

COUNTERING MEDICAL MISINFORMATION

A FRAMEWORK TO SUPPORT SUCCESSFUL INTERVENTIONS

CRITICA™

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Executive Summary	3
Introduction.....	4
Methods	5
Overview of Frameworks	6
The nature of past and current communication models	6
Epidemiological framework	7
Environmental health framework.....	7
Socio-ecological model	8
How the frameworks fit together	8
Activities by Stakeholder Group	9
Coalitions/Collaborations	9
Professional Societies	11
Non-governmental Organizations.....	14
Academic Organizations & Research	16
Media/Journalism	18
Intergovernmental Organizations.....	19
Private Sector & Technology Platforms	21
US Federal, State, & Local Government.....	23
Conclusions & Recommendations	27
Table 1: Summary of stakeholder activities by public health framework	29
Works Cited	30

Executive Summary

Since the beginning of the COVID-19 pandemic and the diagnosis of an “infodemic” (an overabundance of the information both accurate and inaccurate) by the World Health Organization (WHO) in 2020, there have been many attempts to counteract the potentially harmful effects of misinformation on health and well-being both in the United States and globally. Over the past 3 years, increasing attention to medical and health-related misinformation is evidenced by a wide range of initiatives by a range of players, including government agencies (state, federal, and local), academic institutions, professional societies, non-governmental organizations, and private sector (big tech) companies, among others. This report, commissioned by the American Board of Internal Medicine (ABIM) Foundation, provides an outline of the significant initiatives in this arena over the past several years. We have used this as an opportunity to reflect on how such initiatives fit into public health frameworks that could guide our overall response to misinformation. By “frameworks” we simply mean different lenses used to conceptualize the problem of misinformation that can then help visualize solutions. The frameworks described in this report are derived from key concepts in public health: the epidemiological model, the environmental health framework, and the socio-ecological model. Each is explained in turn and the wide range of ongoing initiatives in the medical misinformation field are coded and categorized as belonging to one of these frameworks when applicable.

This exercise has led to an important realization of some of the key gaps in our knowledge of effective misinformation interventions. By looking at the field holistically and categorizing initiatives in a new way, we were able to uncover where evidence and action are strongest and where there is an urgent need to expand. In particular, this report concludes that an overwhelming majority of misinformation initiatives focus on the “individual” level of the socio-ecological model with not enough attention especially to “structural” solutions, which is a key determinant of the information environments in which people are immersed in the first place. Individual-level interventions are unlikely to be sustainably effective without some attention to structural-level problems. In addition, we note that the entire field suffers from a lack of definition of key outcomes that misinformation initiatives should be targeting. Most studies in the field are controlled laboratory experiments with key outcomes defined as sharing behavior of misinformation on social media. Interventions are generally thought to be a success if they provide high-integrity information or reduce misinformation-sharing intention and behaviors, but our knowledge of how these behaviors translate into health decisions and behaviors of consequence is limited. Importantly, we also noted that while there are myriad initiatives in the misinformation arena, there is relatively little coordination among actors, which would likely produce greater efficiencies and possibly more efficacious and sustainable interventions by leveraging different kinds of expertise in joint efforts.

Introduction

Since the onset of the “infodemic,” or abundance of information both accurate and inaccurate (WHO 2020), public health responders sought to displace misconceptions about COVID-19 and vaccines. These efforts incorporated a wide array of strategies to urgently address a public health emergency of international concern and the corresponding infodemic. As the COVID-19 pandemic is shifting to being endemic, the nature and degree of urgency about the infodemic has also shifted to contemplating longer-term, sustainable, and preventive strategies to address the problem. Major stakeholders in public health response—including coalitions, professional societies, non-governmental organizations (including foundations and community-based organizations), academic organizations and researchers, media/journalism, federal, state and local governments, international governmental organizations, and private sector technology platforms—have also morphed their strategies to address the problem. As more stakeholders are acting in this space, it is important to understand the approaches they are taking to identify gaps and opportunities to further a sustainable infodemic response.

This report is intended to provide an overview of stakeholder actions taken to address the infodemic. The goal is not to provide a detailed analysis of every intervention to address misinformation leveraged by all public health stakeholders as those attempts are being done elsewhere (see, for example, (Sundelson et al. 2023; Pundir et al. Forthcoming 2023)). Instead, this report will describe major stakeholders’ actions in this space while illuminating their potential effectiveness and sustainability by examining them against common public health frameworks, or lenses that help us conceptualize public health problems. The goal is to highlight the overall thrust of efforts by sector and key stakeholders, then assess how those general efforts fall into various frameworks. Such mapping can then identify opportunities for high-value, sustainable interventions that fill gaps in the overall infodemic response.

Before diving in, it’s crucial to take a step back and try to understand any key gaps in the *overall* efforts currently underway that address the infodemic and medical misinformation specifically. Our knowledge of, and experience with complex health problems, especially ones that are associated with difficult-to-change attitudes and behaviors with complex motivations, such as diabetes or smoking, suggests we will need a range of public health activities to combat medical misinformation. Similarly, focusing only on individual or institutional solutions for the infodemic will be insufficient. Instead, we will need a comprehensive, multi-level strategy that takes a variety of complex issues and social forces into account, much like the whole-of-society approach recommended by the Surgeon General in his 2021 Special Advisory on misinformation (Murthy 2021). To that end, we offer recommendations for suggested strategies and potential roles the medical profession can play as a key stakeholder in this space.

Methods

To build this report, we drew on two key research reports mapping efforts to respond to the public health infodemic created by the pandemic. One was commissioned by the National Academies of Science, Engineering, and Medicine (NASEM) for their recent workshop [The Public Health Infodemic and Trust in Public Health as a National Security Threat](#) (Sundelson et al. 2023). We also drew conceptually on a draft World Health Organization (WHO) initiative entitled “Infodemic management interventions during health emergencies: an evidence and gap map of the case of the COVID-19 pandemic” set to be released publicly soon. David Scales, MD, PhD, has taken part in the NASEM workshop and is a member of the working group advising the WHO evidence gap mapping process (Pundir et al. Forthcoming 2023). Both projects searched academic literature and reports and sought input from key stakeholders to identify initiatives seeking to address misinformation. They then inductively coded these initiatives based on the tools and approaches used.

Both reports acknowledge the many initiatives undertaken during the pandemic, noting that uncoordinated and siloed efforts often led to redundancy and ineffectiveness. It is reassuring that both reports reach similar conclusions despite different methodologies and inductive coding. However, since the NASEM report is public with publicly available data ([found here](#)) and the WHO evidence gap map and data are not yet public, we drew primarily from the NASEM report for this analysis, augmenting their database with missing initiatives based on our own knowledge of key actors and stakeholders working to address misinformation. We then reorganized their inductive categories according to the frameworks below. Finally, we broadly summarized the overall thrust of activities by sector, highlighting key stakeholders and initiatives. This report supplements the important work of those other reports with framework analysis that offers further insight into the sustainability of various initiatives and gaps in public health’s overall response to the infodemic.

We acknowledge key limitations to our work. First, we are describing public activities; however, many major stakeholders, particularly technology platforms, are addressing misinformation in various ways that are not all publicly disclosed. This gap also includes initiatives with well-known non-profit organizations collaborating with technology companies in this space, such as Public Good Projects or fact-checking organizations like FactCheck.org. Second, framework analysis is subjective and susceptible to bias. To minimize this, Sara Gorman, PhD, MPH, and Dr. Scales worked in tandem to assess the various initiatives and categories. More robust qualitative methodologies such as discursive coding with kappa evaluation were not possible in the short timeline of this project; however, we are planning such analysis to follow in a subsequent paper for peer review.

We define ‘misinformation’ as “information that is false, inaccurate, or misleading according to the best available evidence at the time,” drawn from the definition in the Surgeon General’s report, which was inspired by experts in misinformation studies (Vraga and Bode 2020; Murthy 2021). However, stakeholders discussed here may have used different definitions of misinformation or infodemic. Similarly, some stakeholders’ initiatives focus on ‘disinformation,’ distinguished from misinformation in

the existence of deception and intent to harm (Freelon and Wells 2020; de Cock Buning 2018). As disinformation is often seen as a subset of misinformation (Wardle and Derakhshan 2017), distinguished only by motive, we will not separate out such initiatives in this report as motives behind information’s spread is often difficult, if not impossible, to ascertain. We also use the terms “high-integrity” and “low-integrity” information drawing from The National Science & Technology Council’s recent report defining high-integrity information as “trustworthy; distinguishes fact from fiction, opinion, and inference; acknowledges uncertainties; and is transparent about its level of vetting...is also accurate and reliable, can be verified and authenticated” (National Science & Technology Council 2022).

