

Chapter 2

Key Concepts and Definitions in Infodemic Management



Atsuyoshi Ishizumi and Brian Yau

2.1 Introduction: Overview of WHO Infodemic Management Framework

Key terms defined in section: *infodemic*, *infodemic management*.

Infodemic management is an amalgamation of a wide range of disciplines. It is also a relatively new practice compared to other public health functions and has a rapidly growing scientific evidence base. Due to the nascent and transdisciplinary nature of infodemic management, it is important to have a harmonised understanding and agreed language when discussing key concepts. This chapter will specifically explore how we can conceptualise and operationalise the key concepts that underlie each stage of the infodemic management framework (World Health Organization 2020a).

Before we consider the framework, however, we must first define the main problem it aims to address – the infodemic. An infodemic is best regarded as too much information, including false or misleading information, within digital and physical environments during a disease outbreak. It makes it difficult for people to find information to better protect themselves and their communities, leading to risk-taking behaviours that can harm health or increase mistrust in health authorities (Calleja et al. 2021; World Health Organization 2022a). From this definition, infodemic management can then be defined as the systematic use of risk and evidence-based analysis and approaches to manage the infodemic and reduce its impact on health behaviours during health emergencies (World Health Organization 2022a). The infodemic management framework illustrates the different steps involved in successful infodemic management (World Health Organization 2021a).

A. Ishizumi (✉) · B. Yau

Unit for High Impact Events Preparedness, Department of Epidemic and Pandemic Preparedness and Prevention, WHO Health Emergencies Programme, World Health Organization, Geneva, Switzerland
e-mail: ishizumia@who.int

2.2 Social Listening and Infodemic Insights – Questions, Concerns, Narratives, and Misinformation

Key terms defined in section: *social listening, information void, confusion, rumours, mis/disinformation.*

The implementation of social listening is one of the first activities that infodemic managers should consider. It is an essential step because it helps you to better characterise a population's concerns and worries, to understand the questions, and, thus, frame risk communication messages accordingly. It also enables the collection and analysis of data that can be used to inform the subsequent stages of the infodemic management framework. The conventional definition of social listening comes from the business world, where it has been used to track online conversations among consumers about a certain brand or product to inform marketing, branding, or other sales strategies. Although we sometimes employ similar social listening methods in infodemic management, our definition and approach are more expansive. Social listening in infodemic management can be defined as any form of data collection and analysis activity conducted across social media, traditional media, and when integrated with other data sources, such as user search trends, epidemiological data, and socio-behavioural data, it yields infodemic insights to identify, categorise, and understand the concerns and narratives expressed. Social listening and infodemic insights use an integrated method for public health analysis and insights generation to inform evidence-driven infodemic interventions (Purnat et al. 2022).

There are many different challenges that constitute an infodemic and we can apply social listening and infodemic insights to track and understand them. Information voids, for example, occur when there is a lack of reliable and accessible health information, which can consequently lead to anxiety or confusion among the affected population or provide a fertile ground for rumours. Information voids are often a result of the inability of health authorities to quickly disseminate information due to inadequate evidence (Calleja et al. 2021). Confusion, in this context, can be understood as difficulty in understanding publicised health information or the inability to discern the best course of action for protecting one's health during an infodemic.

There are also more obvious challenges associated with infodemics, such as misinformation and disinformation. The former refers to information that is false but not intended to cause harm. The person disseminating misinformation may believe it to be true (World Health Organization 2020b). Disinformation, conversely, is false information that is deliberately created or disseminated with the express purpose of causing harm where the person disseminating disinformation knows it to be false (World Health Organization 2020b). Lastly, rumours refer to unverified information that can either be true or false (World Health Organization 2020b). Social listening and infodemic insights are a useful tool for monitoring and assessing all of the above, but we cannot address infodemics with social listening and infodemic insights generation alone.

