Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Global health and data-driven policies for emergency responses to infectious disease outbreaks

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In 2011, WHO reached a global health milestone when the organisation achieved international agreement on a framework for pandemic influenza preparedness that would facilitate the sharing of influenza virus samples and data, allow vaccine access, and address aspects relevant to low-income and middle-income countries (LMICs).[1] Similarly, in 2015, a WHO consultation during the Ebola virus outbreak in west Africa emphasised the need for global norms and for the public availability of data during public health emergencies.[2] This position was echoed a few months later by the Wellcome Trust and other leading scientific organisations and health agencies during the Zika virus outbreak in the Americas, which encouraged widespread and rapid data availability.[3]

The notion of sharing data during public health emergencies is thus generally accepted and practised during times of crisis. Indeed, data sharing is a cornerstone of the COVID-19 pandemic response, informing public health policies and interventions and measuring their effects. However, these crisis experiences provide a strong argument that data sharing should not simply be limited to emergencies or a few high-priority threats. Emergency preparedness for anticipated and novel public health challenges requires near real-time, broad-based, continuous information, and a collaborative framework for data collection, sharing, analysis, alerts, investigation, and response.

Clinical microbiology laboratories worldwide routinely report pathogen identification and antimicrobial susceptibility results of diagnostic samples, but typically only to the patient's health-care provider. Only a small proportion of these data are subsequently reported to national authorities to support public health objectives and action. Recognising the richness of data generated through routine diagnostic testing facilities and the potential for geographically comprehensive and real-time alerts for emerging resistance threats, in 2015, WHO established the Global Antimicrobial Resistance Surveillance System (GLASS) to promote a standardised approach to the collection, analysis, and sharing of antimicrobial resistance data at the global level, including modules for routine reporting and reporting of emerging antimicrobial resistance , thereby informing global action plans on antimicrobial resistance.[4] 91 countries and territories now participate in GLASS,[5] with data sharing becoming increasingly acceptable. However, all microbiology laboratories and surveillance sites have yet to be enrolled to ensure comprehensive data collection, and data sharing is not in real time.

Automation and digitisation are central to empowering data use, and technological capacity can be best leveraged when standardised data from many sources are collated and analysed. This approach allows the detection of dangerous outbreaks and open sharing of genetic information from pathogenic organisms as well as providing evidence to policy and decision makers to inform public health responses. Such surveillance offers unparalleled opportunities to create a global infrastructure comprising collaborating clinical, public health, academic, and research laboratories as the basis of a microbial sensor network for data sharing, analysis, notification, and response by pre-designated responders.[6]

However, challenges remain in the technical and legal ability to achieve such data sharing mechanisms, particularly in the context of LMICs. Clinicians and scientists might not be able to share clinical, routine diagnostic, and genomic data effectively because of inadequate infrastructure, workforce capacity, or legal frameworks. Uncertainties over data ownership, authentication, and validation can present further barriers to effective data sharing, especially with the diverse teams of professionals mobilised in response efforts.[7] As highlighted by the well publicised retraction of published studies due to concerns regarding data validity and integrity, data authentication and validation are an important challenge. Another challenge is protecting intellectual property, particularly concerning new discoveries, research publications, and secondary use of data. Standard mechanisms for data users to credit data providers are required,[7] along with appropriate agreements ensuring patient confidentiality and data use.

Many public health and governmental agencies rely on manual efforts to gather, structure, and submit

data, resulting in incomplete and missing information and therefore loss of data integrity and an inability to predict and map infection surges. In the case of the COVID-19 pandemic, novel approaches have been explored, such as e-signatures and e-consent for clinical trials and the collection and biobanking of residual human biological material obtained during routine clinical care, which could serve as a useful model for expansion.[8] Nevertheless, automation of data aggregation (eg, with dashboards for test availability, bed occupancy rates, and ventilators) to monitor the response to outbreaks is challenging, particularly in LMICs with limited resources. Real-time data sharing is not free of drawbacks and can be misused, particularly during conflicts of interest, political disputes, and trade tensions. An automated approach requires strong and shared transparency. Thus, boosting trust between countries, nations, and international bodies is crucial.

Nevertheless, the COVID-19 pandemic can act as a transformation catalyst for global health, accelerating the implementation and adoption of changes in public health interventions. Economic and structural barriers to transformation will be softened, allowing new models of health-care delivery to emerge with more emphasis on preventive measures, remote care, and technology-enabled data sharing.

Compulsory powers in response to public health emergencies are justified under a common legal and ethical standard, taking into account the risk of the pathogen to the individual and the general population, the incidence rate and transmission mode of the pathogen, the effectiveness of available public health interventions, and the availability and type of clinical treatments. In the case of emerging crises, as in the case of COVID-19 when the science is uncertain, adoption of the precautionary principle is reasonable to ensure public safety. The global nature, scale, and rapidity of spread across nations, continents, and the globe will require international collaboration to assess these measures on their timing, effectiveness, and resource implications; whether the nature of the measures and their implementation was proportionate to the risk; whether the health and legal assessments of the partial scientific evidence were successful; and the effect of sovereign nations adopting different approaches on the extent of international spread of COVID-19.[9]

This assessment of COVID-19-related responses should be integrated into the wider discussion of high-quality health systems.[10] High-quality health systems represent a new generation of health systems that are judged primarily on their effects, including the equitable distribution of improved health, the confidence of people in the system's efficacy, and the system's wider economic benefit. In addition to these strong foundations, health systems need to develop the capacity to measure and use data to learn, including surveillance data that can inform the emergence of or response to infectious diseases.

Public health's scope of responsibility is increasing along with the technological solutions that might support a more prescient public health policy. A new expression of global health policy that is data-driven needs to emerge, strongly intertwined with surveillance, infection control, and policy making to optimally combat existing and future pandemics. With the economic consequences of a global pandemic now evident, the political will to invest in a new vision of public and global health has never been more important.

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