Overview of Frameworks

Frameworks are metaphors. They bring certain issues into relief as useful exercises to think through complex problems. They are not reality but projections of reality. As such, they are not meant to be exhaustive or mutually exclusive. Complex ideas require intersecting frameworks to understand their different dimensions and how they concatenate. In addition to describing how the structure of information flows have changed in our networked information ecosystem, we employ three different frameworks derived from the public health field to illuminate different components and gaps in the overall infodemic response efforts: epidemiological, environmental, and socio-ecological.

The nature of past and current communication models



Figure 1A: Unidirectional model of traditional public health communication. Facts flow top-down from experts to the public. Gatekeepers have power over what information to broadcast/amplify

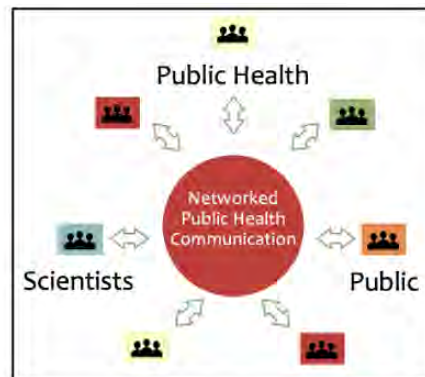


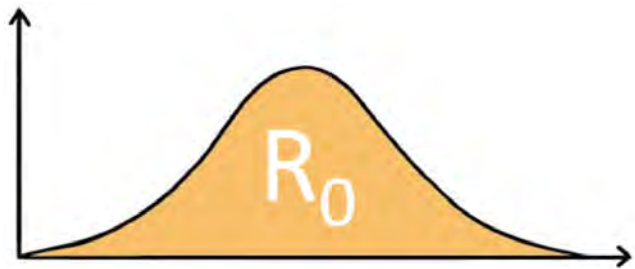
Figure 1B: Networked public health communication. Experts and the public are engaged directly in conversation with each other without intermediaries or gatekeepers.

In their chapter “Political Communication” in the *Oxford Handbook of Political Psychology*, Young and Miller describe the nature of our current communication ecosystem (Young and Miller 2021). Rather than top-down communication where elites and experts decide the messages to be disseminated and broadcast in mass media messages to large swaths of the population (Figure 1A), our communication ecosystem is increasingly decentralized, interpersonal, horizontal, and networked (Figure 1B). It is decentralized because, in this system, no one actor controls what narratives circulate. It is interpersonal

because influence is determined by the ability to leverage contacts to generate engagement and attention, a mode of communication based more on identity and emotions than logic or rationality. It is horizontal because in various digital environments (e.g. Twitter), experts and non-experts are constantly in conversation. In contexts that produce such “context collapse” (Davis and Jurgenson 2014) users tend to be “source blind,” not processing source cues to assess the reliability of information (Pearson 2021). Finally, it is networked because information does not spread from experts to the public via broadcast or print media but instead spreads through connected individuals and communities. To be effective, we need to target interventions to match the information environment in which we are living.

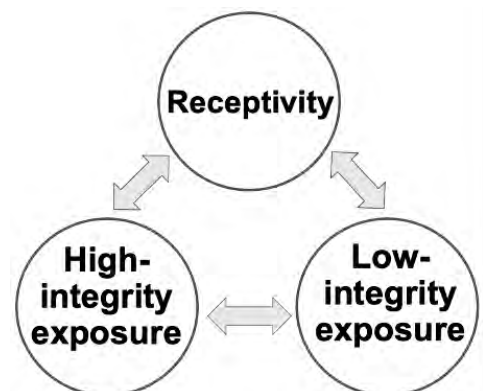
Epidemiological framework

Misinformation can spread “virally,” just as pathogens can, and there is thus good reason to approach responding to misinformation the same way we would respond to an infectious disease epidemic. By this we simply mean utilizing the activities common in epidemiologic investigations and applying them to the spread of information. The most prominent steps in this process include prevention, social listening, diagnosis (with risk assessment), and response. An epidemiological view of misinformation dictates a response that takes the nature of the spread of low-integrity information into account and counteracts the potential for these tidbits to go viral by employing evidence-based methods for subverting the spread of false or misleading information in settings where people naturally congregate, such as on social media.



Environmental health framework

The 2021 Special Advisory by the Surgeon General was titled *Confronting Health Misinformation: The US Surgeon General’s Special Advisory on Building a Healthy Information Environment* (Murthy 2021). In it, he argued that “misinformation pollutes our information environment,” making it harmful to human health. But his report did not define “information environment,” which, as one of the conditions in which we live, work, and play, we believe to be a social determinant of health (Scales and Gorman 2022). We define a healthy information



environment as one where people and communities are immersed in high-integrity information of public health importance and enveloped by a communication context that underscores the trustworthiness and importance of that integrity (Scales and Gorman 2022). Because even water is toxic in high enough doses, seeing misinformation as a toxin or poison in our information environments challenges strict definitions of misinformation at the level of a statement or truth claim. It forces us to think more broadly about misinformation narratives or campaigns. Along this perspective, any piece of information has the potential to be misinformation depending on the context in which it is presented.

As it is impossible to eradicate our environments of all toxins or pathogens, the focus according to this paradigm should be on three factors: understanding the proportion of exposure to low- and high-integrity information, people’s receptivity to finding misinformation credible, and a risk analysis to hone in on the toxins least likely to be abated with the potential to cause most harm.

Socio-ecological model

The socio-ecological framework originated to understand human development (Bronfenbrenner 1977), then was applied as a health-related theory in the 1980s (McLeroy et al. 1988). It emphasizes various interconnected factors that influence health: individual, interpersonal, organizational, community, and public policy. The goal of the model is to inform the development of comprehensive interventions to systematically target underlying mechanisms of behavior change at various levels of influence (Sallis et al. 2015). It has since been adopted by the CDC and other public health agencies to understand public health interventions from type 2 diabetes to cancer to HIV. For misinformation, this framework highlights the various influences on a person or community’s information environment. Effective responses to misinformation require an understanding of various levels of influence on exposure to information, how vulnerable they are to believing or making decisions based on that exposure, and how quickly and effectively low-integrity information exposure is mitigated.



How the frameworks fit together

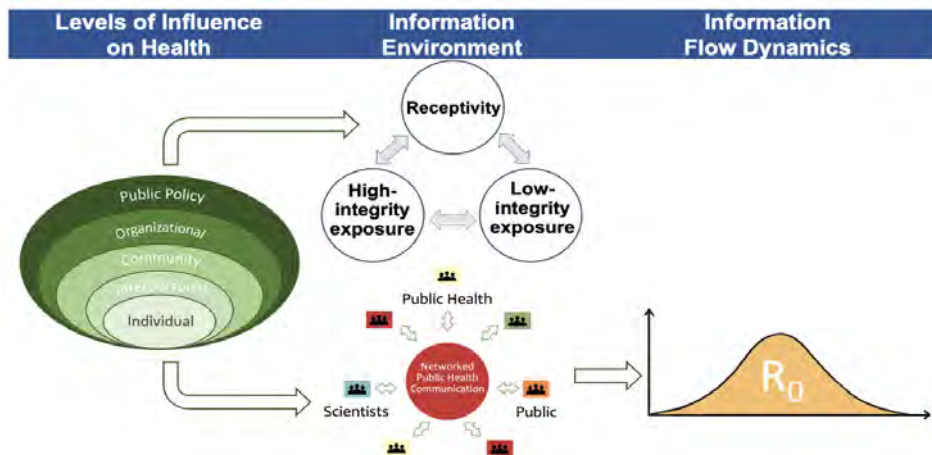


Figure 2: Combined frameworks

The socio-ecological framework details the broad structural factors that create the conditions in which different types of information environments form; information environments and networked communication determine the architecture of how people interact with information and contributes to their receptivity to misleading or false information; and this architecture then determines how information is spread and absorbed by people within various communities (Figure 2).

Activities by Stakeholder Group

The NASEM report organized initiatives by type of intervention. To offer a different viewpoint and a perspective on how the American Board of Internal Medicine (ABIM) and other medical specialty organizations can effectively contribute to this space, we chose to organize the document based on stakeholder type. This approach gives a sense of stakeholders’ main mechanisms of influence according to the above frameworks, emphasizing that cross-sectoral coalitions/collaborations are needed to cut across all aspects of the socio-ecological, epidemiologic, and environmental frameworks.

