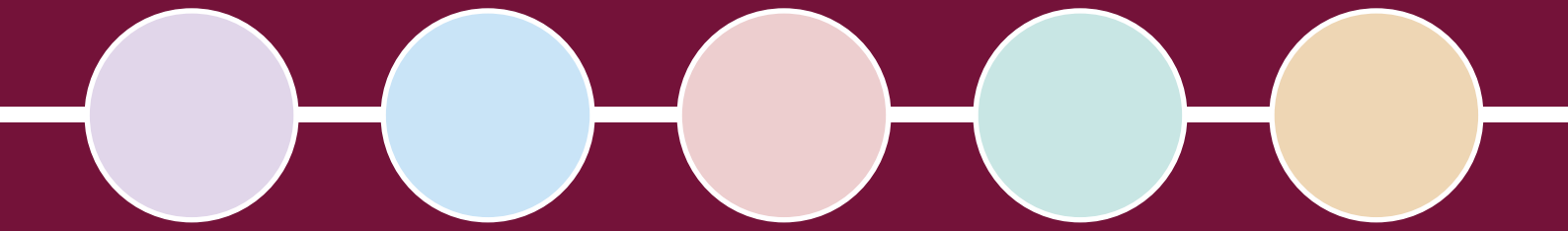
Strengthening Health Systems

A PRACTICAL HANDBOOK FOR RESILIENCE TESTING



Julia Zimmermann, Charlotte McKee, Marina Karanikolos, Jonathan Cylus
and members of the OECD Health Division

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Foreword from the European Commission

The COVID-19 pandemic taught us a hard lesson about the importance of resilient and responsive health systems. This handbook was born out of necessity and urgency to improve our health systems' capacity to respond to adverse events: not just pandemics, but also other "shocks" or crises that may be related to societal challenges, economic downturns, antimicrobial resistance or climate change.

The resilience testing methodology builds on the work of the Commission Expert Group on Health Systems Performance Assessment, which produced a report on assessing the resilience of health systems in 2020.

In the same year the European Commission tasked the Expert Panel on effective ways of investing in Health to explore how healthcare systems could be reorganized following the pandemic to make them more effective and more responsive in crisis situations. The report they produced raised the importance of Member States testing the resilience of their health systems, similar to stress tests carried out in the financial sector with banks. I am grateful to the Expert Panel for proposing how to introduce this concept to the health sector: in other words, enabling policy-makers to gain insights into critical health system weaknesses and address them before a crisis hits.

The European Commission gave a grant under the EU4Health Programme to the Organisation for Economic Co-operation and Development (OECD) and the European Observatory on Health Systems and Policies to turn this concept into a fully-fledged methodology and to pilot it in several Member States. The handbook is the result of this two-year project.

The health systems resilience testing methodology is designed to enable Member States to improve their preparedness for future crises and emerging structural challenges. When put into practice, it could facilitate better data analysis and information exchange with the participation of a wide range of relevant stakeholders.

This methodology can support the implementation of the EU Regulation (2022/2371) on serious cross-border threats to health which envisages stress tests and simulation exercises to support the development of prevention, preparedness and response at the local, regional and/or national levels.

The European Commission would like to encourage Member States to make use of this handbook, carry out resilience tests and make effective steps to strengthen health system resilience. This methodology is one of the tools that can continue to strengthen our European Health Union for the benefit of all citizens.

Sandra Gallina
Director General
Directorate-General for Health and Food Safety
European Commission

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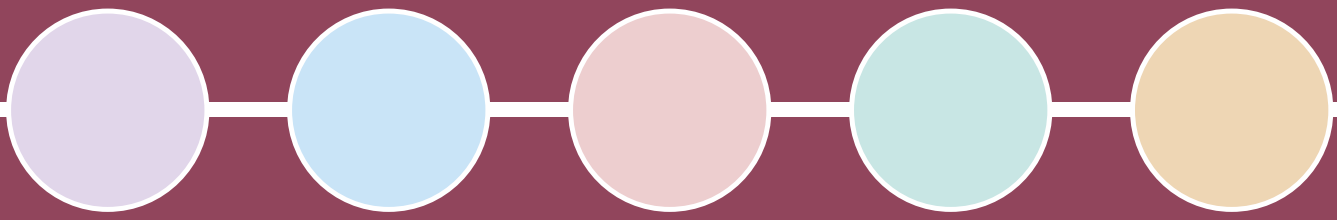
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Abbreviations

ACSC	Ambulatory Care sensitive conditions
AMR	Antimicrobial Resistance
BMI	Body Mass Index
CDC	Centres for Disease Control and Prevention
CHF	Congestive Heart Failure
COPD	Chronic Obstructive Pulmonary Disease
CT	Computed Tomography
DTP	Diphtheria, Tetanus and Pertussis
ECDC	European Centre of Disease Prevention and Control
EMA	European Medicines Agency
EU	European Union
EXPH	Expert Panel on effective ways of investing in Health
GAP	Global Action Plan
GDP	Gross domestic product
HERA	Health Emergency Response Authority
HSPA	Health System Performance Assessment
ICU	Intensive Care Unit
ILO	International Labour Organization
IPC	Infection prevention and control
IPCC	Intergovernmental Panel on Climate Change
JEE	Joint External Evaluation
MDRO	Multidrug Resistant Organisms
MRI	Magnetic Resonance Imaging
NAP	National Action Plan
NGO	Non-Governmental Organization
NRL	National Reference Laboratory
OBS	European Observatory on Health Systems and Policies
OECD	Organisation for Economic Co-operation and Development
OOP	Out-of-pocket
OTC	Over the Counter
PCR	Polymerase Chain Reaction
PET	Positron Emission Tomography
PFM	Public Financial Management
PPE	Personal Protective Equipment
SARS	Severe Acute Respiratory Syndrome
SPAR	States Parties Self-Assessment Annual Report
UNDRR	United Nations Office for Disaster Risk Reduction
WHO	World Health Organization

1

Step-by-step guide to resilience testing



1.1 Introduction

What is this handbook for?

This handbook helps health system actors (leaders, managers, providers and payers) assess how vulnerable their health system is to a shock, pinpoint the kinds of actions needed to make it resilient and begin to develop responses to protect it.

Pandemics, natural disasters and other shocks place enormous stresses on a health system. Its ability to respond to these stresses can affect population health and impact on economies and societies. Weak health system resilience underlies some of the poor performance shown in the face of previous pandemics and financial crises. By understanding health system resilience, policy-makers can improve how a health system performs when faced with adversities, minimizing the impact of any type of shock on population health and ensuring essential health system functions continue.

The key to improving health system resilience is identifying weaknesses and developing actions to address them. This handbook will allow health policy-makers and health system planners to "stress test" the resilience of their health system, identify and shape remedial action and implement changes that improve health system resilience.

The key to improving health system resilience is identifying weaknesses and developing actions to address them.

It has been developed as part of the EU's training and capacity building initiatives in response to the COVID-19 pandemic (see Box 1.1.1 on page 3) and outlines a collaborative testing methodology for assessing the vulnerabilities of the health system in relation to a specific shock. The methodology is designed to be used to test a wide range of shock scenarios and not just the examples explored in this handbook.

What is resilience?

Health system resilience is the capacity of a health system to a) proactively foresee, b) absorb, and c) adapt to shocks and structural changes in a way that allows it to i) sustain required operations, ii) resume optimal performance as quickly as possible, iii) transform its structure and functions to strengthen the systems, and iv) reduce its vulnerability to similar shocks and structural changes in future.

How can countries test health system resilience?

The resilience testing methodology outlined in this handbook asks countries to identify a "suitable" shock, to commission a piece of tailored, background research that will illuminate the health system's capacity to absorb and adapt to the shock, and then to bring together a group of key stakeholders to work

Box 1.1.1 EU response to recent shocks to European health systems

The EU has responded to the COVID-19 pandemic by strengthening joint activity in health. Existing agencies and structures, such as the European Centre of Disease Prevention and Control (ECDC) and the European Medicines Agency (EMA) have been strengthened and new legislation on serious cross-border threats to health was agreed in 2022 Regulation (EU) 2022/2371 on serious cross-border threats to health and repealing Decision No 1082/2013/EU (europa.eu). In addition, the new Health Emergency Response Authority (HERA) has the objective of ensuring timely availability, access and deployment of effective medical countermeasures during health emergencies. Other structures, such as the European Health Union and European Health Data Space aim to foster a shared approach to common health challenges and health data respectively.

The resilience testing handbook is part of the training and capacity building initiative of the European Union (EU) to provide healthcare and public health staff with the knowledge and skills necessary to develop and implement national prevention, preparedness and response plans. The term "resilience test" is used as a synonym for "stress test" as per Article 5 of Regulation (EU) 2022/2371 on serious cross-border threats to health. The term "stress test" has largely been avoided for this handbook, to differentiate the methodology from other forms of stress testing that are in use in the fields of material science, banking and cardiology.

through the "shock scenario". A facilitator supports the group and together they think through how challenges are likely to work out in practice and identify points of vulnerability. They also work collaboratively to explore how these might best be addressed.

The approach uses the Health System Performance Assessment (HSPA) Framework to understand the component parts of health systems, how they link to each other and how shock and its impacts are relayed through the system (and can be tackled). It also uses the shock cycle framework (see Section 2.1) to assess the health system's response to shock. The boundaries of the health system are understood in light of the Murray & Frenk (2000) definition of the health system "health actions … whose primary intent is to improve or maintain health". This includes "classical" health services as well as preventive care, health promotion and all activities within public health. There is flexibility to analyse functions outside this definition of the health system if they are deemed relevant to the shock scenario and support analysis of health system resilience.

Section 2.1: Resilience, shocks and the shock cycle page 30

How to use this handbook

This handbook is designed to be used as a guide for anyone planning to undertake a health system resilience test. The process of resilience testing includes preparing for, conducting and facilitating a test, and using the test results to design remedial action.

Resilience testing is a five-step process during which a substantial hypothetical shock is designed, and stakeholders are assembled, to review the (hypothetical) performance of the health system under this shock. The stakeholders use the test to identify health system weaknesses and then to identify steps to improve health system resilience. This handbook includes a selection of shocks as examples and users are guided in developing their own shock scenarios (Section 1.2).

Section 1.2: The resilience testing process page 5

This handbook has three parts:

- **Part 1** is a step-by-step guide for the facilitator and team organising a test. It covers instructions on how to conduct the resilience test and provides direction on how to use the results of the test to improve health system resilience. Readers familiar with the concept of health system resilience may wish to start with this part of the handbook.
- **Part 2** outlines the background literature that underlies resilience testing. It defines resilience and describes the HSPA Framework selected for this handbook. Readers wishing to understand why health system resilience is important and how the shock cycle and HSPA Framework can provide structure to resilience testing may wish to start with this part of the handbook.
- **Part 3** gives a series of examples of shock scenarios that can be adapted and used for health system resilience testing. They may also serve as inspiration when creating new scenarios. The example scenarios include a respiratory pandemic, a financial crisis, an outbreak of an antimicrobial resistant pathogen, and a heatwave related to climate change.

Who should use this handbook?

This handbook is aimed at policy-makers, health system planners and academics who are interested in conducting a health system resilience test at national, regional or local level. Users of the handbook are expected to have an existing understanding of health systems, the health system context and the health policy landscape.

1.2 The resilience testing process

Overview

The purpose of this section is to serve as a step-by-step guide to offer practical, operational instruction on how to design, develop, conduct and evaluate resilience testing exercises to help policy-makers understand and improve health system resilience to different shocks. Resilience testing is a five-step process that includes a one-day resilience test event. Throughout this section the reader will find ESSENTIAL points that should be followed, as well as useful TIPS for advice on how to conduct resilience testing.

The following roles are required to conduct a resilience test:

- **Facilitators.** We recommend using two facilitators to guide participants through the resilience test day. Facilitators should be senior health system experts with in-depth knowledge of the health system under consideration. Facilitators should have facilitation experience and be competent to lead a group discussion. Facilitators should be seen as neutral by test participants, should be independent from the national government and able to manage potential conflicts of interest that may affect the resilience test. Facilitators may be part of the test organizing team, or work closely with them.
- **Test organizers.** This is a small team of analysts and administrative staff who prepare the resilience test day and the follow-up report. In addition to the two facilitators, we recommend that at least two test organizers are available to support the running of the resilience test day by taking notes, keeping time, managing IT and ensuring smooth running. Test organizers also need to be independent of the national government to ensure objectivity.
- **Participants.** These are high-level health system stakeholders, identified through a stakeholder analysis, who contribute to the resilience test day.
- (Optional) **External observers.** These are international experts who give feedback on test preparations, observe proceedings during the resilience test day and review the outcome report.

Facilitators should be seen as neutral by test participants.

The handbook includes a number of examples and templates that resilience testing organizers and facilitators may find helpful: these can be adapted according to the needs of the project.

A repository website aims to collect expertise and share experience of resilience testing. Previous scenarios and test questions are collected by the website to provide examples for other test organizers and test organizers are encouraged to contribute their scenarios and questions.

The resilience testing process can be broken down to five distinct steps. The entire process is expected to take 4–6 months (see Figure 1.2.1).

Figure 1.2.1 The resilience test project timeline



Step 1: Initiation of the process

The decision to conduct a resilience test is expected to come from the Ministry of Health or other relevant ministry or agency which will then appoint independent test organizers and facilitators. The Ministry or agency, together with facilitators and test organizers, agree on the aims of the test and the nature of the shock and set a date for the resilience test day.

Step 2: Planning

Test organizers write the shock scenario and conduct the stakeholder analysis. Participants are selected and invited. Venue and logistics are confirmed.

Step 3: Research

Background research and analysis is conducted, and test questions selected. The participant information pack and test day materials are prepared.

Step 4: Resilience test day

The resilience test event will be held in the national language and take a full working day. Participants will be asked to examine the resilience of the health system in context of a defined shock at each stage of the shock cycle. This is different from a simulation exercise, as participants are not asked to "solve" the scenario.

