# Building health system resilience

## A roadmap for navigating future pandemics

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# FOREWORD

Over the past two-and-a-half years, it has become increasingly clear that most health systems are not sufficiently resilient to withstand major shocks. The pandemic has wreaked havoc on a global scale. Health systems have been inundated with COVID-19 patients; routine and elective care has been interrupted and postponed; and the healthcare workforce has been left overwhelmed and burned out.

As we move beyond the COVID-19 pandemic, it is imperative that we acknowledge the health system vulnerabilities exposed during this crisis and ensure that we address these weaknesses to prepare for future pandemics and shocks.

Using the World Health Organization (WHO) Health Systems Framework, this report examines the challenges posed by COVID-19 to health system functioning across each building block. It provides examples of innovative responses to these challenges, and highlights opportunities for improvements in the future. It concludes with a number of policy recommendations – across the short, medium, and longer term – to improve the resiliency of health systems globally.

We hope that this report provides a practical starting point for policy-makers in navigating the health system challenges that lie ahead.

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# EXECUTIVE SUMMARY

The pandemic has revealed the underlying vulnerabilities across health systems globally, with routine care disrupted on an unprecedented scale, and healthcare facilities overwhelmed by COVID-19 patients.

This crisis has provided a unique opportunity to reflect on how well our health systems function in the face of emergency shocks, and to what extent they are resilient. To be considered 'resilient', health systems are expected to be able to protect and serve their populations, even when faced with disruptive events, including pandemics.

Through the lens of an adapted version of the WHO Health Systems Framework (also known as 'the six building blocks'), this report aims to identify gaps in health system functioning and resilience – as exposed during the pandemic – to provide key policy insights into how health system functioning can be enhanced.

Based on these insights, we propose that governments, policymakers and health system leaders consider the following policy recommendations to build future health system resilience in the short term (next 12 months), medium term (12–24 months) and longer term (24–36 months):

- **Short-term actions:** Develop an evidence-based, multi-sectoral pandemic preparedness plan with clear objectives, responsibilities and reporting lines.

- **Medium-term actions:** Address health system weaknesses identified throughout the pandemic by adapting care models, improving information systems and strengthening the health workforce.

- **Longer-term actions:** Implement country-level structural and regulatory changes to improve resilience and work with international organizations to ensure global co-ordination for future pandemics.

# SECTION 1. BACKGROUND AND SCOPE

According to the 2019 Global Health Security Index – released just months prior to the first reports of the spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 virus) – no nation in the world was equipped to handle a global pandemic.[1]

**"National health security is fundamentally weak around the world. No country is fully prepared for epidemics or pandemics, and every country has important gaps to address."**

2019 Global Health Security Index

Globally, as of May 2022, there have been nearly 550 million cases of COVID-19, leading to more than 6.3 million deaths.[2] The pandemic has exposed and exacerbated global, regional and local health system vulnerabilities. Systems have struggled to care for the large influx of COVID-19 patients, and access to routine healthcare has been severely disrupted due to overwhelmed facilities and healthcare workers.

Although vulnerable populations were disproportionately affected, even health systems considered the most 'robust' failed to deliver under these challenges, emphasizing the fact that systems work in synchrony, and that civic society is only ever as strong as its weakest link. During health crises, to be deemed resilient, health systems must respond to the crisis at hand, but also maintain the provision of other essential health services and functions.[3-5]

## Definition of a health system

According to the WHO, "Health systems are responsible for delivering services that improve, maintain or restore the health of individuals and their communities".[6,7] These services encompass the care that is provided by primary, secondary and tertiary care, but also include less visible components such as the provision of public health, health workforce planning and maintaining health information systems. In addition to direct health-improving activities, this definition also includes efforts aimed at improving determinants of health, such as inter-sectoral efforts to influence the overall environmental, social and economic conditions in which people live.[8]

# Measuring health system resilience

WHO defines a resilient health system as: "One that can prepare for, respond and adapt to disruptive public health events while ensuring the continuity of quality essential health services at all levels of the health system."[9] Therefore, resilient health systems are expected to be able to protect and serve their populations, even when faced with disruptive events, including pandemics. Resilient health systems should contribute to positive health outcomes before and during a disaster, but also afterwards.[10] This requires robust data collection and analysis, evidence-based investments and a careful redesign of health and related systems worldwide.

# How do we measure health system functioning?

For the purposes of this report, we will consider health system functioning using an adapted version of the WHO Health Systems Framework, which outlines six essential building blocks of health systems: leadership and governance (stewardship); financing; information (which we have expanded to include information governance and systems); health workforce; service delivery; and medical products, vaccines and technologies (see Figure 1).[11] In employing this definition, we recognize that healthcare does not operate in a vacuum – it is impacted by (and impacts) other societal systems such as social care, the economy, education and tourism.

**Figure 1. WHO Health Systems Framework (adapted)**
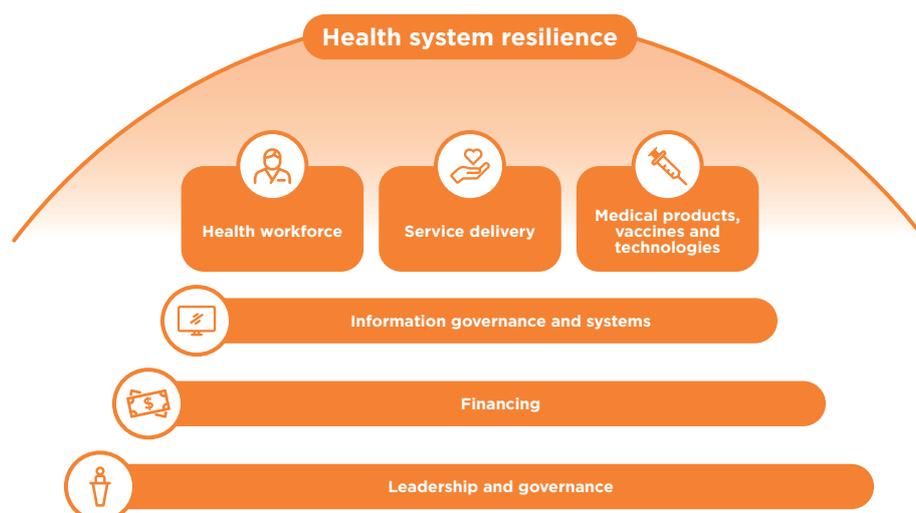


Source: Adapted from the WHO Health Systems Framework.[12]

Each of the six building blocks contributes in different ways to health system strengthening (see Table 1). Some components are key cross-cutting inputs into the system: leadership and governance; financing; and information governance and systems. Between them, they provide the foundation for the overall regulation of the other components (blocks) of the health system. The health workforce, service delivery, and medical products and technologies, are the key outputs, which support the health system goals of access, coverage, quality and safety.[13]

