The British Journal for the History of Science (2025), 1–17
doi:10.1017/S000708742510126X

RESEARCH ARTICLE

Emerging infectious disease outbreaks and real-time health communication: intermediality, uncertainty and dissent

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Abstract

This article maps out the challenges of public global health communication in the context of the COVID-19 pandemic by providing an overview of the shifting media of health communication from the post-Second World War era to the present. The article explores the communication of science in real-time or live media of film, television, video and digital social media during three emerging infectious-disease (EID) outbreaks to place COVID-19 health communication in historical perspective. Examination of the transition from centralized, top-down communications to distributed, many-to-many, mobile communication illuminates challenges to expertise, authority and control of health narratives and imagery. Through theories of intermediality, the article explores the central function of gaps in communication networks. The article considers three cases of crisis communications amid EIDs: the influenza outbreak of 1957, HIV/AIDS around 1990 and COVID-19 in the early 2020s, and the challenges posed by scientific uncertainty under these circumstances of live, intermedial health communication. The article concludes that 'liveness' in intermedial health communications may have an inherently destabilizing effect on scientific authority.

The COVID-19 global pandemic left the landscape of health communication in ruins. As the United States approached a million deaths from COVID-19 in May 2022, researchers showed that one quarter to one third of those lives lost could be classified as vaccine-preventable deaths.[1] Worldwide, the global death toll stretched to over six million at the same point in time. While these catastrophic losses had multiple causes, a significant contributing factor, borne out by subsequent research, was the lack of trust in government and public-health authorities driving the low uptake of vaccines.[2] Researchers framed the prevalence of vaccine misinformation as a consequence of lost trust in official sources of information, arguing, 'In a world with dramatically increased capacities to develop, manufacture and distribute vaccines, pandemic resilience will increasingly depend on the

[1] Katherine M. Jia *et al.*, 'Estimated preventable COVID-19-associated deaths due to non-vaccination in the United States', *European Journal of Epidemiology* (2023) 38(11), pp. 1125–8; Brown School of Public Health and Microsoft AI for Health, 'New analysis shows vaccines could have prevented 318,000 deaths', *Global Epidemics*, at https://globalepidemics.org/2022/05/13/new-analysis-shows-vaccines-could-have-prevented-318000-deaths (accessed 13 May 2022).

[2] Leonard Hofstra and Heidi J. Larson, 'Factors associated with vaccination refusal: critical lessons from the Omicron wave in Hong Kong', *JAMA Network Open* (2023) 6(10), e2337829; Phyllis Lun *et al.*, 'COVID-19 vaccination willingness and reasons for vaccine refusal', *JAMA Network Open* (2023) 6(10), e2337909.

ability of governments, experts, institutions and community leaders to generate vaccine demand'.[3] Researchers have further argued that, in future pandemics, communication that can persuade publics to get vaccinated will be the critical variable in societal resilience and recovery.[4] Linking COVID-19 excess mortality to the ways in which people 'receive information, how they make sense of the world, and who they trust', this stark analysis points to the public communication of scientific information as a critical site of pandemic intervention.[5]

While health communication has historically been recognized as a vital component of front-line response during outbreaks of emerging infectious diseases (EIDs), this core public-health function has faced seemingly insurmountable challenges during the SARS-CoV-2 pandemic. Despite early warnings of the COVID 'infodemic' and calls for authorities to employ social media as a tool for combating misinformation, conspiracy theories have dominated social networks, undermining public trust in scientific messaging.[6] Defining an 'infodemic' as 'an overflow of information of varying quality that surges across digital and physical environments during an acute public health event', experts at the World Health Organization argued that this kind of misinformation leads to 'confusion, risk-taking, and behaviours that can harm health and lead to erosion of trust in health authorities and public health responses'.[7] Although prominent scientists and celebrities were enlisted to convey life-saving information to the general public, the message often failed to meet its mark. These recent failures in the public communication of science point to gaps in the health media ecosystems where messages from sources such as the WHO circulate, prompting scientists and policymakers alike to seek new methods for promoting the authority and trustworthiness of their expertise in the public sphere.[8] Many discussions of the COVID-19 'infodemic' claimed that this communication crisis, like the virus itself, posed an unprecedented challenge, implying that experts had been more effective communicators during pandemics that occurred prior to the social-media era.[9] Such claims raise questions for health media researchers, who have asked whether the history of health communication about EIDs can shed light on these shortcomings.[10]

One widely discussed target in debates about the recent failures of public-health messaging is the contemporary social-media environment, which is widely blamed for creating the conditions that allowed mistrust and misinformation to emerge more forcefully during COVID-19 than in past EID outbreaks.[11] However, this article will argue that an underexplored aspect of health communication can be illuminated by considering the intermedial

[3] Stefanie Friedhoff and Daisy Winner, 'What is vaccine demand?', *Global Epidemics*, at https://globalepidemics.org/2022/05/13/what-is-vaccine-demand (accessed 13 May 2022).

[4] Jon Roozenbeek *et al.*, 'Psychological inoculation improves resilience against misinformation on social media', *Science Advances* (2022) 8(34), eabo6254.

[5] Friedhoff and Winner, op. cit. (3).

[6] Adhanom Ghebreyesus Tedros, 'WHO Director-General's speech at the Munich Security Conference' (World Health Organization, 15 February 2020), at www.who.int/director-general/speeches/detail/munich-security-conference.

[7] Neville Calleja *et al.*, 'A public health research agenda for managing infodemics: methods and results of the first WHO infodemiology conference', *JMIR Infodemiology* (2021) 1(1), e30979.

[8] Gillian K. SteelFisher *et al.*, 'Trust in U.S. federal, state, and local public health agencies during COVID-19: responses and policy implications', *Health Affairs* (2023) 42(3), pp. 328–37; Qing Han *et al.*, 'Trust in government regarding COVID-19 and its associations with preventive health behaviour and prosocial behaviour during the pandemic: a cross-sectional and longitudinal study', *Psychological Medicine*, 2021, pp. 1–11.

[9] John Zarocostas, 'How to fight an infodemic', *The Lancet* (2020) 395(10225), p. 676; Sylvie C. Briand *et al.*, 'Infodemics: a new challenge for public health', *Cell* (2021) 184(25), pp. 6010–14.

[10] Nancy Tomes and Manon S. Parry, *What Are the Historical Roots of the COVID-19 Infodemic? Lessons from the Past* (WHO Health Evidence Network Synthesis Reports), Copenhagen: WHO Regional Office for Europe, 2022.

