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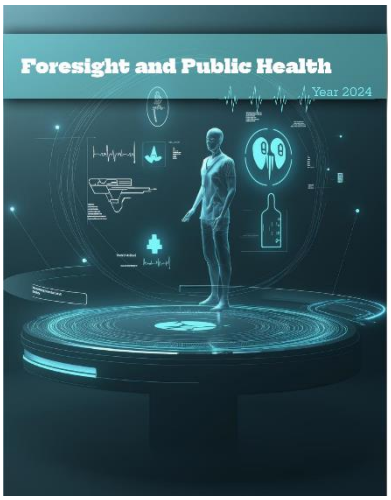

How Public Health Professionals Perceive and Adapt to Emerging Health Threats

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ABSTRACT

This study aims to explore how public health professionals perceive and adapt to emerging health threats. This study employed a qualitative research design using semi-structured interviews with 24 public health professionals recruited through online announcements and professional platforms. Data collection continued until theoretical saturation was achieved. The interviews were conducted virtually, transcribed verbatim, and analyzed using thematic analysis with NVivo software. Open coding, axial coding, and selective coding were applied to identify key themes related to professionals' perceptions, adaptive strategies, and barriers in responding to health threats. The results revealed three primary themes: perception of emerging health threats, adaptation strategies, and challenges in crisis response. Participants reported that their perception of threats was influenced by past experiences, institutional preparedness, and exposure to misinformation. Adaptation strategies included institutional policy adjustments, professional training, technological integration, and community engagement. However, participants also faced significant challenges, including policy and governance limitations, resource shortages, public resistance, and ethical dilemmas. The findings suggest that while public health professionals demonstrate strong adaptive capacities, systemic barriers continue to hinder their ability to implement effective responses. Understanding public health professionals' perceptions and adaptation mechanisms is crucial for improving crisis preparedness and response strategies. Strengthening institutional support, enhancing professional training, and addressing misinformation can contribute to more effective public health interventions. Future research should explore long-term workforce resilience and the role of emerging technologies in supporting adaptation.

Keywords: Public health professionals, emerging health threats, adaptation strategies, risk perception, crisis response, misinformation, public health preparedness.

Introduction

Public health professionals play a critical role in identifying, responding to, and mitigating emerging health threats. These threats, which range from novel infectious diseases and antimicrobial resistance to climate-related health crises and misinformation, require professionals to continuously adapt their strategies and decision-making processes (Rivera-Lozada et al., 2025). Given the increasing frequency and complexity of global health emergencies, understanding how public health professionals perceive and respond to these threats is essential for improving preparedness and response strategies (Battle et al., 2025). The COVID-19 pandemic, in particular, underscored the vulnerabilities within public health systems and the necessity of rapid adaptation to emerging threats (Rodriguez-Arrastia et al., 2022). Despite growing investments in disease surveillance, workforce training, and digital health technologies, professionals continue

to face challenges related to policy implementation, resource allocation, public trust, and ethical decision-making (Murdock et al., 2024). These challenges highlight the importance of examining the perceptions and adaptive strategies employed by public health professionals in the face of evolving crises.

Perception is a fundamental component of how public health professionals engage with emerging health threats. Their ability to recognize the severity of a threat and anticipate its potential impact influences both individual and institutional responses (Robins, 2022). Research has shown that professionals' risk perceptions are shaped by multiple factors, including previous experiences with health emergencies, institutional preparedness, media coverage, and public sentiment (Abdelmagid et al., 2022). In highly vulnerable regions, professionals often rely on epidemiological alerts and global health networks to detect potential threats early and determine appropriate response measures (Ossebi et al., 2022). However, even in well-resourced settings, perception gaps can occur due to misinformation, bureaucratic delays, and competing political priorities (Golan et al., 2022). One study examining the public and health professionals' epidemic risk perceptions found that subjective risk assessments often differ from objective epidemiological data, leading to inconsistencies in response efforts (Abdelmagid et al., 2022). This discrepancy suggests that personal and institutional factors influence how professionals perceive emerging threats, which, in turn, affects their ability to implement effective countermeasures.