Step 5. Follow-up

A summary of resilience test outcomes is made available and next steps are agreed.

Step 1 Initiation

Step 1.1 Initiation of a resilience test

The Ministry of Health, or another relevant ministry or agency, initiates a resilience test and commissions independent health system experts to organize and facilitate the test. The rationale for this is to ensure high-level support and participation. Test organizers and facilitators may be part of an independent public health or research institution, who will be planning and preparing the test.

ESSENTIAL

All actions within step 1 need to be agreed by the test organizers, facilitators and the Ministry or agency initiating the testing exercise.

TIP

Ensure sufficient time, resources and budget to design, develop, conduct and evaluate the resilience test.

Step 1.2 Agree resilience test scope and aim

This guide describes a resilience test conducted over the course of one day. Test participants are usually high level and have significant time constraints. This sets a limit to the scope of discussions. A single-day exercise is sufficient to define strengths and weaknesses of the health system in the context of a shock and start an initial discussion on remedial action. The broad aim of a one-day resilience test is to identify key strengths and vulnerabilities of the health system in the context of a defined shock.

Multi-day resilience testing exercises, potentially on non-consecutive days, could be conducted using an adapted test methodology, if budget, time and availability allow. Multi-day resilience tests would allow for more in-depth discussion on remedial action or allow for follow-up to monitor resilience and evaluate actions taken.

ESSENTIAL

The scope of the resilience test day should include the duration of the resilience testing exercise and the level (local, regional, national, cross border). Many shock scenarios may be dependent on decisions taken beyond the scope of control of the authorities at the level of the resilience test, for example at international level. In this case, test organizers should present any such decisions as part of the shock scenario, to allow the focus of discussion to remain at the level of the test.

TIP

Cross-border shocks can be evaluated using this methodology with some adaptations. Evaluating health system resilience at a cross-border level has not been piloted and is likely to be challenging as the test will involve more than one national authority and health system. As most health system structures are country specific, the methodology described by this handbook would need to be adapted to account for two different systems, as well as the bilateral or multilateral mechanism that determines the cross-border relationship. Alternatively, the test methodology could be adapted to include considerations on a country's ability to interact with supranational organizations relevant to the shock.

At any test level, test day participation and discussions should suit the agreed scope of the resilience test. Test organizers may need to provide decisions made at a different level from the level of the resilience test discussion so that discussions can move forward (for example decisions made nationally that would impact a regional level resilience test).

Step 1.3 Agree resilience test objectives

Objectives are the strategies implemented to achieve the exercise aim and suit the scope. Objectives should be SMART and avoid pass/fail situations.

SMART stands for:

- **S**pecific
- **M**easurable
- **A**chievable
- **R**elevant
- **T**ask and time oriented.

Formulate and agree up to four complementary objectives that are consistent with the exercise aim (see Box 1.2.1). Objectives will vary between contexts and shock scenarios.

TIP

During piloting, participants responded positively to the opportunity to connect with other stakeholders and to consider the entire system. Such wider benefits of the test day can contribute to capacity building and, if desired, should be made explicit in the test objectives.

Box 1.2.1 Example objectives of a resilience test

- At the end of the resilience test day, participants identify the overall top three strengths and weaknesses of Country X's health system in the context of a pandemic shock.
- At the end of the discussions on each stage of the shock cycle, participants identify the top three strengths and weaknesses of Country X's health system in the context of the pandemic shock and the respective stage of the shock cycle.
- Key stakeholders engaged in pandemic preparedness and response have the opportunity to discuss and consider the pandemic shock from multiple perspectives throughout the resilience test day.
- Stakeholders identify opportunities for future collaboration to improve preparedness as part of the concluding discussions.

Step 1.4 Choose the shock scenario

The shock scenario should address context-specific vulnerabilities or concerns. A shock that primarily impacts the health system or a wider shock can be chosen. Functions outside the definition of the health system as per the HSPA Framework may be considered by this exercise, if required by the nature of the shock, with the aim of furthering understanding of health system resilience. Where functions outside the health system are brought into the resilience testing methodology, the purpose of including these functions should be to improve understanding of health system resilience. As such, the analysis, test day discussions and results should primarily consider the resilience of the health system as defined by the HSPA Framework.

Use the "Typology of Shocks" (see Section 2.1) to choose the category of shock for the scenario. Within the chosen shock category, choose a shock scenario that pushes the health system to breaking point and outline it in 1–3 sentences (see Box 1.2.2).

Section 2.1: Typology of shocks page 36

Box 1.2.2 Example shock summary that contributes to scenario development

What
Pandemic caused by a new infectious disease

Where
Country X in Northern Europe

Duration
Approximately two years

Shock at a glance
A global communicable respiratory disease that meets the criteria for a pandemic emerges and spreads to Country X. Key at-risk groups for this disease are young children (aged 6 months to 9 years) and older people (aged 70+). Working age adults are often asymptomatic but may infect others. The shock causes a major social crisis and disrupts health system functioning, affecting the delivery of essential services. The pathogen differs from the recent COVID-19 pandemic because of its strong impact on children.

Step 2 Planning

Step 2.1 Build the shock scenario

Creating a shock scenario is an iterative process between the research team and the facilitator. Together they make decisions on the scenario and its effects on health, society and the health system in view of the national context. The shock scenario should be designed to push the health system beyond or close to breaking point and highlight health system weaknesses. It should be designed around the resilience test objectives and contain sufficient detail to illustrate the likely impact of the shock on the health system. Box 1.2.3 provides an example shock scenario and Part 3 of this handbook contains worked sample scenarios. Examples of past resilience test scenarios can be found on the repository website.

The shock scenario should be designed to push the health system beyond or close to breaking point.

Prompts to build the scenario:

1. Make short notes to answer "Who?", "What?", "When?", "Where?" and "Why?" to help you define the basic parameters of the scenario.
2. Conduct a PESTLE analysis to determine potential immediate, short term and long-term impacts of the shock and the likely response on wider society (Basu, 2004). PESTLE stands for:
   - **P**opulation health
   - **P**olitical
   - **E**conomic
   - **S**ocietal
   - **T**echnologic
   - **L**egal
   - **E**nvironmental

ESSENTIAL

Make use of expert knowledge where possible to ensure the scenario is as accurate and realistic as possible. This is important, as test participants are likely to focus on criticizing the scenario if there are inaccuracies.

ESSENTIAL

Use the HSPA Framework and shock cycle (see Sections 2.1 and 2.2) to identify health system functions and sub-functions most impacted by the shock scenario at each stage of the shock cycle. Refer to the typology of shocks (Section 2.1) as needed. Resilience test organizers should systematically assess all sub-functions in the context of the shock scenario and identify the sub-functions that are likely to be most impacted by the shock scenario. Table 1.2.1 shows an example of how to use the two frameworks in conjunction to highlight the most impacted parts of the health system. A tabular breakdown of the HSPA Framework into assessment areas can be found in Appendix 1. The identified parts of the health system are likely to require discussion during the resilience test day and relevant background material and test questions should be made available (Step 3).

Section 2.1: The shock cycle page 41

Section 2.2: The HSPA Framework page 43

Section 2.1: Typology of shocks page 36

Table 1.2.1 Example use of the HSPA Framework and the shock cycle in conjunction to identify priorities for the resilience test (marked in bold)

Function: Financing	Sub-function: Revenue Raising	Assessment area #1: Sufficient funds	**Preparedness**
			Onset and alert
			Impact and management
			Recovery and learning
		Assessment area #2: Stable funds	**Preparedness**
			Onset and alert
			Impact and management
			Recovery and learning
		Assessment area #3: Equitable revenue raising	**Preparedness**
			Onset and alert
			Impact and management
			Recovery and learning

TIP

Use an iterative approach to develop the shock scenario, providing targeted detail when building the shock scenario. Expand on the scenario to outline and provide relevant detail of the impact of the chosen shock on areas of the health system identified as most impacted.

TIP

When finalizing the scenario for distribution to participants, adjust the length of the scenario so that it takes up to 5 minutes to read. Reiterate to participants that the focus of the resilience test will be on health system strengths and weaknesses rather than on "solving" the scenario.

Box 1.2.3 Example description of the shock

The new disease occurs in late November outside of Europe and spreads over a period of three weeks before the first cases are detected simultaneously in different locations in Europe. The pathogen is rapidly identified as a new virus which has not previously been detected in humans. The disease spreads across all population and age groups.

In Country X, the disease is first detected in a holiday resort in late November, which is frequented by both international and domestic tourists. The holiday resort is located approximately three hours travel by car from the capital city.

Within the holiday resort, cases spread rapidly among visitors and workers, and then spread throughout Country X as domestic tourists return home, spreading the centre of the epidemic to the capital region.

The disease is characterized by respiratory symptoms, a short incubation period and airborne transmission. The risk of severe complications is higher in children aged 6 months to 9 years, older people aged 70+, people who are overweight, and people who have chronic pulmonary or heart disease. In the most serious cases, the disease progresses rapidly and requires intensive care and protracted respiratory support. A large portion of adults are asymptomatic.

For the first 6 months of the pandemic, no vaccinations or curative medicines are available. Therefore, only non-pharmaceutical mitigation measures are available: use of masks, physical distancing, improved ventilation, travel restrictions and restrictions on private and public gatherings. Stocks of medicines and commodities to control symptoms (i.e., paracetamol, ibuprofen), personal protective equipment (PPE), and other items needed for paediatric treatment run low owing to increased demand, both domestically and globally, and disruptions to global supply chains.

Within one month of detection in Europe, a polymerase chain reaction (PCR) test becomes available, but testing capacity is limited and prioritization is required.

In the early stages of the pandemic, control of the spread of disease is difficult owing to a lack of understanding of the primary means of transmission, lack of reliable identification of at-risk groups, and significant overloading of the capacity of the health system. Public health capacities, such as testing, tracing and surveillance, are stretched. In addition to increased demand for healthcare services, health systems are impacted by increased sick leave among healthcare personnel and the need for healthcare personnel to remain at home to care for children, leading to staffing shortages and overburdened staff.

Impact of the pandemic at the population level

Around 10% of paediatric patients with the new disease need hospital treatment 1 week after infection. Paediatric patients with severe disease die 3–4 weeks post infection. This results in waves of patients presenting to emergency healthcare facilities. In addition, parents' concerns about children's health may cause panic in the population, as well as a desire to find out whether the child has been infected. This places a large burden on different parts of the health system (for example, primary care facilities) and on a wider range of services outside of the health system, such as schools and childcare facilities.

Hospitalization and mortality increase dramatically, and demand for care in paediatric and intensive care units (ICUs) is very high. There are several uncertainties surrounding case mortality and hospitalization, especially in the early stages of the pandemic. It is soon clear that the disease causes increased morbidity and mortality, especially in children 6 months to 9 years of age. In the early stages of the outbreak, estimates of hospitalization needs and case mortality are as follows:

- In the absence of effective vaccines, potentially up to 8% of the population 6 months to 9 years of age will require hospitalization. Up to 10% of children admitted to hospital will require intensive care.
- At the same time, up to 4.8% of the population over 70 will require hospitalization and up to 5% of adults over 70 who are hospitalized will require intensive care.
- The mortality rate could peak at 3% (children aged 6 months to 9 years) and 0.4% (adults aged 70+).

Among other age groups (aged 10–69), severe cases are low, and adults are often asymptomatic, but infectious carriers of the disease.

Many parents choose to withdraw their children from childcare or school, making it necessary for parents to stay at home to care for their children. Several healthcare personnel who are parents will not attend work because of fear of transmission of the disease to their children.

Step 2.2 Select resilience test participants

Test day outcomes will depend on the participants in the room. Therefore, participants need to be chosen carefully and in accordance with the aim, objectives, and the scenario. Participants need to be chosen from a broad range of stakeholders who represent different functions of the health system and other areas relevant to the shock. Participants also need to be of sufficient seniority to contribute to discussions constructively. Some participants may be experts who are already advising the government through other channels, but care should be taken to achieve balance and avoid conflicts of interest.

We recommend no more than 20 participants take part in the resilience test day. This number of participants is large enough to represent the functions most relevant to the scenario, but small enough to allow all participants to contribute to discussions. Consider inviting more than 20 participants as some invitees may not be able to attend the resilience test. Box 1.2.4 shows roles to consider for an example participants list.

ESSENTIAL

To identify test participants, a stakeholder analysis and a stakeholder power analysis should be conducted. The stakeholder analysis will help identify and select a broad set of relevant test participants. The power analysis will help the facilitators understand ongoing power dynamics that may influence discussions. Detailed instructions on how to conduct these analyses can be found in Varvasovszky & Brugha, 2000.

Ministerial or other political participation in the resilience test day has advantages and disadvantages. Advantages include that ministerial participation ties the resilience test closer to the decision-making process. Disadvantages include that participants may not feel empowered to speak freely. The choice whether to include politicians in the resilience test day is dependent on the national context and experience of the facilitator, who will need to be able to manage the power balance in the room.

Box 1.2.4 Example participants list

- Representative from the Ministry of Health
- Representative from the Ministry of Finance
- Representative from health financing agency (e.g., health insurance fund)
- Representative from the national public health institute
- Representative from local/regional government
- Representatives from primary, secondary and tertiary care providers
- Representatives of relevant medical specialties
- Representative of nursing
- Representative of allied health professionals
- Health system regulator representative
- Health system supply chain specialist/hospital procurement manager
- Representative from shock-affected population groups (e.g., children's ombudsman)
- Representatives from shock-affected services (e.g., rescue, education, social care)

TIP

Identify and invite participants early, to ensure availability on the resilience test day. Consider sending a named invitation with the possibility for the invitee to delegate a colleague to attend instead, should they not be available.

TIP

Consider inviting external observers. External observers have no active role in discussions, but their presence may add to the perceived legitimacy of the methodology and therefore may help facilitators to maintain a balanced, objective discussion. External observers may also provide independent feedback on test preparations (scenario, background material, questions, etc.) and review the follow-up report. External observers can represent an international organization (for example, the European Observatory on Health Systems and Policies (OBS), the World Health Organization (WHO) or the Organisation for Economic Co-operation and Development (OECD)) or may be health system experts, past resilience test facilitators or past test organizers from another country. If external observers are present on the test day, simultaneous translation should be arranged for them to follow discussions.