[11] Michael A. Gisondi *et al.*, 'A deadly infodemic: social media and the power of COVID-19 misinformation', *Journal of Medical Internet Research* (2022) 24(2), e35552.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

communicative gaps that are present in any mass-mediated response to an EID, during or prior to the social-media era, thereby creating the opportunity for misinformation to flourish. These gaps between media point to the negative spaces of intermediality as potential sites for investigating and theorizing how health communications can fail in multimedia campaigns. By exploring American health communications during three global pandemics that occurred in distinct mass media configurations – the influenza pandemic of 1957, early HIV/AIDS around 1990, and COVID-19 in the early 2020s – this article will argue that EID outbreaks provide a powerful laboratory for considering intermedial science communication in action, with its affordances and consequences for public understanding. Further, this article will show that the fractures identified in contemporary information networks were already present in mid-century health media such as broadcast television and documentary film that, like COVID-19 media, attempted to present a 'live', real-time response to the threats posed by EIDs. This article will build on scholarship emphasizing that EID outbreaks are, by definition, characterized by scientific uncertainty, a quality that poses significant communication challenges in a public sphere where anxiety is high and ambiguity is unwelcome.[12]

By examining EID outbreak communications in historical context, this article suggests that analysis of health media through the lens of intermediality reveals a critical vulnerability – and opportunity – embedded within media infrastructures that have previously been overlooked. Specifically, I argue that the intermedial space – that is, the space between media – is a space of indeterminacy that opens the possibility for dissent. The potential to mobilize this space can serve as a corrective to real and perceived power imbalances, as when it enables suppressed or marginalized voices and perspectives to be heard; however, the same gaps can be exploited for the purpose of spreading misinformation, particularly when framed as a critique of scientific and government authorities.[13] The article will conclude by arguing that despite the need for real-time guidance from health authorities during EID outbreaks, 'liveness' in intermedial health communications may have an inherently destabilizing effect on scientific authority.

Emerging infectious diseases as laboratories for intermediality

In considering the contemporary landscape of health communication, many critics have blamed social media for the erosion of public trust in scientific authorities, particularly in light of the exposure of exploitative practices by companies such as Facebook, Twitter (X) and Google, whose platforms provide the infrastructures of the social web.[14] In addition to the ethical failures of the companies themselves, the architecture of social media, with its many-to-many capacity for decentralized, citizen-led communication, has been seen as creating the structural preconditions for fragmentation and diminution of belief in expert authorities who speak though such official outlets of governments and institutions as the NIH YouTube channel, the CDC twitter feed, the NHS Instagram or the WHO TikTok account.[15] Viewed in the context of media history, the COVID 'infodemic' appears in a trajectory of declining top-down control over public opinion from the Second World

[12] José van Dijck and Donya Alinejad, 'Social media and trust in scientific expertise: debating the COVID-19 pandemic in the Netherlands', *Social Media + Society* (2020) 6(4), 2056305120981057.

[13] Zeynep Tufekci, *Twitter and Tear Gas: The Power and Fragility of Networked Protest*, New Haven, CT: Yale University Press, 2018.

[14] Zarocostas, op. cit. (9).

[15] Sohaib R. Rufai and Catey Bunce, 'World leaders' usage of twitter in response to the COVID-19 pandemic: a content analysis', *Journal of Public Health* (2020) 42(3), pp. 510–16; Lan Li *et al.*, 'The response of governments and public health agencies to COVID-19 pandemics on social media: a multi-country analysis of twitter discourse', *Frontiers in Public Health* (2021) 9, 716333.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

War- and Cold War-era mobilization of propaganda through centralized power, authority and ideology mass transmitted through broadcast media (produced, for example, by the United States Public Health Service (USPHS) or the World Health Organization (WHO), and distributed by national television networks and movie theatres).[16] In post-war top-down communication scenarios, the control over health messages would appear to be strong and consistent, as production of television programmes and films was mostly consolidated in the studios of large, powerful corporations and governments, and their products were disseminated to millions of viewers in identical form.[17] As production technologies became cheaper and more mobile, the power to produce media slowly moved out of the hands of elites and into the hands of the masses, resulting, eventually, in the fragmentation of messages, power and perspectives through mobile, social media.[18] This narrative suggests that the democratization of access to media production might result in the erosion of paternalistic, global North hegemony and the expansion of media spaces for dissent.[19] Alternatively, this historical trajectory might be seen as merely shifting the locus of power from radio and television monopolies to digital-media monopolies, with a seeming proliferation of platforms and opportunities for individual self-expression by users that nonetheless takes place within a continued centralization of power and control in global technology corporations.[20]

While this narrative presents a broad rendering of media history, certain aspects shed light on the functioning and failures of health communication during EIDs. Critically important to understanding communication during EIDs is the dispersed control over the creation of media messages that is enabled by broader access to the tools of media production. This proliferation of mass media channels creates the conditions of possibility for intermediality to play a significant role in EID information campaigns by creating fragmentation, or gaps, in the flow of information. Tomes and Parry call these 'expectation gaps', noting that 'infodemics' thrive in the negative spaces between authoritative communications.[21] As Irina Rajewsky explains,

> intermediality may serve foremost as a generic term for all those phenomena that (as indicated by the prefix *inter*) in some way take place *between* media. 'Intermedial' therefore designates those configurations which have to do with a crossing of borders between media, and which thereby can be differentiated from *intra*medial phenomena as well as from *trans*medial phenomena.[22]

For the purposes of this article, the important point is that intermediality takes place in the gaps between media, which might be seen as the spaces of interpretation, of dissent or, in the case of conspiracy theories and misinformation, of manipulation.

[16] C.W. Anderson, 'Propaganda, misinformation, and histories of media techniques', *Harvard Kennedy School Misinformation Review* (2021) 2(2), pp. 1–6.

[17] Klaus Bruhn Jensen, 'Intermediality', in K.B. Jensen *et al.* (eds.), *The International Encyclopedia of Communication Theory and Philosophy*, Chichester and Hoboken, NJ: John Wiley & Sons, Ltd., 2016, pp. 1–12, 6.

[18] Tufekci, op. cit. (13).

[19] Christian Sandvig, 'The internet as the anti-television: distribution infrastructure as culture and power', in Lisa Parks and Nicole Starosielski (eds.), *Signal Traffic: Critical Studies of Media Infrastructures*, Champaign: University of Illinois Press, 2015, pp. 225–45.

[20] Jean-Christophe Plantin and Aswin Punathambekar, 'Digital media infrastructures: pipes, platforms, and politics', *Media, Culture & Society* (2019) 41(2), pp. 163–74.

[21] Tomes and Parry, op. cit. (10).

[22] Irina O. Rajewsky, 'Intermediality, intertextuality, and remediation: a literary perspective on intermediality', *Intermédialités: Histoire et théorie des arts, des lettres et des techniques/Intermediality: History and Theory of the Arts, Literature and Technologies* (2025) 6, pp. 43–64, 46, original emphasis.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

A bedrock principle of health communication is that 'trusted sources' should convey public-health messages.[23] Traditionally, these trusted sources were experts: scientists, doctors and government officials; more recently, they have expanded to include social-media 'influencers' such as celebrities, musicians, sports stars and even popular fictional characters from television or movies.[24] Yet the idea that listening to experts – or officially sanctioned influencers – would prevent conspiracy theories from taking hold assumes an outdated theory of media influence that fails to account for the role that some physician experts and wellness influencers played in spreading vaccine misinformation during the COVID pandemic.[25] Moreover, the principle of 'trusted messengers' relies on the outdated sender–message-receiver communication model, influentially critiqued by cultural theorist Stuart Hall, that presumed a linear transmission of communication with a singular meaning to its content that would be universally interpreted by its receivers without divergence.[26] This model not only erroneously assumed univocality in all communicative acts, but also assumed a tight linkage across instances of communication, rather than acknowledging the gaps and spaces of divergence that the concept of intermediality brings to our attention.