The growing reliance on digital surveillance tools, artificial intelligence, and big data analytics has transformed how public health professionals detect and monitor emerging threats (Ackerhans et al., 2024). Clinical decision support systems, for example, are increasingly being integrated into public health practice to assist professionals in identifying patterns, forecasting outbreaks, and optimizing response strategies (Regehr et al., 2023). While these technologies have enhanced efficiency, they have also introduced new challenges related to data privacy, algorithmic biases, and the digital divide among healthcare professionals (Kızılkaya & Buğdali, 2025). Furthermore, the proliferation of misinformation on social media has complicated threat perception, as professionals must distinguish between credible sources and misleading information (Battle et al., 2025). Studies have shown that misinformation can influence not only public behavior but also the decision-making processes of health professionals, particularly when official guidance is unclear or contradictory (Jones & James, 2021). This phenomenon was evident during the COVID-19 pandemic when professionals had to navigate rapidly changing recommendations while countering widespread misinformation regarding vaccines, treatments, and disease transmission (Rodriguez-Arrastia et al., 2022).

In addition to perceiving threats, public health professionals must also develop adaptive strategies to manage and mitigate risks effectively. Adaptation involves both institutional and personal mechanisms, including policy reforms, professional training, crisis simulations, and emotional resilience (Burns, 2023). Research indicates that effective adaptation is largely dependent on institutional preparedness and support structures that enable professionals to implement best practices during crises (Lakan et al., 2022). A study on knowledge-sharing among public health professionals highlighted the importance of collaboration and interdisciplinary learning in strengthening adaptive capacity (Lakan et al., 2022). When professionals have access to robust training programs and interdisciplinary networks, they are better equipped to respond to emerging threats in real time (Ossebi et al., 2022). However, challenges such as workforce shortages, burnout, and bureaucratic constraints often hinder adaptation efforts (Wongnuch et al., 2022).

One of the most significant adaptation strategies used by public health professionals is community engagement and public communication. Effective risk communication plays a crucial role in ensuring public compliance with health guidelines, reducing misinformation, and building trust in health institutions (Pouvrasseau & Jeannot, 2023). Studies have shown that professionals who actively engage with communities and utilize culturally sensitive communication strategies are more successful in promoting adherence to health measures (Uppalapati et al., 2023). However, professionals often face resistance when attempting to implement public health interventions, particularly in communities with high levels of distrust in government and healthcare systems (Kızılkaya & Buğdali, 2025). Vaccine hesitancy, for example, remains a major public health challenge, as misinformation and political ideologies influence public attitudes toward vaccination (Pouvrasseau & Jeannot, 2023). Research on healthcare system distrust has

demonstrated that professionals must employ targeted messaging and leverage community partnerships to address public concerns effectively (Kızılkaya & Buğdali, 2025).

Despite their ability to adapt, public health professionals encounter numerous challenges in responding to health threats. Policy and governance limitations, resource scarcity, and coordination failures are among the most frequently cited obstacles (Becker, 2022). Bureaucratic inefficiencies and political interference can delay response efforts, exacerbating the impact of health crises (Flintham et al., 2022). For example, studies on government responses to COVID-19 highlighted how inconsistent policies and fragmented communication hindered containment strategies (Rodriguez-Arrastia et al., 2022). In resource-limited settings, professionals often struggle with inadequate medical supplies, overburdened healthcare systems, and insufficient funding (Ossebi et al., 2022). These structural challenges not only impact crisis response but also contribute to professional burnout and job dissatisfaction (Akter, 2023).

Ethical dilemmas also arise when professionals are forced to make difficult decisions regarding resource allocation, prioritization of care, and transparency in crisis management (Gunasekara et al., 2022). Research on antimicrobial stewardship and epidemic preparedness has emphasized the ethical tensions between individual patient care and public health priorities (Gunasekara et al., 2022). Professionals must navigate these dilemmas while maintaining public trust and adhering to institutional policies (Robins, 2022). Studies have also shown that professionals face significant psychological burdens when working in high-pressure environments, leading to increased rates of stress, anxiety, and burnout (Murdock et al., 2024). Addressing these mental health concerns is essential to ensuring the long-term sustainability of the public health workforce (Akter, 2023).

Given the complexities of perception and adaptation in public health practice, this study aims to explore how professionals understand and respond to emerging health threats.