## Table 1. The six building blocks of a health system

| Building block | Health system goals |
| --- | --- |
| **Leadership and governance** | Leadership and governance involves ensuring that strategic policy frameworks exist and are combined with effective oversight, coalition building, regulation, attention to system design and accountability. |
| **Financing** | A good health financing system raises adequate funds for health, in ways that ensure that people can use needed services, and are protected from financial catastrophe or impoverishment associated with having to pay for these. It provides incentives for providers and users to be efficient. |
| **Information governance and systems** | A well-functioning health information system is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status. |
| **Health workforce** | A well-performing health workforce is one that works in ways that are responsive, fair and efficient to achieve the best health outcomes possible, given available resources and circumstances (ie, there are sufficient staff, fairly distributed; they are competent, responsive and productive). |
| **Service delivery** | Good health services are those which deliver effective, safe, quality personal and non-personal health interventions to those that need them, when and where needed, with minimum waste of resources. |
| **Medical products, vaccines, and technologies** | A well-functioning health system ensures equitable access to essential medical products, vaccines and technologies of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use. |

Source: WHO (2007).[14]

### Limitations of WHO's Health Systems Framework

The division of any complex construct such as a health system is fraught with challenges. The WHO Health Systems Framework focuses largely on the actions of the health sector, underplaying actions from other sectors, and fails to take into account factors that influence health-related behaviors and underlying socioeconomic determinants of health.[15] It also ignores the dynamic links and interactions that take place across the different components.

Nonetheless, the WHO Health Systems Framework provides a well-defined set of goals and capacities – recognized by ministries of health – that can be used to appraise health systems through the identification of strengths, weaknesses and potential areas for development.[16]

## Our scope and approach

Through the lens of an adapted version of the WHO Health Systems Framework, this report aims to identify gaps in health system functioning and resilience – as exposed during the pandemic – to provide key policy insights into how health system functioning can be enhanced. Our approach involved drawing on the expertise of our international, multidisciplinary advisory group, conducting a review of the international literature and undertaking a series of semi-structured interviews with an international panel of experts.

This report should be seen as complementary to a number of existing expert reports focusing on other aspects of the pandemic,[17] and related initiatives such as the work conducted on COVID-19 by the Exemplars in Global Health,[18] the WHO rankings of best performing countries during the pandemic,[19] and the Independent Panel for Pandemic Preparedness and Response on making COVID-19 the last pandemic.[20]

# SECTION 2. HEALTH SYSTEM RESPONSES TO RESILIENCE CHALLENGES POSED BY COVID-19

In this section, we outline the key challenges of the pandemic for health system functioning using the adapted WHO Health Systems Framework. We also explore examples of innovation and transferable lessons on how to improve health system resilience within each building block.

## Leadership and governance

### Challenges

The COVID-19 crisis has presented unprecedented leadership challenges.[21] Leaders have been expected to play multiple roles – including understanding the problem, effectively adapting and reacting, and planning for and implementing solutions to restore normalcy as soon as possible – while keeping their populations abreast of developments.[22] In many countries, normal legislative channels were bypassed during the COVID-19 pandemic, calling on laws that govern national emergencies to avoid dangerous delays in action. Faced with the first wave of the pandemic, many aspects of civic society shut down, putting leaders under great pressure to find innovative ways of maintaining safe societal functioning. While there is no single correct answer, different leaders and leadership styles have led to varying levels of success in terms of population outcomes during the pandemic. Examining these approaches can help us draw conclusions to guide strategy formulations for future pandemics.[23]

### Effective responses and lessons learned

#### Well-tested pandemic plans and legislation

Countries' performances in pandemic management changed over time. Countries that had well-established and tested pandemic plans, and were able to operationalize these quickly, were able to manage the pandemic relatively well from the outset (see Case study 1 for more details). In contrast, countries that did not have plans or had plans that had not been thoroughly tested were at a distinct disadvantage from the outset.[24]

Legislative provision for emergency measures, such as lockdowns, should be drafted and ready for use well in advance of possible pandemics. Countries with emergency measures in place were able to enact these laws quickly, which helped to slow the spread of the virus and ease pressure on health systems.[25]

## CASE STUDY 1. EXPERIENCES OF COUNTRIES PURSUING A ZERO COVID-19 POLICY

### Context

- A number of countries – including Australia, Cambodia, China, Laos, Mongolia, New Zealand, Singapore, South Korea, Taiwan and Vietnam – have pursued a 'Zero COVID-19' policy, aimed at preventing foreign importation of SARS-CoV-2 and eliminating community transmission.

### Approach

- The policy uses a rigorous Find, Test, Trace, Isolate and Support (FTTIS) approach, which includes targeted mass testing, repeated testing to avoid false negatives, tracing contacts, mandating and facilitating quarantine and, when necessary, enforced, targeted lockdowns.

- FTTIS aims to detect cases early and to break chains of transmission through tracing contacts and supporting them through isolation periods, whether financially, socially or psychologically.

- Strict border control measures may include preventing travel into the country from countries deemed to be high risk, implementation of COVID-19 vaccination passports, airport screening for signs of infection, and mandatory quarantining of those entering the country.

- FTTIS is typically coupled with other non-pharmacological interventions, including consistent public health messaging, physical distancing and mask-wearing in public places.

### Results

- No country achieved zero COVID-19.

- However, countries that pursued a Zero COVID-19 agenda appear to have had fewer COVID-19 deaths. As of 15 March 2022, deaths remained below 50/100,000 in all of these countries – China: <1, New Zealand: 2, Taiwan: 4, Laos: 9, Singapore: 20, South Korea: 21, Australia: 22, Vietnam: 43 – compared to countries that pursued a mitigation policy where deaths were up to as high as 650/100,000 in Peru (UK: 244, Italy: 260, USA: 294 and Brazil: 310).

- Many Zero COVID-19 strategy countries had more limited impacts on their economies when compared to other countries. Taiwan and China saw growth of their economies in 2020 and 2021. Australia, New Zealand and South Korea saw declines in gross domestic product (GDP) in 2020, but increases in GDP over 2021.

## Lessons learned

- Early decisive preventive measures are likely to contain case numbers and minimize the risks to healthcare personnel and of breaching health system capacity.

- Countries should review Zero COVID-19 approaches once they achieve high vaccination coverage.

- Longer-term health and economic data are needed to evaluate the overall effectiveness of the Zero COVID-19 strategy.

### Command and control structures

Crucial to well-developed plans is a command and control structure allowing for an appropriate and co-ordinated early response. For example, South Korea began planning for their national response very early on in January 2020.[26] There was an agreement between Korea, the US Food and Drug Administration (FDA) and the private sector (pharma), which enabled swift production of reverse transcription polymerase chain reaction (RT-PCR) kits. Just before the pandemic hit, they underwent a pneumonia simulation exercise, which also prepared them for the shock of the pandemic. In Pakistan, a National Command and Operation Center (NCOC) included representation from the Federal Ministry of National Health Services, Regulation and Coordination, National Disaster Management Authority, and all provincial health and administrative arms. The group met daily and has helped forge a co-ordinated response in the country, despite having relatively limited resources.