Klaus Bruhn Jensen discusses three conceptions of intermediality, deriving from three different notions of what a 'medium' is. Jensen's second category most closely aligns with the aspect I wish to emphasize here: 'intermediality represents the combination of separate material vehicles of representation, as exemplified by the use of print, electronic, and digital platforms in a communication campaign'.[27] In this discussion, Jensen builds on the work of Walter Benjamin, who described the distinctive societal effects of the mechanical reproduction of mass media, noting that the media of photography, film and television (as well as printed books and newspapers) 'took social shape as one-to-many institutions and practices of communication, feeding into fundamental social transformations'.[28] While Jensen links one conception of intermediality to the movement of ideas and information across different media, his work does not specifically characterize the effects of that intermedial movement. Building on Jensen's work through analysis of historical health communications in the context of EIDs, this article demonstrates that the movement of public-health messages through diverse channels of mass media creates the conditions for producing uncertainty, as the emergent quality of scientific knowledge poses a challenge to the operation of scientific authority.

While limited research is available on the historical intersections of EIDs and the media of health communication, numerous researchers have acknowledged the destabilizing effects of the emergence of new phenomena that expose gaps in established scientific knowledge.[29] Researchers in the field of zoonoses have observed,

> Because [EIDs] are new diseases, or old diseases in a state of flux because of the acquisition of novel virulence factors or antimicrobial resistance genes, knowledge

[23] Taylor A. Holroyd *et al.*, 'Communicating recommendations in public health emergencies: the role of public health authorities', *Health Security* (2020) 18(1), pp. 21–8.

[24] Richard M. Carpiano *et al.*, 'Confronting the evolution and expansion of anti-vaccine activism in the USA in the COVID-19 era', *The Lancet* (2023) 401(10380), pp. 967–70.

[25] Sahana Sule *et al.*, 'Communication of COVID-19 misinformation on social media by physicians in the US', *JAMA Network Open* (2023) 6(8), e2328928; Rory Smith *et al.*, 'A systematic review of COVID-19 misinformation interventions: lessons learned', *Health Affairs* (2023) 42(12), pp. 1738–46.

[26] Stuart T. Hall, 'Encoding/decoding', in Simon During (ed.), *The Cultural Studies Reader*, London: Routledge, 1999, pp. 507–17.

[27] Jensen, op. cit. (17), p. 1.

[28] Jensen, op. cit. (17), p. 6.

[29] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, Chicago: University of Chicago Press, 1962.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

> about their epidemiology and ecology is minimal. Accurate predictions are difficult or impossible to make and rely on historical events that parallel the disease as closely as possible.[30]

Further commenting on the limited development of research on this issue, another set of researchers found, 'Although academic studies of EID communication on social media are on the rise, they still suffer from a lack of theorization and a need for more methodologic rigor'.[31] At the metaphorical level, EIDs themselves could be seen as examples of intermedial emergence, as they are often characterized by the unpredictable mutations that occur in the temporal and spatial gaps between animals and humans during zoonotic transmission events.[32] As defined by the World Health Organization,

> An emerging infectious disease is one that either has appeared and affected a population for the first time, or has existed previously but is rapidly spreading, either in terms of the number of people getting infected, or to new geographical areas. Many EIDs are zoonotic in origin, which means that the disease has emerged from an animal and crossed the species barrier to infect humans.[33]

Just as Rajewsky's definition of intermediality emphasizes the 'crossing of borders between media', the WHO's definition of EIDs emphasizes the crossing of borders between species. In this sense, intermediality in the context of EIDs offers a particularly compelling site to investigate public science communication.

The uncertainties of health communication by scientific authorities in the context of EIDs may productively be examined as a discursive challenge, considering the symbolic uncertainty associated with the notion of interspecies viral mutation.[34] EIDs are frequently discovered in tropical environments where rich biodiversity collides with human impingement on habitats to create the conditions for zoonotic diseases to emerge.[35] In the past decade, numerous researchers have raised concerns that ecological factors, including deforestation and climate change, are increasing the rate of zoonotic disease emergence, with some researchers estimating that 75 per cent of EIDs are zoonotic.[36] The prevailing theory of the origin of the SARS-CoV-2 virus identified the Huanan Seafood Wholesale Market in Wuhan, China, as the site of the first human exposure, where the virus presumably 'jumped species'.[37] The epidemiological narrative for the SARS-CoV-2 virus, like that

[30] D. Tabbaa, 'Emerging zoonoses: responsible communication with the media – lessons learned and future perspectives', *International Journal of Antimicrobial Agents* (2010) 36, pp. S80–3.

[31] Lu Tang *et al.*, 'Social media and outbreaks of emerging infectious diseases: a systematic review of literature', *American Journal of Infection Control* (2018) 46(9), pp. 962–72, 962.

[32] David M. Morens and Anthony S. Fauci, 'Emerging infectious diseases: threats to human health and global stability', *PLoS Pathogens* (2013) 9(7), e1003467.

[33] World Health Organization, Regional Office for South East Asia, *A Brief Guide to Emerging Infectious Diseases and Zoonoses*, WHO Regional Office for South-East Asia, 2014, p. 1.

[34] Bishnupriya Ghosh, *The Virus Touch: Theorizing Epidemic Media*, Durham, NC: Duke University Press, 2023.

[35] Kate E. Jones *et al.*, 'Global trends in emerging infectious diseases', *Nature* (2008) 451(7181), pp. 990–3; Kirsten Ostherr, 'How do we see COVID-19? Visual iconographies of racial contagion', *American Literature* (2020) 92 (4), pp. 707–22.

[36] Jones *et al.*, op. cit. (35); Toph Allen *et al.*, 'Global hotspots and correlates of emerging zoonotic diseases', *Nature Communications* (2017) 8(1), p. 1–10, at www.nature.com/articles/s41467-017-00923-8; Wondwossen A. Gebreyes *et al.*, 'The global one health paradigm: challenges and opportunities for tackling infectious diseases at the human, animal, and environment interface in low-resource settings', *PLoS Neglected Tropical Diseases* (2014) 8(11), e3257.

[37] Chaolin Huang *et al.*, 'Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China', *The Lancet* (2020) 395(10223), pp. 497–506.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

for many zoonotic EIDs, emphasizes the threatening image of the malevolent, boundary-crossing creature, in this case a bat, which likely contaminated another mammal such as a civet or pangolin, before the virus made the 'spillover' to humans.