2.3 Delivering High-Quality Health Information and Programming

Key terms defined in section: *evolving science, outdated information, risk communication, changing guidance, trusted messenger, pretesting, co-development, vulnerable communities, debunking.*

In addition to understanding the public's concerns and questions via social listening and infodemic insights, another important role public health can play during an infodemic is that of ensuring delivery of high-quality health information and health programming. High quality can be defined in various ways, and is particularly difficult to achieve during an infodemic. For instance, when responding to a novel public health threat that requires new scientific investigations and knowledge, people are likely to struggle with what we may call *evolving science*, a state in which the scientific evidence base relating to a specific topic is constantly being updated at a rapid pace. This can easily lead to public confusion, as the imperative to replace outdated information with new evidence or reinterpretation becomes greater. In these instances, it becomes increasingly important to adhere to the principles of risk communication, or the real-time exchange of information, advice, and opinions between officials and people who are facing the emergency (World Health Organization 2022b).

Even if risk communication is implemented appropriately, as a consequence of *evolving science* and outdated information, changing guidance released by health authorities that repeatedly undergoes updates can add to people's confusion or anxiety and requires ongoing engagement with the community of concern. In such situations, it is particularly important to leverage networks of trusted messengers who are considered by members of the community to be credible sources of health information. Examples of trusted messengers include physicians, faith leaders, or co-workers. However, we need also to remember that those whom the health authority thinks are trusted messengers may not always be considered well-respected or trustworthy by those receiving the message. This means that infodemic managers must identify trusted messengers specific to the community in which they are working and avoid making any assumptions.

Evidence suggests that the use of trusted sources and channels can be effective in addressing mistrust or misinformation, especially when working with vulnerable communities who may be disproportionately affected by health emergencies and infodemics (Dada et al. 2022; van Prooijen et al. 2021). Messages should be subject to pretesting when possible before dissemination. Pretesting refers to the process of examining the acceptability, understandability, and potential effectiveness of health communication materials before they are officially released to the public, and ideally includes direct input from members of the affected community. These types of participatory processes that involve trusted messengers and community members in decision-making are known as *co-development*, and lead to community ownership and contextually appropriate interventions (World Health Organization 2017).

Furthermore, strategies for delivering health information to members of vulnerable communities should be prioritised, as they are more likely to experience

barriers to accessing accurate and timely information that can promote healthy behaviours. There are additional challenges in collecting social listening data in these communities due to factors such as their unique information environment or inherent mistrust of health authorities. Examples of communities susceptible to infodemics include ethnic or racial minority populations that have experienced historical health inequities, migrant communities without access to routine health services, or the elderly who may lack digital and data literacy.

Although misinformation and disinformation are merely one part of the plethora of challenges that constitute an infodemic, they can sometimes hinder the delivery of health information or programmes. Responding to specific pieces of mis/disinformation may not always be as practical or effective as addressing the root causes of these problems, such as information voids or poorly delivered health information. Nonetheless, on occasion, it may be necessary to directly manage misleading or incorrect claims that have spread widely. This process is known as debunking: providing corrective information that reveals the falsity of misinformation or disinformation *after* people have been exposed to it (World Health Organization 2020b).

2.4 Intervening Through Design, Implementation, and Evaluation

Key terms defined in section: *integrated analysis, behavioural models and theories, human-centred design, monitoring and evaluation, strategy refinement.*

The delivery of high-quality health information is an integral part of infodemic management, but the sole reliance on health communication is often insufficient. When countering infodemics, we must also develop and implement data-driven interventions that go beyond the delivery of information. Analysis of social listening data should be carried out in such a way that generates recommendations for action that public health authorities, or other organisations, can develop interventions or base decisions about programmes on. Infodemic management interventions are strategies, policies, or health programmes designed to identify, address, or mitigate the harms of an infodemic and may include, but are not limited to, science and knowledge translation, design of the information environment, community engagement, design and quality of health service delivery, updates to health guidance, or capacity building to build resilience to misinformation.

An important approach for deriving actionable recommendations is what is known as integrated analysis, using social listening and other data sources, not only that obtained from monitoring social media, but which through integrated analysis and infodemic insights generaiton also incorporates both quantitative and qualitative interpretations of the synthesised material. Since most data sources and listening tools used for infodemic management have some degree of limitation, relying on a single data source is likely to result in biased or misleading recommendations,

which, in turn, leads to suboptimal interventions or programmes. To avoid this, human analysts, who are ideally well-versed in quantitative and qualitative indicators, are recommended as the drivers of data triangulation and synthesis of infodemic insights.