### Scientific involvement in policy

Supporting the development of evidence-based science to inform policy has been extremely important during the pandemic. It is important that these scientific committees are at arm's length from government in order to maintain their independence and also public trust. In a related vein, effective communication is vital and certain models have worked well in building public trust.[27,28] For example, early on in the pandemic, countries governed by leaders with honest, transparent communication styles had high public trust ratings – for example, New Zealand, Scotland, South Korea and Taiwan.[29-32]

### Planning for Disease X

There is an expectation that leaders of all countries will take seriously the threat of a further pandemic and have well-developed, well-rehearsed, actionable plans in place that prioritize the planning for Disease X – a term coined by WHO and used throughout the sector to refer to a future unknown pathogen that could lead to a pandemic[33] (see Case study 2). With appropriate planning and preparation, there should seldom (if ever) be the need to resort to prolonged national lockdowns, thereby avoiding much of the catastrophic health, social and economic impacts seen during COVID-19.

# CASE STUDY 2. PLANNING FOR DISEASE X

## Context

- WHO first included 'Disease X' – an unknown pathogen with the potential to cause a future pandemic – in its list of priority diseases in 2018, signaling the importance of developing the clinical, public health and research and development infrastructures needed to respond to novel infectious disease threats.

## Approach

- Most countries with pandemic preparedness plans had prepared for influenza pandemics; no country had plans to deal with Disease X.

## Results

- In the case of COVID-19, countries with recent experiences with other coronaviruses in the form of Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) were able to adapt pandemic preparedness plans by using:

  - already established surveillance measures to identify new virulent strains quickly – for example, Singapore, through community, laboratory, veterinary, external and hospital surveillance.

  - accreditation for hospitals, including pandemic preparedness and regular exercises to test this readiness. Taiwan has regularly practiced its emerging infectious disease surveillance and response system, which has clear measures to prevent the healthcare system being overwhelmed, and a support network to minimize community transmission of infections.

  - early activation of a co-ordinated multi-agency, inter-governmental pandemic response with clear, previously established high-level command-control centers, such as in China, Singapore and Taiwan.

  - financing mechanisms for pandemic healthcare, such as Taiwan's National Healthcare Insurance, which had advance payment plans in place to ensure healthcare sustainability.

- a live online portal allowing physicians to submit timely notification of infectious diseases and to access real-time information on local and global infectious disease events, as in Singapore.
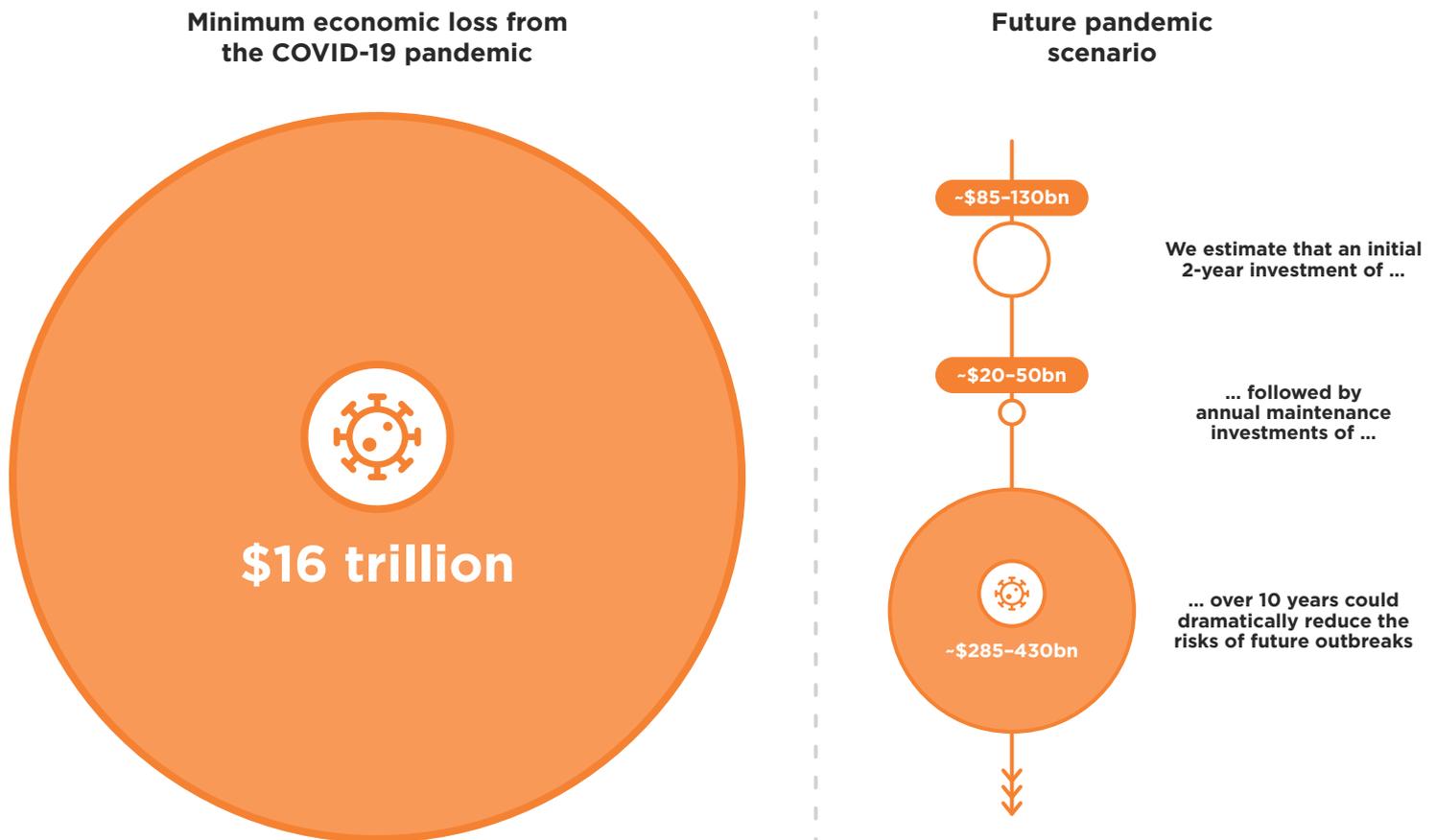
## Lessons learned

- Pandemic preparedness plans remain sub-optimal in most nations.

- Countries with recent experiences of other coronavirus infections have been able to repurpose infrastructures and resources to respond effectively and efficiently to SARS-CoV-2.

- Pandemic plans need to consider the potential array of infectious disease threats rather than focus on one condition (for example, influenza or coronavirus) or group of conditions (such as a virus). Appreciation and adoption of the concept of Disease X should prove helpful in the context of preparing for future pandemics.

- Pandemic plans need to be regularly stress-tested through simulation exercises involving the highest level of government, with publication of findings and transparency in relation to remedial actions taken.

- The European Council has started planning for an international pandemic preparedness strategy which, if approved, would be binding for Member States under international law.