Coalitions/Collaborations

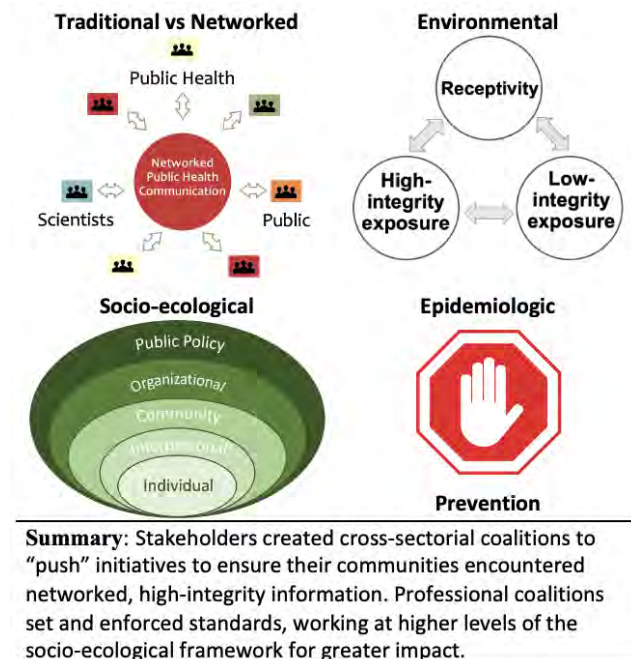
As misinformation is a complex problem, some of the most promising of the 13 initiatives labeled coalitions described in the NASEM database have involved collaborations that bring together stakeholders from multiple sectors. These include initiatives from various ad hoc coalitions, public-private partnerships, and other partnerships that aim to work at structural levels.

Activities Summary

The majority of activities in this sector fall into three categories: first, building toolkits that stakeholders can use to better address misinformation (e.g. clinicians, teachers, communities of color, university students, NGOs, community health workers, and individuals); second, “push” efforts in different communities to disseminate high-integrity information to community members; and third, efforts to establish standards professions or organizations could adopt to help prevent the spread of misinformation.

The first set of activities (toolkits) has produced several useful and high-quality documents, but as they are unidirectional with an audience of individuals, who must then in turn address misinformation among other individuals, the extent of their uptake and effectiveness is unclear.

Second, “push” initiatives do not require consumers to seek out information but are disseminated out to members of a community, often by trusted sources. This removes a significant barrier to exposure and uptake. Rather than needing to become aware of and actively search out and use this information, community members will passively encounter it. Two innovative coalitions have leveraged this approach. One, spearheaded by the International Federation of Red Cross and Red Crescent Societies, sought to lean into the participatory aspect of our networked information ecosystem and built a global influencer network to disseminate high-integrity information about COVID-19 vaccines to their social networks on social media. The second was a collaboration among the US Department of Health and



Human Services, Maryland Center for Health Equity, the Black Coalition Against COVID-19 and the National Association of County and City Health Officials (NACCHO), and SheaMoisture. It sought to leverage 1,000 barbers and beauty stylists in Black communities to push out educational information about both COVID-19 and associated vaccines.

Structural-level activities

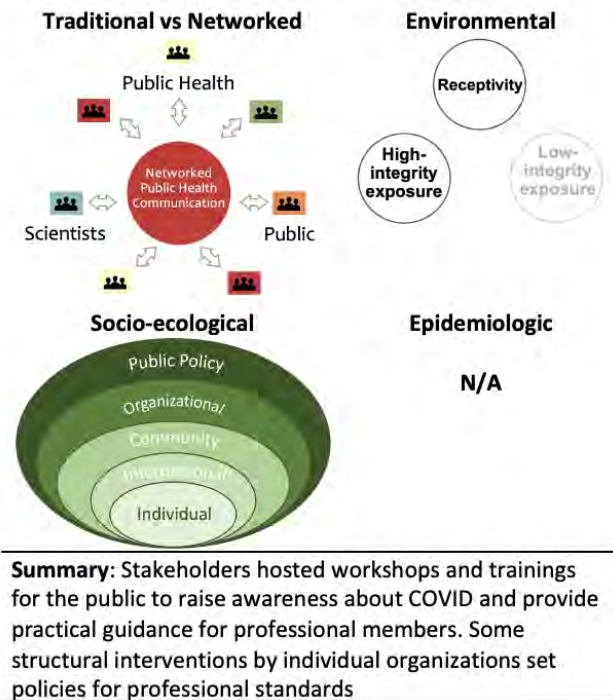
The third set of activities includes setting professional guidelines or principles. Examples include [the Trust Project's](#) efforts to establish indicators to engender trust in journalism and the [Santa Clara Principles](#), which set standards for accountability in content moderation. The Trust Project sought feedback from consumers on what principles media organizations must display to elicit trust, developing eight Trust Indicators that participating news organizations should build into their websites. Those that do so are then allowed to display the Trust Project's logo on their sites. These included disclosure about their methods, best practices, expertise, type of work, locally sourcing material, centering diverse voices, citations and references, and actionable feedback. The Trust Project notes that Facebook, Google, and Bing use these indicators to differentiate reliable, trustworthy journalism from other information.

The Santa Clara Principles were drafted in 2018 in response to the lack of transparency around content moderation guidelines, then updated with a broad coalition of more than 50 stakeholders from various sectors in 2021. They contain both foundational and operational principles in defining content on social media sites and any actions taken by a company against that content. While writers of the Principles acknowledge that implementation is inconsistent, they report that Apple, Facebook, Google, Instagram, LinkedIn, Medium, Reddit, Tumblr, Twitter and YouTube have endorsed and [committed to adhering to the Principles](#). These initiatives are seeking to set and enforce standards across entire professions, placing them higher in the socioecological framework than other initiatives in the NASEM database.

However, several key initiatives are missing from the NASEM database that are worth highlighting. First, the collaboration between the NASEM and the WHO (in discussion with Alphabet, Google's parent company) identified key attributes of trusted sources for health information on social media (Kington et al. 2021). Alphabet has applied these principles to highlight trustworthy sources in its search recommendation algorithms. While the effectiveness and cross-platform applicability of such credibility tags is not clear (Lalani and Laine 2023), such steps have so far been rare and can likely be improved with iteration. Additional coalitions have come together, such as a joint effort by ABIM, the American Board of Family Medicine, and the American Board of Pediatrics to support the Federation of State Medical Boards' position of taking disciplinary action against physicians who spread medical misinformation (Baron and President 2022; Baron and Ejnes 2022). Similar to the Trust Project, professional coalitions, including a broader coalition of medical specialties, have a significant opportunity to work at organizational levels of the socioecological framework by setting and enforcing professional and ethical standards among their ranks (Jurecic 2023). Finally, a [new coalition](#) of over 60 professional organizations, consulting companies, community-based organizations, and private sector organizations (like PhRMA) has also been established. With the goal of building trust in science, the organization has so far focused on "myth busting" using trusted sources. As it is still quite new, it is not yet clear what the coalitions' other activities will be.

Professional Societies

There is a fair amount of activity on misinformation across a variety of professional societies focusing on health, science, and medicine. Because few have been formally evaluated, most do not appear in either the NASEM database or the WHO evidence gap mapping project. For example, professional organizations of community health workers and nurses were actively engaged in addressing misinformation during the pandemic, but these initiatives do not appear in any of the above evaluations. These activities broadly fall into four categories: training activities/workshops; awareness-raising about misinformation; structural-level activities; and practical guidance for physicians.



Training Activities/Workshops

Training activities and workshops usually take the form of didactic and hands-on sessions for members to learn about what misinformation is, how to spot it, and how to respond to it. The **American Physical Society (APS)** is a good example of activities in this category. In 2021, APS announced a new Science Trust Project to “leverage scientific expertise in pursuit of addressing the spread of misinformation.” As part of this project, APS held a two-part training series with Critica to train members in counteracting misinformation on social media platforms. They also held occasional workshops on responding to misinformation using reflective listening and about effective science communication.

