Europe and North America stood out as the most thematically diverse geographies with all four driver categories– individual, message, platform, and societal– represented in their findings. This suggests a developed research capacity as well as greater engagement and understanding of the complexity of the mis/disinformation ecosystem in these regions. This wide representation may also be influenced by the volume of studies, seeing that these two geographies were among the most represented in our sample.

In contrast, [Figure 7b](#) shows a more continent-specific picture of driver categories. For example, individual-level drivers drive majority of vaccine mis/disinformation in Asia and Africa, pointing to a more human-centered interpretation of vaccine mis/disinformation drivers. Further aligning with cultural frameworks such as Hofstede's cultural dimensions theory, which links these regions with collectivist inclinations, a dimension which might have affected how mis/disinformation spreads and how researchers from these geographies explore this pattern. The dominance of message-level drivers in North America further points not only to a developed media ecosystem but could have also been shaped by the design of many of the studies from the region (e.g., content analysis). The limited presence of platform and societal-level drivers in Asia and Africa further suggests an under-exploration of deeper network factors in these contexts, showing a research orientation that might be prioritizing individual behaviors over institutional or technological issues (see [Supplementary material 3](#)).

In Europe ($n = 4$), all the levels of drivers were evident in the sampled studies. Antivaccination promoters in Europe made use of significant events in the development of a health event– The COVID-19 pandemic in this case to drive vaccine misinformation. [Faccin et al. \(2022\)](#) discovered that the antivaccination crusaders used the announcement of the Pfizer vaccine, the documentary– hold-up–, AstraZeneca retraction in Denmark, and health pass in Europe to drive vaccine mis/information spread across the media. In Finland, vaccination mis/disinformation spreads in the media through deliberate attacks on pro-vaccine authorities by responding to posts by these authorities ([Unlu et al., 2024](#)), further revealing a low power-distance dimension where hierarchies and authorities can be questioned. This in turn amplifies their messages as followers of these pro-vaccine government agencies. The age of social media accounts (older accounts) ([Manuel Noguera-Vivo et al., 2023](#)), and possession of right-wing authoritarian attitudes by users of social media ([Schulte-Cloos and Anghel, 2024](#)) also promote the dissemination of vaccine/misinformation across the media in Europe.

North American studies explored different drivers of vaccine mis/disinformation cutting across all the four levels of drivers. For example, misinformation posts that were not flagged and labeled as vaccine misinformation ([Calac et al., 2022](#)) had the propensity of being shared across social media (platform-level driver). Profit goals were not exactly part of the drivers of vaccine mis/disinformation in North



America, however, message-level factors such as appeal to motherhood emotions (Baker and Walsh, 2023) were used to generate profit through alternative healthcare promotion. Perceived expert cues via medical qualifications (individual-level driver) would increase the propensity of a vaccine mis/disinformation post being shared by North Americans (Di Domenico et al., 2022). Objective content, and concrete words (Saini et al., 2022) also proved to be a major determinant of vaccine mis/disinformation spread in North America. The event of the death of a major baseball player (Hank Aaron) after taking the COVID-19 vaccine also shaped the spread of vaccine mis/disinformation in the media as (Calac et al., 2022) discovered.

Discussion

We sought to synthesize existing evidence around the spread and diffusion of vaccine mis/disinformation in the media. Our review is specifically aimed at identifying the potential drivers of vaccine mis/disinformation across the media, exploring the geographies that have been studied for this, and how the different drivers relate to the different geographical landscapes studied. This was to explore existing gaps in the literature and provide actionable insights that will serve as a springboard for future research efforts and interventions to counter vaccine misinformation in the media. 27 studies published between 1

January 2011 and 30 June 2024 were included based on our criteria after a series of processes as shown in Figure 2.