Step 2.3 Confirm test day venue and logistics

Allow for sufficient time to organize a venue, catering and technical facilities and contact potential venues early to ensure availability. The venue can be any conference-style room large enough for participants to sit roundtable or u-shape style. It is important that the venue has reliable technical systems for presentations and Wi-Fi, with enough bandwidth for all participants. Consider the venue's audio systems and check that sufficient microphones are available. Visit the venue before confirming the booking to ensure it meets your requirements. If external observers are joining the test day and do not speak the local language, simultaneous translation should be provided.

ESSENTIAL

Resilience testing should always be conducted in the local language, to make sure all participants can understand the discussions and express themselves comfortably.

TIP

Ensure all participants on the test day have a clear and visible name tag and/or name plate that also lists the participant's function.

Step 3 Research

Step 3.1 Prepare background materials

Background materials should contain a summary of health system-related evidence most relevant to the scenario. While all participants are experts in their field, they may not have a detailed understanding of the entire health system. This document offers a baseline of information for discussions. The background research is also crucial for test organizers and facilitators to prepare for resilience testing discussions. Facilitators will need to identify and direct discussions towards the most relevant areas of the health system. For example, these could be sub-functions with pre-existing weaknesses or sub-functions particularly impacted by the shock scenario. Box 1.2.5 on page 16 contains example background materials using a fictional country.

Background research is crucial for test organizers and facilitators to prepare for resilience testing discussions.

Draw on the parts of the HSPA Framework that have been identified as the most relevant for each stage of the shock cycle (previous step) and use Sections 2.3 and 2.4 to identify indicators that can guide the background research. Indicators may be quantitative, qualitative or contextual. Contextual indicators sit outside the health system, but impact upon both the health system and its ability to respond to shocks, serving as important background information to the resilience test. While some indicators will be specific to the shock being considered, many are likely to be relevant to a range of different shocks. The scenarios in Part 3 of this handbook contain examples of indicators that would be considered suitable for each scenario.

Section 2.3: Indicators and the assessment of resilience page 56

Section 2.4: The impact of shocks and the capacity to respond page 95

ESSENTIAL

Where available, existing national quantitative and qualitative data and existing health system assessments should be collated to provide the background information on the health system.

TIP

International data and international comparisons may be helpful to ensure evidence is appropriately contextualized. International sources for health system data and comparison include:

- Health system reviews (OBS) – for countries of the WHO European Region
- EU country health profiles (EC/OECD/OBS) – for EU Member States and Norway
- Health at a Glance: Europe (OECD)
- Eurostat database
- OECD Health Statistics database – for OECD Member countries and key partners
- Electronic IHR States Parties Self-Assessment Annual Reporting Tool (e-SPAR)

TIP

If some data are expected to cause controversy, consider including information on the methodology used to collect the data.

Box 1.2.5 Example background materials

Health system overview

The health system in Country X is a decentralized system. Services are delivered primarily through public institutions, with an increasing number of the population accessing care through private providers. The central government has responsibility for overall health policy, setting care standards and allocating funds to regional authorities. Regional authorities are responsible for providing health services (including public health functions) to their populations.

Delivery of healthcare

Primary health centres are the first point of contact with publicly funded health services. These centres provide a mix of services, including general practice, community nursing, and antenatal and counselling services. These services have strong links to early childhood education and social services. In the public system, specialist care must be accessed through referral from a General Practitioner (GP).

Most regions have at least one central hospital providing specialized medical services. Like most health systems, physical and human resources are unevenly distributed with a higher density and variety of services offered in the cities. The capital city and some larger cities have multiple hospitals providing specialized care. The only specialist children's hospital in Country X is in the capital city. There is a specialist children's clinic located in a major hospital in the second largest city. Outside of these cities, emergency treatment for children takes place in the same facilities as adults.

Private providers primarily provide outpatient care and are geographically concentrated in the capital city. Remote provision of care via teleconsultations and digital health services has been piloted in some healthcare settings but is not in routine use.

Financing

Health expenditure in Country X comes predominantly from public expenditure with some private spending. Public funds to pay for health services are collected through a mixture of general taxation and social health insurance contributions; private funds come largely out-of-pocket (OOP), with a small share of voluntary health insurance. Approximately 5% of the population have voluntary health insurance.

OOP payments cover co-payments for publicly funded services and medicines, purchase of over-the-counter (OTC) medicines and healthcare services not covered by the statutory system. There are certain exemptions from co-payments, and an annual cap, but it is set at a relatively high level.

Some key figures on the status of the health system can be found in Section 3.1. For an in-depth explanation of commonly used indicators and how they relate to resilience, please see Sections 2.3 and 2.4.

In addition to the information outlined above, consider providing the following, shock-specific information:

- Demographic data
- Flu and Measles-Mumps-Rubella vaccine coverage of different age groups
- The availability of PPE
- The availability of isolation rooms/units
- Paediatric and adult ICU beds per population per region and the availability of qualified (paediatric) intensive care staff
- Use of teleconsultations
- Comparison with similar countries of relevant indicators
- An overview of experience and lessons learnt from another recent or similar shock, and if they resulted in changes to the health system functioning.

Section 3.1: Example scenario: Pandemic page 118

Section 2.3: Indicators and the assessment of resilience page 56

Section 2.4: The impact of shocks and the capacity to respond page 95

Step 3.2 Determine test questions and facilitation style

Determining the test questions is an iterative process that starts with systematically analysing the likely effects of the shock on each part of the health system. A first draft of questions can closely follow the shock cycle and HSPA Framework. For example, Appendix 1 provides basic questions to start the iterative process, which need to be modified to suit the context and shock scenario. For stage 4 of the shock cycle, remember to include questions on recovery and questions on learning in the first draft of questions.

A first draft of questions can closely follow the shock cycle and HSPA Framework.

Once a broad range of questions has been collected, start iterating, prioritizing and combining questions. Iterated questions can move away from the structure provided by the conceptual frameworks as needed. Prioritize the health system functions and sub-functions for assessment to ensure the most relevant sub-functions are included in the final set of questions. Ensure alignment with areas of the health system that were identified as most affected by the scenario (Step 2). Similarly, identify the health system functions and sub-functions that are a priority for discussion at each stage of the shock cycle. Ensure that the final set of questions includes at least one question on recovery and one on learning.

Iterated questions can move away from the structure provided by the conceptual frameworks as needed.

Some open questions, aimed at an expert in the field, may serve as an introduction to further discussion. For example, an expert could be asked to outline how the shock scenario is likely to impact a specific function. This could be followed up with more specific questions on that function. Box 1.2.6 on page 19 provides a sample set of final questions.

TIP

Part 3 of the handbook as well as the repository website contain examples of scenarios, questions and indicators covering different types of shock. The examples serve as a starting point, and organizers and facilitators can build on these and adapt them to their shock scenario and context.

ESSENTIAL

The final number of questions will depend on the facilitation style of the resilience test day and test duration. Determine the facilitation style before finalizing the test questions.

ESSENTIAL

Resilience test discussions should always be held in the local language. If external observers are present on the test day, simultaneous translation should be arranged for them to follow discussions.

TIP

Pilots showed that several facilitation techniques can result in a successful resilience test day. For example, some pilots used a "me-we-us" facilitation approach, where participants are given some time to personally reflect on 2–3 questions (me), then discuss them in small groups (we), then discuss them in the full plenary (us). During the plenary discussions each group is asked to report back and all participants have the opportunity to comment. Using this approach, different groups can be assigned different questions, which may help to use time more efficiently, and cover a wider range of issues. If this technique is used, the small groups should be assigned in advance according to the expertise/roles of the participants and should be seated together. Direct plenary discussions, where all participants directly discuss the same question, also worked well during piloting. We would not recommend direct plenary discussions for more than 15–20 participants. Other facilitation styles, such as Nominal Group Techniques (CDC, 2018), have not been piloted but may also result in a successful resilience test day.

TIP

While facilitators should be health system experts with facilitation experience, facilitators are not expected to have in-depth knowledge of different facilitation techniques. During one of the resilience test pilots, a professional facilitator was consulted, advising on a suitable facilitation technique. This was deemed to be very helpful.

When the questions have been finalized, please contribute to the repository website by uploading the scenario and questions you have prepared to assist other resilience test organizers.

Box 1.2.6 Example resilience test questions

Stage 1 – Preparedness

- Do the current provisions give health authorities and healthcare professionals sufficient powers to act when this scenario materializes? What are the key factors that hinder/prevent effective action?
- Does the system have enough human resources and skills to respond to the pandemic described in the scenario? Is the system prepared for a situation where professionals will need to be trained quickly to treat children (at home, in ICUs, etc.)?
- How does preparedness planning take the health financing model into consideration? What are the incentives to prepare for service providers?

Stage 2 – Onset and alert

- How would you assess the health system's ability to identify a new communicable disease that is rapidly spreading? Is there a mechanism for organizing data collection to provide an overview of the situation? How can different actors in the health system and at different levels access information about the outbreak?
- How will cross-sector collaboration be launched and what structures are in place to do so? Do you identify vulnerabilities? Is it easy to identify key actors? Are the responsibilities for triggering a crisis response clear at the beginning of the crisis? What are the main vulnerabilities?
- How would you assess the health system's readiness to rapidly increase the capacity of paediatric departments? What about intensive care and testing capacity? How are we prepared to support staff moving to medical care and intensive care for children, whose ethical and emotional burden/ load may increase significantly (e.g. decisions on intensive care for children, contact with the child patient and his/her family)?
- How are service prioritization decisions taken? How are health professionals and decision-makers supported in these decisions?

Stage 3 – Impact and management

- Is the evidence base for decision-making transparent? Are all population groups considered when public health messaging is communicated? Which population groups are unlikely to be reached through common communication channels and what would be done to reach them?
- Is it possible to make decisions in a timely manner? Are emergency legal provisions flexible enough to suit a rapidly evolving situation? What checks and balances are in place during the crisis and are these appropriate?
- With whom would health system actors work together to maximize children's rights to safe schooling and early childhood education in the context of this scenario? With whom would health system actors work to maximize the rights of the elderly to safe care in the context of this scenario? How would the different generational interests be balanced against each other when deciding on public health measures and allocating resources?
- In the context of the scenario, how can the other functioning of the system be maintained? Which parts or functions of the system are more vulnerable to resource or labour shortages when the scenario materializes?

Stage 4 – Recovery and learning

- How to ensure that additional funding is allocated to address the consequences of the pandemic? How will the level and allocation of funding be assessed?
- At what stage and on what grounds should it be possible to reallocate healthcare staff to their usual tasks? How will they be supported?
- What processes are in place to ensure that the emergency measures designed to deal with the crisis are not maintained after the acute phase of the pandemic? How are decisions made on which aspects of the emergency response are helpful to maintain in the long term?
- How to organize the systematic collection and summary of the lessons learned from the pandemic? How to collect the experiences of children and families and support families/ children? What about staff?

Step 3.3 Agenda of the resilience test day

Draw up the agenda for the discussion. Include sufficient breaks and allow for time to assess the resilience of the health system at each stage of the shock cycle. Plan for an overall assessment at the end of the day and a short discussion on next steps and remedial action. Ensure the agenda is communicated to the venue to coordinate catering. Table 1.2.2 shows an example agenda, where stages 1 and 2 of the shock cycle are discussed in the morning and stages 3 and 4 after lunch. Although two stages are timetabled within the same timeslot, questions for each of the stages (Box 1.2.6, page 19) are discussed separately.

TIP

While test day discussions should span across all four stages of the shock cycle, some flexibility can be given to time spent on each stage, and sometimes stages can overlap.

Table 1.2.2 Example agenda of the resilience test day

TIMETABLE	
9.00–10.00	Background to the pilot
10.00–10.10	Quick break
10.10–12.00	Shock cycle 1 and 2
12.00–12.45	Lunch
12.45–14.30	Shock cycle 3 and 4
14.30–14.50	Coffee break
14.50–15.50	Final assessment and next steps
15.50–16.00	Summary and closing

Step 3.4 Circulate pre-test information to participants

Participants are expected to spend around 30 minutes familiarizing themselves with the pre-test material. Send the following material to test participants a week prior to the resilience test day.

- Shock scenario
- Background information
- Agenda for the meeting

Step 3.5 Prepare the interactive elements of the discussion

The test day should be introduced by a short presentation of the two conceptual frameworks and the shock scenario.

ESSENTIAL

Identify means of summarising the strengths and weaknesses to obtain clear results. Pilots showed that participants can be asked to vote on the top three strengths and top three weaknesses of the health system at different stages of the discussion. Results should be available to the test organizers after the session has ended.

ESSENTIAL

Materials should be in the language of the workshop even if external observers are involved.

The test day needs to have at least two polls. The first poll should be conducted at the beginning of the day and aims to understand health system strengths and weaknesses at baseline, without considering the additional pressure of a shock. The final poll should be conducted at the end of the resilience test day and should consider the impact of the shock on the health system and spill-over effects across functions. The first poll should use health system sub-functions listed by the HSPA Framework as criteria for voting. The final poll can either use the same list of sub-functions, or list issues mentioned by participants during the test day (captured by the note takers on the day). Example poll questions can be found in Box 1.2.7.

TIP

Additional polls can be used to conclude discussions on each stage of the shock cycle. These four optional polls ask participants to consider the resilience of the health system in relation to the shock and the stage of the shock cycle. The optional polls can also either use the same list of sub-functions used by the first poll or list issues mentioned by participants during the discussion of that part of the shock cycle (captured by the note-takers on the day).

TIP

Various online polling tools work well for the purpose of voting, but make sure the tools chosen are user friendly and/or familiar to participants.

Box 1.2.7 Example poll questions

First poll

What are the strengths of the health system?

What are the weaknesses of the health system?