Another essential aspect of intervention development is ensuring that it is informed by behavioural models and theories to the fullest extent possible. Usually, the final goal of infodemic management interventions is to induce positive health behaviour change among the community of focus, whether it be increasing vaccine uptake or reducing incorrect use of masks. Therefore, it is critical that interventions are designed and deployed based on theoretical frameworks used in public health, and more specifically in the discipline of social and behavioural sciences.

There is a wide range of behavioural theories and models, ranging from frameworks that have been used extensively in public health such as COM-B (WHO Regional Office for Europe 2019; World Health Organization, Food and Agriculture Organization, UNICEF 2012; Michie et al. 2011), to more recent ones such as nudge theory or the Fogg Behavior Model (Agha et al. 2019; Thaler and Sunstein 2008). Where possible, it would be valuable to identify a behavioural scientist who can help you or your infodemic management team in selecting the appropriate framework and applying it during intervention development. Regardless of which framework you choose, it is important that it is applied to the infodemic management workflow early in the process so that it can guide data collection activities, for example, through developing a survey instrument based on theoretical constructs.

Furthermore, infodemic managers may also want to consider employing human-centred design (HCD) when developing interventions. HCD is a problem-solving approach revolving around the principle that successful solutions are created with the needs and wants of the end user in mind (Adam et al. 2019). This process involves understanding the problem you are trying to address from the perspective of the community member, empathising with their needs, and co-creating intervention ideas through their inputs. Even if it is not feasible to implement the entire HCD process, it would be worthwhile keeping the basic principles of HCD in mind as you design interventions so that they are more likely to be effective and widely adopted by target community members.

Once interventions have been developed and are ready for launch, their rollout and impact should be tracked and assessed systematically using the guiding principles of monitoring and evaluation. Monitoring informs programme planning through ongoing and periodic data collection that measures the progress of intervention implementation, including process indicators such as how well the intervention is reaching its target audience. Evaluation entails assessment of the intervention's impact, both in terms of effects on health outcomes and cost-effectiveness. Monitoring and evaluation indicators should be designed and incorporated into programme planning early on, ideally during the intervention development stage. These indicators should be tracked and analysed periodically to inform continuous strategy refinement, whereby interventions are quickly adapted to the changing needs of target communities.

2.5 Promoting and Supporting Resilience, Health Behaviours, and Community Engagement

Key terms defined in section: *community empowerment, community engagement, information equity, health/digital/data literacy, social inoculation.*

Successful infodemic management is not only defined by a health system's ability to deliver high-quality information and implement effective interventions, it also involves empowering individuals and communities to navigate an infodemic. Empowerment of community members should be conducted through the framing of access to reliable health information as a right (World Health Organization 2021b). A key factor in achieving community empowerment is community engagement, the process by which communities, organisations, and individuals build a long-term relationship with a shared vision for the benefit of the community (World Health Organization 2020b).

At every step and level of infodemic management, we should seek opportunities for community involvement and collaboration, especially when dealing with vulnerable communities. Bidirectional relationships between health systems and community members are vital to achieving information equity, where everyone has equitable access to acceptable, relevant, credible and current health information regardless of language, age, race, or other sociodemographic characteristics.

In order to support resilience during infodemics, we must also build and promote literacy at the individual level. In the context of infodemic management, there are different types of literacy that are interrelated and all of them are important. Health literacy is the degree to which people are able to access, understand, appraise, and communicate information, and to engage with the demands of different health contexts in order to promote and maintain good health across the life-course (Dodson et al. 2015; World Health Organization 2020b). Digital literacy refers to people's awareness, attitude, and ability to use digital tools to identify, access, manage, integrate, evaluate, analyse, and synthesise digital resources, construct new knowledge, and communicate with others appropriately (Martin and Madigan 2006; World Health Organization 2020b). Similarly, data literacy includes skills and thinking that revolve around undertaking everyday activities such as searching, evaluating, interpreting, and citing data, while also being able to critically think about digital rights, privacy, and the mechanisms of the online ecosystem (Carmi et al. 2020; World Health Organization 2020b).

