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## From fragmented messaging to digital resilience: A health communication framework for artificial intelligence, climate change and infodemics

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### ABSTRACT

Health communication is entering an era of unprecedented complexity. Artificial intelligence, climate change and increasingly sophisticated misinformation ecosystems are reshaping how individuals access information, interpret risk, trust institutions and adopt health behaviours. Although these challenges are often examined separately, their convergence is creating a communication environment characterised by information overload, algorithmic influence, climate-related uncertainty and declining trust. Artificial intelligence can improve access to personalised health information and support large-scale communication, yet it can also amplify misinformation, obscure source credibility and reproduce inequities. Climate change is generating new health risks while increasing psychological distress, risk uncertainty and demand for timely guidance. Infodemics further undermine public trust, distort risk perception and weaken behavioural adaptation. We argue that health communication must move beyond reactive misinformation correction towards a digital resilience paradigm that strengthens critical appraisal, trust, adaptive behaviour and community engagement before crises occur. We propose a Digital Resilience Communication Framework comprising artificial intelligence literacy, digital health literacy, climate-health communication, misinformation resilience, social listening, trusted messengers, youth engagement and participatory governance. The framework positions resilience as a central communication outcome and offers a practical pathway for strengthening public trust and behavioural adaptation in increasingly complex information environments.

Keywords: health communication; artificial intelligence; climate change; infodemic; misinformation; digital resilience; trust; behavioural adaptation.

### INTRODUCTION

Health communication has traditionally focused on improving knowledge, shaping risk perception, supporting informed decision-making and enabling health behaviour change. Those goals remain central, but the communication environment has changed substantially. Artificial intelligence (AI), climate change and infodemics now influence how health information is created, distributed, interpreted and acted upon. Contemporary communication practice increasingly depends not only on message content, but also on digital infrastructures, algorithmic visibility, institutional legitimacy and community participation.

AI has rapidly entered health communication through search engines, recommender systems, predictive analytics, translation tools, symptom checkers, chatbots and generative language models. The technology can support tailored messaging, multilingual communication, rapid synthesis and wider access to health information. Yet AI also raises concerns about bias, transparency, privacy, hallucinated content, overconfidence and the large-scale production of persuasive misinformation. Recent public health scholarship notes that AI may support communication, surveillance and decision-making, but its adoption requires attention to accountability, equity, workforce skills and institutional readiness [1]. The World Health Organization (WHO) has similarly emphasised that large multi-modal models used in health require safety, transparency, human oversight and responsible governance [2].

Climate change is also reshaping health communication. The 2024 Lancet Countdown report documented escalating climate-related health threats, including heat exposure, food insecurity, wildfire smoke, air pollution and climate-sensitive infectious

disease risks [3]. These hazards increase demand for clear, locally relevant and behaviourally actionable communication. Climate-related health risks also intersect with mental wellbeing, including anxiety, grief and distress among young people and exposed communities [4-6]. Communication that is technically accurate but psychologically insensitive may unintentionally increase fatalism or disengagement.

Infodemics add a further layer of risk. WHO defines an infodemic as an overabundance of information, including false or misleading information, in digital and physical environments that can create confusion, encourage harmful behaviour and weaken public health responses [7]. Reviews of health misinformation show that misleading claims can affect vaccine confidence, preventive behaviour and trust in health authorities [8,9]. In the era of generative AI, misinformation can be produced and personalised more easily, making source credibility harder for the public to judge [10,11].

This Perspective argues that health communication should move from fragmented messaging to digital resilience. Digital resilience refers here to the capacity of individuals, communities and institutions to access trustworthy information, appraise uncertain claims, maintain trust, resist manipulation and adopt protective behaviours under conditions of digital complexity and environmental stress.

### **Sources and approach**

This article is a narrative evidence synthesis rather than a primary empirical study or systematic review. Literature was identified through targeted searches of PubMed, Scopus, Web of Science, Google Scholar, WHO publications, Lancet Countdown materials and recent public health communication reports. Search terms included “health communication”, “artificial intelligence”, “generative AI”, “health misinformation”, “infodemic management”, “digital health literacy”, “climate communication”, “climate-health communication”, “public trust”, “risk communication”, “social listening” and “behavioural adaptation”. Priority was given to peer-reviewed articles, systematic reviews, scoping reviews, conceptual papers and major policy documents published between 2020 and 2025. Older sources were retained only where they were conceptually important to health communication, health literacy or misinformation science. The purpose was to develop a practical framework for health communication research, policy and implementation rather than to estimate pooled effects.

### **From reactive correction to digital resilience**

Current health communication systems often remain reactive. Public health agencies frequently respond after misinformation has spread, after trust has weakened or after protective behaviour has failed to occur. This approach is increasingly inadequate in environments where false claims travel quickly, algorithmic systems reward engagement and generative AI can produce fluent and persuasive content at scale.