Shock cycle

What are the strengths of the health system in this scenario during Stage x of the shock cycle?

What are the weaknesses of the health system in this scenario during Stage x of the shock cycle?

Final poll

What are the strengths of the health system in this scenario?

What are the weaknesses of the health system in this scenario?

Step 4 Resilience test day

Ideally, two facilitators lead discussions on the test day. At least two additional team members are required for note-taking, timekeeping and ensuring the smooth running of the day.

ESSENTIAL

The facilitators should ensure that all participants feel comfortable and empowered to contribute. The test can be conducted using Chatham House rules.

ESSENTIAL

At least one additional team member (not the facilitator) should be responsible for recording poll results and taking notes to capture more granular information.

TIP

If top governmental officials are present (e.g., the Minister of Health), facilitators may wish to establish that they will allow for other contributions first, to empower all participants to voice their opinion.

The facilitators should ensure that all participants feel comfortable and empowered to contribute.

The start of the day includes introductions, a summary of the HSPA and shock cycle frameworks used and the scenario, establishing the rules for the discussion and the initial vote on strengths and weaknesses of the health system at baseline.

TIP

If participants question the validity of the scenario, facilitators can confirm that it has been reviewed by experts in the field. Facilitators can ask participants to accept any deficiencies in the scenario and ask them not to fight it, redirecting the focus on the purpose of the exercise; the intention is to push the health system to identify strengths and weaknesses rather than accurately quantify the shock impact.

Step 4.1 Facilitate a discussion on each function of the health system

Facilitators should facilitate discussions on the impact of the shock scenario at each stage of the shock cycle according to the pre-determined facilitation style. For each part of the day, start by introducing the step of the shock cycle and allocating questions. Some open questions aimed at an expert in the field may serve as an introduction to further discussion; for example, an expert could be asked to outline how the shock scenario is likely to impact a specific function. This could be followed up with more specific questions on that function. If small groups are used, give each group time to discuss questions. Then ask a delegate from each group to report back to the plenary and encourage plenary discussion.

Open questions aimed at an expert in the field may serve as an introduction to further discussion.

TIP

If participants conclude that an otherwise unforeseen political intervention would be needed to support a health system function, it could be a strong indicator that the health system function may not be resilient by design but that it can be strengthened through specific actions.

TIP

The facilitator should summarize discussions and signpost the next issue when changing the focus of the discussion.

The health system's strengths and weaknesses should be assessed in relation to each stage of the shock cycle. Use the (optional) online poll to ask participants to assess top strengths and weaknesses after discussions on the shock cycle stage have concluded. Alternatively, lead a group or plenary discussion to summarize discussions and determine strengths and weaknesses at each stage of the shock cycle.

TIP

Some controversial issues may come up during discussions, which will need experienced and unbiased facilitation to gently challenge opinions and bring discussions back to the focus.

Step 4.2 Facilitate a final assessment and consider next steps at the end of the day

Close overall discussions with a final assessment session where participants vote on the top three strengths and the top three weaknesses of the health system in relation to the shock, across all four stages of the shock cycle, with the hindsight of all discussions.

ESSENTIAL

Allocate some time for participants to provide views on possible follow-up actions after the top strengths and weaknesses have been identified.

Follow-up actions could be reflected on individually or through small groups. Some example questions are provided in Box 1.2.8.

Box 1.2.8 Example questions to reflect on follow-up actions

- What are the most important weaknesses in the system that need to be addressed?
- What are reasonable next steps to improve health system resilience to this shock?
- If the proposed steps were implemented, what else would need to change to ensure implementation is successful?

TIP

As in previous discussion rounds, open the floor for a 15 minute plenary discussion where groups share and discuss their answers.

TIP

Consider collecting participant feedback on the resilience test day to inform the evaluation of the resilience test. The feedback questionnaire could include questions on exercise organization, test conduct and the validity of results.

Thank everyone involved, outline next steps, and close the test day.

Step 5 Follow-up

Follow-up to the resilience test day consists of evaluating and reporting test day outcomes and considering remedial action to address the main shortcomings identified by the test. The organizing team is responsible for test evaluation and reporting.

Step 5.1 Evaluating resilience test outcomes

Evaluation is an essential part of a resilience test, as it elevates the whole process to an actionable learning experience. The evaluation strategy should be agreed and prepared early, in accordance with the exercise aim, scope and objectives. The strategy should ensure that all relevant data required for evaluation are collected during the resilience testing process. At a minimum, background research, notes from the test day and voting results should be considered for evaluation and outcome reporting purposes.

Step 5.2 Reporting resilience test outcomes

The outcome report should be a 2–4 page document that considers whether exercise objectives were met, summarizes the resilience test day findings and recommends next steps. The outcome report should be prepared by the resilience test organizers in accordance with the evaluation plan. The outcome report should be produced as soon as possible after the resilience test event to capitalize on any momentum gained by the resilience test day. The report should be made available to the requesting Ministry or Agency and all test participants.

Step 5.3 Remedial action

The purpose of an effective and successful resilience testing exercise is not only to identify health system strengths and weaknesses, but also to identify and stimulate concrete remedial policy action for improvement and address the main bottlenecks to health system performance. The resilience test outcome report can be the starting point to plan remedial action, but in some cases additional research may be needed (Box 1.2.9, page 26). Policy-makers should ensure broad consensus on identified strengths and weaknesses as a baseline and design remedial actions around the identified weaknesses.

Box 1.2.9 Conducting additional research

When preparing their final report and recommendations, test organizers may choose to draw exclusively on their preliminary research and findings from the resilience test, or they may choose to conduct additional research. The cost of and opportunity for further research should be weighed against the potential benefit of drawing evidence-based conclusions.

Two questions to ask when deciding whether to carry out additional research may include:

Was broad consensus achieved and do the findings align with those from preliminary research?
Data saturation doesn't only refer to the volume of data collected, which can vary, but to how confident researchers feel that the evidence collected can answer the question (Braun & Clarke, 2019). Test organizers should therefore consider whether the evidence collected through the resilience test sufficiently addressed key issues and questions. If no or limited consensus is achieved as a result of the resilience test and/or if the conclusions of participants vary dramatically from the test organizer's expectations, informed by preliminary research, it may be helpful to conduct further research to understand why this is.

What impact will the additional research have on the receptiveness of recommendations by policy-makers?
Studies on the effectiveness of evidence to influence policy indicate that the context in which the evidence is received (including factors such as collaboration, relationships, timing and opportunity) have a significant impact (Olivier et al., 2014). The resilience test is both a means of collecting insights on the health system, and an opportunity for a wide range of stakeholders to work collaboratively and deliberatively. Stakeholders who have been involved in the resilience test may be most engaged in the process straight after the exercise. Timely reporting and actioning on the findings from the test may capitalize on this momentum. On the other hand, taking time to engage with additional individuals, including policy-makers, may provide an opportunity to build buy-in from additional stakeholders.

The Expert Panel on effective ways of investing in Health (EXPH), in their report The Organisation of Resilient Health and Social Care Following the Covid-19 Pandemic (Expert Panel on effective ways of investing in Health, 2020), provided some examples of how additional information on health system resilience could be collected, including through debrief sessions with key decision-makers and focus group discussions with relevant experts.

In multi-day resilience tests, formulating policy options and remedial action can be part of the resilience test objectives. If this is the case, test organizers should develop a remedial action document that outlines a set of short-, medium- and long-term actions aimed at different levels of the health system, which directly address core health system weaknesses.

TIP

Participants from all resilience test pilots fed back that they would like continued involvement. For example, participants could be asked to participate in a follow-up focus group with more specific objectives to formulate remedial actions.

TIP

Each remedial action should include specific agreed measures, the person, agency or organization responsible for implementation and a deadline for implementation.

TIP

Several European Union tools have supported health systems in recent years and may be suitable for supporting remedial action to improve health system resilience (see Box 1.2.10).

Box 1.2.10 European Union (EU) support for improving health system resilience

EU support to national health systems is playing an increasingly important role, while respecting the primary responsibility of EU countries for their own health systems. Many of the existing EU tools can support health systems, even though strengthening health systems is not their primary objective. Examples of tools that have supported health systems recently include the European Semester, the Cohesion Policy Funds, the European Commission's Technical Support Instrument and the Recovery and Resilience Facility. Different EU tools are best suited to address different stages of the change process. Making best use of these instruments typically requires combining various EU tools across multiple stages of the change process (Fahy, Mauer & Panteli, 2021).

Step 5.4 Implementation and follow-up

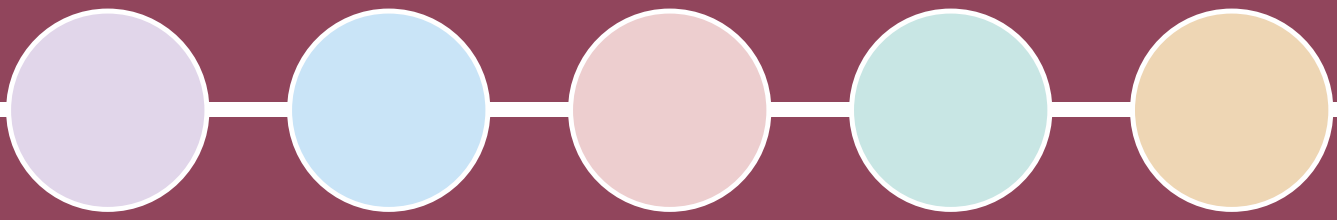
To ensure that the measures outlined in the remedial action plan are implemented, support at the appropriate strategic level should be secured early and required resources should be made available. Implementation and follow-up of remedial action will be very dependent on the individual policy content, the actors involved and the policy context.

ESSENTIAL

Remedial actions that have been agreed should be tracked to completion and reported on.

2

Background



2.1 Resilience, shocks and the shock cycle

Defining health systems resilience

Why resilience?

In the European context, thinking on health systems resilience has developed gradually over the last 20 years (Alessi et al., 2020), moving from a narrow understanding of preparedness for specific shocks, to a growing understanding of how a wide range of external shocks can have system-wide impacts. Widespread acknowledgement of the importance of considering resilience when studying European health systems emerged in response to the 2008 financial crisis. During this crisis, countries across Europe implemented fiscal consolidation mechanisms which directly impacted on health systems, by introducing budget constraints while, simultaneously, demand for healthcare increased as social protection mechanisms were weakened and rates of unemployment, homelessness and food insecurity increased (Karanikolos et al., 2013; Stuckler et al., 2017). While all EU Member States were impacted by the financial crisis to some extent, their ability to respond to the health impacts of the crisis varied, with significant differences in the capacity of each health system to cope with resource shortages and surges in demand (EU Expert Group on Health Systems Performance Assessment, 2020). This experience served to move resilience even higher on the European policy agenda as commentators reflected on the potential for external shocks to have system-wide impacts (European Commission, 2014).

A range of crises have demonstrated the catastrophic impact that external shocks can have on health systems

Subsequent thinking on health systems resilience at a global level has been influenced by experience of a range of crises that have demonstrated the catastrophic impact that external shocks can have on health systems, notably the outbreak of Ebola in West Africa in 2014 (Abimbola & Topp, 2018; Turenne et al., 2019) and major conflicts (Martineau et al., 2017). These crises revealed weaknesses in national health systems and the global architecture in which they are situated (see Box 2.1.1 on page 31). More recently, the COVID-19 pandemic revealed how even those health systems that were considered well-prepared, for example countries scoring high on the Global Health Security Index (Global Health Security Index, 2024), have struggled to respond appropriately to the increased disease burden while maintaining provision of basic health services. In many countries, COVID-19 has interacted with and exacerbated existing challenges, such as the legacy of austerity policies, with adverse consequences for health systems (Thomas et al., 2020).

As the risk of larger and more frequent shocks and stressors that have the potential to impact on health systems is likely to increase, caused by developments including geopolitical threats, global warming, increased migration, economic crises, emerging infectious diseases and others, health systems resilience will

Box 2.1.1 How the concept of health systems resilience contributes to thinking on health systems strengthening

Research on recent crises has generated a substantial body of literature that has highlighted the importance of incorporating the concept of resilience into thinking about health systems. For example, Kruk et al. (2017) outlined three key ways in which the concept of resilience has contributed to thinking on health systems strengthening:

Resilience emphasizes the functions that health systems need to respond and adapt to shocks. By emphasizing the functions that health systems need to respond to shocks, and by considering resilience as an objective of health systems, thinking on resilience demonstrates the dynamic nature of health systems, which need to be equipped to respond to emerging threats and changing contexts of health service delivery.

Resilience contributes new ideas to health systems borrowed from other sectors. The concept of resilience brings thinking from a range of disciplines, for example on supply chains, logistics and communications, which can usefully be applied to thinking on health and health systems.

Resilience helps to bridge health and development agendas. By responding quickly to crises, and containing their impact, resilient health systems can contribute to economic stability by containing crises. Analysis of health systems resilience, which identifies the immediate and longer-term payoffs of a responsive and adaptable health system, can therefore provide fresh impetus to health and development agendas such as Universal Health Coverage, the Global Health Security Agenda and the Sustainable Development Goals.

continue to attract greater attention from researchers and policy-makers (Thomas et al., 2020). In these circumstances, it will be increasingly important for health leaders to secure and strengthen the resilience of their health systems, enabling them to respond and adapt to a range of often overlapping and interacting shocks which will threaten their ability to deliver health services.

Defining health systems resilience

For the purposes of this handbook, we have adopted the definition of health systems resilience developed by the EU Expert Group on Health Systems Performance Assessment (HSPA) (EU Expert Group on Health Systems Performance Assessment, 2020) that can be found in Box 2.1.2.

Box 2.1.2 EU Expert Group on Health System Performance Assessment (HSPA) definition of resilience

The Expert Group defines health systems resilience as: "The capacity of a health system to a) proactively foresee, b) absorb, and c) adapt to shocks and structural changes in a way that allows it to i) sustain required operations, ii) resume optimal performance as quickly as possible, iii) transform its structure and functions to strengthen the systems and iv) (possibly) reduce its vulnerability to similar shocks and structural changes in future."