Preliminary findings show a geometric increase in studies conducted during and after the COVID-19 pandemic, further confirming that the COVID-19 pandemic heralded a new era of mis/disinformation's popularity in vaccine discourse in literature. Our analysis reveals that the majority of the studies analyzed social media platforms, which confirms the tenets of Veblen and McLuhan's technological determinism theory (Madaki et al., 2024; Marshall, 1962) that the available technology of an era drives all its civilization, including health communication scholarship. The social media continues to be a major driving force in the spread of vaccine mis/disinformation, making it the most studied media type further justifying the focus of earlier reviews on misinformation (Wang et al., 2019; Skafle et al., 2022) on social media alone. The absence of studies focusing on the traditional media points to this fact.

Drivers of vaccine mis/disinformation in the media

The factors that drive vaccine mis/disinformation in the media were categorized into distinct levels. Individual-level drivers emerged as the most frequently identified motivators of vaccine mis/disinformation in our sample, followed by message-level drivers with the other two –platform and societal levels- appearing less frequently. The findings point to the centrality of individual factors in the spread of vaccine mis/disinformation in the media. These drivers included mistrust in institutions (Hoffman et al., 2019), existing biases in health beliefs (Sharevski et al., 2022), conservative right-wing authoritarian attitudes (Schulte-Cloos and Anghel, 2024), avoidance of cognitive dissonance with mental fatigue of platform users (Mønsted and Lehmann, 2022), and trust in expert sources (Samya et al., 2023). Studies have continuously demonstrated how skepticism and existing biases toward government institutions, and pro-vaccination actors fuel the spread of health mis/disinformation (Jaiswal et al., 2020; Lee et al., 2024). Trust in the source of mis/disinformation holds great potential for a user to disseminate such misinformation without paying cognitive attention to the veracity of the details of such messages since it does not demand too many resources from the decision-maker (Unlu et al., 2024; Siegrist, 2021). Even though a majority of the studies adopted content analysis as research design, which is naturally disposed to message-level analysis, the dominance of individual level occurrence points to the centrality of the agent and interpreter in the information disorder ecosystem as seen in Wardle and Derakhshan (2017).

On the other hand, message-level drivers such as emotional and negative framing of messages accompanied with different emotions, and testimonials from 'past witnesses' also strongly promote the spread of vaccine mis/disinformation in the media. The dominance of the message, agent, and interpreter components in the propagation of vaccine mis/disinformation aligns with the general postulation of the *agent-message-interpreter* framework of information disorders. Previous reviews have discovered the dominance of these factors in the spread of misinformation in other similar areas- health (Wang et al., 2019), COVID-19 (Malik et al., 2023), COVID-19 vaccines (Skafle et al., 2022), further showing a similar trend in vaccine-focused studies and the

relevance of the interrelatedness of these drivers in the mis/disinformation discourse.

Although the other categories- platform-level and societal level drivers- were found with less frequency, their occurrence reveal a larger challenge with current interventions, the inability of existing automated debunking mechanisms in stopping the spread of all vaccine mis/disinformation (Schmid and Betsch, 2022; Sun and Ma, 2023; Zhang et al., 2021).

The dataset also provides insights into the sustained relevance of individual-level drivers such as mental as well as its interplay with message-level drivers. While both drivers were identified and cited in equal number of studies (10 each), individual drivers emerged with a higher frequency of observations, suggesting not only wider distribution but also greater relevance and depth in vaccine mis/disinformation discourse. Conversely, message-level drivers such as message framing, appeal to emotions, use of scientific sources, use of concrete and vivid expressions, etc., though appearing in multiple studies, were less frequently observed, suggesting a possibility of an interplay between the two highest ranking drivers. This further implies the possibility of the message-level drivers serving as avenues to infer deeper individual-level motivations since the individual reacts to the content based on their own beliefs as it aligns with certain content in the message. Overall, this position reinforces the critical role the individual –agent and interpreter- in the vaccine mis/disinformation discourse.

Drivers and geography studied

Geographical (and by extension, cultural) peculiarities affect the spread of vaccine mis/disinformation across the media. Factors including the development of the media and social media system, economic development, and media literacy level, which vary widely across different geographies impact the spread of misinformation. When examined at a continental level, the drivers of vaccine misinformation slightly vary, giving nuanced insights that can be leveraged in designing tailor-made interventions for different cultural and/or regional contexts. Continents share similar characteristics in cultural and media consumption patterns, as well as economic and literacy levels. This approach prioritizes the significant role of localized responses in a global crisis that thrives on regional peculiarities. Existing literature buttresses the adoption of public health interventions that are culturally relevant to maximize impact (Grover et al., 2024; Pope et al., 2024; Pastrana et al., 2020).