As Christos Lynteris has shown, EID 'spillover' narratives and imagery are often infused with colonial and xenophobic imagery, framing both the animal species and the racial or ethnic cultural identity of the geographic locale as malevolent, exotic and pathological.[38] Lynteris emphasizes the ideological and epidemiological work that is done in the gaps or lacunae left by scientific uncertainty:

> No longer seen as mere reservoirs or spreaders of disease, but as the very ground where new pathogens emerge, non-human animals are today conceived as the incubators of existential risk for humanity. Visually, ideologically and affectively inflected, these framings are often developed in the context of epistemic lacunas: a lack of scientific certainty about the true reservoir of SARS or Ebola is thus compensated by systematic and widespread representations of few select animals, such as bats or civet cats, as epidemiological 'rogues'.[39]

Other scholars have also critiqued the racist effects of EID rhetoric, while arguing for a new approach to framing the zoonotic interface in more holistic ecological terms through the 'One Health' paradigm. In the context of anthropogenic climate change, this paradigm has emerged as a call for greater research attention to 'the inextricable relationship between the health of the environment, humans, and animals', and the COVID pandemic 'suggests there is an urgent need for a One Health approach in controlling and preventing future pandemics, through developing integrated, dynamic, spatiotemporal early warning systems based on a One Health approach for emerging infectious diseases'.[40] In turn, calls to develop a decolonized and more-than-human approach to 'One Health' have cited the epistemological roots of that paradigm in colonial knowledge formations, and researchers have argued for expansion of methods to include local and animal knowledge through multispecies ethnography and other approaches that foreground indigenous insights about local environments.[41] All of these efforts share an interest in closing the gaps between different frameworks for understanding EIDs, which, in their present, porous configuration, leave humans vulnerable to ever-increasing outbreaks of contagion. In the context of these discursive challenges, the gaps that pervade intermedial communications appear as potent sites of investigation.

To better understand the interactions among EIDs, the media of health communication and the COVID-19 'infodemic', this essay now turns to an examination of three global pandemics to analyse and compare typical instances of health messaging in each historical period. The three examples selected are the influenza pandemic of 1957, the early years of the HIV/AIDS pandemic around 1990, and the emergence of COVID-19 in the early 2020s. These cases were selected for their historical significance and their ability to demonstrate examples of three different types of mass media that were prevalent in each respective EID outbreak. A WHO study of the history of 'infodemics' in the context of COVID-19 articulated

[38] Christos Lynteris, 'The prophetic faculty of epidemic photography: Chinese wet markets and the imagination of the next pandemic', *Visual Anthropology* (2016) 29(2), pp. 118–32.

[39] Christos Lynteris, 'Introduction: infectious animals and epidemic blame', in Lynteris (ed.), *Framing Animals as Epidemic Villains: Medicine and Biomedical Sciences in Modern History*, Cham: Palgrave Macmillan, 2019, pp. 1–25, 1.

[40] Hannah McClymont *et al.*, 'Future perspectives of emerging infectious diseases control: a one health approach', *One Health* (2022) 14, p. 100371.

[41] Nicolas Lainé and Serge Morand, 'Linking humans, their animals, and the environment again: a decolonized and more-than-human approach to "one health"', *Parasite* (2020) 27(55), pp. 1–10.

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a view of the value of similar historical case studies (1918 influenza, HIV/AIDS and SARS) consistent with this framework, explaining,

> Comparison across time demonstrates how changes associated with new information technologies and mass media (primarily, print media in 1918; print and electronic media in the 1980s; and print, electronic and digital media in 2003) intersected with changes in scientific knowledge-making, public health communication and public participation in health policymaking.[42]

While their primary focus was on information dissemination and scientific authority, not on media form, style or content, the findings of the WHO report underscore the value of historical case studies for highlighting the role of gaps in scientific understanding in creating the conditions of possibility for misinformation to spread. By examining specific media examples from each selected historical period, the present study builds on previous work to illuminate the significance of intermediality as a means of explaining how gaps in information flows can amplify gaps in scientific knowledge.

The specific media examined for each EID outbreak in this study have been selected from hundreds of examples of public-health mass media produced during the relevant historical periods, based on their wide dissemination through broadcasting on major television news networks or on the social-media channels of global health organizations with millions of viewers. Further selection criteria are the typicality of the media examples and their relevance to debates about the role of media in shaping scientific authority during health crises. By comparing the mediated health communications of earlier EID outbreaks with those circulating on social-media platforms during the COVID pandemic, we can place the 'infodemic' of 2020 into historical perspective and illuminate the role of intermedial gaps in shaping or undermining scientific authority during health crises.

Broadcasting and containing pandemic influenza (1957)

To consider how the spaces of intermediality and zoonotic EIDs shape the public communication of scientific information, this section examines an example of the ostensibly centralized command and control of 'official' health messaging through a television news broadcast about a global influenza outbreak in 1957. This section will analyse a made-for-television documentary film called *The Silent Invader* (Westinghouse Broadcasting Corporation, 1957), which was produced in the format of a live news programme, featuring interviews with public-health experts, documentary film footage, and epidemiological maps of the spread of contagion, and was aired on United States broadcast television nationwide. In one sense, this programme serves as an exemplary representation of mid-twentieth-century American public-health media, with all of the common elements of public-health films of the era, including a prevailing narrative tone of confidence, certainty and authority.[43] On the other hand, although the film demonstrates the world view of centralized command and control of official health messaging that was characteristic of its time, a closer examination through the lens of intermediality shows how televisual 'liveness' functions in this programme as a form of uncertainty.

The Silent Invader was introduced as 'an up-to-the-minute report on Asian influenza' as that disease was rapidly spreading worldwide in 1957.[44] The pandemic would result in

[42] Tomes and Parry, op. cit. (10), p. 4.

[43] Kirsten Ostherr, *Cinematic Prophylaxis: Globalization and Contagion in the Discourse of World Health*, Durham, NC: Duke University Press, 2005.

[44] *The Silent Invader* (Westinghouse Broadcasting, 1957).

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approximately 80,000 deaths in the United States, and more than a million deaths worldwide.[45] Retrospective analysis has found that the 1957 flu virus was an H2N2 subtype resulting from a recombination of avian and human influenza viruses; that is, it was an EID with zoonotic transmission. *The Silent Invader* was clearly designed to inform and reassure the American viewing public, yet the scientific uncertainty characteristic of EID communications is evident throughout.[46] The film is twenty-nine minutes long, and is set in a conventional mid-century American television newsroom, featuring a white male announcer standing behind a desk, in front of a world map. The announcer interviews several prominent scientific experts, including US Surgeon General Leroy E. Burney; Dr James A. Crabtree, associate dean of the University of Pittsburgh Graduate School of Public Health; Dr Dorland Davis, associate director of the National Institute of Allergy and Infectious Diseases; and Dr George Lowe, secretary general manager of the American Medical Association. The discussion explains how the disease has spread globally, its symptoms and treatment, and plans for managing an epidemic in the United States.