Awareness-Raising about Misinformation

This is the most common type of action that professional societies take concerning misinformation. This usually consists of webinars, conference talks, and public-facing videos and written materials about misinformation, how to spot it, and ways to counteract it. Here are some of the professional societies engaged in this category of activities:

- **American Association for the Advancement of Science (AAAS):** AAAS has rolled out a number of educational webinars, videos, and meeting agendas over the past few years. In 2021, they released a video series on mis- and disinformation, covering sexually-transmitted infections, using AI to combat misinformation, misinformation on HIV, climate change, and vaccine misinformation. There are also numerous commentaries in *Science* that cover misinformation, including extensive interviews with people who study it and review articles on interventions to counteract misinformation across an array of scientific fields.
- **AcademyHealth:** As a public health-oriented organization, AcademyHealth has aimed to draw more attention to the need for systemic and structural responses to misinformation. This notion

has mostly been presented at various annual events and meetings. For example, AcademyHealth representatives such as CEO Lisa Simpson have presented the idea that social determinants such as gender, race/ethnicity, and prior health behaviors and habits need to be taken into account to address vaccine hesitancy. Some of their blog materials discuss the need to move beyond fact-checking in favor of a “multi-layer, systemic response.” In 2022, AcademyHealth also supported initiatives to combine social media and in-person outreach to target zip codes with high rates of vaccine hesitancy. A lot of their work on misinformation has focused on vaccines, with a particular focus on COVID-19 immunizations.

- **American Public Health Association (APHA):** APHA’s activity around misinformation has been focused on the pandemic and misinformation surrounding COVID-19 and the vaccines. Most of this activity has furthermore been in the form of professional publications and public-facing materials such as podcasts. In October 2020, APHA released a special issue of the *American Journal of Public Health* focusing on misinformation and social media. The issue was sponsored by the National Cancer Institute and included 20 essays and studies about how and why people fall for misinformation and how it can be counteracted by evidence-based information. The main subject areas examined included COVID-19, vaccines, cancer, and health emergencies. There was also a 2022 podcast series called “Healthy You” focused on COVID-19 misinformation, covering what misinformation is, who is responsible for it, and what to do about it.
- **American Board of Obstetrics and Gynecology (ABOG):** ABOG has played a smaller role in response to misinformation than the American College of Obstetrics and Gynecology (ACOG, see below) but has made a public-facing commitment to counteracting misinformation. The organization released a statement in 2021 asserting that spreading misinformation/disinformation on a variety of topics, including reproductive health, contraception, abortion, and COVID-19, can lead to loss of ABOG certifications. Whether or how this is enforced is less clear.
- **ABIM Foundation:** Holds monthly Building Trust webinars and has provided funding to organizations to address misinformation, seeking to fund groups working at different parts of the epidemiological spectrum, i.e working on prevention, social listening, “diagnosis” (i.e. risk assessment), and response. In 2022, the Foundation funded Factchequeado for its work on social listening and a project from the city of Annapolis, Maryland (Cuidate Annapolis) for work to coordinate between social listening, risk assessment, and risk analysis, and then respond to misinformation. (Disclosure: This report was commissioned by the ABIM Foundation.)

Structural-Level Activities

Structural-level activities tend to refer to policy-level interventions or responses to misinformation. In the world of health and medicine, the **American Medical Association (AMA)** is the most prominent organization working at this level. In 2022, the AMA published a comprehensive policy on addressing mis- and disinformation. Included in this policy were some educational interventions, such as educating healthcare providers and members of the general public on what disinformation is and how to spot it. There are also some attempts to improve access to high-integrity information, including working with publishers and academic institutions to provide better overall access to health and medical information.

Importantly, as noted above in the section on collaborations, the AMA's work involves a fair amount of putting pressure on state licensing boards and state and local medical societies to take action against healthcare providers who spread disinformation. The AMA has also pressured social media companies to do more about mis- and disinformation on their platforms. The tangible outcomes of these advocacy activities are less clear.

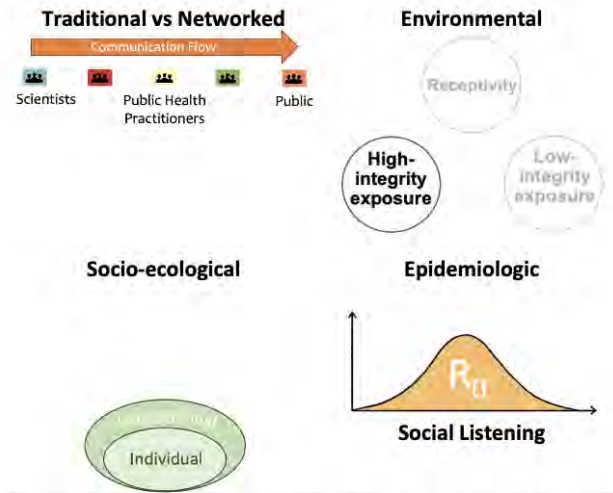
Practical Tools

Some professional societies also excel at providing hands-on, practical guidance for healthcare professionals that can be readily used in the clinic. A great example of this is **ACOG's** wealth of resources on misinformation, mostly surrounding abortion. ACOG created a toolkit, replete with social media graphics, that includes Q&As about various topics in abortion care, including how abortion affects mental health, whether people regret abortions, risks associated with abortions, reversing abortions, getting pregnant after an abortion, and risk of cancer following an abortion. There is also a research page on ACOG's website where abortion providers can watch webinars and learn tips about how to talk about abortion, including a set of core messages that the organization suggests providers use. ACOG also offers a regular workshop for providers on constructive discourse about abortion. It is worth mentioning that reproductive health has a longer history of dealing with misinformation than other medical specialties. With their experience and lessons learned about how to respond to misinformation, they likely offer several potential lessons to other medical specialties.

Non-governmental Organizations

Non-governmental organizations (NGOs), which includes non-profit community-based organizations, think tanks, foundations and registered 501(c)(3) organizations, have been extremely active during the infodemic. Often more nimble and well connected to communities they serve, these organizations generally work at a smaller scale but may have more impact than larger but less community-tailored initiatives.

Think tanks have also been active in trying to set agendas and conducting research on misinformation. Rand Corporation, for example, has been working on misinformation for a long time, though mostly from a national defense perspective. Other think tanks involved in this space include the Brookings Institution and the Center for American Progress.



Summary: Stakeholders participated in a range of activities primarily leveraging top-down or occasionally bi-directional communication methods to increase exposure to high-quality information. Initiatives in this sector were often siloed, leading to redundancy & inefficiency that likely blunted effectiveness

Activities Summary

The diversity of projects by different actors in this space is inspiring. Most projects are focused at the individual or interpersonal level and seek to increase exposure to high-integrity information. The tools built to do this include fact-checkers, podcasts offering trusted information, gamified tools to identify fake/misleading content, and source verification (e.g. identifying Twitter bots). Some of these efforts work upstream to empower various groups and organizations, such as teachers, librarians, and schools, to train others in digital/media literacy and counteracting misinformation.

An especially prominent organization in this space is the Public Good Projects (PGP), which runs various initiatives seeking to monitor misinformation and work with communities to address it. For example, PGP runs Project VCTR, a social listening system that started by monitoring anti-vaccine misinformation and has broadened to track other types of medical misinformation with regional specificity. This work helped them build the Vaccine Demand Observatory, a collaboration with multiple partners that consists of a dashboard of circulating anti-vaccine misinformation and tracks vaccine information gaps in different countries. They use insights from Project VCTR to inform the Public Health Communications Collaborative, which provides information to US public health departments about what rumors and misinformation are circulating and suggests messaging to address them in their communities. They also have acquired the This Is Our Shot (TIOS) project, a network of volunteer physicians and health professionals who sought to shape norms in online spaces about getting vaccines and spread high-integrity vaccine information in digital networks. PGP now also runs “Shots Heard,” an initiative seeking to provide a digital backstop to support pro-vaccine advocates who are being attacked in online spaces.

These projects have had different degrees of effectiveness. For example, TIOS, while an innovative idea, has not secured funding to continue its work. PGP also ran stronger.org, an attempt to build a coalition of organizations and individuals to support each other's work in addressing misinformation within each organization's local context. While the size or effectiveness of the stronger.org coalition is not clear, their lack of social media presence suggests the coalition has lost either funding, momentum, or both. Notably, PGP has had several other initiatives, including leveraging influencers to spread pro-vaccine messages and working with various communities to address anti-vaccine misinformation. They also partnered with social media companies, but the goals and effectiveness of these projects are not public.

Structural-level activities

Several foundations have been working in the misinformation space, including the Robert Wood Johnson Foundation, Craig Newmark Foundation, Knight Foundation, Rita Allen Foundation, Bill & Melinda Gates Foundation, The Rockefeller Foundation, and Open Society Foundation and foundations associated with federal government agencies, like the CDC Foundation and the Reagan-Udall Foundation (affiliated with the FDA). While their emphasis on medical/science misinformation varies, during the pandemic most turned their attention to the health emergency.