## Financing

### Challenges

The COVID-19 pandemic has shed light on the existing gaps in healthcare funding and the alarming differences in health outcomes between the rich and the poor.[34] In most countries, funding remains insufficient for workforce training, community health, primary care, and countermeasures such as diagnostics, therapeutics and vaccines. Currently, the financial resources available for outbreak management mostly depend on ad hoc funding, which is unsustainable for future shocks and can weaken resilience plans. COVID-19 has further re-emphasized the persistent weaknesses related to health financing policies in countries with social health insurance schemes.[35] Although primary healthcare is known to be the most cost-effective way to deliver healthcare to communities, spending on primary healthcare accounts for less than 50 percent of current health budgets.[36] As such, WHO has called for investment in primary care to be increased annually by 1 percent of GDP.[37]

**Figure 2. Cost of epidemic preparedness actions compared to estimated economic losses from COVID-19 pandemic\***

**Minimum economic loss from the COVID-19 pandemic**

**$16 trillion**

**Future pandemic scenario**

~$85–130bn

We estimate that an initial 2-year investment of ...

~$20–50bn

... followed by annual maintenance investments of ...

~$285–430bn

... over 10 years could dramatically reduce the risks of future outbreaks

\* Assuming a COVID-19 scale epidemic is a 50-year event.
Source: McKinsey & Co (2020).[38]

The economic disruption resulting from the COVID-19 pandemic has been estimated to cost over $16 trillion.[39] The investment needed for pandemic preparedness to prevent future shocks resulting from pandemics is likely to be a fraction of that cost (see Figure 2). This re-emphasizes the business case for investing in health system resilience and pandemic-response capabilities at global, regional and local levels.

## Effective responses and lessons learned

### Investment in publicly funded health systems, universal health coverage and primary care

Emergency budgets were released in many countries, allowing additional resources to be invested into health systems, where they were publicly funded. Having universal health coverage (UHC) within the country as well as a value-based health system was advantageous on several fronts, including having a workforce distributed across the country who could be trained, upskilled and repurposed. In contrast, for-profit healthcare facilities faced major challenges – for example, in the US, at a time where healthcare workers were needed, a number of doctors were furloughed as routine clinics were non-functioning and financially unsustainable.[40]

There is a need for increased investment in healthcare systems and the healthcare sector at large. This is not limited to infectious diseases, but must also include non-communicable disease (NCD) 'pandemics' such as coronary heart disease, diabetes, cancer and mental health. There is a need for increased investment in healthcare innovation for low-cost, scalable solutions, particularly in primary care.

### Targeted investment in public health and research

Large sums of money were released to strengthen public health in order to rapidly provide a coherent test, trace and isolate system in countries such as Cambodia, Singapore, the USA and Vietnam. Parts of the world, including Taiwan, acted proactively to support the 'isolate' aspect of the Find, Test, Trace, Isolate and Support (FTTIS) system where financial support was provided to isolate.

Further finance was released by some countries, such as the UK, to allow for the development of vaccines, antiviral therapeutics and research and development. The resulting collaborations – such as the COVID-19 Genomics UK Consortium (COG-UK) and the Oxford-AstraZeneca vaccine – produced remarkable results in extremely short timeframes.

### Global co-operation to address inequity

COVID-19 has illustrated the inherent inequalities that exist across the globe, which is perhaps best illustrated through the lens of vaccine inequity. Despite the best efforts of WHO and the COVAX scheme, much more needs to be done to address this. WHO figures from 4 May 2022 show that three in four people from high-income countries had received at least one dose of a vaccine compared to one in six of those from low- and middle-income countries (LMICs).

To strengthen global health governance, the mobilization of regional and international resources is crucial. This should include appropriate and sufficient financing and enforcement mechanisms to protect health systems from recurring pitfalls in preparedness and response.[41] The G20 Financial Intermediary Fund (FIF) for pandemic preparedness and response was established in 2021 with this purpose in mind. As such, the FIF has adopted a 'One Health' approach while working toward the goal of ensuring adequate and sustained financing for pandemic prevention through the development of co-ordination arrangements between ministries of health and finance globally.[42]

## Information governance and systems

### Challenges

Accurate data on COVID-19 that are timely, disaggregated and reliable are essential to understand the dynamics of pandemics and to guide decision-making and policy formation.[43,44] The ability to link and interrogate disparate data sources at pace is essential in order to inform the multitude of decisions that need to be made at a time of health crises.[45] However, combining different sources of data has proven to be challenging for a number of reasons, including accessing data, information governance requirements, data standardization/harmonization and having sufficient capabilities to process, link, curate, analyze and interpret the data.[46-49]

### Effective responses and lessons learned

COVID-19 has highlighted the fact that safe and ethical health data-sharing is possible, if complex, but also essential to an effective pandemic response. Robust surveillance systems combined with ready access to real-time data have been fundamental to national and regional COVID-19

responses, informing major decisions such as the imposing and lifting of lockdown restrictions.[50] Examples include the Johns Hopkins dashboard[51] and Our World in Data.[52]

Health systems should be able to forecast and predict future crises, (utilizing advances in modeling capabilities) in order to respond faster and smarter. This approach is facilitated by a uniform, centralized, well-developed national public health system with integrated electronic health records across primary and secondary care. Examples of countries that developed these capabilities during the COVID-19 pandemic, and were relatively successful in using these data to inform public health and clinical decision-making, include Iceland, Israel, Qatar, Scotland and Taiwan.[53,54] However, access to health data must be carefully regulated, with legislation balancing the need for privacy and security with any public health benefits.[55] Countries should have policies that take into account the need for flexibility during emergency situations such as pandemics.

Globally, we have also seen the power of international collaboration and data sharing to improve the pandemic response for the benefit of all. For instance, the International COVID-19 Data Research Alliance (ICODA), developed by Health Data Research UK (HDR UK), allows researchers to access global COVID-19 data to understand the impact of lockdown measures[56,57] and facilitate the rapid development of new treatment approaches.[58] Moving forward, countries must continue to invest in these initiatives in the long term, while establishing clear standards and common approaches to ensure full benefits for all countries, including LMICs.[59]

## Health workforce

### Challenges

The COVID-19 pandemic has placed extraordinary stress on healthcare workers worldwide. There was no surge capacity built into health-care provision to deal with the increased number of COVID-19 patients requiring treatment, which made it challenging to keep health and care workers safe. During the first six months of the pandemic, a significant number of healthcare workers were infected with SARS-CoV-2. Risk of infection in this group was associated with multiple factors, including lack of availability of personal protective equipment (PPE), workplace setting, exposure, contact, and inadequate testing.[60]

The stresses of extreme workloads, high risks of exposure, moral dilemmas, increased regulation leading to reduced autonomy, and a rapidly evolving practice environment and organization during the pandemic, also led to healthcare workers feeling anxious, depressed, stressed and burned out (see Figure 3).[61-65]