The definition of health systems resilience developed by the HSPA Expert Group and used in this handbook is a broad and inclusive definition, building on and incorporating key features of resilience definitions used by health systems researchers and policy-makers, as identified in scoping reviews (Turenne et al., 2019; Fridell et al., 2020) (see Box 2.1.3 on page 32). The definition is therefore

Box 2.1.3 Contemporary debates on the definition of health systems resilience

The growing interest in the concept of health systems resilience and the accompanying literature examining resilience in health systems has not, so far, led to a single agreed definition of the term (Fridell et al., 2020), which, although often discussed within a common frame of reference, remains "highly confused" (Turenne et al., 2019).

The debate around definitions of health systems is likely to continue, reflecting ongoing academic and political interest in resilience and the scope of the concept, which can be multi-level (being impacted by actions taken at the individual, organizational, national, or international level), multisectoral, going beyond the health system (covering not just health, but social services, education and finance), and involve multiple populations and stakeholders (Blanchet et al., 2016; Turenne et al., 2019). However, while this debate contributes usefully to thinking about health systems, the lack of a consistent definition has at times held back the development of operational tools to assess and promote resilience, and left the concept open to criticisms both that it is too broad to be operationally useful and that it focuses too narrowly on technocratic preparedness for shocks, while ignoring the wider socioeconomic and political factors which impair responses to shocks and stressors (Kruk et al., 2017; Abimbola & Topp, 2018). These challenges have led researchers to call for clarity and a definition of resilience which can be used by policy-makers and researchers alike to measure the resilience of a health system (Kruk et al., 2017).

Two fundamental elements that recur in many definitions are: 1) an explanation of the types of stressors which may impact on a health system, and 2) discussion of the ways in which a resilient health system responds to these stressors.

consistent with the trend identified by Turenne et al. (2019) towards a broader conception of resilience.

Key characteristics of this definition include:

- A broad range of shocks, changes and chronic challenges which have the potential to test health system resilience (see Typology of shocks);
- A sense of time as it incorporates all stages of the shock cycle (see The shock cycle), moving the concept of resilience beyond a focus on preparedness; and
- Various responsive capacities required of a resilient health system throughout the shock cycle (forecasting, adaptive, absorptive and transformative capacities).

Typology of shocks page 36

The shock cycle page 41

Defining stressors which can impact on a health system

Scoping reviews of health systems resilience have identified three broad categories of definition in terms of how they relate to various types of threat (Turenne et al., 2019; Fridell et al., 2020):

- *Narrow definitions*, adopted in the majority of papers studied, addressing resilience in the face of sudden and severe shocks, such as natural disasters or pandemics;
- *Slightly broader definitions*, which encompassed both shocks and less acute events, using words such as "challenges" and "uncertainty"; and
- *The widest definitions* of resilience, which have been more commonly used in recent literature, and which incorporate the entire spectrum of challenges that can impact a health system, including acute shocks, slower moving impacts, and chronic stresses (termed "everyday resilience" by Barasa, Cloete & Gilson (2017)).

The definition of health systems resilience used in this handbook includes discussion of both shocks and structural changes, acknowledging the impact that both acute and longer-term threats can have on a health system. The methodology for resilience testing developed in this handbook focuses primarily on how health systems respond to acute shocks ("shocks"). By focusing on acute shocks, states can identify the direct impact that a specific shock will have on the resilience of their health system. In spite of this focus, we acknowledge the significant impact of long-term threats and structural challenges on the resilience of a health system.

What is meant by a health system "responding" to a crisis?

The literature on health systems resilience has revealed different views on how a resilient health system should be expected to respond to a crisis. The response will depend on the capacity of the health system, the type of shock and broader contextual factors, which will influence the extent to which a particular shock will impact on a health system, if at all. Early work on health systems resilience focused on how health systems absorb, adapt and transform to cope with changes (Barasa, Cloete & Gilson, 2017). However, more recent research has adopted a broader definition of resilience, which considers a health system's ability to minimize exposure to shocks, and which introduces resilience as a dynamic objective of health systems (Thomas et al., 2020). In broadening the definition to include minimizing exposure to shocks, researchers have acknowledged that the experience of a shock is not a precondition for a health system to be judged resilient, allowing policy-makers to consider opportunities for assessing and strengthening resilience through all stages of a potential or experienced shock.

The HSPA Expert Group definition of resilience does not require a health system to avoid experiencing any impact of a shock to be judged "resilient" – a health system is judged to be resilient through its ability to prepare for a shock as well as its ability to absorb the impact of a shock and adapt in response. Below (The shock cycle) we discuss how the experience of and response to a shock can be conceptualized and visualized.

The shock cycle
page 41

Operationalizing the concept of health systems resilience

This resilience testing methodology builds on the work by the Expert Panel on effective ways of investing in Health (EXPH) and their review of resilience of health and social care following the COVID-19 pandemic (Expert Panel on effective ways of investing in Health, 2020). The panel drew on the experience of conducting stress tests in the banking sector as a model offering lessons for the health sector. The authors identified the following necessary characteristics of an assessment of health systems resilience:

- The resilience test must "belong" to the state in question, so it should be conducted through a collaborative process led by either state health authorities and/or an international support team;
- The resilience test should be a forward-looking exercise, operating as a "what if" analysis, rather than a performance assessment which seeks to rank states against one another;

- The resilience test should focus on the system-wide effects of a shock, not on the impact of specific healthcare institutions and how they cope individually. It should test the impact of a shock on the health system as a whole, through the resilience of interconnected components;
- The resilience test should involve both quantitative and qualitative data collection by key informants.

For actionable results, modifiable risks and weaknesses identified through the resilience test should be linked with strategies for improvement, which take into consideration context and resource availability.

Building on the work of the Expert Panel and the definition of health system resilience, three key variables need to be understood in order to operationalize health systems resilience and develop tools to assess the resilience of a health system: 1) the boundaries of the health system; 2) the larger ecosystem in which the health system is situated; and 3) the severity of a shock which has the potential to impact on the resilience of the health system.

Delineating the health system and wider ecosystem

While we acknowledge that health systems exist within a larger ecosystem of interconnected factors, including those in the social, political and educational arenas, for this handbook, we will be discussing the resilience of *health systems*, rather than wider societal resilience to shocks. From a practical policy perspective, this approach allows us to focus on actions to strengthen resilience that lie within the health system and to identify accountable parties or institutions. For our purposes we will delineate the health system from the wider ecosystem according to the HSPA Framework. The health system boundaries of the HSPA Framework are largely adopted as per the Murray & Frenk (2000) definition of the health system as "health actions … whose primary intent is to improve or maintain health". This includes "classical" health services as well as preventive care, health promotion and all activities encompassed within public health (see Section 2.2).

Section 2.2: The HSPA Framework page 43

Assessing the severity of the shock

Resilience also needs to be understood in the context of the severity of the shock it is facing. Some shocks are minor and would be expected to be easily absorbed by the health system, causing minimal, if any, disruption. The more severe a shock is, the more disruption it is likely to cause. The most severe shocks would be expected to cause the most severe disruption (UNDRR, 2023).

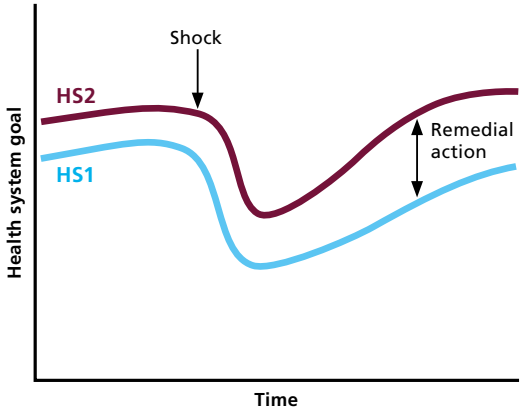
Assessing the impact of a shock on health system resilience

The impact of a shock on the health system is therefore determined by three variables: the health system itself, the larger ecosystem and the severity of the shock. The aim of improving health system resilience is to minimize the impact of a shock. This results in the following relationship:

Min(impact) = f(S, HS, LE),
where S = severity of shock, HS = health system, LE = larger ecosystem

Given a constant severity of shock and larger ecosystem, a health system that performs better is likely to minimize the impact of the shock and therefore be more resilient (Figure 2.1.1, page 35). To improve the health system, remedial action should be targeted at health system weaknesses in context of a shock.

Figure 2.1.1 Improvement in health system performance improves health system resilience



Adapted from EU Expert Group on Health Systems Performance Assessment, 2020

Notes: (HS1) Health system performance, understood through analysis of health system goals, before the resilience test and (HS2) after health system weaknesses identified through the resilience test have been addressed through remedial action.

This means that for the purpose of improving resilience it is more helpful to understand health system weaknesses in context of a shock scenario with the aim of developing remedial action, than attempting to understand overall health system resilience.

Likely health system weaknesses include: health system functions and sub-functions with existing fragilities (OECD & European Union, 2020); functions likely to be particularly strained when affected by a shock; functions affected by spill-over effects from other functions; or a combination of the above. On the other hand, an understanding of health system strengths is also helpful when designing effective remedial action. In the context of a shock, an understanding of health system strengths rules out areas for remedial action and may help identify lessons for successful policy change. Therefore, the resilience test methodology outlined by this handbook identifies top strengths and weaknesses of the health system in relation to a shock scenario at different stages of the shock cycle.

Using evidence to understand resilience

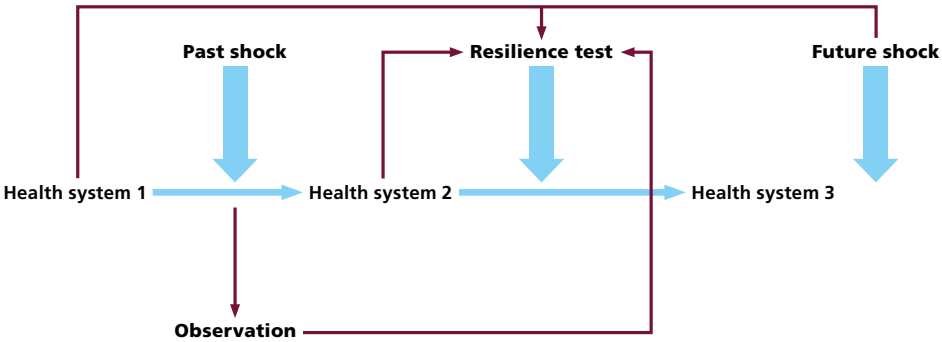
For the resilience testing methodology outlined in this handbook, quantitative and qualitative indicators are used to describe the current health system and to analyse how a health system has functioned across the stages of a shock cycle during past shocks. This information informs the background materials that are used to prepare for the resilience dialogue (see Section 1.2). During the resilience dialogue, participants draw on their expert opinions to add further qualitative or quantitative information, informed by their experiences of working within the health system. The resilience dialogue uses current and past performance indicators to inform assessment of the hypothetical future performance of the health system during a shock. Lessons learned from the resilience test, and resulting remedial action, are intended to help adapt and transform a health system so it becomes more resilient. The resilience test process may therefore replicate a shock cycle, including the transformative phases of recovery and learning, without requiring the system to endure an actual shock.

Section 1.2: The resilience testing process page 5

Two aspects should be considered by the facilitators and the participants. First, while examining the past can be valuable, systems are dynamic; systems may have learned from previous crises or experienced lasting effect, potentially leading to

different system behaviours. For example, the changes in data and institutional arrangements after the COVID-19 pandemic may reduce the time taken to respond to the threat. Telehealth may be more prevalent and the expectation of when vaccines may be available different (OECD, 2023k). Second, increased public debt relative to gross domestic product (GDP) may alter the decisions around social support programmes. This can be seen in Figure 2.1.2, where we observe what happens to the health system 1 with a shock. The health system learns as part of the shock cycle (health system 2), and we undertake the resilience test to improve that health system (delivering health system 3).

Figure 2.1.2 Conceptual framework of past shocks and the resilience test



An example of this process is the experience of some countries with the previous infectious diseases shocks. For example, the Republic of Korea was able to respond quickly to the COVID-19 pandemic with processes and resources that had been developed because of the experiences with MERS. While these included the availability of resources with surge capacity, it also included legislative changes and development of the ability to combine multiple pieces of data to produce value information for track and trace requirements (Yang et al., 2021; Yang, Noh, Song, Cheong, & Kim, 2021; OECD, 2023k). These changes reduced the vulnerability to similar shocks. Another suggestion is that the financial support during 2020 and 2021 aimed at the self-employed benefited from the knowledge gained during the global financial crisis (OECD, 2022b). The second aspect is the importance of appreciating that adaptation and transformation will occur when the shock is sufficiently large, and the exact form of the adaptation and transformation can be difficult to predict. Even if the exact transformation cannot be predicted, anticipating some of the obstacles to transformation and how safety, quality and equity can be preserved will be a useful exercise by the facilitator and the participants.

Anticipating some of the obstacles to transformation and how safety, quality and equity can be preserved will be a useful exercise.

Typology of shocks

As discussed above, much of the recent thinking on health systems resilience has emerged in response to the financial crisis and major outbreaks of infectious disease. Consequently, the literature is dominated by these types of shock. The EU Expert Group on Health Systems Performance Assessment's 2019 survey on European countries' resilience plans (EU Expert Group on Health Systems Performance Assessment, 2020) found that, among countries with health systems resilience plans in place, 93% included epidemiological shocks, 70% included environmental shocks, and 46% included economic shocks. Less than one third included technological, societal or geopolitical shocks.

While the risk of financial, environmental and economic crises remains high, there is a wide range of shocks that have the potential to impact the health of a population, directly and via the socioeconomic and political environment within which health systems operate (European Observatory on Health Systems and Policies & McKee, 2021). While Regulation (EU) 2022/2371 on serious cross-border threats to health relates specifically to threats of biological, chemical and environmental origin, recent crises have demonstrated that other types of shock can also impact on health systems and the health status of a population.