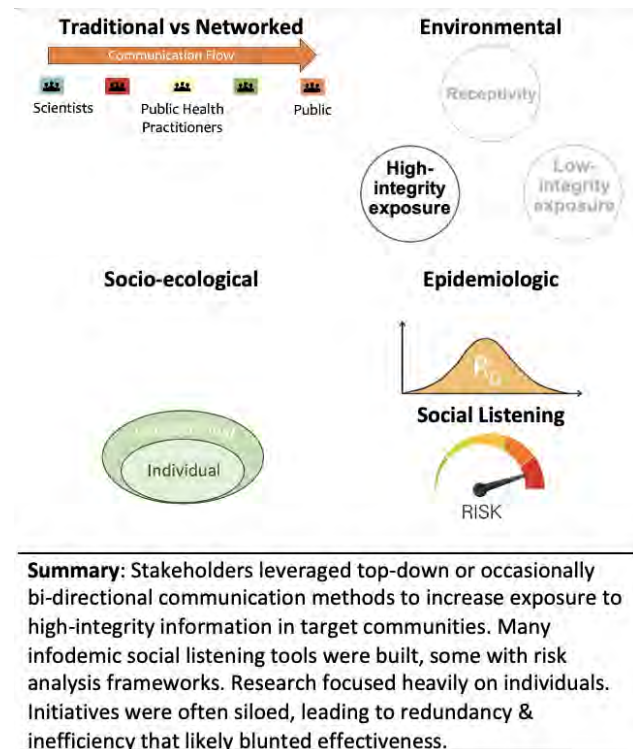
As these funders have supported various academic and non-profit initiatives, their priorities will not be covered separately except to note that together foundations' funding priorities have major influence over the funding landscape. For example, the Mercury Project, a joint initiative of the Rockefeller, Robert Wood Johnson, Gates, and Craig Newmark Foundations, required that all applications focus beyond opinions and beliefs by using behavior as an outcome. They also required the use of randomized controlled trials (RCTs). As a result, their first round of funding supported [several innovative projects](#), but the RCT design lends more easily toward examining interventions affecting individuals or communities over structural interventions. Outcomes remain limited to individual knowledge, "vaccine information literacy," whether people share vaccine information, and ultimately get vaccinated. The Mercury Project has innovatively restructured how the research is done, however, by bringing awardees together to provide input on each other's draft projects and collaborate on a research framework. Such coordination among researchers before doing the experiments is rare and welcome.

Academic Organizations & Research

Actors in the academic sector include some researchers, projects, and initiatives with varying degrees of academic affiliations, like professors, research centers, or institutes. The database contains 46 initiatives, which is not exhaustive but offers an overview of such activities.

Activities Summary

Not surprisingly, much of the focus here is on education and providing high-integrity information. This can include websites or podcasts that provide factual information or fact-checking, various technological solutions to verify sources like twitter bots or urls on a website, databases of fact-checking websites, and gamified tools to help users identify fake or misleading content. Some initiatives track misinformation and go a step further by trying to forecast geographic locations where there may be higher rates of vaccine hesitancy based on the trends of circulating mis/disinformation.



It should be noted that there are many researchers now studying misinformation and how to combat it. Misinformation research has been noted to have an “i-frame” bias, meaning that the research products predominantly focus on individuals rather than structures, in part because individuals are much easier, cheaper, and faster to study (Chater and Loewenstein 2022). As some researchers have noted, this research and publication bias toward i-framed research “pollutes” the discourse around potential solutions, giving the impression that because i-framed solutions predominate in the literature they are the best or only options (Maani et al. 2022).

Structural-level activities

From the educational standpoint, there are several initiatives providing tools or education in various formats to diverse stakeholders (students, teachers, librarians, schools, organizations, rural communities, indigenous groups) to better equip them to reach the target group or community of interest. Many of these initiatives, while laudable, suffer from lack of demand. These tools and toolkits were built with the hope that people would find and use them, without sufficient marketing budget to support dissemination. As a result, the update and impact of these academic initiatives is variable, with the prestige of the university sometimes assisting to draw people to the resource.

One organization worth highlighting is the Information Futures Lab, which is now housed at the Brown School of Public Health (formerly First Draft News, an NGO). They have engaged in multiple initiatives,

like a prebunking toolkit for public health professionals, a field guide to studying false information, and resources for news verification. They have published a case study called Infrastructures of Trust: The Case for Investing in Vaccine Demand, arguing that we should be [assessing and meeting the information needs of communities](#). They also developed “Cross Check,” an initiative to assist journalists in monitoring and verification techniques but leveraging the training to build a working network of over 60 journalists to collaborate on assessing and debunking claims. It was a novel approach to addressing misinformation around an event expected to produce mis- and disinformation. It is a rare example of an initiative designed to increase high-integrity information while trying to reduce the spread of mis/disinformation through a networked community. Starting the initiative in France, they ultimately built similar networks in Nigeria, Brazil, and the US.

Media/Journalism

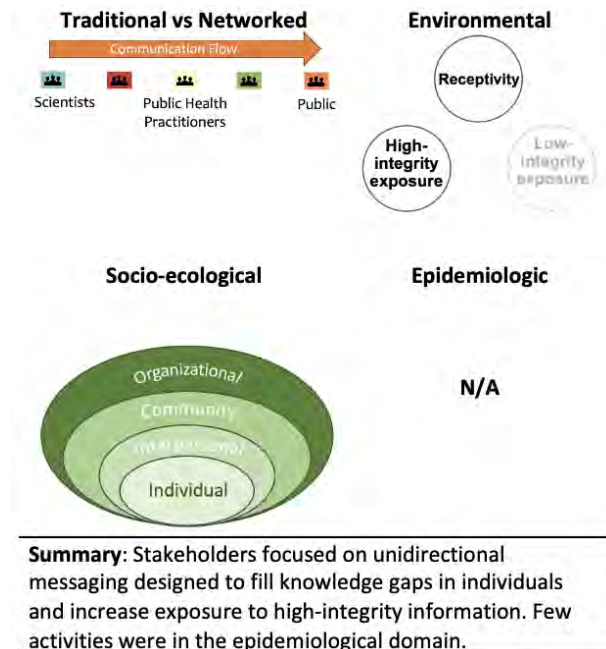
A number of organizations fit in this category; however, only 11 are in the database. It is worth noting that there are over 100 signatories to the International Fact Checking Network from more than 40 countries, so these organizations represent a fraction of global fact-checking efforts. Other actors in this space include peer-reviewed journals, preprint servers, journalism organizations, and broadcast, print, and online news organizations.

Activities Summary

Most activities done by actors in this category are consistent with fact-checking. In much of the world, journalists and journalism organizations have spearheaded fact-checking endeavors, resulting in their having similar characteristics according to the frameworks applied in this analysis. For example, they are usually unidirectional and focused on disseminating high-integrity information to individuals that seek it. Other organizations go beyond fact checking to provide assessments about source credibility (e.g. [Quackwatch](#)) and media bias assessments ([Media Bias/Fact Check](#)). Many news organizations in the US have added tags to articles that highlight the publication date to reduce the chances that they will be shared out of context in online spaces. Preprint servers have also added notices to highlight the fact that the manuscripts they contain have not been peer reviewed. Whether these initiatives reduce the spread of misinformation is not clear.

Structural-level activities

There are not many media/journalism initiatives focused on a structural level interventions. The reasons are myriad: journalism is in a funding and human resources crisis that has lasted a generation, such activities do not traditionally fall under the scope of journalism, and journalism's business model incentivizes reporting on sensational social problems rather than informing the public about solutions (for more on this, see Pickard 2019; Curry and Hammonds 2014). Some are moving toward bi-directional interactions or working to improve journalism at a professional level through training. Additional activities include building media literacy with the goal of reducing receptivity to finding misinformation credible. For example, BOOM, an organization focused on India, Myanmar, and Bangladesh, offers courses on fact-checking and media literacy plus a BOOM WhatsApp factcheck tipline in Gujarati that can answer user-inputted questions, similar to Factchequedo's [WhatsApp chatbox](#). This makes them two of relatively few media organizations working towards a bidirectional, rather than unidirectional, model, and responding to the information needs of communities. Factchequedo's founders from Maldita.es and Chequedo (Argentina) also have a history of working closely with communities in Latin America to ensure trust in and uptake of their fact-checking activities.