However, the assurances of the scientific experts are repeatedly undermined by their own acknowledgements of the difficulties of containing the pandemic. For example, when Dr Crabtree describes how, 'in three short months, every continent on the globe had been involved in this great pandemic', interviewer Carl Ide asks, 'Wouldn't it have been comparatively simple to have isolated these known cases and prevented the spreading of them, and kept them from coming in at all?' Dr Crabtree replies,

> Unfortunately, not so simple, for the reason that quarantine against influenza is not effective. Had it been possible for all of the cases on board these ships to have been isolated, it would have had little effect on the actual spread of the disease because undoubtedly there were many more people on board these same ships, who by reason of a more recently acquired infection, would have shown no symptoms whatever of the disease, and therefore, they could not have been readily identified if they were passing through a quarantine station.

Later in the programme, Dr Dorland Davis explains the many different types of influenza strain, and describes the scientific progress in developing vaccines against them. But the progress narrative is quickly undermined by his statement that

> the antigenic composition of this Asian type is different from that which we have described in the more recent strains. So that a person who is immune to the older strains is probably not immune to this new strain. And thus, the vaccines which have been developed in the recent years by Doctors Francis, Salk, and others, have no, probably no effect on this invader from Asia.

Dr Lowe of the AMA emphasizes an intermedial mass communications strategy to convey authority and control, stating, 'if an epidemic does strike, the medical professions will use every means of communication possible – pamphlets, newspapers, radio, and television – to tell the general public what to do'. Yet, building on the gaps in knowledge that the medical experts on *The Silent Invader* readily admit, the visual intermediality of the programme underscores the disjunction between the official aim of assuring the public and the acknowledgement that pandemics are, by their nature, out of control. Intercut with

[45] Mark Honigsbaum, 'Revisiting the 1957 and 1968 influenza pandemics', *The Lancet* (2020) 395(10240), pp. 1824–26.

[46] Wang-Shick Ryu, 'Chapter 15: influenza viruses', in Ryu (ed.), *Molecular Virology of Human Pathogenic Viruses*, Boston, MA: Academic Press, 2017, pp. 195–211.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

the 'live' interviews with scientific authorities are several montage sequences of documentary film footage that build on the xenophobic and militaristic rhetoric of so-called 'Asian invasion'. For example, one sequence cuts from the public-health professor tracing the global flow of contagion on world maps to documentary footage of streets crowded with pedestrians in Hong Kong and Singapore, as a voice-over narrates the epidemic spread of disease to Formosa, Borneo and Japan, and 'from the major shipping areas of those places, to widely dispersed locales'. In this juxtaposition, the orderly control conveyed by the newsroom filled with the nation's medical leadership is contrasted with imagery of uncontrolled tropical locales, a visual juxtaposition that resonates with colonial and xenophobic imagery of 'spillover' events in EIDs that appear in COVID-19 media as well.[47] One setting is an organized presentation of white, professional men in a television studio in business suits, with well-lit filming by cameras on steady tripods, while the other shows chaotic street scenes filled with people walking, on bicycles, in cars and on wagons pulled by cattle. Some pedestrians cross directly in front of the camera, momentarily obscuring the view, while groups of men in the background of the shot crouch on the street, eating food. This sequence comes shortly after a montage of promotional imagery from American pharmaceutical companies, where workers are shown busily producing vaccines and described as 'an example of the know-how and the expeditious way in which free enterprise, through our American industry, can do a good job'. With the United States' military engagement supporting South Korea's fight against communist forces in the North during this period, the contrast between the capitalist West and the communist East asserts American scientific and commercial superiority, yet the threat from the so-called 'Asian invasion' reveals the limitations of American scientific defence.

Looking at this instance of intermedial EID communication, several features are worth noting. Although this programme was produced in an era known for the centralized communication model of mid-century broadcast news corporations, the programme itself is intermedial, containing a filmed 'live' interview segment intercut with several different sources of documentary and stock film footage. The sense of liveness is important to the programme's tone of urgent response to an impending national crisis, framed as a health, economic and metaphorical military crisis. The need to project liveness is driven by the EID characteristics of the situation; although influenza is a known virus, the emergence of novel strains from exoticized parts of the globe, against which existing vaccines are useless, places the viewing public in the position of uncertainty and vulnerability typical of an EID. The scientists featured on the programme do little to dispel the uncertainty, as they plainly acknowledge the many unknown facts about this influenza outbreak, including its origin, the ability to prevent its spread and the ability to treat it. This is, in fact, a feature of EID scientific communication, and one of the recurring challenges for the public culture of science: unlike television news personalities, these public-health officials state bluntly the concrete, known facts about a disease, without consideration of the impact of those facts on viewing audiences. By stating the uncertainties that they know exist, these experts seem to undermine their own authority. As an example of an earlier EID outbreak that was managed through broadcast media communication systems, this case suggests that even prior to the emergence of the digital, many-to-many networked social-media communications of the COVID pandemic, the inherent uncertainty posed by EIDs on a global scale created parallel uncertainty in the messages of public-health experts. By identifying how this uncertainty appeared in different media forms over time, we can begin to see that the COVID 'infodemic' may indeed have historical precedent, even prior to the digital age.

[47] Lynteris, op. cit. (38).

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

HIV/AIDS on television news and guerrilla media

As the previous discussion has shown, the seeming stability of authority in scientific communications through broadcast news is in fact an illusory effect, due to the instability asserted by EIDs, even in the 1950s era that was dominated by centralized, corporate control of mass media messages. This section will address further challenges to scientific authority in health media of the early phase of the HIV/AIDS crisis. In this era, the virus was an EID initially called 'gay-related immune deficiency' (GRID) in the *New York Times*'s first report warning of 'a serious disorder of the immune system that has been known to doctors for less than a year'.[48] This example will focus on contested meanings in live television when planned media activism by the group AIDS Coalition to Unleash Power (ACT-UP) produced disruptions of centralized broadcast messages. The visual mediation of scientific authority in crisis in this era occurred through an intermedial shift where the filmed footage of protest occurring external to the broadcast newsroom undermines, rather than enforces, the certainty of the communications emanating from centralized authorities. This section will extend the consideration of what role media 'liveness' may play in presenting or challenging scientific evidence and authority in health communications.

This analysis will focus on five television news and tele-magazine broadcasts aired between April and May 1990 that were focused on the AIDS crisis and on events involving ACT-UP protestors. ACT-UP and other protests were widely covered on nightly news programmes, and this selection of segments captures a period of activity marked by several historically noteworthy actions focused on medical organizations, making these particularly useful sites for interrogating the public communication of science during an EID outbreak. The selections include a segment of *ABC Nightly News* that aired on 23 April 1990 and covered ACT-UP protests in Chicago, where, as anchor Peter Jennings reported, 'More than 120 people were arrested outside the Prudential Insurance Company, City Hall, and the Headquarters of the American Medical Association'. An *NBC Nightly News* segment on 21 May 1990, anchored by Tom Brokaw, described how '1,000 [AIDS activists] converged at the National Institutes of Health outside of Washington, DC, demanding more research on the disease. Eighty-one were arrested'. A *CBS Nightly News* segment on 20 June 1990 covered the 6th International AIDS Conference taking place in San Francisco, where, 'against a background of scientific reports, protestors demonstrated against federal government policies, including a perceived lack of action as the death toll mounts'. An *ABC Nightly News* episode of 'Nightline' on 20 June 1990 covered protests at the 6th International AIDS Conference in San Francisco in depth, featuring interviews with key government officials (Health and Human Services Secretary Louis Sullivan), scientists (Dr Anthony Fauci, head of the National Institute for Allergy and Infectious Diseases at the NIH), and AIDS activists (Peter Staley and Alvin McCain), with anchor Forrest Sawyer. Finally, *CBS Nightly News* on 22 June 1990, hosted by Dan Rather, provided further coverage of the AIDS conference in San Francisco, including a disruptive outburst in response to debates over access to experimental treatments.

