

VIEWPOINT

The First 2 Years of COVID-19 Lessons to Improve Preparedness for the Next Pandemic

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Viewpoint

On December 31, 2019, the World Health Organization (WHO) Country Office in China reported novel “viral pneumonias of unknown cause” in Wuhan, but China did not confirm case clusters until January 3, 2020. Two years later, more than 285 million cases and 5.4 million deaths have been reported. As of December 2021, more than 800 000 COVID-19 deaths have occurred in the US, surpassing the 675 446 total deaths that occurred during the great influenza pandemic of 1918. The COVID-19 pandemic reduced global economic growth by an estimated 3.2% in 2020, with trade declining by 5.3%; an estimated 75 million people entered extreme poverty, with 80 million more undernourished compared with prepandemic levels.¹ Although the COVID-19 and 1918 influenza pandemics stand alone in morbidity and mortality, evidence suggests the frequency of infectious disease emergencies will increase. What lessons does COVID-19 teach to advance preparedness, detection, and response?

Health Systems Should Become the Bedrock of Pandemic Preparedness

Since the first reports of SARS-CoV-2, health systems were instrumental in responding to COVID-19. Clinicians recognized novel viral pneumonias in Wuhan. Clinical data offered insights on transmission and progression to severe disease. Yet COVID-19 has stressed

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health systems beyond their capacities. Amid surging cases, China built 2 hospitals in Wuhan to isolate and treat patients with COVID-19. A global pattern emerged of hospital admission surges, creating shortages of hospital resources, such as critical care unit beds, personal protective equipment (PPE), and ventilators. Well over 100 countries ordered “lockdowns” (closure of commercial and leisure activity) by April 2020 to preserve health system capacities. Overcrowding led to delayed diagnoses and treatments for many health conditions, contributing to excess deaths that exceeded an estimated 1.2 million in 2020.²

These challenges were unsurprising. The 2019 Global Health Security Index found that health systems were the lowest-performing area of overall pan-

dem preparedness. That fundamental weakness continued in the 2021 index.³ These data suggest that health system surge capacities should become the bedrock of pandemic preparedness—adequate personnel, medical supplies, and intensive care beds to meet acute demands, including provision of routine diagnosis and care.

Testing Capacity Is Vital to Detect, Characterize, and Manage Crises

The COVID-19 response was severely hampered by insufficient testing capacities. Constrained capabilities led many countries to use travel-based algorithms to determine qualifications for SARS-CoV-2 testing. Diagnostic testing kits issued by the Centers for Disease Control and Prevention (CDC) were initially flawed, and all laboratory results had to be analyzed at the agency. Initially, only hospitalized patients with a travel history to China could be tested. Highly targeted and limited testing missed infections from other regions, particularly Europe, which seeded a major outbreak in New York City in March 2020 while delaying recognition of widespread community transmission.

Inadequate testing capabilities persist to this day. Although more diagnostic tools now exist, the US and many other countries still report results with higher-than-expected test positivity, indicating failures to cast a sufficiently wide net to identify infections and limit forward transmission. Uneven access to testing may create surveillance biases and limit disease prevention and control. Incomplete diagnosis and surveillance also limit the ability to characterize the virus as it mutates, including changes in transmissibility, pathogenicity, and evasion of immunity. The current Omicron variant, for example, appears to be more transmissible than the Delta variant, and also may reduce immune protection from disease recovery or vaccination.

Building Public Trust and Fostering Risk-Mitigation Behaviors

Public distrust of health agencies and lack of population-level adherence to risk-mitigation measures proved major impediments in the COVID-19 response. A US survey of 1305 people in early 2021 found high levels of distrust: only 52% expressed high trust in CDC, 37% in the Food and Drug Administration, and 41% in state health departments.⁴ This distrust has led to social and political division over the utility of masks and vaccinations. Non-pharmaceutical interventions require high levels of population-level adherence. Even highly effective

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medical countermeasures such as vaccines require population-wide uptake to reduce disease transmission and progression to serious disease. Building public trust in scientific recommendations, especially through community leaders and social and religious institutions, is vital to future preparedness.

Redressing Social Vulnerabilities and Inequities

COVID-19 did not affect all members of society equally. The US experienced stark racial and ethnic disparities. Age-adjusted per capita hospitalizations among American Indian or Alaska Native, Non-Hispanic Black, and Hispanic or Latino people were, respectively, 3.2, 2.5, and 2.5 times higher than among Non-Hispanic White people.⁵ Similar disparities in severe disease among ethnic minority populations were reported globally, including in the United Kingdom, Brazil, and South Africa. These differences are likely due to long-standing social determinants of health. Future preparedness plans must include concrete measures to reduce disparities.