Methods and Materials

This study employs a qualitative research design to explore how public health professionals perceive and adapt to emerging health threats. The research follows an interpretive paradigm, aiming to gain in-depth insights into participants' experiences and perspectives. A purposive sampling strategy was used to recruit public health professionals, ensuring that individuals with relevant expertise and practical experience in responding to health crises were included. The study reached theoretical saturation after conducting interviews with 24 participants, meaning that additional data collection no longer provided new themes or insights. Participants were recruited through online announcements and professional platforms, targeting individuals engaged in various public health roles across different regions.

Data collection was conducted using semi-structured interviews, allowing for flexibility in probing participants' responses while maintaining a consistent focus on key research themes. The interview protocol included open-ended questions related to public health professionals' experiences in identifying, responding to, and adapting to emerging health threats. The interviews were conducted via virtual communication platforms, ensuring accessibility for participants from diverse geographic locations. Each interview lasted approximately 45 to 60 minutes and was recorded with the participants' informed consent. Transcriptions were prepared verbatim to ensure accuracy in data representation.

Data analysis was carried out using NVivo software to facilitate systematic coding and theme development. A thematic analysis approach was employed to identify patterns and categories within the data. Initially, open coding was used to capture recurring concepts, followed by axial coding to establish relationships between identified themes. Selective coding was then applied to refine the overarching themes that emerged from the data. The analysis process was iterative, with constant comparison between new and existing data to ensure consistency and rigor. Trustworthiness of the findings was enhanced through member checking, where participants were invited to review and validate the interpretations drawn from their responses. Additionally, peer debriefing was conducted to ensure reflexivity and reduce potential researcher bias.

Findings and Results

The demographic characteristics of the 24 participants in this study reflect a diverse group of public health professionals with varying levels of experience and expertise. Among the participants, 14 (58.3%) were female and 10 (41.7%) were male. The age range of participants varied, with 6 (25%) between the ages of 25-34, 9 (37.5%) between 35-44, 6 (25%) between 45-54, and 3 (12.5%) aged 55 and above. In terms of professional roles, 8 (33.3%) were epidemiologists, 7 (29.2%) were public health policymakers, 5 (20.8%) were healthcare administrators, and 4 (16.7%) were frontline healthcare workers involved in disease prevention and response. Regarding years of experience, 5 (20.8%) had less than 5 years of experience, 8 (33.3%) had 5-10 years, and 11 (45.8%) had more than 10 years of experience in public health practice. Participants were recruited from various regions, with 9 (37.5%) from North America, 6 (25%) from Europe, 5 (20.8%) from Asia, and 4 (16.7%) from Africa. This demographic distribution ensured a comprehensive understanding of diverse public health perspectives in responding to emerging health threats.

Table 1. Qualitative Analysis Results

Categories (Main Themes)	Subcategories (Subthemes)	Concepts (Open Codes)
Perception of Emerging Health Threats	Awareness and Recognition	Early detection, Media influence, Epidemiological alerts, Training programs, Institutional briefings
	Sources of Information	Government reports, WHO guidelines, Peer discussions, Academic research, Online health networks, Social media updates
	Risk Assessment and Perceived Severity	Threat magnitude, Population vulnerability, Health system preparedness, Previous outbreak experiences, Misinformation concerns
	Psychological and Emotional Responses	Anxiety, Uncertainty, Stress management, Personal responsibility, Burnout risk, Community trust issues
	Ethical and Professional Dilemmas	Balancing personal safety, Duty to inform, Resource allocation, Equity concerns, Legal obligations, Public resistance
Adaptation Strategies	Institutional Responses	Policy adjustments, Emergency protocols, Public advisories, Collaboration with policymakers, Crisis simulations
	Personal Coping Mechanisms	Mindfulness, Peer support, Time management, Emotional resilience, Work-life balance, Professional counseling
	Knowledge and Skill Development	Online training, Interdisciplinary learning, Networking with experts, Evidence-based decision-making, Continuous education
	Technological Integration in Adaptation	Digital surveillance tools, AI in outbreak prediction, Virtual health consultations, Telemedicine, Remote data sharing
	Community Engagement and Public Communication	Health literacy campaigns, Misinformation countermeasures, Public trust-building, Grassroots initiatives
Challenges in Response to Health Threats	Policy and Governance Limitations	Bureaucratic inefficiencies, Political interference, Delayed responses, Regulatory gaps, Funding constraints
	Resource Scarcity	Lack of medical supplies, Insufficient personnel, Overwhelmed healthcare systems, Funding shortfalls, Infrastructure deficiencies
	Public Resistance and Misinformation	Vaccine hesitancy, Social media misinformation, Fear-driven behaviors, Trust in alternative medicine, Distrust of authorities, Cultural beliefs
	Ethical Challenges in Crisis Management	Equity in resource allocation, Prioritization of vulnerable groups, Confidentiality dilemmas, Transparency issues
	Coordination Issues Among Stakeholders	Fragmented communication, Lack of inter-agency collaboration, Conflicting guidelines, Role ambiguity