A promising strategy for promoting literacy and resilience is "social inoculation" (Lewandowsky and van der Linden 2021), an approach that is arguably more important than debunking, because it can help prevent mis/disinformation from spreading in the first place. "Social inoculation" is a concept that comes from social psychology and is based on the idea that we can pre-emptively build resistance to mis/disinformation that one may encounter in the future (McGuire 1961; Roozenbeek et al. 2020). It works by identifying and deconstructing hoaxes, myths, or other types of incorrect claims to which we can potentially be exposed so that our psychological susceptibility to taking them at face-value is reduced. Infodemic

interventions that incorporate “social inoculation” can come in a variety of forms, such as an online game that teaches players common disinformation techniques, or pre-emptive “inoculation” messages that highlight scientific consensus (Basol et al. 2021; Cook et al. 2017).

2.6 Strengthening Preparedness, Planning, Policy, and Systems

Key terms defined in section: *whole-of-society approach, routinised social listening.*

The terminology and definitions introduced in this chapter demonstrate that infodemic management requires multidisciplinary collaboration and a whole-of-society approach. As infodemic management is an important public health practice that should be considered as essential as other interventions such as vaccination during an epidemic response. Infodemic management plays a significant role during the whole epidemic and pandemic prevention, preparedness response, and recovery cycle. A key part of preparedness strengthening efforts will be to increase the degree of coordination between stakeholders across the whole of society, including, but not limited to, WHO, its Member States, scientific, professional and public health institutions, private sector communication and telecoms companies, state communication bodies, search engines, civil society, academia, frontline health workers, and others, all the way down to the grassroots level of neighbourhood mutual support groups (World Health Organization 2020c). Ideally, a public health system that has a high level of infodemic preparedness conducts routine social listening, integrated analysis and infodemic insights activities on an ongoing basis, similar to the way in which well-functioning health systems have robust surveillance mechanisms. In such a system, infodemic management insights are regularly discussed with stakeholders who, in turn, are also able to act regularly on recommendations to improve programmes and communication strategies.

References

- Adam M, McMahon SA, Prober C, Bärnighausen T (2019) Human-centered design of video-based health education: an iterative, collaborative, community-based approach. *J Med Internet Res* 21(1):e12128. <https://doi.org/10.2196/12128>
- Agha S, Tollefson D, Paul S, Green D, Babigumira JB (2019) Use of the Fogg behavior model to assess the impact of a social marketing campaign on condom use in Pakistan. *J Health Commun* 24(3):284–292. <https://doi.org/10.1080/10810730.2019.1597952>
- Basol M, Roozenbeek J, Berriche M, Uenal F, McClanahan WP, van der Linden S (2021) Towards psychological herd immunity: cross-cultural evidence for two prebunking interventions against COVID-19 misinformation. *Big Data Soc* 8(1):20539517211013868. <https://doi.org/10.1177/20539517211013868>