## Figure 3. Prevalence of mental health conditions among healthcare workers during the COVID-19 pandemic
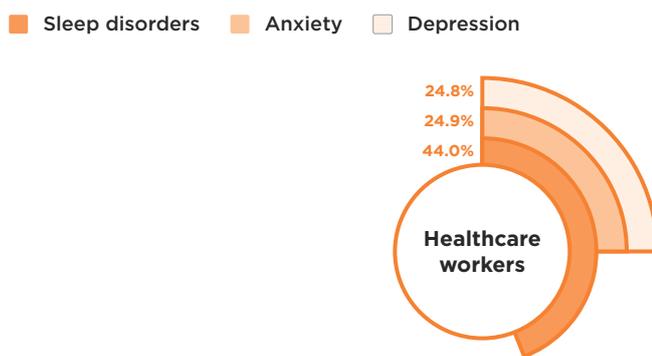


Sources: Sahebi et al (2021)[66]; Marvaldi et al (2021).[67]

While burnout among healthcare workers was an ongoing crisis long before the pandemic,[68,69] COVID-19 has undoubtedly presented additional new challenges. Working conditions, mental health and wellbeing, and the overall perception of safety in the workplace have all been impacted.[70] Many healthcare workers also expressed anxiety over having to fill roles under emergency situations due to feeling inadequately protected, and the accompanying fear of risk of infection to themselves or their families.[71,72] Many healthcare staff found themselves providing care for increasingly long hours in overwhelmed facilities, and working alongside colleagues often unequipped with the necessary skills or training, some-times without adequate PPE.

The prevalence of burnout among healthcare workers was highest in intensive care units and related settings, and among resident physicians and nurses – in many cases leading to anxiety and depression.[73] High levels of burnout adversely affect healthcare workers themselves, but can also affect their productivity and the quality of care they provide to patients.

## Effective responses and lessons learned

### Safe working conditions for healthcare workers

Healthcare workers need to be able to provide frontline care while mini-mizing risks to their and their families' health. Providing adequate PPE is an essential first step to preventing infection in this group. In many

countries, the healthcare workforce was also prioritized for vaccines and therapeutics, once these became available. Many healthcare workers were also provided with accommodation away from their families as a means of reducing risk of household infection. Yet the result of being separated from family for long periods of time, and working in isolation from colleagues within the grips of a pandemic, led to issues such as low morale and mental health problems. This highlights the need to provide further support for healthcare workers' mental health and wellbeing (see also, the WISH Forum report: *Time's up: A global call to action to protect the mental health of health and care workers*). The Cochrane Library provides a comprehensive review of evidence in supporting the wellbeing of healthcare workers.[74] A number of services tackled this issue through counselling, primarily via telephone, text messages and online provision.[75]

Importantly, health systems must work to improve working conditions and safeguard the rights of workers at the organizational level, in addition to offering individual-level psycho-social services.

### Mobilizing and augmenting the healthcare workforce

The acute surge in demand for care, coupled with the large numbers of healthcare workers needing to isolate due to COVID-19 infection, resulted in widespread staff shortages. Many countries tackled this issue by bringing in additional personnel to augment the workforce[76] via:

- relicensing those that had recently retired.
- employing staff from overseas.
- redeploying personnel (such as army personnel driving ambulances).
- upskilling (for example, mass training allied health workers to provide vaccinations or training of ward nurses to serve as intensive care nurses).
- accelerating licensing timelines (for example, medical students were granted their licenses early in the UK).

As part of their emergency response in Malaysia in January 2020, the National Institutes of Health operation room established a workforce mobilization team, so workers could be deployed efficiently and effectively to areas of greatest need. This was achieved through a centralized online data management system, which allowed rapid deployment of staff. Many countries tapped into the private workforce through public–private partnerships, thereby rapidly increasing capacity.[77] There is also a critical need to strengthen the role of grassroots healthcare workers in rural and semi-urban areas.

### Expansion of pharmacy services

Workers need to use the full extent of their skills for health systems to gain maximum efficiency. Pharmacists have considerable expertise in all aspects of medicines management, yet this is seldom fully utilized and provides an untapped opportunity – particularly in LMICs, where community healthcare systems may be poorly developed. In China, for example, pharmacists took a more prominent role in patient education, testing, medicines management and vaccination.[78-81] In June 2022, the UK Government announced that pharmacists in England will soon have the power to assess patients with potential cancer symptoms and refer them to the appropriate specialist, thereby potentially speeding up cancer referrals, and freeing up time for general pratictioners (GPs).[82]

## Service delivery

### Challenges

Globally, the pandemic substantially disrupted routine and emergency health services.[83] These disruptions were experienced in up to 90 percent of countries, across all regions, countries, and income levels (see Figure 4 illustrating impact on hospital activity across UK nations).[84] Disruptions occurred across all healthcare settings, reducing access to care at the primary and community care levels, as well as in emergency care settings and ambulatory services.[85] In addition, elective surgery has been disrupted in about 60 percent of countries, creating a backlog of cases, which can have considerable consequences on the health and wellbeing of populations as the pandemic continues, and after it ends. One WHO survey found that roughly 50 percent of countries experienced disruptions to rehabilitative care and palliative care services. Healthcare utilization was further reduced by about a third during the pandemic, due to fear of becoming infected when visiting a care facility.[86]

**Figure 4. Weekly hospital admission rates (per 100,000 people) prior to and during the pandemic, UK**
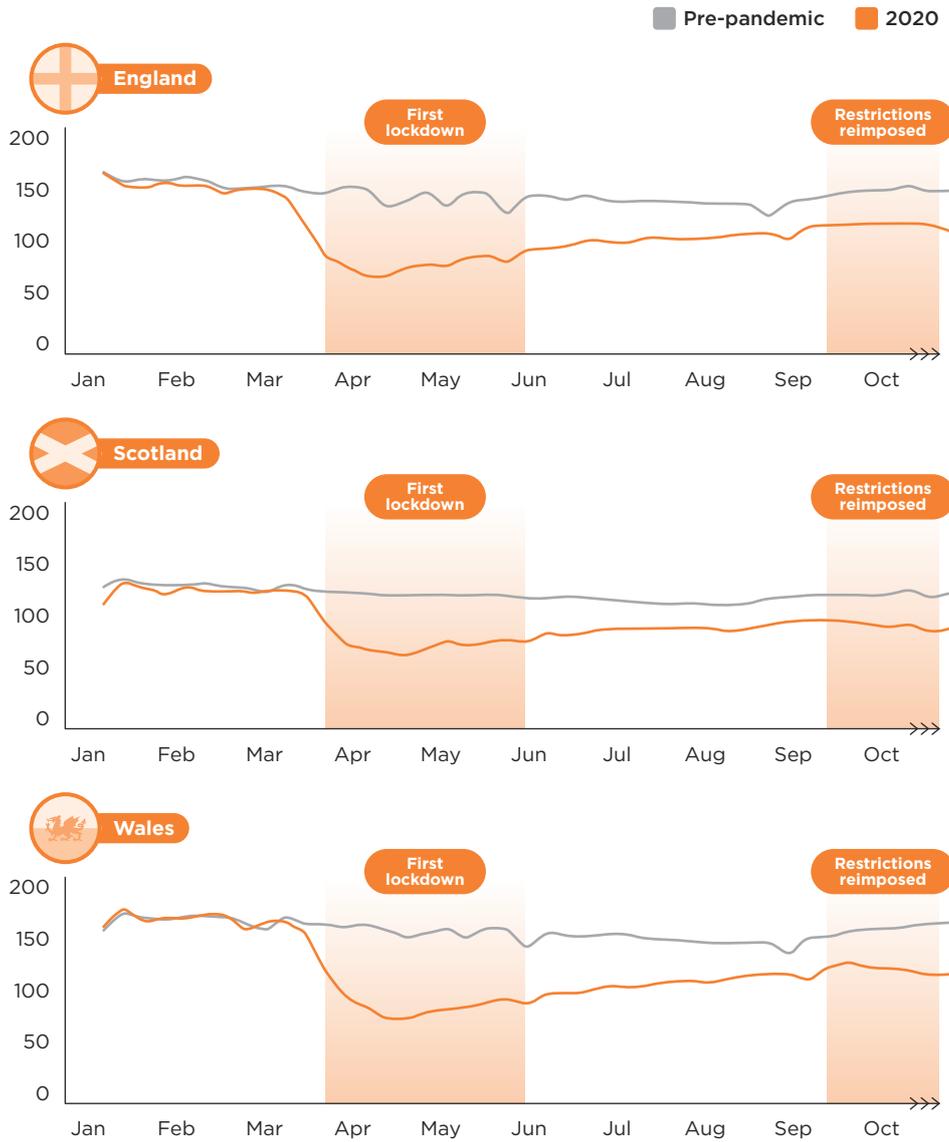