The prominence of the US in geographies studied aligns with the fact that misinformation has largely been popularized from the US, especially since the 2016 presidential elections (Gaultney et al., 2022; Padda, 2020). Studies from Europe and Asia also ranked quite high in the vaccine misinformation drivers literature, corroborating the prevalence of mis/disinformation in developed Western cultures (Skafle et al., 2022; Li et al., 2023). Africa and South America – two of the world's least developed continents- were the least researched, in line with a recent review (Skafle et al., 2022). The low output from less-developed regions portends a risk-filled future for these societies, seeing that they might be more susceptible to misinformation due to low media literacy. Low immunization uptake, which is correlated to misinformation is highest in least developed societies (World Bank, 2021) where antivaccination campaigners may likely exploit the

ignorance of the populace to drive their cause. This further amplifies the recent calls for more health communication research from low-income societies, given that they account for only 0.27% of global health communication research output (Mheidly and Fares, 2020).

In a broad sense, the review reveals the dominance of individual-level drivers across all continents represented except one- South America, underscoring the significance of personal factors – particularly trust in institutions and sources, age and gender- in driving the spread of vaccine misinformation across different cultural contexts. While cultural contexts might differ, these shared psychological factors are universal. The absence of individual-level drivers in the South American study (Tokojima Machado et al., 2020) could be significantly due to the nature of the study- YouTube videos from anti-vaxxers were analyzed.

Throughout our sample, Europe and North America had the most varied drivers of vaccine misinformation in the media. They both had all four level drivers of vaccine misinformation identified, though granular factors slightly differ. Misinformation, particularly health misinformation has long been associated with more developed countries/continents in the global North (Li et al., 2023), hence the identification of all categories of drivers in these contexts. However, in North America –dominated by the US- message-level drivers are more eminent, implying the level of sophistication in the research ecosystem regarding the availability and application of technological tools for natural language processing (Getzoff, 2023), as well as a developed media ecosystem. The developed status means there is relative freedom of expression, and freedom after expression, unlike less-developed countries. This freedom enables citizens and dwellers alike to propagate what they deem fit on social media, which may be vaccine mis/disinformation, aligning with what Jeremy Bentham recognizes as ‘the liberty of doing mischief’ (Phiri, 2023). This liberty is part of what Hofstede refers to as power distance in his cultural dimensions theory, where the US ranks low (Hofstede, 2011).

In Africa, only individual-level drivers were identified. Though only one study was in our sample, data was collected from six African countries. The prevalence of individual-level drivers such as age, gender, and trust in Africa shows how deep-rooted social beliefs play a role in driving vaccine misinformation. Older males in Africa are more prone to sharing vaccine misinformation in the media. This finding aligns with existing literature that older people are less media literate, and are more inclined to share conspiratorial conjectures given their deeply rooted socio-cultural beliefs (Akello, 2024; Osuagwu et al., 2023), owing to widespread poor media literacy and a paucity of media literacy interventions in the continent (Boshoff and Fafowora, 2024; Cunliffe-Jones et al., 2021).

Similarly, the Asian context, dominated by individual-level drivers, reflects similar regional and cultural characteristics with Africa. While the study designs, experiments, survey, and content analysis are different from that of Africa- survey-, the result reflects deeper dimensions of similarity and focus on individuals as major contributors to the spread of vaccine/disinformation in the media. Asia and Africa’s emphasis on individual-level drivers such as age and gender are traceable to established theories such as the cultural dimensions where group roles (collectivism) define and shape the way individuals act on vaccine mis/disinformation. Individual behaviors in these societies are thus deeply rooted in social expectations. Further, the recurrence of trust and mistrust in authorities, an outworking of high-power distance cultures in the cultural dimensions theory could be indicative of the collectivist

tendencies in these cultures. Given that individual behaviors are shaped by collective expectations, it becomes easier for these groups to easily convince members to trust or mistrust authorities by spreading vaccine mis/disinformation. These dimensions therefore explain why individual-level drivers are prevalent in collectivist cultures.