The news segments covering ACT-UP protests highlight the disruptive potential of the intermedial gaps in health communication about EIDs. ACT-UP was known for its media-savvy tactics, staging dramatic events in locations and on dates that would garner news coverage and provoke emotional reactions.[49] An *ABC Nightly News* broadcast on 23 April 1990 starts with a shot of anchor Peter Jennings, sitting at a desk in a suit and tie, with perfectly controlled light and sound quality, directly addressing the camera in a calm tone of voice. As Jennings describes the protests in Chicago, the image cuts to a chaotic scene of

[48] Lawrence K. Altman, 'New homosexual disorder worries health officials', *New York Times*, 11 May 1982, p. C1.

[49] Sarah Schulman, *Let the Record Show: A Political History of Act up New York, 1987–1993*, New York: Farrar, Straus and Giroux, 2021.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

protestors sitting handcuffed on a street, chanting angrily, while others are dragged and pushed by police, with the news camera visibly jostled by the crowd, at times blurring the image. A voice-over by reporter John McKenzie describes 'the storming of the statehouse' as protestors with megaphones march and chant slogans, and later describes the group's 'guerilla tactics, meant to intimidate anyone ACT-UP believes is not doing enough to fight the disease'. These scenes are followed by a clip of a protestor trying to 'shout down President Bush' while he gave a public speech. The reporter explains that the most effective protests targeted the US Food and Drug Administration (FDA), where only one new drug was approved in the first eight years of the epidemic. Under highly visible pressure from ACT-UP, seven new drugs were approved by the FDA in two years. The theme of disruption pervades the segment, both narratively and in its intermedial form. The clips from protests present a visually and sonically jarring contrast to the controlled and predictable environment in the television newsroom, while the content of the protestors' demands threatens to disrupt the functioning of mainstay institutions of American political and social life. Through this disruption, intermedial gaps opened up between the official narratives, calmly presented by scientists, politicians, corporate executives and government officials, and the counternarratives, emotionally and forcefully presented by ACT-UP protestors.

An *NBC Nightly News* segment on 21 May 1990 covered an ACT-UP protest at the National Institutes of Health outside Washington, DC. Reporter Robert Bazell described the group as 'militant', and the atmosphere at their meetings as 'enthusiasm and belligerence toward established institutions'. Bazell interviewed playwright and ACT-UP founder Larry Kramer, who dramatically asserted, 'I am so sick of hearing about our tactics offending people … the Vietnam War was not ended by people being nice. Nice people walk into gas chambers'. The reporter went on to describe the organization's efforts against the FDA as 'enormously successful', and interviewed an activist who also served on an NIH advisory panel, 'even though he helped organize today's protest'. The segment closes with Bazell standing in front of an NIH building stating, 'Now the activists are trying to force scientists to work faster to develop and test new treatments. In the past, scientists have strongly resisted such pressure.' The shot cuts to footage of protestors being tackled by police in riot gear as Bazell closes, 'ACT-UP thinks the scientists can be made to listen.' In the contrast between the controlled newsroom sequences and the intercut footage of unruly ACT-UP protests, scientific authority occupies a liminal, intermedial space that opens up the possibility of dissent.

ABC News reporter John McKenzie remarked, 'As AIDS continues to kill more and more people, those fighting the disease promise more and more disruption' (23 April 1990), and a *CBS Nightly News* segment on 20 June 1990 confirmed that claim, as it covered protests at the 6th International AIDS Conference in San Francisco. The target was a law prohibiting immigration to the United States by people with HIV, and the slow progress of scientific research on AIDS. The conference was given further attention in the *ABC Nightly News* episode of 'Nightline' aired on the same date (20 June 1990), which opened with a media montage of some of ACT-UP's most newsworthy protests to date, starting with images of a mass of protestors chanting and pushing crowd-control fences while a line of police officers on the other side of the barricade hit them with batons. Additional segments included scenes on the floor of the New York Stock Exchange, where activists protested against the high drug prices of pharmaceutical manufacturer Burroughs Wellcome; at the NIH, where delays in access to experimental drugs were a primary target; and at St Patrick's Cathedral in New York City, where a die-in was staged to criticize hypocritical church positions on homosexuality and safer-sex education. The loud and chaotic protest scenes are again dramatically intercut with shots of the anchor from the controlled environment of the newsroom, but

the four-way interview in this programme threatens to undermine the anchor's control, once the programme shifts from filmed footage to live debate. Reporting that about a hundred protestors had already been arrested at the AIDS conference, host Forrest Sawyer introduces his guests, framing the programme as addressing an 'often divisive' issue. The participants in the live interview segments – Dr Louis Sullivan, US Secretary of Health and Human Services; Dr Anthony Fauci, director of the National Institute for Allergy and Infectious Diseases at the NIH; and AIDS activists Peter Staley and Alvin McCain – frequently interrupt one another and were interrupted by the host, shouting and creating a sense of disruption within the broadcast that mirrored the scenes of protest during the conference. By the end of the thirty-minute programme, the host appears to be on the verge of losing control of the situation.

CBS Nightly News on 22 June 1990 provided additional coverage of the AIDS conference in San Francisco, opening with footage of protestors marching and getting arrested in the streets before showing a clip of a conference presentation by a representative from a community group called Project Inform, who discusses 'incomplete but dramatic' results of a study of a highly toxic experimental AIDS drug, called Compound Q, 'made from the root of the Chinese cucumber'. While the white, male presenter is dressed similarly to the news reporters and other presenters on the panel, in a suit jacket and tie, his affect and attitude mark his challenge to traditional scientific authority. Defending the work of his group, the presenter, named Martin Delaney, states, 'I don't find our operation unethical, I find it extremely compassionate. I applaud the physicians who have been part of it. If it's threatening to others, that's their problem.' A medical doctor on the panel, Dr Arnold Relman from the *New England Journal of Medicine*, calls the presenter 'irresponsible for making such statements without publishing your data', to which the presenter replies that patients who have found benefits are angry that the group is not promoting the drug even more. The medical doctor responds, 'We frankly don't know. You don't know, and we don't know, whether what you've said is just another example of a flash in the pan, or whether it is something great.' This open debate about the procedures and authority of medical research science is followed immediately by an interview with a patient taking the drug, who presents what the reporter calls 'the least reliable evidence, personal testimony'. The CBS News medical correspondent, Susan Spencer, concludes the segment, noting, 'Medical files are littered with unorthodox AIDS drugs that didn't work out. But that's clearly not always the overriding consideration when organized medicine has produced no sure answers either'. In the reporters' efforts to adhere to the journalistic practice of balanced viewpoints, they reinforced the intermedial gap created by the contrast between the protest footage and expert commentary. This space, in the subsequent Internet and mobile social-media era, became detached from the literal and figurative news anchor, thereby extending the uncertainty present in the 1957 and 1990 examples throughout information networks.