The COVID-19 pandemic exposed these limitations. Misinformation often moved faster than corrective communication, while trust became fragmented across platforms, communities and political identities. Similar dynamics are emerging in climate-health communication, where uncertainty, polarisation and competing narratives can reduce engagement with adaptive behaviours [12]. A purely corrective approach also places public health communicators in a permanent defensive position.

A digital resilience approach starts earlier. It aims to prepare people before crises by strengthening critical appraisal, digital health literacy, AI awareness, source evaluation, trust relationships and community participation. This does not mean abandoning timely correction. Rather, correction should be embedded within a broader communication system that builds public capacity to recognise uncertainty, evaluate evidence and act collectively.

### **Why artificial intelligence, climate change and infodemics belong together**

AI, climate change and infodemics interact through shared communication pathways. First, climate change increases uncertainty and demand for rapid health guidance. During heatwaves, floods, wildfires or disease outbreaks, people often seek information about symptoms, safety, evacuation, food access, air quality and recovery. In these moments, communication must be timely, clear and locally meaningful.

Second, AI increasingly structures access to this information. Search algorithms, recommender systems, automated translation, generative chatbots and personalised feeds influence which messages people see and trust. These tools may improve reach, especially in multilingual and resource-limited settings, but they may also produce inaccurate information, hide uncertainty or make unreliable claims appear authoritative [2,11].

Third, infodemics exploit fear, uncertainty and distrust. Misinformation is often emotionally salient, identity-reinforcing and resistant to correction [13,14]. Climate-related emergencies may create fertile conditions for misleading claims about causes, risks, public health measures, relocation, vaccines, humanitarian assistance or institutional motives. Health communicators must therefore address misinformation as a social and behavioural challenge, not only as a factual error.

Fourth, the combined effect is likely to be inequitable. People with limited digital access, low health literacy, language barriers, disability, poverty or low institutional trust may be more exposed to poor-quality information and less able to verify claims. Digital resilience should therefore be treated as a health equity issue.

### **A Digital Resilience Communication Framework**

A digital resilience approach should combine eight interconnected communication functions.

#### **Artificial intelligence literacy**

Communities should understand the capabilities, limits and risks of AI-generated information. Individuals need practical skills to assess AI outputs critically, recognise uncertainty and avoid assuming accuracy because a message appears fluent or personalised. Public institutions using AI should disclose its role and retain human oversight [1,2].

### **Digital health literacy**

Health communication should strengthen the ability to find, understand, appraise and apply digital health information. Contemporary digital health literacy includes access, evaluation, communication, privacy awareness and safe use of digital tools [15-17].

### **Climate-health communication**

Communication strategies should translate climate hazards into specific health actions while avoiding fatalism. Messages should link heat, air quality, flooding, food insecurity, displacement and infectious disease risks to feasible protective behaviours [3,12].

### **Misinformation resilience**

Prebunking, inoculation, fact-checking and critical-thinking approaches should be integrated into communication programmes before misleading claims spread widely. Online interventions show promise, but they must be tailored to the characteristics of misinformation and the needs of target audiences [13,14,18].

### **Social listening**

Continuous monitoring of concerns, questions, rumours and emerging narratives should inform communication strategies. Social listening can help public health teams detect misinformation early, identify unmet information needs and adjust messages before distrust intensifies [7,19].

### **Trusted messengers**

Community health workers, teachers, faith leaders, local journalists, youth advocates, patient organisations and civil society groups should be engaged as communication partners. Trust is more likely when messages are locally credible, culturally relevant and delivered through relationships that already exist.

### **Youth engagement**

Young people should be treated as communication co-creators rather than passive recipients. They are highly exposed to digital platforms, climate concern and online misinformation, but they also have strong potential to lead peer education, digital citizenship and climate-health advocacy [6].

### **Participatory governance**

Communities should contribute to communication planning, implementation and evaluation. Participation improves legitimacy and helps ensure that communication reflects local priorities, languages, channels and lived experience [20].

### **Legitimacy, implementation and equity**

Digital resilience cannot be achieved through technology alone. Communication effectiveness depends on legitimacy. Communities are more likely to trust information when it is transparent, culturally relevant and delivered through trusted relationships. Public health institutions should therefore invest in long-term engagement rather than relying only on crisis messaging.

Implementation should begin with communication mapping. Health teams should identify trusted messengers, preferred channels, digital access gaps, local languages, misinformation patterns, climate-health vulnerabilities and psychosocial concerns. These data can guide locally adapted communication rather than generic campaigns.