These shocks can vary in their nature, severity, duration, impact, frequency and impact on morbidity and mortality, and the supply of and/or demand for health services (EU Expert Group on Health Systems Performance Assessment, 2020) and can cause wider economic and social disruption. It is likely that, as the risk and frequency of shocks increase, so too will the potential for shocks to interact in terms of their impact on health systems, provoking both supply and demand challenges and impacting the inputs, outputs and outcomes of a health system (Expert Panel on effective ways of investing in Health, 2020).

Below, we outline and categorize some of the shocks which have the potential to impact on the health of the population and/or the functioning of national and international health systems, noting that a number of shocks will have an impact across several categories. The categorization of these shocks has been adapted from the framework developed by the World Economic Forum in their annual survey of global risks (World Economic Forum, 2023), which identifies societal, economic, environmental, geopolitical and technological shocks. To these we have added a category of disease outbreak, to reflect the direct impact that hazards such as infectious disease outbreaks, epidemics and pandemics have on demand for health services and systems.

The examples of shocks outlined below are not intended to be a comprehensive list of shocks. Instead, the aim is to promote thinking on the types of shocks which have the potential to test the resilience of health systems, either through a direct impact on the health of the population or by challenging the ability of a health system to continue to provide quality healthcare.

Disease outbreaks

Disease outbreaks, which include pathogen-related shocks such as virus outbreaks and antimicrobial resistance (AMR), are a broad category. These shocks are closely related to serious cross-border threats in the sense of EU Regulation 2022/2371 and can overlap with, or result from, other types of shock listed below, while having a distinct place in terms of existing health system preparedness efforts. Instances of infectious disease outbreaks have been rising exponentially, from fewer than 100 per year before 1980 to more than 400 per year since 2000 (World Bank, 2022). The COVID-19 pandemic demonstrated the potential catastrophic impact that infectious disease can pose to the functioning of health services and health service delivery on an international scale.

At the international level, countries respond to health emergencies drawing on provisions of the International Health Regulations, which provide for international cooperation to prevent, control and respond to international threats of disease (EU Expert Group on Health Systems Performance Assessment, 2020). In the European region, the European Commission proposed a new health security framework fit for the health challenges of tomorrow in response to the COVID-19 pandemic.

Examples of disease outbreaks

- Outbreak of new or re-emerging infectious disease
- Emergence of large-scale antimicrobial resistance
- Foodborne disease

The new framework strengthens the EU architecture for prevention, preparedness and response to serious cross-border health threats through the new Regulation (EU) 2022/2371 and extends the role of ECDC and EMA through the new mandates (European Commission, 2024).

Several European institutions are responsible for monitoring and responding to health emergencies. These include (adapted from Anderson, Forman & Mossialos (2021)):

- **The EU Health Emergency Preparedness and Response Authority (HERA)**, launched in 2021, responsible for preventing, detecting and rapidly responding to health emergencies. In an emergency outbreak, HERA is responsible for ensuring the development, production and distribution of medicines, vaccines and other medical countermeasures.
- **The Directorate-General for Health and Food Safety (DG-SANTE)**, responsible for EU policy on health, which hosts the Health Security Committee (HSC) and provides forums to coordinate and share best practice for preparedness and response activities.
- **The Directorate-General for Research and Innovation (DG-RTD)**, responsible for EU policy on research, science and innovation, which includes biomedical and health-related research.
- **The European Centre for Disease Prevention and Control (ECDC)**, responsible for communicable disease surveillance, provision of scientific advice on communicable disease epidemiology, prevention and control, and training of public health professionals.
- **The European Medicines Agency (EMA)**, responsible for assessing available technologies including vaccines and medicines.
- **The EU Civil Protection Mechanism** responds to requests for assistance from countries that experience emergencies or disasters, channelled through the Emergency Response Coordination Centre (ERCC), and carried out through the rescEU programme. While originally envisaged as responding to environmental disasters, it played a key role in coordinating the delivery of medical countermeasures and equipment to countries in need during the COVID-19 pandemic.

Societal shocks

Societal shocks include all domestic shocks that threaten or impact on the function and cohesion of a particular society. Societal shocks impact both on top-down governance of health systems and on how societies engage with health systems and health service providers.

Examples of societal shocks

Political fragility and instability

- Political and/or constitutional crisis
- Failure of Rule of Law
- Acute failure of essential services

Threats to social cohesion

- Widespread and targeted disinformation
- Employment and livelihood crisis
- Collapse of social security systems
- Serious criminal acts

Recent societal shocks include the Russian invasion of Ukraine, which has effected a global cost-of-living crisis (ranked as the most severe global risk over the next two years by the World Economic Forum's Global Risk Report) and which saw the FAO Food Price Index reaching an all-time high in March 2022, as well as domestic political instability in a number of EU Member States, which continues to pose threats across Europe.

Economic shocks

The impact of economic shocks and financial crises on health systems has been well documented. The 2009 sovereign debt crisis and the austerity policies adopted by many countries impacted on health and health systems in two key ways (Stuckler et al., 2017):

1. a "social risk effect" of increasing unemployment, poverty, homelessness and other risk factors for poor health, while simultaneously scaling back on social protection programmes which can mitigate the risk of these factors to health; and
2. a "healthcare effect" as cuts to healthcare services and reductions in health coverage increased OOP expenditure and restricted access to care.

In the European context, the legacy of the 2009 sovereign debt crisis persists, with enduring macroeconomic imbalances, high public deficits in a number of states, and post-crisis vulnerabilities, including societal inequality, youth unemployment and high in-work poverty risk levels (Szczepanski, 2019).

Examples of economic shocks

Structural instability

- Severe commodity shocks
- Supply chain disruption
- Collapse of a systematically important industry
- Employment crisis

Financial and macroeconomic instability

- Debt crisis/default
- Rapid price rises
- Financial crisis

Environmental shocks

Climate change, which the WHO has called the single biggest health threat facing humanity, and the environmental crises that come in its wake, such as extreme weather events, threaten the ability of health systems to provide quality healthcare by, simultaneously, exacerbating existing barriers to accessing health services, increasing the existing burden of disease, and undermining many of the social determinants of good health, such as livelihoods, equality and access to healthcare (WHO, 2021a).

Climate change is accelerating, and its impacts are increasing, with 2011–2020 the warmest decade ever recorded (Global Challenges Foundation, 2021). In their 2023 Global Risks report, the World Economic Forum identified environmental threats as four of the five most critical global threats over the next 10 years, with

Examples of environmental shocks

Environmental degradation

- Ecosystem collapse
- Natural resource crises
- Crop failure
- Acute water shortages
- Water poisoning

Environmental disasters

- Earthquake
- Extreme weather events
- Asteroid impact
- Volcanic eruption
- Geomagnetic storm

concerns about the political feasibility of taking necessary action to mitigate and adapt to global warming seen as a key challenge (World Economic Forum, 2023).

In Europe, countries are experiencing a warming trend, with all the warmest years on record documented during the last decade. Europe has seen an increase in the frequency, duration and severity of heatwaves; changes in water availability; and an increase in vector-borne diseases. European countries have had to manage increasing numbers of natural disasters resulting from climate change, such as the record rainfall and flooding in Western Europe in July 2021, which resulted in over 200 fatalities, and widespread fires in Southern Europe in 2023, while also responding to changes in patterns of disease transmission, demonstrated by the increase in locally acquired human cases of West Nile virus infections seen in EU Member States and EU neighbouring countries (Semenza & Paz, 2021).

Geopolitical shocks

Geopolitical shocks, including interstate and intrastate conflicts (including civil wars), have, during the twenty-first century, largely had indirect effects on Europe, with conflict-displaced individuals seeking relative safety in Europe. The 2022 Russian invasion of Ukraine was a reminder that the threat of conflict, whether the emergence of new conflicts or the resurgence of past conflicts, remains ever-present within Europe, with the potential to impact on health outcomes by increasing health needs while decreasing opportunities to access healthcare (Martineau et al., 2017).

The consequences of these events in Ukraine have compounded existing geopolitical shocks facing the European region, which is still dealing with the ongoing impact and after-effects of challenges including the COVID-19 pandemic, impacting on supply chains and contributing to a jump in the price of everyday commodities. In their Global Risk Report, the World Economic Forum ranked geoeconomic confrontation as the third most critical global risk over the next two years. This is a recognition that the weaponization of economic policy, between global powers integrated through trade, technology and financial systems, may highlight vulnerabilities for the public and private sectors (World Economic Forum, 2023).

Examples of geopolitical shocks

- Interstate conflict, including nuclear war
- Intrastate conflict, including civil war
- Mass migration
- Collapse of international order
- Geo-economic confrontations
- Geopolitical contestation of strategic resources
- State collapse
- Terrorist attacks including bioterrorism

Technological shocks

In an increasingly interconnected world, the risk of technological shocks to the functioning of society and the health of populations increases. Technological shocks can refer to the hostile use of information and digital technologies, such as disinformation, cyberattacks and failure of critical information infrastructure, as well as challenges relating to the interaction of populations with technology, including the potential for adverse effects of technological developments and digital exclusion.

In addition to these direct threats, as the use of digital technologies in everyday life increases, the risk of digital exclusion leading to social exclusion and widening social and geographical inequalities also increases as digitally excluded individuals and communities are unable to access essential services, such as healthcare and education. The European Parliament, in its review of the impact of COVID-19 on EU cohesion policy, concluded that rural areas are likely to face lasting

Examples of technological shocks

- Breakdown of critical information infrastructure
- Internet outage
- Failure of cybersecurity measures
- Failure of technology governance
- Power failures and blackouts
- Hostile artificial intelligence

challenges from digitization pressures (Böhme et al., 2022), while research from the United Kingdom has shown substantial overlap between individuals at risk of digital exclusion and those vulnerable to poorer health outcomes from COVID-19 (Sounderajah et al., 2021). The risks posed by digital exclusion have been particularly acute for education, which in many countries went online during the COVID-19 pandemic. This development, while essential for maintaining access to education for many children, also resulted in further disadvantage for vulnerable children, especially those living in poverty or with disabilities (Zheng & Walsham, 2021).

The experiences of the COVID-19 pandemic have demonstrated the growing potential for technological shocks, such as failure of information systems, to impact not just the systems which rely on these technologies, but whole societies.

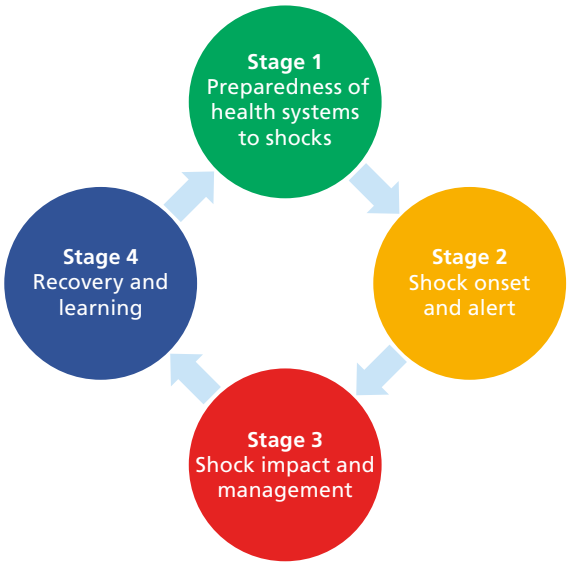
The shock cycle

The European Observatory on Health Systems and Policies, in their review of key concepts and strategies of health systems resilience, summarized and visualized how health systems experience a shock in the four-stage shock cycle, with each stage presenting opportunities for enhancing resilience (Thomas et al., 2020).

The cycle consists of the following stages (Figure 2.1.3):

- **Stage 1: Preparedness**, which includes a system's vulnerability to challenges and its readiness for when a shock hits.
- **Stage 2: Shock onset and alert**, during which the focus for a health system is on timely identification of the onset and nature of the shock.
- **Stage 3: Shock impact and management**, during which the system absorbs the shock and, where necessary, adapts and transforms to ensure that health system goals are still achieved.
- **Stage 4: Recovery and learning**, at which point there is a return to a kind of normality, which may account for changes which have resulted from the legacy of the shock.

Figure 2.1.3 The four stages of the shock cycle



The actions taken by health systems actors at each stage of the shock cycle will vary and each stage will require different responsive capacities, including the following (adapted from Blanchet et al., 2017; EU Expert Group on Health Systems Performance Assessment, 2020):

1. **Preventative or forecasting capacity**: the ability of a health system to proactively foresee a shock and minimize its potential future impact;
2. **Absorptive capacity**: the capacity of a health system to continue to deliver the same level of healthcare services using the same level of resources and capacities despite the shock;
3. **Adaptive capacity**: the capacity of a health system to make organizational adaptations which allow actors to continue to deliver the same level of healthcare services with fewer or different resources; and
4. **Transformative capacity**: the capacity of a health system to transform its structure and functioning to respond to changes in the operating environment.

Section 2.4 of this handbook contains an example of how, alongside indicators and feedback loops, these responsive capacities can be understood in the context of COVID-19.

Section 2.4: The impact of shocks and the capacity to respond page 95

2.2 The HSPA Framework

Introduction

A resilient health system is one that, when faced with a shock, can continue to provide essential health services to a population, while limiting the impact of disruption on performance and, ultimately, continue to work towards achieving the goals of the system.

Ensuring a strong and resilient health system requires policy-makers to identify, prioritize and resource policy actions based on the best available evidence. This requires health systems to be monitored and regularly assessed, in order to identify their strengths and any shortcomings.

Ensuring a strong and resilient health system requires policy-makers to identify, prioritize and resource policy actions.

A key initial stage of any assessment will involve defining the boundaries of the health system. For this purpose, we use the global HSPA Framework (Rajan et al., 2023), referred to as the "HSPA Framework" in this handbook, which maps out the constituent parts of a health system as well as assessment areas which can be used to test the strength or resilience of the system. The HSPA Framework: 1) brings together existing HSPA efforts in a coherent way for policy-makers to examine the performance of each of the health system functions routinely; 2) outlines the linkages that exist between the performance of individual functions and of the overall health system; and 3) can be used to assess health system resilience through the prism of performance assessment, making it possible to identify strengths and weaknesses and thus draw attention to points of vulnerability to future shocks to the health system. Box 2.2.1 identifies the key features of the HSPA Framework.