Intergovernmental Organizations

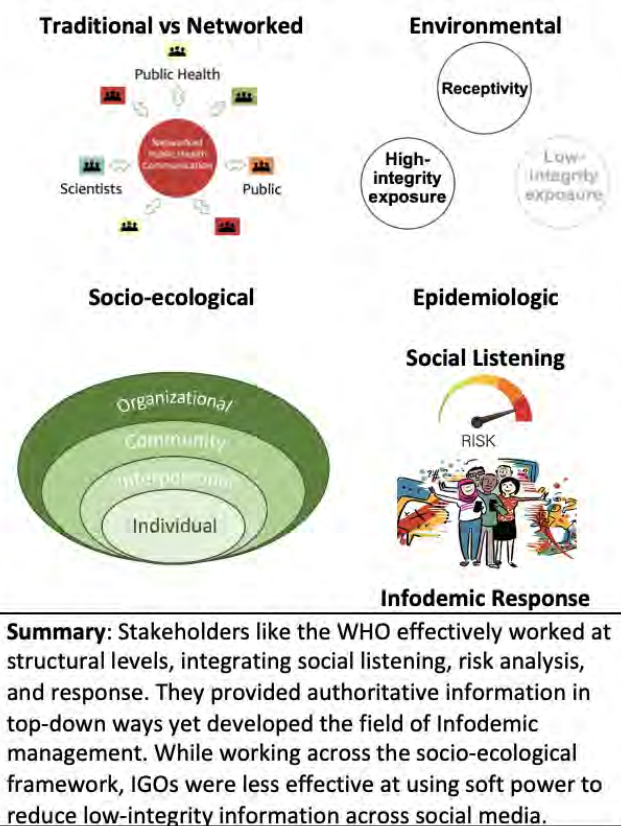
Of the 22 initiatives reported in the NASEM database, 13 were spearheaded by the WHO, six by other UN organizations, and the rest by the European Union or European Commission. It is important to note that the number of entries here can be misleading since some of the initiatives cut across organizations and others are the work of a single organization. A draft report with a more detailed assessment of the UN's response to the infodemic will soon be released by the [International Peace Institute](#) (IPI) (International Peace Institute forthcoming 2023). For example, the WHO/Google SEO partnership affected search results worldwide, and the WHO Health Alert WhatsApp messaging service partnership with Reach Digital Health provided high-integrity information to users in 20 languages.

Activities Summary

Most of the activities fall into categories like providing high-integrity, authoritative information either directly to individuals that seek it, or providing field guides or handbooks for different organizations to use when addressing misinformation. A small number of the listed initiatives focused on improving digital health literacy or media/information literacy, offering ways for people to report misinformation, or fact-checking. As such, most of the initiatives are unidirectional, focusing on increasing exposure to high-integrity information, and target individuals, communities, or professions. For example, the Africa Infodemic Response Alliance (AIRA) was formed early in the pandemic, drawing from seven different UN organizations, NGOs and African public health agencies, and sought to better tailor the WHO's official messaging to local populations so it would be more likely to resonate and change behavior.

Structural-level Activities

There are a few outliers to the above initiatives that fall under structural-level activities, however. First, during the pandemic, Google and the WHO worked together on search engine optimization to ensure high-integrity sources were prioritized over lower-integrity sources in search engine results. This rare example of a structural solution working at both increasing high-integrity information exposure while reducing exposure to low-integrity information ultimately led to the partnership with the National Academies of Medicine to identify the principles of trustworthy sources described in more detail in the Collaborations section. Additionally, the WHO engages in social listening through its EARS tool (Early AI-Supported Response with Social Listening), but as the WHO does not have any official response capacity, they pass off this social listening information to external stakeholders who can then respond.



The draft IPI report notes two important aspects of the UN’s work, and especially that of the WHO—an overall agenda-setting and norm-establishing strategy typical of the WHO’s “soft power.” For example, the WHO convened 1300 EPI-WIN stakeholders early in the epidemic, subsequently held multiple Infodemiology conferences with various experts and stakeholders (Calleja et al. 2021; Wilhelm et al. 2023), and developed an Infodemic Management training to meet the needs identified at those convenings. Now the term “infodemic management” is commonplace in public health departments worldwide, with public health professionals seeing infodemic management and combating misinformation as a core function of public health (Knudsen et al. 2023). To date, the WHO, with collaboration and support of the CDC, has trained over 1,300 infodemic managers from 142 countries, creating a networked “community of practice” that has been leveraged for infodemic insights on other outbreaks, like the ongoing global mpox (formerly monkeypox) epidemic (WHO 2022).

Aside from the WHO, work by the European Union (EU)/European Commission (EC) had a heavy structural focus as well. For example, an EU code of practice on disinformation and a high-level expert group on fake news and disinformation, both in 2018, sought to set guidelines for tech companies and EU policy for addressing disinformation. Not mentioned in the NASEM database is the possible follow-up to these 2018 initiatives, the Enlightenment 2.0 Project by the EC that has written three reports to offer guidance to policymakers trying to make decisions in the setting of our current networked information ecosystem (David et al. 2019; Lewandowsky et al. 2020; Scharfbillig et al. 2021).

Private Sector & Technology Platforms

This category includes a diverse set of 39 different initiatives consisting primarily of two types of technology companies: relatively small technology companies (from start-up to large) versus extremely large technology platforms like Facebook (Meta), Twitter, or Google (Alphabet). The smaller companies engage in several different activities, split primarily between the detection and tracking of misinformation, browser extensions and online tools that provide users with credibility ratings for information, images, video, and other online users, and educational applications primarily for children to build media and digital literacy.

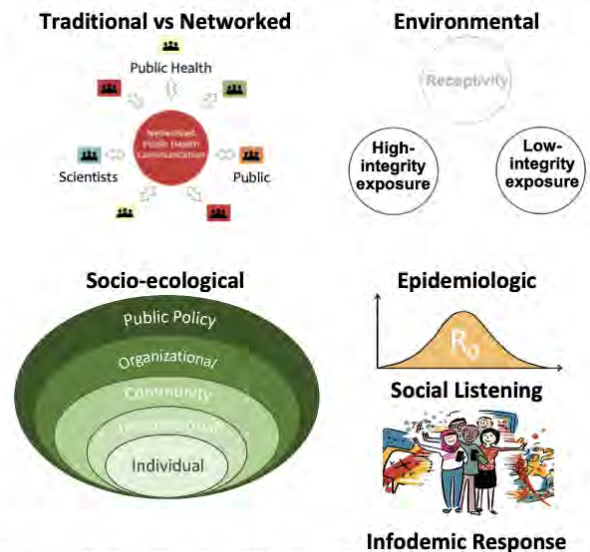
Activities summary

Many of the social listening activities involve monitoring platforms for mis/disinformation, often leveraging artificial intelligence (AI) or machine learning (ML) technologies. A number market themselves to help protect brands by monitoring rumors and assisting in response to “threats” (which are not well defined). While some of these commercial solutions have been cited by, for example, the Arizona Department of Health Services [Crisis & Emergency Risk Communication Plan](#), how well integrated and coordinated the essential functions of social listening, diagnosis, risk analysis, and response are remains unclear. While the Arizona plan notes the use of such monitoring tools, it goes on to state “Misinformation in the media should be corrected and addressed during the following news cycle,” but does not provide more details. While most activities require someone to actively seek out the information these services provide, once engaged, some of the rumor/misinformation monitoring technologies “push” alerts out to clients. However, as many of these initiatives come from private companies leveraging proprietary AI or ML technology, their algorithms and effectiveness is not yet clear.

A handful of activities from smaller technology firms offer solutions for building digital and media literacy, mostly among children through entertainment or games, essentially trying to reduce their receptivity to finding misinformation credible.

Structural-level activities

In contrast, the initiatives undertaken by the larger technology platforms like Twitter, Instagram (Meta), Facebook (Meta), WhatsApp (Meta), and YouTube (Alphabet) are likely to be more impactful, though data and transparency are lacking. For example, when Pinterest removed anti-HPV vaccine content from



Summary: Stakeholders like technology platforms had major influence on the dynamics of the infodemic. Their policies (when enforced) dramatically affected the information environment of users. The information they communicated was networked, facilitating dissemination of high-integrity information, and reducing exposure to misinformation across billions of users. Given their scale and position to enable structural changes to information environments, these stakeholders could have done much more to mitigate the spread of low-integrity information in their networks.