Source: Shah et al (2022).[87]

The pandemic and its effect on essential health services have also undermined decades of progress in fighting other diseases, including human immunodeficiency virus (HIV), malaria, and tuberculosis (TB), as shown in Figure 5.[88]

## Figure 5. Reasons for change in patient attendance for HIV, TB and malaria services from April to September 2020*

**Individual/community reasons**
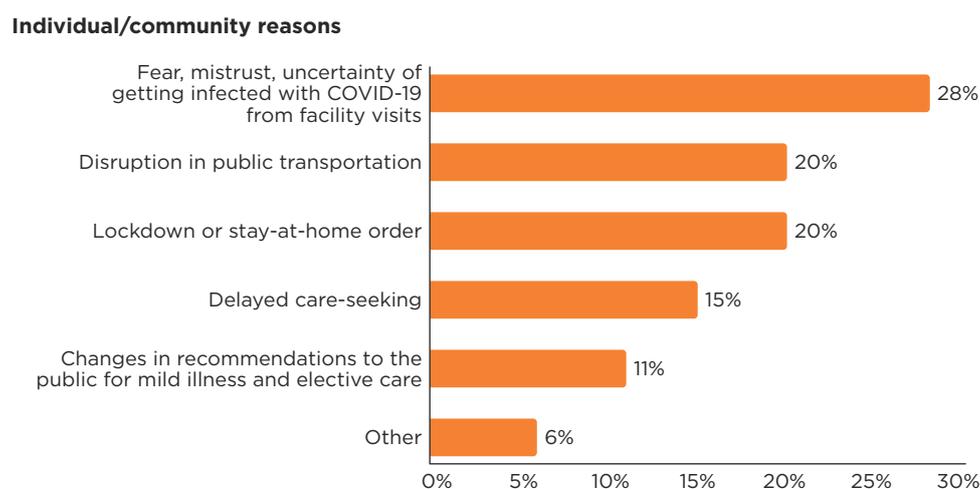


* According to the perspectives of staff interviewed in spot-checks across 32 countries.
Source: The Global Fund (2021).[89]

## Effective responses and lessons learned

### Separate COVID-19 and non-COVID-19 pathways of care

Early on, many hospitals were ill-prepared for the highly contagious nature of COVID-19, the sheer volume of severely ill patients requiring long-term critical care, and the lack of experience in treating an unknown pathogen.[90] Data on disease transmission pathways were also limited at the beginning of the pandemic, complicating strategies to prevent healthcare-associated infections.[91] In response, health system leaders focused on creating separate communicable disease facilities or dedicated treatment areas within facilities, including through creating new hospitals (for example, China), makeshift/temporary or repurposing of facilities to use as COVID-19 hubs (for example, Qatar) or different pathways for patients to follow within the same institution (as in the UK).[92,93]

### COVID-19 protocols

Faced with a new disease, sharing research findings as early as possible with the public, health system leaders and clinicians is essential. Examples of such initiatives include the *Handbook of COVID-19 Prevention and Treatment*, published first in China in March 2020, and the creation of living clinical guidelines and risk stratification algorithms for use in community and hospital care.[94-96] Also, WHO and other global organizations have rapidly produced essential technical guidance to aid countries, particularly LMICs, in their COVID-19 responses.[97]

**Public–private partnerships**

Many countries have faced a need to urgently increase health system capacity, particularly for hospital beds, medical workforce and equipment such as ventilators. To rapidly increase capacity for facilities and the workforce, a number of countries have forged public–private partnerships, including Australia, Italy, India, Liberia and Spain.[98] Some countries seconded healthcare workers from private healthcare to the public healthcare sector, or hired retired or unemployed healthcare workers temporarily to help address shortfalls. International organizations and non-governmental organizations (NGOs) should play a more substantial role in brokering these relationships and supporting service delivery.

**Remote care**

There was a mass, almost overnight movement from traditional face-to-face consultations to remote models of care involving telephone appointments, text messaging, eHealth, photo and video consultations, to reduce the spread of nosocomial infection and protect medical staff (see Case study 3).[99] Some care was delivered in situ in hotels and people's homes, enabled by remote monitoring and mobile units.

Remote health services offer considerable potential to move health systems from episodic models of care for people with long-term conditions to more continuous, longitudinal models of care. Use of remote models of care can be accelerated through: developing mobile phone/WiFi networks; training staff and patients/carers; and incentivizing longitudinal models of care that reward outcomes rather than a fee-for-service model. However, there must be an evidence-based assessment of the safety and quality of care provided through these platforms and also consideration for groups who may be excluded due to lack of digital access.

## CASE STUDY 3. APOLLO HOSPITALS' PROJECT KAVACH

### Context

- Remote models of care have been discussed and advocated for well over two decades, yet many barriers – from patient preference for face-to-face consultations to clinicians' concerns around quality, to reimbursement challenges – prevented their widespread adoption prior to the pandemic.

- The onset of the pandemic led to very rapid shifts to remote models of healthcare provision, where possible.

### Approach

- Apollo Healthcare – India's largest private health provider with a network of over 300 primary care clinics and 73 hospitals – launched Project Kavach, a multi-pronged, innovative telehealth approach to help tackle the challenges presented by COVID-19. Key components included:

  - **Standardized treatment protocols:** Evidence-based standards were published in a 'Red Book' circulated to all Apollo units, as well as other hospitals and referral doctors in the community.