There is a complex connection between message-level, platform-level, and structural/societal-level drivers in South America, particularly Brazilian antivaccination YouTube (Tokojima Machado et al., 2020). The use of links to external social media drives followers to these other platforms where they are fed with mis/disinformation and also get alternative health solutions sold. The antivaccination channel owners also use these platforms to collect testimonials from followers and feed them back into the YouTube channel, which amplifies the spread.

The complex mix of drivers from South America is reflective of the prevailing collective culture in the continent, seeing that Brazil ranks low on individualism in the cultural dimensions theory. In this type of culture, the basis of trust is relationship, which includes testimonials from past users of alternative health products, making the use of WhatsApp and Telegram groups veritable tools for community-driven dissemination of mis/disinformation. Interestingly, the socio-economic dynamics that tend to drive the spread of vaccine mis/disinformation reveal how such low-income settings –where legitimate income streams are not sufficient- propel the development of other avenues such as monetizing mis/disinformation for livelihood.

Study limitations

Our review, despite following standard systematic review and evidence synthesis protocols, fell short in some respects, which might have affected the quality of the results. First, we did not include grey literature, conference papers, and pre-prints in this review. This might have limited the options of available evidence to synthesize, hence possibly leaving out some interesting insights that would have enriched the results. Second, the review was limited to articles in English and Spanish, leaving out studies in other languages, which might have affected the results generated. As a result of this exclusion, certain drivers or regions-specific mis/disinformation patterns might have been underrepresented in this review, leading to an incomplete understanding of what is known about the drivers of vaccine misinformation globally and regionally. While we acknowledge this limitation, research has established that the exclusion of non-English articles has little to no effect on systematic review results (Nussbaumer-Streit et al., 2020).

Furthermore, only three databases –WOS, Scopus, and PubMed- were searched to generate the analyzed studies based on available timelines and interests. While the combination of these three databases produces robust enough results, some relevant studies might have been inadvertently omitted from the review. Additionally, our review, particularly the analysis of drivers according to geographies, was skewed toward broad-level factors to provide an overview, thus limiting deeper-level insights that could have been generated from comparing individual-level factors and how they exactly drive vaccine mis/disinformation in different contexts.

Notwithstanding the foregoing limitations, this review has strengths in advancing evidence around the spread of vaccine mis/disinformation with study duration and data spanning years before the COVID-19 pandemic, evaluating how these drivers of mis/

disinformation spread vary and are shaped by different contextual realities based on geography.

Conclusion

Our review shows how drivers of vaccine mis/disinformation are not only thematically diverse, but also shaped by distinct cultural and socioeconomic dynamics across various regions of the world. While individual-level drivers are prominent across most of the continents studied, they were more prominent in regions with collectivist and high power-distance tendencies like Asia and Africa, where individuals' propensity to spread disinformation is largely shaped by group identity. Conversely, the dominance of message-level drivers in North America shows low power distance, and robust research ecosystem that supports complex analysis of content. These regional variations reiterate the need for tailoring interventions to combat vaccine mis/disinformation that go beyond what is being said or shared, but to the how, where, and within which cultural frame the circulation happens.

Future research directions

The findings from our review open up avenues for further exploration in critical areas that would foster better understanding around the spread of vaccine mis/disinformation.

Theoretically, future research could undertake an in-depth exploration of the interplay between cultural theories such as Hofstede's dimensions and the spread of vaccine mis/disinformation. Our review has applied the Cultural dimensions theory to explain broad-level differences across geographies; future empirical studies should go beyond category-level analyses to test the direction and strength of cultural characteristics in strengthening the prominence of specific drivers across geographies, with their theoretical implications. In addition, empirical studies could mainstream cultural theories in a narrower geographic classification than ours, since our review also did a broad-level classification of geographies to provide an overview based on continents. The theoretical implications of cultural theories would provide further insights necessary for explaining why specific drivers influence the spread and perception of vaccine mis/disinformation in specific geographies.