Equity should be built into every stage of implementation. Digital-only strategies may exclude older adults, rural communities, people with disabilities, linguistically marginalised groups and populations with low connectivity. AI-enabled communication should be assessed for bias, readability, language coverage and cultural relevance. The aim is not to replace human communication with technology, but to use technology to support more responsive and inclusive communication systems.

### **Research and policy priorities**

First, validated measurement tools are needed to assess digital resilience, AI literacy, misinformation susceptibility, trust, climate-health communication competence and behavioural adaptation. These indicators should be usable in community, clinical, school and emergency preparedness settings.

Second, intervention research should evaluate integrated communication approaches rather than isolated campaigns. Studies should test whether combining AI literacy, digital health literacy, climate-health communication, social listening and prebunking improves trust and adaptive behaviour.

Third, workforce development is essential. Health communicators need competencies in AI governance, digital engagement, social listening, climate communication, risk communication, behavioural science and misinformation response.

Fourth, policy frameworks should support collaboration across health, education, environment, communication, technology and civil society sectors. Health communication cannot address AI, climate change or infodemics effectively when these domains are governed in separate silos.

Fifth, communication equity should become a core evaluation criterion. Future interventions should assess whether they reduce or widen disparities in access, comprehension, trust and behavioural response.

### **Discussion**

Health communication is undergoing a fundamental transformation. AI, climate change and infodemics are changing not only what information people receive, but also how information is produced, ranked, interpreted, trusted and acted upon. Traditional communication models that emphasise one-way message transmission are insufficient for this environment.

The proposed Digital Resilience Communication Framework expands health communication by integrating technological, environmental and informational determinants of behaviour. It positions misinformation within a wider ecosystem shaped by

AI, climate uncertainty, psychological vulnerability and social trust. Its contribution is deliberately translational: it can inform public health agencies, climate adaptation programmes, school health communication, community medicine, emergency preparedness and digital health initiatives.

The framework should not be interpreted as a single programme. Rather, it is a systems approach that can be adapted to local contexts. Its success will depend on whether health institutions are willing to move from episodic campaigns towards sustained resilience-building, community partnership and accountable digital governance.

### CONCLUSION

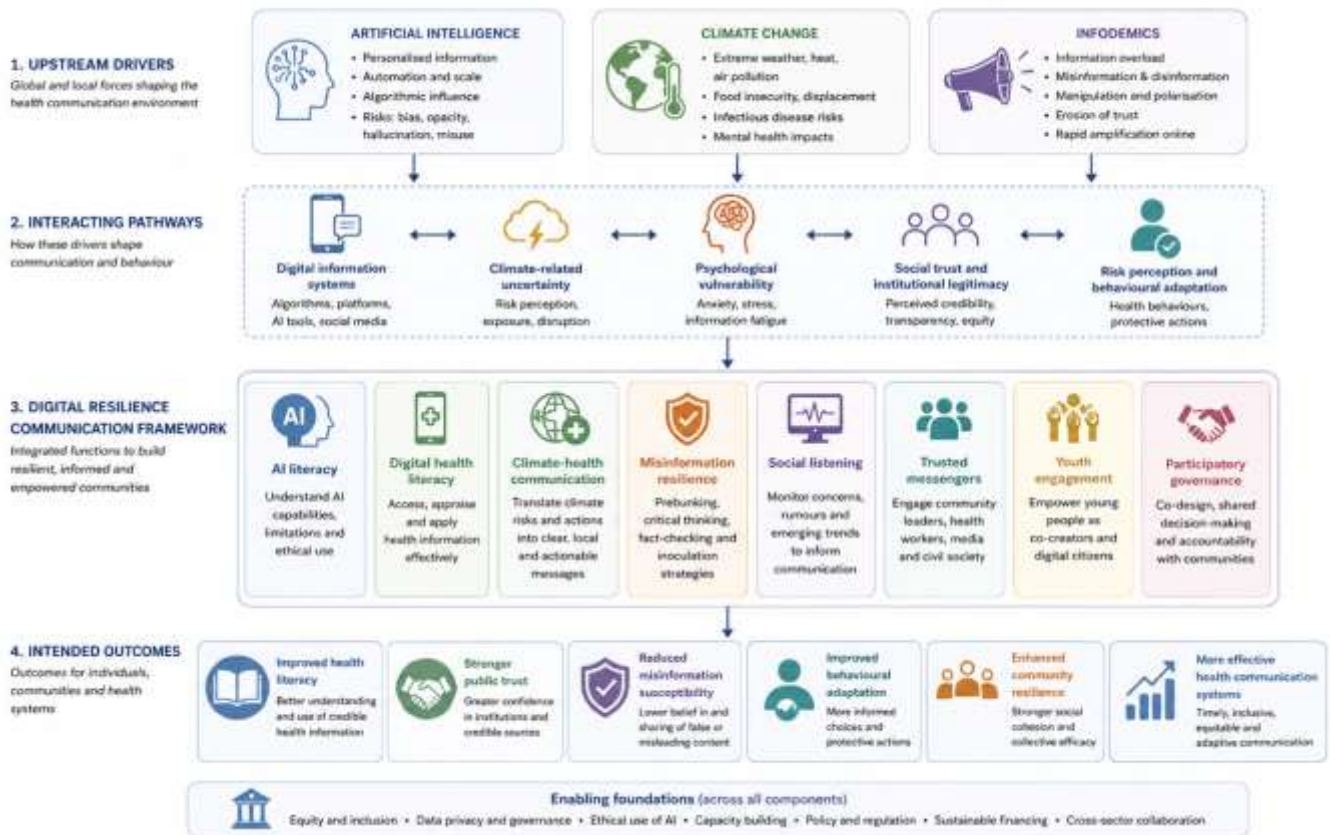
Artificial intelligence, climate change and infodemics are reshaping the landscape of health communication. Their interaction influences public trust, risk perception, health literacy and behavioural adaptation. Health communication must therefore move from reactive messaging towards proactive digital resilience.