The findings of this study reveal three major themes regarding how public health professionals perceive and adapt to emerging health threats: perception of emerging health threats, adaptation strategies, and challenges in response to health threats. Each theme consists of several subcategories that reflect different aspects of professionals' experiences, as detailed below.

Public health professionals' perception of emerging health threats is shaped by their awareness and recognition of risks. Many participants emphasized that early detection mechanisms, media influence, and epidemiological alerts play a crucial role in shaping their understanding of potential threats. Institutional briefings and training programs were frequently mentioned as essential sources of preparedness. One participant noted, "We often rely on global surveillance systems and institutional updates to detect emerging threats before they escalate into crises." Another important aspect is the sources of information used by professionals, which include government reports, WHO guidelines, peer discussions, academic research, and online health networks. Social media updates were also cited as a double-edged sword, providing rapid information but also contributing to misinformation. In terms of risk assessment and perceived severity, professionals consider factors such as the magnitude of the threat, population vulnerability, and the preparedness of the healthcare system. Some interviewees highlighted the role of past outbreak experiences in shaping

their current risk perception. One respondent stated, "Having worked through previous outbreaks, I can quickly recognize the early signs of a public health emergency and anticipate the necessary steps." Psychological and emotional responses also emerged as a key concern, with participants reporting anxiety, uncertainty, stress, and burnout. Many professionals described experiencing a heightened sense of personal responsibility, with one noting, "The pressure to make the right decision in uncertain situations can be overwhelming, especially when the public looks to us for guidance." Finally, ethical and professional dilemmas were frequently mentioned, including the balance between personal safety and professional duty, concerns over resource allocation, and the challenge of addressing legal obligations amid public resistance. A participant remarked, "There are times when we must make difficult ethical decisions—do we prioritize limited resources for the most vulnerable, or do we focus on containing the spread as quickly as possible?"

In terms of adaptation strategies, institutional responses were highlighted as a crucial mechanism for managing emerging threats. Many professionals emphasized that policy adjustments, emergency protocols, and public advisories are rapidly deployed when new threats arise. Collaboration with policymakers and crisis simulations were also identified as essential tools in response preparedness. One participant stated, "When policies are updated in real-time based on emerging evidence, we can adapt faster and minimize risks." Personal coping mechanisms were also critical, with professionals relying on mindfulness, peer support, and time management to mitigate stress. Emotional resilience was frequently cited as a factor that determined long-term engagement in the field. "Sometimes, just having a strong network of colleagues to talk to makes a huge difference in how we cope," shared one interviewee. Another key adaptation strategy was knowledge and skill development, with professionals engaging in online training, interdisciplinary learning, and networking with experts. Evidence-based decision-making and continuous education were viewed as fundamental in responding effectively to emerging health threats. One participant noted, "Keeping up with new research and best practices is essential; otherwise, we risk being reactive rather than proactive." The integration of technology into adaptation efforts also played a significant role, with digital surveillance tools, AI-driven outbreak prediction, and telemedicine being widely utilized. Professionals noted that these tools enhance efficiency but also require training to be used effectively. "AI-based monitoring has transformed how we predict outbreaks, but many public health workers still need training to use it optimally," commented one respondent. Lastly, community engagement and public communication were identified as key elements in adaptation. Health literacy campaigns, misinformation countermeasures, and grassroots initiatives were all emphasized as essential in maintaining public trust. "Engaging the community early helps reduce fear and misinformation, making our job much easier in the long run," said one participant.