The presence of Dr Anthony Fauci in the media of the EID phase of HIV/AIDS offers a throughline that highlights some commonalities, despite historical differences, in the process of scientific knowledge formation during periods of novel infectious-disease emergence. While Fauci's antagonists were radical left-wing ACT-UP activists during the 1990s, during the EID phase of COVID his critics were radical right-wing conspiracy theorists. In both cases, the uncertainty resulting from the gaps in knowledge about the emerging pathogen were amplified in the intermedial spaces of broadcast television and the Internet. In the 1990s, these spaces of indeterminacy were mobilized as sites of dissent by HIV/AIDS activists, while in the 2020s the gaps were filled with conspiracy theories about COVID-19. The dominant mass media of each era – live video on broadcast television and real-time video and text messages on social media – made visible the scientific uncertainty expressed through the EID outbreak.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

SARS-CoV-2 and intermedial disintegration

The struggles to define the scientific and humanitarian narratives about HIV/AIDS took place on broadcast media, a site of discourse where dominant narratives about the health crisis were defined in the early 1990s. In contrast, the societal relevance of broadcast media was significantly diminished before the SARS-CoV-2 outbreak of late 2019, leaving the health communications ecosystem without a central site of power and authority. While some scholars saw the decentralizing affordances of social media as enabling new forms of protest and dissent, particularly for political movements, this shift also enabled the rapid spread of conspiracy theories that organizations like the WHO were not equipped to manage.[50] The novel threat to scientific authority posed by rapid circulation in real time of unverified information on mobile social networks highlights the growing tension between seemingly stable media forms that function to present and preserve the grammars of scientific certainty, and instant media that may undermine traditional approaches to the scientific construction of 'facts'.[51] Yet, as the preceding examples from 1957 and 1990 have shown, even under more centralized media structures, the instability and uncertainty of EID outbreaks posed significant challenges to the public communication of scientific expertise. In this section the analysis will focus on the level of the platform, rather than close textual analysis of individual films or broadcasts, to emphasize how social-media companies attempted to manage the fragmentation and volume of COVID communications from a wide and disparate range of messengers during this EID.

As the COVID-19 crisis evolved, numerous experimental approaches to health communication emerged on relatively new social-media platforms, including TikTok, as well as more established platforms, such as YouTube, Facebook, Twitter and Instagram. The heightened digitization of pandemic health communication was amplified by the extended periods of lockdown and isolation that made traditional forms of stable, durable and printed health media (such as posters or billboards) less relevant forms of crisis communication. In the intermedial space of the Internet, the efforts of formal health organizations such as state and federal health departments on these novel social platforms collided with the media products of self-appointed health ambassadors who created health content without scientific authorization.[52]

'Tailoring', or the personalization, of health messages represented a major methodological advance in health communication in the 1990s. The concept of tailoring meant 'creating communications in which information about a given individual is used to determine what specific content he or she will receive, the contexts or frames surrounding the content, by whom it will be presented and even through which channels it will be delivered'.[53] This approach was intended to increase the relevance and influence of the health messages an individual might receive, in contrast to previous models of generic, one-size-fits-all health campaigns. Yet, in the current digital media communication environment, the tailoring approach has been appropriated as a technique for predatory targeting of advertising and other forms of content based on digital profiling, with – in our case – users' search histories leading to recommendations for vaccination or COVID misinformation, depending

[50] Tedros, op. cit. (6); Calleja *et al.*, op. cit. (7).

[51] Mary Poovey, *A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society*, Chicago: University of Chicago Press, 1998.

[52] Rina Raphael, 'TikTok is flooded with health myths. These creators are pushing back', *New York Times*, 29 June 2022, p. D7.

[53] Robert P. Hawkins *et al.*, 'Understanding tailoring in communicating about health', *Health Education Research* (2008) 23(3), pp. 454–66, 454.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

on past online behaviours.[54] The targeting practices of the COVID 'infodemic' flourished in the intermedial spaces of the Internet, prompting reconsideration of the dynamics of authority and expertise in crisis situations where scientifically accurate information is of critical importance. In this context, attention to emergency health communications online may well have been diverted to COVID misinformation videos, prompting health experts and policymakers to demand that social-media platforms address the proliferation of dangerous misinformation on their sites.[55] YouTube, Google, Facebook and Twitter launched several misinformation interventions, such as promoting scientifically accurate information in search results, flagging or removing false claims and de-platforming known COVID conspiracy theorists.[56] The companies, in turn, requested guidance from scientists at the US National Academies of Medicine, to help them define 'authoritative health content' online.[57]

Despite the efforts of YouTube, Google, Facebook and Twitter to close the 'expectation gaps' between authoritative guidance and misinformation, the COVID health communication mediascape demonstrated significant continuity with influenza- and HIV/AIDS-era media, as official messaging channels struggled to maintain control over the dominant narratives about each EID. In one widely publicized example, the '#DoctorsSpeakUp hashtag' was designed by physicians in the spring of 2020 to promote COVID-19 vaccination on Twitter, but was hijacked by anti-vaccine advocates who used it to spread anti-vaccine messaging.[58] The incident was an example not only of scientific counterpublic messaging, but also of the ways in which gaps in intermedial communication about EIDs allow uncertainty and dissent to flourish. Because there was no centralized authority governing and validating the accuracy of health information posted online, social-media platforms functioned as vast repositories of undifferentiated claims, where entities such as the WHO shared space and competed for attention with science deniers and active promoters of disinformation.[59] Such cases are characterized by a degree of liveness that builds upon but exceeds the liveness of crisis communications in the earlier EID examples discussed in this article.

One distinction between the earlier examples and COVID-19 media is the accelerated speed with which 'live' communications occurred. Because websites and social-media accounts run by scientific organizations are dedicated to presenting the scientific process of verifying new claims related to EIDs, they are unable to engage users at the new platforms' speed of live communication and response. In the pandemic, as a result, viral memes

[54] Heidi Oi-Yee Li *et al.*, 'YouTube as a source of information on COVID-19: a pandemic of misinformation?' *BMJ Global Health* (2020) 5(5), e002604.

[55] Talha Burki, 'The online anti-vaccine movement in the age of COVID-19', *The Lancet Digital Health* (2020) 2(10), e504–5.