In terms of geographic context, there is a need for an equitable distribution of research outputs from the global south- particularly Africa, parts of Asia, and South America. Studies from less-developed continents –such as Africa and South America- remain scarce, omitting critical insights from these contexts, which contribute a significant quota to the global human population, and by extension, vaccine mis/disinformation spread. Despite the fact that the survey from Africa provides insights from six countries, it is not sufficient, as the interpretation or the design of the study could be influenced by the research orientation of the researchers. Limited representation from these parts of the world portends a form of looming challenge in global health, given that they contribute a significant percentage of low vaccine uptake. This status makes these societies even more relevant in providing empirical evidence. The lack of studies from these regions shows the increasing divide between the global north and south in terms of

knowledge production. Interventions designed on data generated in other climes will be less potent in combating the challenges on the ground in these continents. Hence, there is an urgent need to conduct studies that not only focus on drivers, but also interventions from these regions.

Future studies from a constructs perspective, should undertake a deep dive into how specific drivers that are present in different geographies affect the spread of vaccine mis/disinformation in their respective cultures. For instance, if age drives vaccine misinformation in Africa and Asia for instance, how age drives misinformation in Africa could be largely different from how it does in Asia. It could be that the younger population are more susceptible in Asia, compared to Africa where the older population may be susceptible, showing deeper dynamics that can foster interventions that propel positive change.

Furthermore, our review highlighted the regional distribution of broad vaccine misinformation drivers with little focus on the overlapping nature of these drivers. The finding that message-level drivers could be a lens to eventually infer a connection with individual-level drivers needs further attention. The interconnected and mutually reinforcing nature of these drivers needs to be explored. For instance, how message-level appeals are amplified by platform-level drivers and individual dispositions. The interplay of these relationships in different geographical contexts could present insights that would lead to practical interventions for each society studied. In the same vein, the direction of influence of each specific factor ought to be explored.

From a methodological standpoint, as observed in previous reviews (Whitehead et al., 2023; Skafle et al., 2022; Zhao et al., 2023), the study of health misinformation has largely been conducted using textual and content analysis to identify patterns of spread in the media, with the majority using Twitter data. While this has been because the Twitter API lends itself to research-friendly ends, it is important to note that more insights from other social media platforms would be interesting to compare results between platforms, particularly multimedia-based platforms such as TikTok and YouTube. These platforms have become more popular among the younger population, and if vaccine mis/disinformation must be combated at all levels, a worthy next step would be generating empirical insights from these platforms. The continued dominance of short video content (from YouTube and TikTok) among fact-checked mis/disinformation content points to the urgent need to further explore these platforms (International Fact-Checking Network, 2025). Additionally, more insights need to be generated from locally dominant social media platforms such as the WeChat and Weibo in China.

In the future, ethnographic studies in mis/disinformation-prominent settings that focus on locally motivated drivers of vaccine mis/disinformation, particularly in low-income settings should be a major consideration. This would provide insights beyond self-reported surveys, content analysis, and social or quasi-experiments that have dominated the literature. The ethnographic studies should take a deeper dive into the individual-level drivers identified and explore the connection between cultures and these drivers based on careful observation. Insights generated from these studies, with definitions from the cultural dimensions theory, could provide an avenue where tailored intervention can be designed for specific societies with similar dominant cultural dimensions.

By addressing these gaps in theory, context, construct, and method, future studies can generate evidence that can inform practical interventions that would help combat the spread of vaccine misinformation.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Author contributions

OA: Conceptualization, Methodology, Project administration, Resources, Writing – original draft. DC-M: Conceptualization, Funding acquisition, Methodology, Project administration, Supervision, Writing – review & editing. CE: Methodology, Project administration, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that Gen AI was used in the creation of this manuscript. The authors declare that the JuliusAI (<https://julius.ai/>) data analysis tool was used to generate the heatmaps in [Figure 7](#) after inputting data from the review. The AI support was solely data visualisation.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomm.2025.1550216/full#supplementary-material>

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