Despite these adaptation strategies, professionals encountered numerous challenges in response to health threats. Policy and governance limitations were a significant issue, with professionals citing bureaucratic inefficiencies, political interference, and regulatory gaps as major barriers. "We often know what needs to be done, but slow decision-making processes delay our response," stated one respondent. Resource scarcity was another critical challenge, as professionals frequently reported a lack of medical supplies, insufficient personnel, and overwhelmed healthcare systems. Many participants emphasized the need for better funding and infrastructure, with one explaining, "During crises, we struggle with basic needs like protective equipment, making it difficult to operate effectively." Public resistance and misinformation further complicated response efforts, with participants pointing to vaccine hesitancy, fear-driven behaviors, and distrust of authorities as significant obstacles. One professional remarked, "Convincing the public to follow guidelines is often more difficult than dealing with the actual health crisis." Ethical challenges also emerged in crisis management, particularly in resource allocation, confidentiality dilemmas, and transparency issues. Several interviewees spoke about the moral distress of prioritizing some patients over others, with one stating, "It is heartbreaking to know that limited resources force us to make decisions that impact who gets treatment first." Finally, coordination issues among stakeholders presented another major challenge, as fragmented communication, lack of inter-agency collaboration, and conflicting guidelines often led to inefficiencies. "When different agencies provide conflicting information, it confuses both professionals and the public, making crisis management even harder," explained one respondent.

Discussion and Conclusion

The findings of this study provide a comprehensive understanding of how public health professionals perceive and adapt to emerging health threats. The results indicate that professionals rely on multiple sources of information to assess risks, including epidemiological alerts, media reports, and institutional briefings. Their perception of threats is influenced by previous experiences, institutional preparedness, and the broader public response. While professionals demonstrate strong adaptive capacities through policy reforms, community engagement, and the integration of technology, they face significant challenges related to resource scarcity, public resistance, and ethical dilemmas. These findings align with previous research on risk perception and public health decision-making, suggesting that the ability to adapt to health crises is contingent on both systemic and individual-level factors (Rivera-Lozada et al., 2025).

One of the most striking findings of this study is that public health professionals' perceptions of emerging health threats are shaped by their previous exposure to crisis situations. Participants frequently mentioned that their past experiences with pandemics, epidemics, and other public health emergencies helped them recognize early warning signs and assess the severity of new threats. This aligns with research indicating that professionals who have previously encountered public health crises develop a heightened awareness and more proactive response strategies (Abdelmagid et al., 2022). Furthermore, institutional preparedness played a key role in shaping perceptions, with professionals from well-resourced institutions reporting greater confidence in their ability to manage emerging threats. Studies have shown that organizations with clear response protocols and access to up-to-date information enable professionals to act decisively and mitigate the impact of health threats (Ossebi et al., 2022). However, some participants noted discrepancies between their personal risk assessments and official public health guidelines, particularly in situations where political and institutional interests influenced decision-making. This finding supports previous research indicating that public health professionals sometimes struggle to balance scientific evidence with administrative constraints (Rodriguez-Arrastia et al., 2022).

Another key aspect of perception was the role of misinformation in shaping public and professional responses. Many participants cited challenges in distinguishing credible sources of information from misleading narratives, particularly in the age of social media. Previous studies have highlighted how misinformation can exacerbate public health crises by undermining trust in health institutions and influencing decision-making processes (Battle et al., 2025). Research on vaccine hesitancy and public compliance during the COVID-19 pandemic demonstrated that misinformation not only affects the general public but can also impact healthcare professionals who are constantly exposed to conflicting information (Pouvrasseau & Jeannot, 2023). The results of this study reinforce these findings, as many participants reported encountering misleading claims about disease outbreaks, treatment options, and policy responses. Addressing misinformation remains a critical challenge for public health professionals, requiring targeted communication strategies and stronger collaborations between healthcare organizations and media outlets (Jones & James, 2021).

In terms of adaptation, the study found that public health professionals employ a range of strategies to mitigate risks and respond effectively to emerging threats. Institutional responses such as policy adjustments, emergency preparedness drills, and collaboration with policymakers were widely cited as essential adaptation mechanisms. This aligns with previous research demonstrating that adaptive institutions are better equipped to manage crises and maintain public confidence (Lakan et al., 2022). Additionally, many professionals emphasized the importance of continuous education and professional training in ensuring that they remain up to date with evolving health threats. Studies on professional identity and decision-making support systems have shown that ongoing education enhances professionals' ability to integrate evidence-based practices into their responses (Ackerhans et al., 2024).