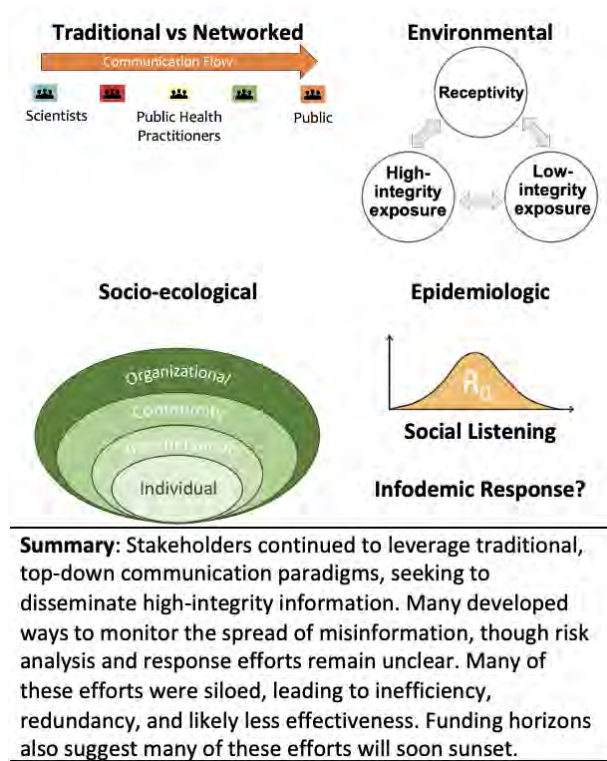
its social network, it significantly reduced the spread of misinformation on the platform but may have created an information vacuum (Guidry et al. 2020). While these platforms do not state how they do this, it is implied that some companies monitor their platforms for mis/disinformation (or are structurally unable to do so by design, in the case of WhatsApp). They then have curation policies to label or remove material that meets criteria they define for various online harms (e.g. hate speech, pornography, mis/disinformation), but, as the Virality Project and [various Avaaz reports](#) have shown, these policies are variably enforced over time, platform, and different languages (Stanford Internet Observatory 2022). As WhatsApp cannot monitor content, it sets structural limits on the reach of misinformation by placing limits on the number of chats/groups a user can forward a message to. Notably, Facebook raised the question of [rolling back its COVID-19 moderation policies](#) with its Oversight Board, which [recommended continued enforcement](#) and to reassess what claims they flag or remove. The Board's recommendation for more a localized approach was [dismissed by Meta as infeasible](#). Despite Elon Musk committing not to change content moderation policies without outside advisor input, Twitter rolled back its COVID-19 moderation policies at the end of 2022 with subsequent concerning upticks in hate speech and misinformation (Carniel 2023).

It is worth highlighting that initiatives by large social media companies are some of few that are pushed out by the companies to users, giving them the potential to reach across their entire network in a massive way that reduces exposure to low-integrity information to potentially billions of people. They are also one of the few groups with integrated activities across the full epidemiological spectrum of social media social listening, categorization of risks, and response mechanisms.

Additionally, many large technology platforms (and their subsidiaries) have provided funds via associated foundations, through funding competitions or contracts to support work to address mis/disinformation on their platforms. For example, WhatsApp has provided a relatively small amount of [funding to fact-checking organizations through the International Fact Checking Network](#), but misinformation is conspicuously absent from [Meta's research funding profile](#). Interestingly, while the organizations have the power to work structurally, most of the initiatives they fund seek to affect individual behavior through, for example, accuracy nudges or fact checking.

US Federal, State, & Local Government

City, county, state, and federal public health officials worked extremely hard to address the problem of misinformation during the COVID-19 pandemic. The size and diversity of various initiatives makes it difficult to collect a database of all stakeholder efforts. Even cataloging the various activities that the New York City Department of Health and Mental Hygiene used to monitor and address misinformation was a large undertaking (Knudsen et al. 2023). Therefore, while the NASEM database lists 21 different initiatives, most represent actions done by governments outside the US. As laws in other jurisdictions are less relevant to the goals of this report, we excluded these from our analysis, except to note that several laws have been put in place, for example in Singapore and Egypt, to curtail misinformation in theory but are used in practice as mechanisms for the government to silence critics.



We augmented the NASEM database with a handful of well-known federal government initiatives, but we caution that this list is also not exhaustive. Here we will describe only some initiatives that can help give a sense of both scale and range, highlighting ones that are particularly relevant as ABIM and partner organizations consider additional steps to take in this space.

Activities Summary

Federal government

Several agencies across the US government engaged in activities to address misinformation during the pandemic. These included efforts to offer and disseminate accurate information, toolkits, frameworks and guides to help other stakeholders like state or local health departments boost vaccine demand or combat misinformation, as well as agenda-setting convenings and documents. An exhaustive list is beyond the scope of this document, but there are a few notable initiatives worth highlighting.

The Centers for Disease Control and Prevention (CDC) focused on disseminating high-integrity information, offering digital media toolkits and rapid community information needs assessment guides as well as a COVID-19 disinformation toolkit to assist states in combating misinformation. The CDC continues to disseminate social listening of health-related rumors daily to key stakeholders at the CDC.

The Office of the Surgeon General sought to set an agenda and provide a pathway for other stakeholders to address the infodemic through its [Special Advisory on Combating Health Misinformation](#) released July 2021 (Murthy 2021). It subsequently issued a Request for Information (RFI) on the harms caused by misinformation during the pandemic. (Disclosure: Dr. Scales was contracted by the Office of the Surgeon General to assist with the RFI.) While the effect of these initiatives is unclear, such agenda setting did take place in some locales, as San Diego County sought ways to align its approach to the infodemic to that of the Surgeon General.

The National Institutes of Health (NIH) also approached the issue of misinformation and vaccine confidence. This was surprising because the NIH is known for its research funding, not implementation. It worked with state level partners, academics and community-based organizations to create Community Engagement Alliance (CEAL) Teams that had four objectives: create trustworthy COVID-19 information, develop educational tools, host events, and listen, partner, and engage the community. The NIH fostered partnerships in 21 different states, mostly functioning in a bidirectional model, seeking to make public health communication more responsive to questions raised by the community and leveraging trusted messengers to deliver those messages. Based on these goals, the initiative was oriented toward filling knowledge gaps and was not well equipped to manage strident vaccine hesitancy, for example. However, these initiatives served as incubators of innovative projects, some of which are expanding beyond the pandemic, for example in the Delaware, Maryland, Virginia region where the CEAL teams were trained in motivational interviewing, leveraging a decade of research showing the efficacy of this technique in reducing vaccine hesitancy among parents of newborns. The [iHeard St. Louis](#) collaboration between Washington University's Health Communications Research Laboratory and the local CEAL team produced a dashboard that has served as a model that is being expanded elsewhere.

The National Academies of Science, Engineering and Medicine (NASEM)¹ saw the need for scientific rapid response teams to provide evidence-based guidance to policymakers during the pandemic. With the support of the National Science Foundation and the Alfred P. Sloan Foundation, NASEM established the Societal Experts Action Network (SEAN) with one objective: to “quickly provide actionable responses to urgent policy questions.” This was an unusual initiative in that it sought to provide scientific guidance on social policy questions with turn-around times on the order of days, producing 12 rapid expert consultations, for example, on data types that public health departments should leverage during the pandemic and what made that data reliable, as well as 12 webinars and one consensus study report. It had a broad coalition of advisors and a committee supporting the work, which was informed by bi-weekly national surveys on perceptions of various aspects of COVID-19 and associated vaccines. Helpfully, this initiative was evaluated and a report issued by researchers at American University's School of Public Affairs, who noted how unique the Network's process was and said that by leveraging

¹ The NASEM is a private, non-governmental organization established by congressional charter in 1863. Its role has changed significantly over time, now playing a key role in informing the federal government on issues related to science, engineering or medicine (Blair 2016). While an NGO, 70% of its budget comes from the federal government, so it is included in this section.

dialogue with stakeholders and rapid review and response times, its work was received well by the stakeholders that sought their guidance (Marcotte and Suhay 2021).

State and local governments

Various state and local governments developed some degree of an epidemiologic/social listening infrastructure to respond to the infodemic, many leveraging both publicly available and commercial tools to monitor misinformation, like the Public Health Communications Collaborative or Project VCTR. However, the details of these systems are often not public, for example how they decided what misinformation to act on and what actions they chose to take. Most state activities fell into categories of seeking to increase exposure to high-integrity information. This was often achieved with websites for fact checking or debunking, suggesting messaging for local health departments to use, and hosting virtual town halls.