Box 2.2.1 Key features of the HSPA Framework

1. While other definitions of a health system are possible, it adopts an explicit health system definition and scope with clear boundaries;
2. It sets out the main health system goals and outcomes;
3. It identifies and describes the health system's functions;
4. It provides a framework for assessing the performance of each function;
5. It outlines the relationship between the performance of each function and the attainment of health system goals and outcomes.

Other HSPA frameworks have not been piloted, but could be used for the resilience testing methodology, including the renewed OECD HSPA Framework (OECD, 2024) or national HSPA frameworks.

The HSPA Framework assesses actions only within the health system (see Box 2.2.2). The broader societal goals to which the health system contributes are defined by the HSPA Framework, but are depicted outside the health system. This narrower approach has been taken so that the Framework can be used as an instrument to promote accountability of different health system actors for the performance of the system and propose ways to improve it.

Box 2.2.2 The definition of a health system used in the HSPA Framework

The HSPA Framework defines health system boundaries to include "classical" health services as well as preventive care, health promotion and all activities encompassed within public health.

These health system boundaries are largely adopted as per the Murray & Frenk (2000) definition of the health system as "health actions … whose primary intent is to improve or maintain health". "Improving and maintaining health" is seen as explicitly encompassing services that address public health, staying within the traditional healthcare remit.

Explaining the HSPA Framework

The HSPA Framework visualizes the components of a health system: its functions; their corresponding sub-functions; intermediate objectives; and the final goals of the health system. Assessment areas for each function are also included. Performance and resilience links, running between the components, identify pathways along which health system functions interact with and influence one another to achieve the final goals, such as health improvement and equity. These components of the HSPA Framework are summarized in Box 2.2.3 on page 45.

What is a health system function?

The four well established health system functions (governance, financing, resource generation and service delivery) are at the core of the HSPA Framework (see Figure 2.2.1 on page 46) (WHO, 2000).

As in the traditional WHO health system frameworks, these functions are linked to the intermediate objectives and final goals of the health system. In the HSPA Framework, health system functions reflect the dynamic nature of a health system organization and its processes. The four health system functions are therefore shown on the left-hand side of the Framework (in the grey area), with the structural linkages that connect these functions illustrated by solid arrows.

What is a sub-function?

For the purpose of assessing health system performance, the functions are further disaggregated into *sub-functions*, which pinpoint more specific areas for action. All sub-functions meet the following criteria. They:

- logically reflect the core health system functions, preferably in self-contained, complementary components;
- identify specific actions or necessary elements of each function that are conducive to the achievement of the high-level health system goals;

- have the potential to hold specific actors within the health system accountable for actions and processes;
- can be described or measured, monitored and assessed in relation to high-level goals; and
- ensure consistency with existing HSPA efforts.

What is an assessment area?

In the HSPA Framework, functions and sub-functions are linked to *assessment areas*. These assessment areas can be used to evaluate the extent to which the functions and sub-functions are achieving their objectives. This is reflected in Figure 2.2.2 on page 47, which shows the complete HSPA Framework.

Each assessment area was developed with health system performance metrics in mind. While the conceptual work (Papanicolas et al., 2022) has compiled a selection of indicative measures which could be used for assessment, this handbook provides more specific indicators, which relate specifically to health system resilience, and discuss their use and possible interpretation.

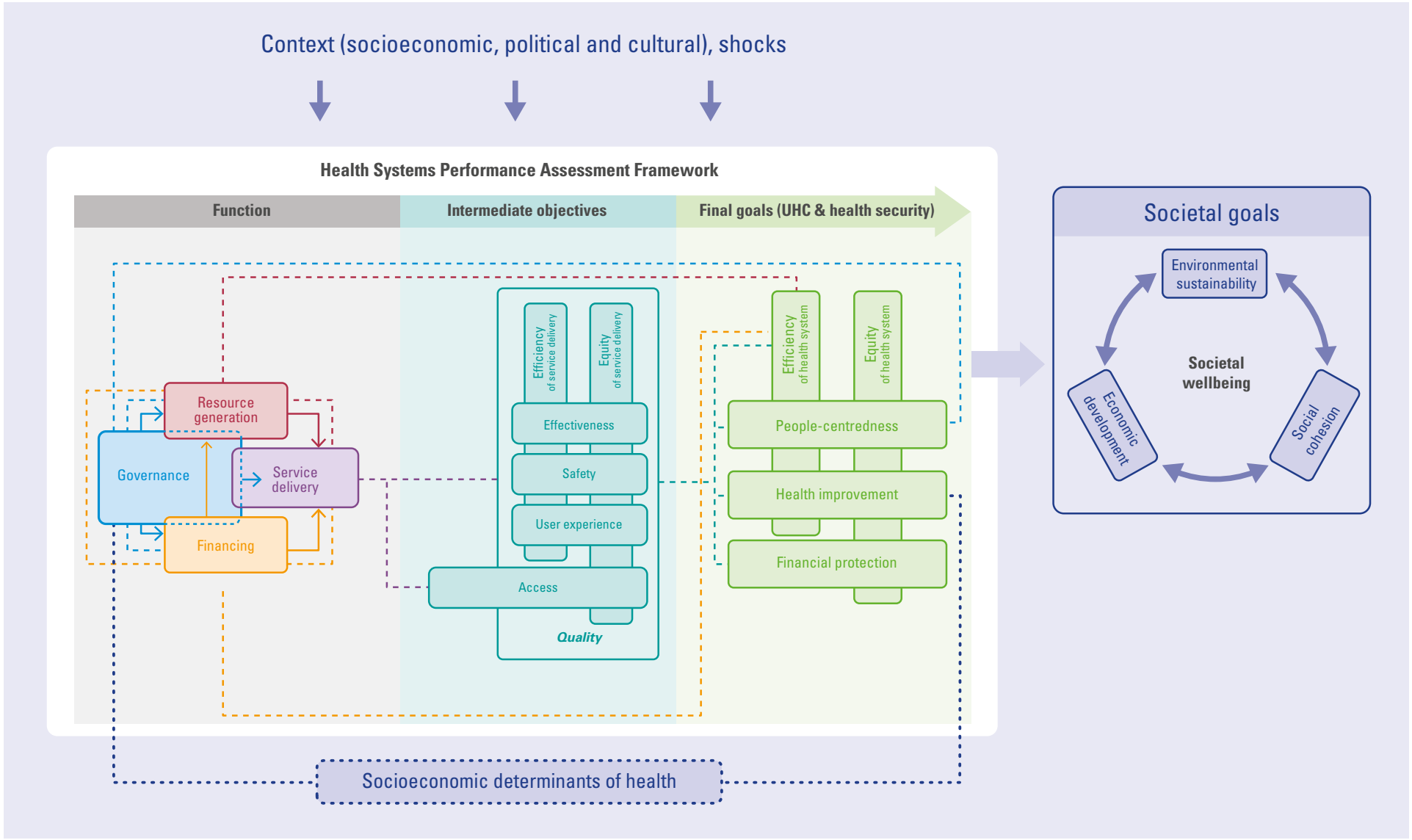
Box 2.2.3 Sub-functions, assessment areas and indicative measures

Sub-functions: the core actions within a function, which determine function-level performance, and influence functions' contribution to overall system performance.

Assessment areas: specifically formulated topical areas, which need to be adequately appraised to assess function or sub-function performance.

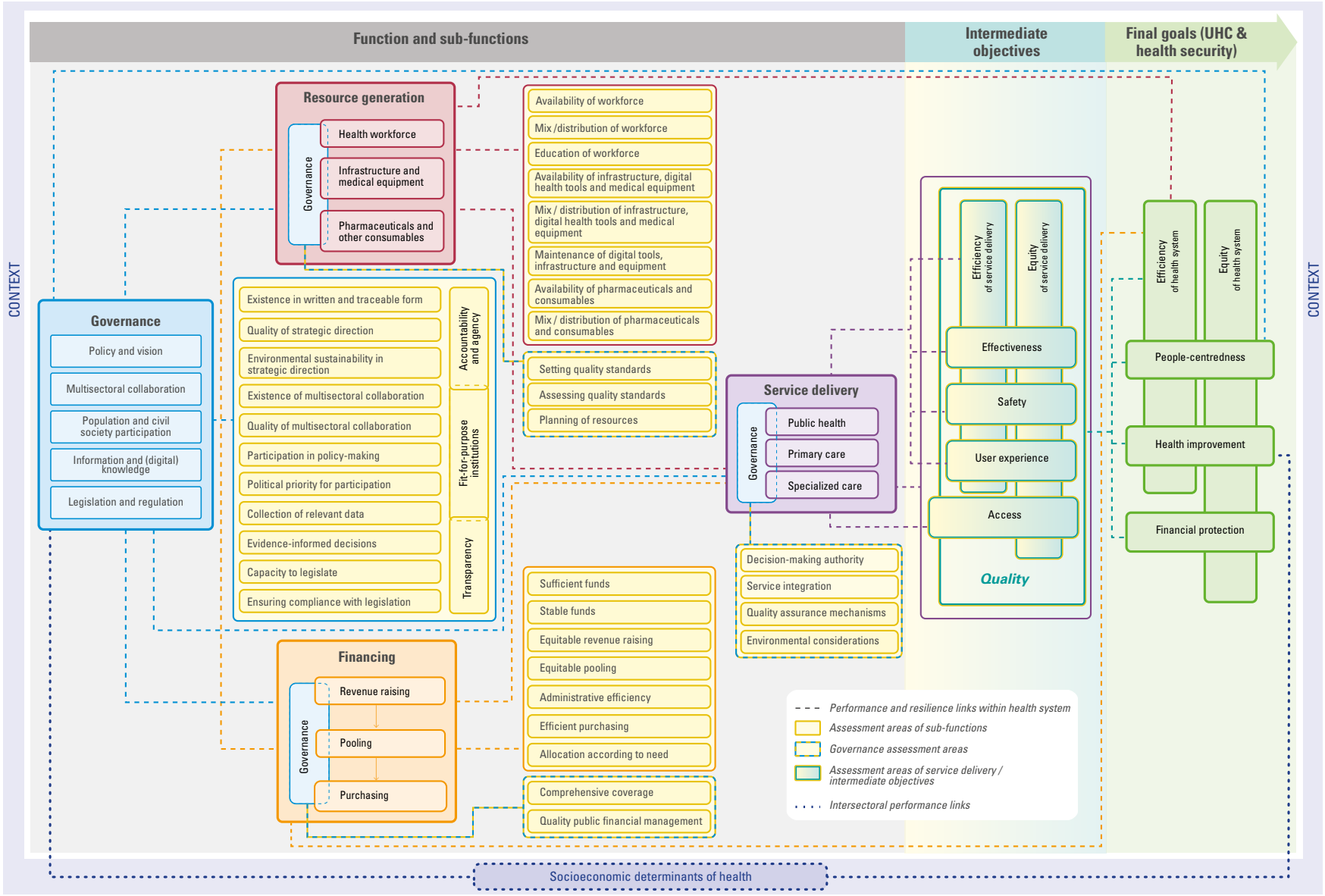
Indicative measures: proposed indicators based on publicly available data sets and/or common health system assessment (qualitative) content. They do not necessarily provide the full picture of function or sub-function performance and may need to be complemented by additional information.

Figure 2.2.1 HSPA Framework



Source: WHO / European Observatory on Health Systems and Policies / UHC2030 HSA TWG

Figure 2.2.2 HSPA Framework including assessment areas



Source: WHO / European Observatory on Health Systems and Policies / UHC2030 HSA TWG

Health system functions

Governance

Governance is conceptualized in the HSPA Framework in two ways: 1) as an overarching, system-level function, and 2) as a sub-function within the functions of resource generation, financing and service delivery. The principal differentiating factor is whether a governance action or activity affects the health system as a whole (overarching governance) or whether it is specific to one of the other health system functions. When assessing the governance function, both overall system-wide governance as well as the governance issues relating to the other three functions need to be examined to comprehend whether the governance function is performing well and is also enabling the system to perform well.

The overarching governance function is placed at the very left of the HSPA Framework, with the governance component of other functions sitting cross-sectionally within each of financing, resource generation and service delivery respectively (in a blue box). This positioning demonstrates how governance brings together and enables all other health system functions. There are four sub-functions of the overarching governance function:

- **Policy and vision**, which focuses on the capability and resource capacity needed to provide a strategic vision for the health sector to achieve universal health coverage and health security.
- **Multisectoral collaboration**, which relates to the ability to collaborate with different government sectors and actors, including private entities, to achieve common policy outcomes beneficial for health, the environment and sustainable development.
- **Population and civil society engagement**, which revolves around the possibility for key stakeholders to contribute meaningfully to health policy decisions. The term "civil society" is used broadly to include professional associations, non-profit coalitions formed by private sector groups, and others.
- **Information and (digital) knowledge**, which refers to data governance and evidence-informed decision-making. The word "digital" is placed in brackets to indicate that not all knowledge and information has a digital component, despite the trend towards digitalization in recent decades.
- **Legislation and regulation**, which refers to the capacity to develop laws and rules, and enforce them through regulatory measures to ensure compliance across the public and private sectors.

In addition to the assessment areas for the overarching governance function (in the yellow box to the right of governance), the HSPA Framework identifies three key outcomes of a well governed health system: transparency; accountability and agency; and fit-for-purpose institutions (shown to the right of the assessment areas for governance within the yellow box). These outcomes represent good performance of the overarching governance of the health system.

Transparency refers to the "public availability of usable information", which ultimately "allows scrutiny of public actors and their decisions" (Vian, 2020).

Accountability and agency are linked to the concept of empowerment and are usually viewed in terms of how well users of a health system can proactively seek services when needed and voice their views and experiences to ensure responsive health policy-making.