Technology integration was another significant adaptation strategy, with many participants reporting that digital surveillance tools, artificial intelligence, and telemedicine have improved their ability to monitor and respond to health crises. These findings are supported by research on digital health interventions, which highlight the benefits of using big data analytics to predict outbreaks and allocate resources more efficiently (Regehr et al., 2023). However, participants also noted challenges related to digital transformation, including concerns about data security, algorithmic bias, and accessibility gaps. Similar concerns have been raised in studies examining the role of artificial intelligence in

public health, which caution against over-reliance on automated systems without adequate human oversight (Golan et al., 2022). Despite these challenges, the integration of technology remains a crucial component of modern public health adaptation strategies, particularly in managing large-scale health threats.

Community engagement emerged as another key adaptation mechanism, with participants emphasizing the importance of clear communication and public trust-building. Many professionals reported that direct engagement with communities helped counter misinformation, improve health literacy, and ensure compliance with public health measures. Previous studies have shown that culturally sensitive communication strategies and grassroots health initiatives are particularly effective in gaining public trust and promoting health behaviors (Uppalapati et al., 2023). Research on public health activism has also highlighted the role of professionals as advocates for policy changes that prioritize community well-being (Burns, 2023). However, some participants expressed frustration with public resistance and distrust, particularly in regions where misinformation and political ideologies influence health-related behaviors. This challenge has been well-documented in studies examining public resistance to vaccination and health mandates (Kızılkaya & Buğdali, 2025). These findings underscore the need for enhanced public engagement strategies that address both scientific and sociopolitical dimensions of public health crises.

Despite their ability to adapt, public health professionals continue to face substantial challenges in responding to emerging threats. Participants widely reported experiencing policy and governance limitations, with bureaucratic inefficiencies and political interference cited as major barriers to effective crisis management. These findings align with research on governance challenges in public health, which highlight how political agendas and administrative hurdles can delay response efforts (Flintham et al., 2022). Additionally, resource scarcity was a recurrent concern, with participants mentioning shortages of medical supplies, personnel, and funding as key obstacles to effective response efforts. Prior studies have demonstrated that resource limitations significantly hinder public health interventions, particularly in low-income settings where infrastructure constraints exacerbate health crises (Ossebi et al., 2022).

Ethical dilemmas were another significant challenge reported by participants, particularly in relation to resource allocation and transparency in decision-making. Many professionals described facing difficult choices about prioritizing limited resources and maintaining ethical standards in high-pressure environments. These concerns align with research on ethical decision-making in public health, which highlights the moral distress experienced by professionals when making life-or-death decisions during crises (Gunasekara et al., 2022). In addition, coordination issues among stakeholders were frequently mentioned, with professionals citing fragmented communication and conflicting guidelines as barriers to cohesive responses. This finding supports studies on inter-agency collaboration, which emphasize the need for stronger coordination mechanisms to ensure consistent and effective crisis management (Rodriguez-Arrastia et al., 2022).

This study has several limitations that should be acknowledged. First, the sample size of 24 participants, while sufficient for achieving theoretical saturation, may not fully capture the diversity of experiences across different geographic and institutional contexts. Second, the reliance on semi-structured interviews means that responses were influenced by participants' own interpretations and recollections, which may introduce subjectivity. Additionally, while the use of NVivo software for qualitative analysis ensured systematic coding, the interpretation of findings remains dependent on the researchers' analytical frameworks. Future research should incorporate longitudinal studies and mixed-methods approaches to provide a more comprehensive understanding of public health professionals' experiences.

Future research should explore the long-term psychological and professional impacts of responding to emerging health threats on public health professionals. Examining burnout, resilience, and workforce retention in crisis settings could provide valuable insights into sustaining an effective public health workforce. Additionally, studies should investigate how emerging technologies, including artificial intelligence and machine learning, can be leveraged to enhance adaptive capacity while addressing concerns about data privacy and bias. Cross-cultural comparisons of public health responses would also be beneficial in identifying best practices that can be adapted across different health systems.

Public health institutions should prioritize continuous professional development and interdisciplinary training to ensure that professionals are equipped with the latest knowledge and skills to respond to emerging threats. Strengthening crisis communication strategies and public engagement efforts can improve compliance with health measures and reduce misinformation. Additionally, enhancing collaboration between policymakers, public health agencies, and community organizations is essential for ensuring coordinated and efficient responses. Investing in mental health support for public health professionals is also crucial in addressing stress and burnout, ultimately contributing to a more resilient workforce.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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