Some interesting initiatives sought to reach people who may not casually be exposed to or seek out high-integrity information. For example, California produced a bilingual WhatsApp chatbot that could answer user-submitted questions. Nebraska, North Carolina, and Virginia developed programs with businesses, faith leaders, and community ambassadors, respectively, to equip them to serve as “COVID-19 mitigation advocates” or promote vaccines. On one of its websites, Nevada asked visitors to sign a pledge to commit to providing factual information about COVID-19 vaccines to family and friends. Innovative approaches that sought to shift from uni- or bidirectional communication to a networked style of communication where people disseminate and propagate high-integrity information within their social networks were rare. The scale, reach, and effectiveness of these initiatives is also not clear. For example, Dr. Allison Arwady’s Facebook Live chats in Chicago (Kueppers 2023) were able to work bidirectionally, eliciting rumors from local residents shared and addressing them live. However, usually due to bandwidth issues, many of these activities were not evaluated and have not been published in peer-reviewed literature, risking that lessons learned from them will be lost in time.

This brings up the larger point of the sustainability of many of these local government initiatives. Even for well-resourced departments of public health like New York City’s, many of the community-based activities and partnerships developed during the pandemic have started to weaken. Many more are likely to disappear once federal emergency funding expires, like the Chicago Department of Public Health, which is funded nearly entirely by external grants. Several efforts to boost vaccine demand, build trust with communities, and address misinformation by leveraging community members as trusted messengers will be closed at that time. This misses an unfortunate but clear opportunity to do pre-emptive messaging on future vaccines like COVID-19 boosters or vaccines for respiratory syncytial virus. In general, public health funding is mobilized for immediate emergencies rather than building and sustaining the essential infrastructure and community partnerships that constitute true preparedness for crises. Public health communications and responses to vaccine hesitancy need to be funded and prioritized regularly, not just when there is a crisis.

Structural-level issues

Two major structural issues come up in evaluating the work of various governmental levels. The first is related to legislation and the second is in reference to coordination. While government has the power to issue legislation, relatively few laws seeking to address aspects of the infodemic were passed during the pandemic, and only at state levels. For example, California passed a law seeking to penalize clinicians who spread misinformation about COVID-19 vaccines, while Texas passed a law making it illegal for social media companies to moderate content. Both laws are being challenged in court. This stands in contrast to Australia and the EU, which passed national laws specifically to address infodemics and prevent them.

Second, despite a number of interesting initiatives, much of the governmental response to the infodemic at all levels was marked by a lack of coordination: within organizations or between government agencies. For example, NIH's CEAL teams were often unaware of what other teams were doing until much later in the pandemic. Additionally NIH, CDC, and FDA are not always aware of each other's infodemic social listening or response activities, or even key events like when FDA approval of COVID-19 vaccines or boosters is slated to occur to help prepare communication materials in advance. Moreover, sustained coordination is lacking between government and external stakeholders like professional societies or community-based organizations.

Conclusions & Recommendations

This overview of actors and their initiatives addressing medical misinformation offers insights that can yield recommendations for further work in this space. Given that there is relatively little data on evaluation, we are circumspect in offering these recommendations, recognizing that considerable uncertainty remains about what initiatives are or will be most effective.

Still, the gaps identified by this report highlight significant gaps and a strategic path forward. We would recommend that any actors considering interventions to address misinformation focus on four important principles: 1) target interventions higher in the socio-ecological spectrum to the extent they can; 2) build and lean into coalitions of stakeholders working across the socioecological spectrum for greater impact; 3) “push” initiatives out via trusted messengers to the communities of interest rather than assume information consumers will find and use such resources; and 4) define and use key outcomes to evaluate the effectiveness of the intervention.

There is a predominance of activities of questionable sustainability at the individual level of the socio-ecological model. NGOs, academic organizations, and researchers make up the bulk of stakeholders working on misinformation initiatives. However, the bulk of activities by these actors is focused on offering high-integrity information to individuals and communities or helping individuals identify low-integrity information. Often these individuals must seek out such information or tools (and heed them) to be effective. Notable exceptions to this are attempts to build digital or media literacy, which are also demand-based but are working toward the preventive end of the epidemiological spectrum, trying to reduce individuals’ receptiveness to misinformation.

Our intention is not to be critical of these or any single initiative working along these lines. Many do excellent work. However, there are two concerns about such a predominance of activities with such characteristics. First, such approaches are usually dependent on funding, with the long-term impact contingent on how long it can be supported and how many people were impacted. In short, the positive impact of many of these initiatives is not likely to be sustained in the absence of larger structural changes to the information environments in which individuals and communities are immersed.

Second, even assuming these initiatives succeed, the paucity of activities working across the socioecological spectrum raises many concerns for the overall efforts to address medical misinformation sustainably. For example, reductions in smoking rates have required sustained initiatives at various levels, including individuals (e.g. smoking cessation medications, warnings on cigarette cartons), structural initiatives (e.g. banning cigarette advertisements, indoor smoking bans, taxing cigarette sales), and a strong normative component that has stigmatized smoking in certain locations. To truly address misinformation, a mixture of both individual- and structural-level initiatives is likely to be needed. Unfortunately, the current landscape is heavily focused on individuals and one-off interventions that rely too much on immediate crisis concerns around situations such as the COVID pandemic for funding. This approach on its own will be neither sustainable nor maximally effective.

Most organizations do not have the capacity or funds to work across various levels of the socioecological spectrum. As this report notes in the section on collaborations, coalitions built striking examples of innovative projects commensurate with how target communities gathered and weighed information, working at different levels of the socioecological spectrum while affecting different aspects of the information environment of their priority communities. On the other hand, the lack of coordination between stakeholders is likely leading to less overall effectiveness in infodemic interventions. This appears to be an issue among government agencies, across academic initiatives, NGO projects, foundation funding priorities, and professional societies. The power of such coalitions suggests that much more effort and funding should go into building and sustaining them.

In addition to working at different levels of the socioecological spectrum, weighing initiatives against the environmental framework reveals that offering high-integrity information alone without considering the overall information environment is likely less effective. Such information dissemination, fact-checking, and prebunking/inoculation initiatives often fall victim to the “Field of Dreams” fallacy, assuming that “if you build it, they will come.” We have learned in our networked information ecosystem that people do not always seek out high-integrity information; it must be brought to them by trusted sources within their network.

Similarly, in the epidemiological framework, social listening is useful, but must be integrated with prevention and response, all based on a risk assessment framework to set thresholds at which actions need to be taken. This is recommended by the WHO (forthcoming 2023), but relatively few groups are doing the level of coordination that would be most helpful. Thresholds for intervention remain ill defined, overwhelming many health departments taking a “whack-a-mole” approach in addressing various pieces of misinformation as they arise.

Aside from the need for a greater degree of collaboration, there is another urgent need in the field of misinformation studies, including in medical misinformation: the need to better define the desired outcomes of various initiatives. While evaluations of digital interventions are hampered by social media platforms’ lack of data transparency, there is a dearth of publicly released evaluations of reach or effectiveness at counteracting misinformation even for didactic materials such as trainings and toolkits. There is also a lack of consensus in the field of misinformation about what outcomes really matter, though tentative discussions about potential outcomes have just begun (Green et al. 2023). Much of the literature in the field covers laboratory experiments that study sharing and other online behaviors. It is still unclear the extent to which these kinds of online behaviors are connected to actual health decisions, behaviors, and, most importantly, health outcomes. The field of medical misinformation needs to align on the key outcomes that will be critical in counteracting the potential impact of misinformation on health decisions and behaviors. Subsequently, more future initiatives in this space need to have evaluation plans as a central component of planning and executing their activities.

Table 1: Summary of stakeholder activities by public health framework

Actor	Frameworks			
	Directionality	Environmental	Socioecological	Epidemiologic
Coalitions/ Collaborations	Networked	Increase high-integrity information; decrease low-integrity information	Organizational; Policy	Prevention
Professional orgs - Independent - Collaborative	Unidirectional	Increase high-integrity information; Receptivity	Individual Organizational; Policy	N/A
NGOs	Unidirectional	Increase high-integrity information	Individual; Interpersonal	Social listening
Academic	Unidirectional	Increase high-integrity information; Receptivity	Individual; Interpersonal	Social listening, some Risk analysis
Media/Journalism	Unidirectional	Increase high-integrity information; Receptivity	Individual; Organizational	N/A
IGOs - With Google - Infodemic mgmt	Networked	Increase high-integrity information, decrease low-integrity information	Individual; Organizational; Policy	Social listening, Risk analysis, Response
Private sector (Smaller companies)	Unidirectional	Increase high-integrity information; Receptivity	Individual, Organizational	Social listening
Private sector (Large companies)	Networked	Decrease low-integrity information	Organizational, Policy	?Social listening, Risk analysis, Response
Government Federal State/local	Unidirectional	Increase high-integrity information; Receptivity; decrease low-integrity information	Individual; Interpersonal	Social listening, Risk analysis, ?Response

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