  - **Information dissemination:** To patients/public via social media, print media and through an e-book. Apollo's medical e-learning platform offered ventilator management training – live and through simulations - to help manage the surge of critical care patients.

  - **Risk assessment:** An artificial intelligence (AI)-based COVID-19 Risk Self-Assessment Tool was available on the Apollo app – Apollo 24/7 – and the website allows patients to assess their personal risk. More than 15.7 million people have used the tool.

  - **Clinical support:** Via Apollo 24/7, an interactive digital platform that allows patients to have round-the-clock access to Apollo services, such as consultations, diagnostic testing, and home delivery of medicine, via their mobile phone or website.

- **Remote monitoring:** Project stay@home allowed patients with mild symptoms of COVID-19 to stay at home via remote monitoring devices, tele-consultations, and other remote support.

- **Isolation support:** Project stay@hotel provided subsidised hotel rooms to facilitate isolation for COVID-19 patients.

## Results

- Apollo provided 20,000 remote clinical transactions daily.

- The interactive digital platform has more than 100,000 daily users spanning 75 cities; users have had over 470,000 prescriptions filled.

## Lessons learned

- Countries across the world rapidly instigated remote models of care, offering the opportunity to build on these early experiences.

- Patient education and empowerment and professional training are essential to maximize the benefits and minimise the risks associated with remote consulting.

### Accreditation

Accreditation – an external review of healthcare services against a set of predefined standards – has long been used to help ensure healthcare quality.[100] Accreditation that includes standards on pandemic and disaster preparedness and regular exercises to test this readiness may help health systems to better respond to shocks. For example, Taiwan has regularly practiced its emerging infectious disease surveillance and response system, which has clear measures to prevent the healthcare system from being overwhelmed. The country has also developed a support network to minimize community transmission of infections.[101]

### Disaster planning and training

All health systems should have major disaster plans – which include expanding capacity and repurposing existing spaces, and a system for ensuring that these plans are regularly tested. Pandemic planning for communicable diseases (including the next flu pandemic) should also be built into routine training.

## Medical products, vaccines and technology

### Challenges

At the start of the pandemic, the world witnessed a global shortage of surgical masks, gloves, hospital gowns, respirators, face shields and goggles, causing panic among healthcare workers and policymakers. The shortage exposed the long-standing vulnerability of the medical supply chain.[102,103] Shortages were largely attributed to panic buying, misuse and hoarding, and a massive surge in demand by health systems worldwide. While much of the attention on medical supply shortages has been focused primarily on PPE, the issues extend well beyond that to testing supplies, pharmaceuticals and dialysis materials, as well as a variety of other commodities that are essential for patients with or without COVID-19.[104] Product shortages cause delays in care and sometimes denial or rationing of care. They increase the risk of medical errors when replacement products are used, which can lead to an increase in mortality and morbidity.[105] These shortages also led to an increase in price, suspect dealers and major interventions by governments.

Vaccine supply chains also face a diverse set of challenges. COVID-19 vaccines were first authorized for use more than 18 months ago, yet global vaccine coverage remains suboptimal. While vaccine hesitancy affected vaccine uptake, the heavy concentration of vaccine manufacturing and research and development (R&D) in high- and middle-income countries

has contributed to lower vaccination rates in LMICs. Regional companies that own the intellectual property rights for vaccine production have sold the majority of their doses to their own governments and other high-income countries.[106] WHO has warned that this "vaccine hoarding" will prolong COVID-19 unnecessarily and is exacerbating issues of inequity.[107]

The need for ultra-cold storage of mRNA COVID-19 vaccines also resulted in large supplies of vaccines going to waste. To minimize wastage and ensure equitable access of the COVID-19 vaccines, a resilient vaccine supply chain that is complemented by temperature monitoring technologies is crucial moving forward.[108]

Even the world's most prominent effort to secure equitable access to COVID-19 vaccines – COVAX – has been heavily criticized.[109] COVAX – launched in April 2020 and headed by Gavi, the Vaccine Alliance, the Coalition for Epidemic Preparedness Innovations (CEPI) and WHO – is an international alliance of healthcare institutions with the aim of improving access to COVID-19 vaccines. COVAX works by buying and distributing vaccines to countries that need these the most. COVAX's initial aim was to purchase and deliver 2 billion COVID-19 vaccine doses to 190 countries by the end of 2021. By January 2022, however, only 1 billion had been delivered to 144 participating states.[110] Its success was largely dependent on several external factors, such as manufacturing capacity and regulation, availability of funding, contract terms, and the readiness of countries to deliver their national vaccination programs.

## CASE STUDY 4. INCREASING CAPACITY TO MANUFACTURE PERSONAL PROTECTIVE EQUIPMENT AND VENTILATORS

### Context

- There was a worldwide surge in requirement for PPE and ventilators during the COVID-19 pandemic, leading to shortages in many countries.

### Approach

- Countries took measures to aid the import of medical supplies, including relaxation of import duties, customs and taxes (examples include Argentina, China, Fiji, Nigeria, Peru and Sri Lanka). Conversely, export of medical products was restricted.

- Some countries relied on purchasing consortia, such as the UN (United Nations) COVID-19 Supply Chain System and Africa Medical Supplies Platform, donations from development partners, or grants and loans from other countries and international financial entities (that is, the World Bank and Asian Development Bank) to secure medical supplies.

- Several countries developed platforms to audit supply chains so they could closely monitor and allocate appropriate resources to those regions that needed them nationwide (including China, India, Japan, Uganda and the UK).

#### PPE

- Some countries (such as China, Thailand, Singapore, South Korea and the USA) had stockpiles of PPE as part of their pandemic prepared-ness plans – which they rapidly mobilized. South Korea had one of the largest stockpiles, and Singapore had six months of reserve supplies.

- Other countries (such as the UK) had stockpiles of PPE that were out of date as they hadn't been checked, and the majority of countries appeared to have no such reserves.

- Measures were taken to increase domestic production of PPE to deal with the increased demand. Thailand approved 12 in-country ventures in March 2020 to add to the 13 already approved facilities. Singapore repurposed a government-affiliated engineering company to start

producing face masks and Japan, through its Ministry of Economy, Trade and Industry, facilitated the production of 100 million face masks per week.

- To replenish stockpiles in Japan, medical product manufacturers were urged to boost production output, resulting in the tripling of production volume as factories operated 24 hours a day.

**Ventilators**
- In India and the USA, automotive manufacturers were repurposed to produce low-cost ventilators.

- Vietnam increased its ventilator production by encouraging inter-industry transfer of technology to produce more innovative, portable ventilators.

- In the UK, a Continuous Positive Airway Pressure (CPAP) device, which could be rapidly produced and distributed to National Health Service (NHS) hospitals to deal with the COVID-19 surge, was designed through a collaboration between a team of mechanical engineers from University College London and Mercedes AMG High Performance Powertrains.

## Lessons learned

- Adequate PPE is always a necessity during a pandemic, to protect health and care workers. Pandemic planning should include a degree of stockpiling, but also the ability to increase stocks at speed, ideally through increasing in-country manufacturing ability.