Income inequality as a barrier to adherence to public health guidance is another important factor in pandemic preparedness. US counties with greater income inequality experienced higher levels of cases and deaths. Higher-income individuals were more likely to report protective behaviors, whereas those with lower incomes were more likely to report life circumstances that impede risk mitigation, including inability to telework. A study examining 22 Organisation for Economic Co-operation and Development countries found those with greater income inequality experienced higher COVID-19 mortality.⁶

Global Cooperation and Robust Institutions

The pandemic exposed inadequacies in global institutions and international cooperation to ensure all countries have access to essential medical supplies, including testing reagents, PPE, and vaccines. Before the pandemic, China manufactured half the world's supply of PPE and was a major producer of other medical resources. However, the Wuhan outbreak caused local disruption in production and increased domestic demand to manage the crisis. These shortages had ripple effects. Many countries responded to supply shortages by imposing export controls for domestically produced

medicines, syringes, vaccines, and other essential medical goods, which exacerbated global supply disruptions.

Today, vast global vaccine inequities are the most egregious example of shortages. Although more than half the world's population is fully vaccinated, only 7% of people in low-income countries have received at least 1 vaccine dose.⁷ Even though countries pledged to donate billions of vaccine doses, only millions have been delivered so far.⁸ Many donated doses have been delivered with little advance notice and close to their expiration dates, making it operationally difficult for countries to use these vaccines.⁹

Gross inequalities in access to vaccines and other medical supplies during COVID-19 should be anticipated for future events. When nearly every country is affected at once, it creates pressures on global response systems and weak global supply chains. With this pandemic reality, reliance on charitable donations for essential medical supplies should be questioned. Diversified regional manufacturing of products is more likely to ensure countries can predictably fulfil their supply needs. That would require pharmaceutical companies to transfer technologies to regional manufacturers, such as the WHO-backed messenger RNA hub in South Africa.

Pandemic Threats Are the New Normal

Although the global tolls of COVID-19 are unprecedented in the modern era, novel diseases are likely to accelerate. Just in the last few decades, the world experienced multiple disease emergencies: West Nile virus (1999), SARS (2003), H5N1 avian influenza (2004), pandemic H1N1 influenza (2009), Middle East respiratory syndrome (2012), Ebola in West Africa (2014), and Zika (2015), and more disease outbreaks should be expected. Even accounting for improved surveillance, novel emerging diseases have steadily increased since 1940.¹⁰ There are strong biological and environmental reasons to expect epidemics as, or more, serious than COVID-19.

The likelihood of even more challenging future scenarios should create urgency to invest in and maintain resilient health systems, testing and surveillance, public trust, equity, and strong global institutions. Failure to address clearly observed weaknesses in the COVID-19 response will have preventable adverse health, social, and economic consequences when the next novel outbreak occurs.

ARTICLE INFORMATION

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REFERENCES

- Jackson JK, Weiss MA, Schwarzenberg AB, et al. Global economic effects of COVID-19. Congressional Research Service. Accessed December 16, 2021. <https://crsreports.congress.gov/product/details?prodcode=R46270>
- World Health Organization. The true death toll of COVID-19: estimating global excess mortality. Accessed December 16, 2021. <https://www.who.int/data/stories/the-true-death-toll-of-covid-19-estimating-global-excess-mortality>
- Nuzzo JB, Bell JA, Cameron EE. Suboptimal US response to COVID-19 despite robust capabilities

and resources. *JAMA*. 2020;324(14):1391-1392. doi:10.1001/jama.2020.17395

- Simmons-Duffin S. Poll finds public health has a trust problem. NPR. Accessed December 16, 2021. <https://www.npr.org/2021/05/13/996331692/poll-finds-public-health-has-a-trust-problem>
- Disparities in COVID-19-associated hospitalizations. Centers for Disease Control and Prevention. Accessed December 16, 2021. <https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/racial-ethnic-disparities/disparities-hospitalization.html>
- Sepulveda ER, Brooker AS. Income inequality and COVID-19 mortality: age-stratified analysis of 22 OECD countries. *SSM Popul Health*. 2021;16:100904. doi:10.1016/j.ssmph.2021.100904
- Coronavirus (COVID-19) vaccinations. Our World in Data. Accessed December 16, 2021. <https://ourworldindata.org/covid-vaccinations>

8. Billions committed, millions delivered: the mixed record of vaccine donations and diplomacy. Think Global Health. Accessed December 16, 2021.

<https://www.thinkglobalhealth.org/article/billions-committed-millions-delivered>

9. Joint statement on dose donations of COVID-19 vaccines to African countries. World Health Organization. Published November 29, 2021. Accessed December 16, 2021. <https://www.who.int/news/item/29-11-2021-joint-statement-on-dose-donations-of-covid-19-vaccines-to-african-countries>

10. Jones KE, Patel NG, Levy MA, et al. Global trends in emerging infectious diseases. *Nature*. Published February 21, 2008. Accessed December 17, 2021. <https://www.nature.com/articles/nature06536>