[56] Wen-Ying Sylvia Chou, Anna Gaysynsky and Robin C. Vanderpool, 'The COVID-19 misinfodemic: moving beyond fact-checking', *Health Education & Behavior: The Official Publication of the Society for Public Health Education* (2021) 48(1), pp. 9–13; Tekla Perry, 'How Facebook is using AI to fight COVID-19 misinformation', *IEEE Spectrum* online (2020); Gerrit de Vynck, 'YouTube is banning prominent anti-vaccine activists and blocking all anti-vaccine content', *Washington Post* online, 29 September 2021.

[57] Kirsten Ostherr, 'The visual language of COVID-19: narrative, data and emotion in online health communications', in Piotr Blumczynski and Steven Wilson (eds.), *The Languages of COVID-19: Translational and Multilingual Perspectives on Global Healthcare*, London: Routledge, 2023, pp. 199–216; Raynard S. Kington *et al.*, 'Identifying credible sources of health information in social media: principles and attributes', *NAM Perspectives*, 16 July 2021, pp. 1–37.

[58] Amanda S. Bradshaw, '#DoctorsSpeakUp: exploration of hashtag hijacking by anti-vaccine advocates and the influence of scientific counterpublics on Twitter', *Health Communication* (2023) 38(10), pp. 2167–77.

[59] Neil F. Johnson *et al.*, 'The online competition between pro- and anti-vaccination views', *Nature* (2020) 582(7811), pp. 230–3.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

and conspiracy theories circulated with a velocity that the slower temporality of scientific media could not match. While earlier EID media also faced challenges associated with liveness, they did so in a comparatively contained media ecosystem. In the accelerated, intermedial chains of online communication during COVID, as the messages proliferated, the gaps between messages also proliferated, generating spaces of uncertainty that posed a serious challenge to public-health authorities. The destabilizing effects of EIDs, which always involve uncertainty and rapid cycles of hypothesis testing, increase in the context of an unstable media ecosystem that lacks a central authority capable of adjudicating truth from misinformation.[60] Yet the 'liveness' hypothesis, that intermedial health communications in times of EID crisis have a destabilizing effect on scientific authority, has been borne out not only in the mobile social-media ecosystem, but also in earlier media configurations of broadcast television. When we look at health communication during EID outbreaks in historical perspective, a paradox emerges: health communicators reach for the most immediate form of mass communication to convey scientific information to the public, yet the very immediacy – or liveness – of these media forms makes them particularly vulnerable to destabilization.

Conclusion: intermediality from below

The concept of 'emerging infectious diseases' is widely viewed as originating in an influential 1992 report by the Institutes of Medicine, called *Emerging Infections: Microbial Threats to Health in the United States*.[61] That report established EIDs as both 'medical terms referring to a group of diseases' and 'socio-political constructs'.[62] Critics have noted that the discourse around EIDs flourished during the 1990s, directing attention and investment to diseases that posed 'risks to the global market and to the wealthy Global North' while framing infectious diseases 'as a threat to national or global security' rather than focusing on their humanitarian consequences.[63] In this way, the EID world view 'gives prominence to military, pharmaceutical, biotechnology and surveillance apparatuses in responding to potential catastrophe'.[64] Contrasting this model to that of 'neglected tropical diseases' (NTDs), a competing construct that gained dominance in the early 2000s, critics point out that the NTD model, unlike the EID model, focuses on human rights, equity and social justice for the 'bottom billion' of the world's inhabitants.[65]

As we consider the intersections of EIDs and intermediality, a set of entanglements emerges between the voices of dissent that may occupy the intermedial spaces, or the gaps between media, and the imagined subjects of these different configurations. In a critique of the global health discourse of governing authorities such as the WHO or the CDC, EIDs, including COVID-19, appear as the concern of capitalists of the global North; NTDs appear as the concern of 'vulnerable populations in tropical regions who lack political attention at national and international levels'.[66] This critique of EIDs posits that the world view is

[60] Morens and Fauci, op. cit. (32); Tang *et al.*, op. cit. (31).

[61] Institute of Medicine, *Emerging Infections: Microbial Threats to Health in the United States,* Washington, DC: The National Academies Press, 1992.

[62] Yves Jackson and Niamh Stephenson, 'Neglected tropical disease and emerging infectious disease: an analysis of the history, promise and constraints of two worldviews', *Global Public Health* (2014) 9(9), pp. 995–1007.

[63] Jackson and Stephenson, op. cit. (62).

[64] Jackson and Stephenson, op. cit. (62), p. 1003.

[65] Jackson and Stephenson, op. cit. (62); Nicholas B. King, 'Security, disease, commerce: ideologies of postcolonial global health', *Social Studies of Science* (2002) 32(5–6), pp. 763–89; Andrew Lakoff, 'Two regimes of global health', *Humanity: An International Journal of Human Rights, Humanitarianism, and Development* (2010) 1(1), pp. 59–79.

[66] Jackson and Stephenson, op. cit. (62), p. 997.

https://doi.org/10.1017/S000708742510126X Published online by Cambridge University Press

a vehicle for public-health investment that prioritizes structures of containment and control that benefit the governing geopolitical power structure. In this sense, the EID paradigm would seem to benefit most from a top-down model of communication that leaves no space for interpretation between instances of media. But as media scholar Clemencia Rodríguez argues, 'Processes of asymmetrical access to material and symbolic resources shape differentiated and unequal access to the public sphere'.[67] For this reason, the margins – or the intermedial spaces of the scientific public sphere – are also 'complex sites of struggle' that function 'in different ways from the mainstream, and also where particular data ecologies and original territories might emerge and thrive'.[68] As the preceding examples show, these struggles may take the form of AIDS activism or COVID conspiracy theories; the intermediality of EID health communication allows for a wide spectrum of expressive possibilities.

In circumstances such as EID outbreaks when publics solicit real-time guidance from health authorities, competing messages emerge from the intermedial gaps and margins of public discourse. Recognition of this dynamic may require a fundamental paradigm shift in health communication that acknowledges the need for messages 'from below' to ensure the credibility of messages 'from above'. As emergency messaging from trusted sources may make the difference between societal resilience and devastation amid climate-driven changes to human and more-than-human ecosystems, the importance of identifying adaptive approaches to health communication only increases. While 'live' science communications seem to have an inherently destabilizing effect on traditional forms of scientific authority, new models of trusted messengers from the margins suggest a potential path forward.

[67] Clemencia Rodríguez, 'Studying media at the margins: learning from the field', in Viktor Pickard and Goubing Yang (eds.), *Media Activism in the Digital Age*, London: Routledge, 2017, pp. 49–61, 49.

[68] Stefania Milan, Emiliano Treré and Silvia Masiero, eds., *COVID-19 from the Margins: Pandemic Invisibilities, Policies and Resistance in the Datafied Society*, Amsterdam: Institute of Network Cultures, 2021, p. 15.

Cite this article: Ostherr Kirsten, 'Emerging infectious disease outbreaks and real-time health communication: intermediality, uncertainty and dissent', *The British Journal for the History of Science* (2025), 1–17. https://doi.org/10.1017/S000708742510126X