- Disposal of PPE should be improved. Recyclable items are needed to prevent exacerbating other global threats such as global warming.

- Ventilators were an essential, often life-saving treatment for patients with severe COVID-19. Repurposing of industry and accompanying financial and legislative changes can enable increased production.

- Several low-cost ventilators are in development, which may help with supply, particularly for LMICs.

## Effective responses and lessons learned

### Manufacturing and distribution

Countries need to invest in local manufacturing of medical equipment and PPE (see Case Study 4) as well as testing and vaccines. Not all countries will have manufacturing abilities, but they do need to ensure that they have adequate PPE provision and distribution channels to facilitate mass vaccination. Legislative changes need to be enacted to allow manufacturing capability to be repurposed – for example to increase national capability to manufacture PPE, ventilators, vaccines and drugs.

There is also a need for upgraded refrigeration systems to store mRNA vaccines at low temperatures, as well as a need for proper cold chain management, which most LMICs don't have.[111] This requires strategic distribution planning and targeted investment.

### Government regulation and co-operation

The development and subsequent manufacturing of COVID-19 vaccines, including the first mRNA vaccines, occurred at an unprecedented rate (see the WISH Forum report: *A New Era for Vaccine Innovation: Harnessing the lessons from COVID-19*). This was enabled by governments realizing the necessity of a vaccine in the fight against COVID-19 and releasing adequate funding, but also through accelerated regulatory processes.[112] This was also the case for developing therapeutics such as antivirals and monoclonal antibodies. In addition, clinical trials were accelerated, resulting in the most rapid trials and delivery of results ever seen, primarily through global R&D and leadership co-operation – for example, through RECOVERY,[113] REMAP-CAP (Randomized, Embedded, Multi-factorial, Adaptive Platform Trial for Community-Acquired Pneumonia) and the COVID-19 vaccine trials.[114-117]

Medical patents could be released to accelerate the provision of vaccines globally. Non-governmental organizations (NGOs) and governments of some countries have demanded the suspension of patent protection of COVID-19 vaccines and the underlying technology to enhance worldwide access.[118-120] WHO has called on governments to ensure universal access to COVID-19 vaccines, therapeutics and technologies, but unfortunately some countries have blocked attempts to ensure access to the know-how, technology, and materials needed to manufacture COVID-19 vaccines and therapeutics.[121-124]

For COVAX to become more effective and efficient, political agreement for the appropriate sharing and redistributing of the available doses of COVID-19 vaccines is crucial. Efforts to align technology transfer and issues surrounding intellectual property could potentially boost efforts to speed up vaccine roll-out globally for COVID-19, and for future pandemics.

# SECTION 3. CONCLUSION AND POLICY RECOMMENDATIONS

**Figure 6. Roadmap for building future health system resilience**



| Short-term actions | Medium-term actions | Longer-term actions |
| --- | --- | --- |
| Develop an **evidence-based, multi-sectoral pandemic preparedness plan** with clear objectives, responsibilities, and reporting lines | Address health system weaknesses identified throughout the pandemic by **adapting care models, improving information systems, and strengthening the health workforce** | **Implement country-level structural and regulatory changes** to improve resilience, and work with international organizations to ensure global co-ordination for future pandemics |

To build future health system resilience, we propose that governments, policymakers and health system leaders consider the following policy recommendations in the short term (next 12 months), medium term (12–24 months), and longer term (24–36 months):

## Short-term actions: Develop an evidence-based, multi-sectoral pandemic preparedness plan with clear objectives, responsibilities and reporting lines.

- All countries should establish a pandemic command-and-control center, ideally chaired by the head of state, with senior representation from ministries of health, homeland security, foreign office and economics/finance, and with provision for independent scientific advice. This command center needs to have authority to declare a local/national outbreak and trigger a plan of action in response to Disease X.

- Governments should create a pandemic preparedness plan for 'Disease X' and regularly stress-test these plans through simulation exercises, with results published for public scrutiny. These plans should include: clear strategies for urgent provision of PPE and vaccines to protect frontline healthcare workers; approaches to maintaining essential services through upscaling telehealth; separate facilities to manage those with potential infectious disorders; and legislation to permit sharing of data to support the pandemic response.

**Medium-term actions: Address health system weaknesses identified throughout the pandemic by adapting care models, improving information systems, and strengthening the health workforce.**

- Use of remote models of care should be accelerated through developing mobile phone/WiFi networks, training of staff and patients/ carers, and incentivizing more longitudinal models of care that reward outcomes, rather than a fee-for-service approach, within the overall strategic goal of advancing UHC.

- National governments should work closely to strengthen the public–private and third sector models of working that have been instrumental in the COVID-19 pandemic.

- There is a need to increase investment to support the mental and physical health needs of the healthcare workforce.

- Empowering the healthcare workforce through emergency pandemic response training is imperative. This should be embedded within all undergraduate and postgraduate training programs, and be offered at scale to healthcare facilities. There is considerable scope for international collaboration in this respect through generating and making resources freely available.

**Longer-term actions: Implement country-level structural and regulatory changes to improve resilience, and work with international organizations to ensure global co-ordination for future pandemics.**

**Country-level:**
- Shortages in clinical and public health workforces should be addressed by national governments in equitable and sustainable ways, and in ways that align with the international drive to create primary-care-led UHC.

- Legislative changes should be considered in order to:

  - allow personal data to be used to inform pandemic responses, building on the experiences in countries in East Asia.

  - ensure manufacturing capability can be repurposed to, for example, increase national capability to manufacture PPE (all countries) and, where appropriate, ventilators, vaccines and drugs.

- Where there is public funding, technology transfer and commitment to voluntary licensing must be included in all relevant agreements.

- Governments should allocate additional funding in annual budgets for:

  - capacity for early detection of outbreaks.

  - protecting health and care workers and other essential personnel.

  - strengthening public health capacity and surveillance (find, test, trace, isolate and support).

  - increasing hospital surge capacity.

  - research capabilities to facilitate evidence-based responses.

  - reducing pre-existing health and social inequalities.

  - procurement of tools for equitable and effective access to diagnostics, therapeutics and vaccines.

**International-level:**
- WHO should introduce measurable targets and set clear, achievable benchmarks for pandemic preparedness and response. National governments should then align their preparedness plans against these targets and ensure the availability of funding, logistics and workforce capacity. These targets should be reviewed periodically by WHO as a means of accountability and shared experience.

- WHO should establish a global surveillance system that connects Member State information centers while protecting people's rights.

- The G20 FIF should meet its minimum annual budget of $10.5 billion to support equitable access to diagnostics, therapeutics, global surveillance, research and development, manufacturing, vaccine development and health system strengthening. An expert advisory group should work to identify best practices in support of health system strengthening.

Although COVID-19 has exposed significant gaps in healthcare systems worldwide, it has also provided new opportunities for building resilience. The coming years offer a critical window for policymakers and healthcare providers to build better systems that prioritize high-quality, high-value care that is accessible for all.

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