- Calleja N, AbdAllah A, Abad N, Ahmed N, Albarracin D, Altieri E, Anoko JN, Arcos R, Azlan AA, Bayer J, Bechmann A, Bezbaruah S, Briand SC, Brooks I, Bucci LM, Burzo S, Czerniak C, De Domenico M, Dunn AG, Ecker U et al (2021) A public health research agenda for managing infodemics: methods and results of the first WHO infodemiology conference. *JMIR Infodemiol* 1(1):e30979. <https://doi.org/10.2196/30979>
- Carmi E, Yates SJ, Lockley E, Pawluczuk A (2020) Data citizenship: rethinking data literacy in the age of disinformation, misinformation, and malinformation. *Internet Policy Rev* 9(2):1–22. <https://policyreview.info/articles/analysis/data-citizenship-rethinking-data-literacy-age-disinformation-misinformation-and>
- Cook J, Lewandowsky S, Ecker UKH (2017) Neutralizing misinformation through inoculation: exposing misleading argumentation techniques reduces their influence. *PLoS One* 12(5):e0175799. <https://doi.org/10.1371/journal.pone.0175799>
- Dada D, Djioemetio JN, McFadden SM, Demeke J, Vlahov D, Wilton L, Wang M, Nelson LE (2022) Strategies that promote equity in COVID-19 vaccine uptake for black communities: a review. *J Urban Health* 99:15–27. <https://doi.org/10.1007/s11524-021-00594-3>
- Dodson S, Good S, Osborne R (eds) (2015) Health literacy toolkit for low and middle-income countries: a series of information sheets to empower communities and strengthen health systems. WHO (Regional Office for South-East Asia). <https://apps.who.int/iris/handle/10665/205244>
- Lewandowsky S, van der Linden S (2021) Countering misinformation and fake news through inoculation and Prebunking. *Eur Rev Soc Psychol* 32(2):348–384. <https://doi.org/10.1080/10463283.2021.1876983>
- Martin AJ, Madigan D (eds) (2006) *Digital literacies for learning*. Facet Publishing
- McGuire WJ (1961) The effectiveness of supportive and Refutational Defenses in immunizing and restoring beliefs against persuasion. *Sociometry* 24(2):184–197. <https://doi.org/10.2307/2786067>
- Michie S, van Stralen MM, West R (2011) The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 6(42). <https://doi.org/10.1186/1748-5908-6-42>
- Purnat TD, Nguyen T, Ishizumi A, Yau B, White B, Cecchini S, Samuel R, Hess S, Bezbaruah S, Briand S (2022) Delivering actionable infodemic insights and recommendations for the COVID-19 pandemic response. *Wkly Epidemiol Rec* 97(27):313–324. <https://apps.who.int/iris/bitstream/handle/10665/359144/WER9727-eng-fre.pdf?sequence=1&isAllowed=y>
- Roozenbeek J, van der Linden S, Nygren T (2020) Prebunking interventions based on “inoculation” theory can reduce susceptibility to misinformation across cultures. *Harvard Kennedy School Misinform Rev* 1(2). <https://doi.org/10.37016//mr-2020-008>
- Thaler RH, Sunstein CR (2008) *Nudge: improving decisions about health, wealth, and happiness*. Yale University Press, New Haven
- van Prooijen J-W, Etienne TW, Kutyski Y, Krouwel APM (2021) Conspiracy beliefs prospectively predict health behavior and well-being during a pandemic. *Psychol Med*:1–8. <https://doi.org/10.1017/S0033291721004438>
- WHO Regional Office for Europe (2019) Tailoring Immunization Programmes (TIP). <https://www.who.int/europe/publications/i/item/9789289054492>
- World Health Organization (2017) Communicating risk in public health emergencies: a WHO guideline for emergency risk communication (ERC) policy and practice. <https://www.who.int/publications/i/item/9789241550208>
- World Health Organization (2020a) 1st WHO infodemic manager training. <https://www.who.int/teams/epi-win/infodemic-management/1st-who-training-in-infodemic-management>
- World Health Organization (2020b) WHO infodemiology conference glossary – working document. <https://docs.google.com/document/d/1LM9OCZAPE1boXH0NDXpLrX7VDnQRvU7ueroKWHpyWg/edit#>
- World Health Organization (2020c) An ad hoc WHO technical consultation managing the COVID-19 infodemic: call for action, 7–8 April 2020. <https://www.who.int/publications-detail-redirect/9789240010314>

- World Health Organization (2021a) WHO competency framework: building a response workforce to manage infodemics. <https://www.who.int/publications-detail-redirect/9789240035287>
- World Health Organization (2021b) WHO public health research agenda for managing infodemics. <https://www.who.int/publications/i/item/9789240019508>
- World Health Organization (2022a) Infodemic. https://www.who.int/health-topics/infodemic#tab=tab_1
- World Health Organization (2022b) Risk communications. <https://www.who.int/emergencies/risk-communications>
- World Health Organization, Food and Agriculture Organization, UNICEF (2012) Communication for behavioural impact (COMBI) – toolkit. [https://www.who.int/publications/i/item/communication-for-behavioural-impact-\(combi\)](https://www.who.int/publications/i/item/communication-for-behavioural-impact-(combi))

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