A Digital Resilience Communication Framework offers a practical pathway for this shift. By integrating AI literacy, digital health literacy, climate-health communication, misinformation resilience, social listening, trusted messengers, youth engagement and participatory governance, health communication can strengthen public trust and behavioural adaptation in complex information environments. The future of health communication will depend not only on delivering accurate information, but also on enabling communities to judge, trust, adapt and act together.

**Table 1: Digital resilience priorities for health communication in the age of artificial intelligence, climate change and infodemics**

Communication domain	Current challenge	Resilience opportunity	Translational priority
Artificial intelligence literacy	Many publics have limited understanding of AI-generated health information.	People can evaluate AI outputs without assuming that fluency equals accuracy.	Develop public AI literacy guidance, disclosure rules and human oversight standards.
Digital health literacy	Information overload and variable source quality make appraisal difficult.	Communities can improve information seeking, evaluation and safe digital use.	Integrate digital health literacy into schools, community programmes and primary care.
Climate-health communication	Climate risks may be communicated as abstract environmental issues.	Health framing can translate climate hazards into protective action.	Develop locally relevant heat, air quality, flood, food security and preparedness messages.
Misinformation resilience	False claims spread rapidly and often persist after correction.	Prebunking, inoculation and trusted correction can reduce susceptibility.	Establish routine prebunking, fact-checking and rapid correction systems.
Social listening	Public concerns and rumours may be recognised too late.	Early listening can identify emerging narratives and unmet information needs.	Use community feedback, rumour logs and digital monitoring to guide messages.
Trusted messengers	Institutional messages may not reach or persuade all groups.	Local intermediaries can improve credibility, relevance and uptake.	Partner with community health workers, teachers, faith leaders, journalists and youth groups.
Youth engagement	Young people are highly exposed to digital content but often excluded from planning.	Youth can lead peer communication, digital citizenship and climate-health advocacy.	Co-design youth-led communication and digital resilience programmes.
Participatory governance	Top-down communication can undermine legitimacy and trust.	Co-design can improve ownership, cultural relevance and accountability.	Include communities in planning, implementation and evaluation.

Note. The table is formatted for journal submission with the table number, title and explanatory note clearly separated. The domains are organised around practical communication functions that can be integrated into public health communication systems, climate adaptation programmes, digital health initiatives and emergency preparedness planning.



**Figure 1: Conceptual framework for digital resilience in health communication**

Artificial intelligence, climate change and infodemics are positioned as upstream drivers shaping health literacy, trust, risk perception and behavioural adaptation. These drivers interact through digital information systems, climate-related uncertainty, psychological vulnerability and social trust. The proposed Digital Resilience Communication Framework comprises AI literacy, digital health literacy, climate-health communication, misinformation resilience, social listening, trusted messengers, youth engagement and participatory governance. Intended outcomes include improved health literacy, stronger public trust, reduced misinformation susceptibility, improved behavioural adaptation, enhanced community resilience and more effective health communication systems as shown in Figure 1 and Table 1.

#### Declarations

#### Conflict of interest

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

#### Funding

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#### Data availability statement

No original datasets were generated or analysed for this article. All sources discussed are publicly available.

#### Ethics statement

This Perspective did not involve human participants, human data, animal subjects or clinical intervention. Ethics committee approval was therefore not required.

#### Author contributions

Emmanuel Ikechukwu Obi contributed to conceptualisation, original drafting, scientific interpretation and manuscript revision. Thaddeus Chijioko Asogwa contributed to public health framing, literature synthesis and critical revision. Victor Ositadinma Nvene contributed to health-promotion interpretation, manuscript editing and final approval. All authors reviewed and approved the final manuscript for submission.

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