A well governed health system is built on the foundations of fit-for-purpose institutions. This outcome refers to the existence of functional institutions that enable the achievement of public health goals, and which involve the resources and support required to undertake the activities needed to achieve these goals.

Resource generation

Resource generation ensures that a health system has all the inputs it needs to operate. These inputs include health workers, medical devices, medical equipment, infrastructure, digital platforms, pharmaceuticals, vaccines, consumables and medical supplies. This function describes how inputs are produced, procured, made available or maintained at the systems level. The way that the resources are brought together and used is reflected in the service delivery function (see Service delivery).

Service delivery
page 50

In the HSPA Framework, resource generation is positioned between governance and service delivery to illustrate that the governance function enables the resource generation function, and resource generation feeds into, and enables, the service delivery function. Ultimately the influence of resource generation on the intermediate and final health system goals works through service delivery; that is, its impacts on health system performance hinge on providing the right resources at the right time for optimal use within the service delivery function.

Although the impact of resource generation on final health system goals is mostly indirect, a notable exception is the direct link between resource generation and the final goal of efficiency. There are three main sub-functions of the resource generation function:

- **Health workforce**, defined as "all persons engaged in actions whose primary intent is to enhance health", thereby including all actors involved in both formal and informal activities undertaken in the health sector.
- **Infrastructure and medical equipment**, which are physical resources that give health providers and users the tools needed to provide effective and efficient health services. This sub-function is characterized by the large capital investments required to build health infrastructure and equip health facilities, as well as the recurrent costs for maintenance, which differentiate it from the pharmaceuticals and other consumables sub-function.
- **Pharmaceuticals and other consumables**, which are either consumed once, or, when used more than once, are considered disposable.

Governance of resource generation affects all three sub-functions, and refers to a range of tasks associated with planning for resources. These include health workforce planning and forecasting; setting quality standards, such as self-regulation of health providers by professional associations; and monitoring those standards. It also includes ensuring data interoperability and standardization efforts of various health information systems.

Financing

Financing constitutes an integral function of a health system: raising and spending money on healthcare. However, its remit is also in making funding available where needed and creating appropriate financial incentives for providers to deliver accessible and effective health services.

Financing is closely linked to other main functions, including through providing monetary resources for operational aspects of governance, resource generation and service delivery. It is also instrumental in achieving health system goals and is particularly closely linked to ensuring efficiency of health systems and (through service delivery) financial protection.

Financing has three well established sub-functions, which together describe the flow of monetary resources through the health system:

- **Revenue raising**, which refers to the ways in which money is brought into the health system. A successful revenue raising sub-function should ensure that a health system has sufficient resources to meet healthcare needs; that those resources are stable, predictable and able to cope with shocks; and that they are collected in an equitable manner so that the burden of financing does not fall on the poor or sick.
- **Pooling resources**, which refers to the accumulation of prepaid funds that can be used to purchase goods and services on behalf of a population. Pooling resources differs from revenue raising as it refers to redistribution of funds across a particular population.
- **Purchasing goods and services**, which refers to payers using funds to pay for healthcare on behalf of a population. Purchasing differs from procurement as it refers specifically to payment for services or items, such as medicines, used in the context of care provision, while procurement refers to the process of obtaining inputs.

Governance of financing refers to the choices and factors that determine if the flow of funds in the health system is fit for purpose and performs adequately. The key aspects of governance of financing are policies relating to benefits design and service coverage, as well as public financial management (PFM).

Service delivery

Service delivery is the most visible and tangible function for the population – it is where health services are provided and thus where the governance, resources and financing come together. For this reason, it is placed to the right of the other three functions and can be seen as their collective outcome. The impact on system goals of actions and interventions taking place within governance, resource generation or financing happen largely through the service delivery function.

Service delivery is the most visible and tangible function [of a health system] for the population.

Service delivery has three main sub-functions. The boundaries between these sub-functions are flexible and have become increasingly blurred, reflecting national and regional differences in the provision of healthcare services as well as developments in the delivery of continuity and comprehensiveness of care. With that degree of flexibility and overlap in mind, service delivery sub-functions have been defined as:

- **Public health**, which can cover the spectrum of health and well-being to fulfill the preventative care needs of the population. Considerable variation

can be seen in this sub-function in terms of the operational areas and activities covered, which can include disease prevention, health promotion, community care, emergency preparedness, social participation and communication.

- **Primary care**, which is commonly understood to refer to the first point of contact for unspecified and common health problems.
- **Specialist care**, which refers to secondary and tertiary care, usually provided in hospitals or specialist outpatient settings.

Governance of service delivery in the HSPA Framework refers to planning and decision-making for health services, including ensuring health service integration, quality assurance mechanisms in service provision, and environmental considerations. The delineation towards overall systems governance lies in the specificity of the decision-making – when it is for the delivery of health services, and not for the system as a whole, then it would be part of the governance of service delivery.

Intermediate objectives

The intermediate objectives are indicative of the performance of service delivery and provide an important link between the performance of the health system functions and the attainment of the final health system goals. These intermediate objectives are the following:

- **Effectiveness**: The extent to which a service achieves the desired results or outcomes, at the patient, population or organizational level.
- **Safety**: The extent to which healthcare processes avoid, prevent and ameliorate adverse outcomes or injuries that stem from the processes of healthcare itself.
- **User experience**: The extent to which the service user perspective and experience of healthcare is measured and valued as an outcome of service delivery.
- **Access**: The extent to which services are available and accessible in a timely manner that does not undermine financial protection.
- **Equity of service delivery**: The extent to which the distribution of healthcare and its benefits among a population is fair. This objective implies that, in some circumstances, individuals will receive more care than others to reflect differences in their ability to benefit or their particular needs.
- **Efficiency of service delivery**: The relationship between a specific product (output) of the health system and the resources (inputs) used to create the product.

The position of the service delivery function, as an interface across which governance, resource generation and financing operate, means that the intermediate objectives largely reflect performance of service delivery. Some of the intermediate objectives describe the service delivery function specifically, such as effectiveness, safety and user experience, while access, equity and efficiency reflect a broader interaction of all of the health system functions working through service delivery.

Final goals

The five health system goals are shown on the right side of the HSPA Framework (in the green area). These are: health system improvement, people-centredness and financial protection, and the cross-cutting goals of equity and efficiency. Efficiency is depicted as a cross-cutting goal because it requires attainment of effectiveness, safety and user experience at the lowest costs, while equity is depicted as cross-cutting because it requires fair distribution of effectiveness, safety, user experience and access. These goals are defined in Table 2.2.2 below.

Table 2.2.2 The final goals of a health system

FINAL GOAL	DEFINITION
People-centredness	Approach to care that consciously adopts the perspectives of individuals, carers, families and communities as participants in, and beneficiaries of, trusted health systems that are organized around the comprehensive needs of people rather than individual diseases, and respects social preferences
Health improvement	Health improvement refers to the improvement of the health of the population (where health refers to health at different stages of the life cycle, morbidity and premature mortality)
Financial protection	Safeguarding people against the financial hardship associated with paying for health services
Efficiency of the health system (cross-cutting)	Maximizing the final health system objectives (health improvement, people centredness and financial protection) given the resources available.
Equity of the health system (cross-cutting)	The distribution of health improvement and people-centredness across the population as a whole, as well as the level of financial protection.

Societal goals

Understanding that the health system does not operate in isolation has driven a shift in thinking around the extent to which health systems contribute to larger societal goals through interface with communities, the economy and the environment. Societal goals are therefore illustrated and defined in the HSPA Framework, but are depicted as sitting outside the health system. The overarching societal goal of societal well-being represents and aggregates measures of quality of life, which is not directly assessed through the HSPA Framework, but acts as a shared understanding of value that embraces the health system in its entirety, including preventative services and other public health functions. The three interconnected sub-goals of societal well-being are defined in Table 2.2.3 on page 53.

Table 2.2.3 The sub-goals of societal well-being

SOCIETAL GOAL	DEFINITION
Economic development	A vital societal goal, which enables higher living standards, job creation and increased innovation, which standard metrics often fail to capture.
Social cohesion	Social cohesion encompasses eliminating discrimination, reducing income inequality and ensuring equal access to things like education, healthcare and opportunities.
Environmental sustainability	This refers to the interconnectedness of environmental concerns with broader sustainability objectives. It emphasizes a balanced and inclusive approach to economic growth that seeks to meet the needs of present and future generations without compromising natural resources and global ecosystems.

Performance and resilience links

The HSPA Framework depicts a small number of direct links between specific functions and goals. These links are purposefully labelled as "performance and resilience links"; along with high-performing functions, the strength of the linkages – between functions, intermediate objectives and goals – fosters synergies across the system for high system-level performance, and those linkages lend resilience to the system as well.

These links include the following:

1. A link from the governance function, which exits the health system and travels through the social and economic determinants of health to impact on health improvement. This direct link acknowledges the potential of the governance function to influence overall population health by collaborating with other sectors and making the case for the co-benefits of addressing health determinants.
2. A direct link from the governance function to people-centredness. As a goal which captures how far the health system adequately addresses people's non-medical health needs, it is heavily influenced by the way the health system is designed, a core action within the governance function.
3. A single direct link from the resource generation function to the final goal of health system efficiency. This demonstrates how the availability, mix, distribution and quality of inputs, all created by the resource generation function, will directly influence how efficient the overall system is, regardless of whether and how those inputs are used in the service delivery function.
4. A link from the financing function to health system efficiency. This demonstrates how financing affects the valuation of the resources available, for example, by determining the cost and prices of inputs, directly influencing the efficiency of the system.
5. Finally, the influence of service delivery on the intermediate objectives of the health system, namely quality and access, can also be seen as a direct link, given that the intermediate objectives and service delivery assessment areas are one and the same. The health system's intermediate objectives influence, in turn, all final goals.

Influence of context and socioeconomic determinants on health system functions performance

The HSPA Framework considers two ways in which the social, economic, political and cultural context can impact the system: directly, through an impact on the performance of the health system functions, and indirectly, through the socioeconomic determinants of health.

The socioeconomic, political and cultural contexts are represented outside the core HSPA Framework as both inputs and outputs of a health system. While measuring the role of socioeconomic determinants of health falls largely outside the scope of the HSPA Framework, some of these determinants, as well as the socioeconomic, political and cultural contexts, are included in the HSPA Framework through the health systems governance function, which has a key role in affecting socioeconomic determinants of health by working together with other sectors to promote health.

Assessing resilience using the HSPA Framework and the shock cycle

Assessing the resilience of a health system offers a starting point for improving preparedness and response planning by learning from experiences of how the system has coped with shocks. However, despite the importance of performing such assessments, developing ways to conduct them in practice remains a major challenge (Azzopardi-Muscat et al., 2021).

Assessing the resilience of a health system offers a starting point for improving preparedness and response planning.

The premise of the HSPA Framework is that the attainment of the final goals is linked to the performance of each of the four health system functions (governance, financing, resource generation and service delivery) and their respective sub-functions. Thus, any weaknesses in the functions, sub-functions or performance and resilience links will also negatively impact on the final goals of the health system, manifesting in worsening performance overall. Consequently, health systems resilience relates to how well the key health system functions perform in the face of shocks, and therefore the extent to which the system as a whole can continue to meet its intermediate and final objectives. The HSPA Framework therefore serves as a conceptual framework that allows for systematic assessment of resilience that considers each individual part of the health system. It also prompts consideration of the links and feedback loops for potential cascading failure.

The shock cycles ensures that all stages of a shock are considered during resilience testing. This is important, as different stages of the shock cycle require different response capacities. A health system sub-function that is resilient in the first stage of the shock cycle may no longer be resilient during the second stage of the shock cycle, and vice-versa. It is therefore important to consider all aspects of the HSPA Framework at each stage of the shock cycle to ensure systematic analysis.

During resilience testing, some functions, sub-functions and assessment areas of the HSPA Framework may be more relevant to the chosen shock scenario than others. Similarly, analysis of some parts of the HSPA Framework across some stages of the shock cycle may not be feasible. It is the role of facilitators and test

organizers to systematically analyse the health system in the context of the chosen shock scenario and identify areas of the health system and shock cycle that need to be prioritized for discussion during the resilience test day (see Section 1.2). Table 2.2.4 shows an example of how the two frameworks can be used in conjunction to identify priorities for the resilience test.

Section 1.2: The resilience testing process page 5

Table 2.2.4 Example use of the HSPA Framework and the shock cycle in conjunction to identify priorities for the resilience test (marked in bold)

Function: Financing	Sub-function: Revenue raising	Assessment area #1: Sufficient funds	**Preparedness**
			Onset and alert
			Impact and management
			Recovery and learning
		Assessment area #2: Stable funds	**Preparedness**
			Onset and alert
			Impact and management
			Recovery and learning
		Assessment area #3: Equitable revenue raising	**Preparedness**
			Onset and alert
			Impact and management
			Recovery and learning

By bringing together the HSPA Framework and the shock cycle, policy-makers can locate potential areas of weakness within the health system and then assess their vulnerabilities to a particular shock. The shock cycle supports the development of actionable policy responses and recommendations by prompting policy-makers to consider how shocks are experienced within a system.

2.3 Indicators and the assessment of resilience

Assessment of resilience requires data and information

The development of actionable policies to improve resilience must be informed by data and information. Data and information comprise an important component of the resilience testing methodology. During Step 3 of the resilience testing process, research and analysis are conducted to prepare for the resilience test day and inform discussions during the day (see Section 1.2). The information that is found is summarized in the background materials. In this section, and in Section 2.4, we consider key data sources, including quantitative, qualitative, institutional and contextual indicators, which can be used to guide research and analysis when preparing a resilience test.

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Section 2.4: The impact of shocks and the capacity to respond page 95

This section contains three sub-sections:

- In the first sub-section, we discuss how indicators can be used to assess resilience in the resource generation, financing and service delivery functions of the health system, as well as the impact of shock on population health. It includes the considerations relevant to assessing resilience using these indicators across the shock cycle.
- In the second sub-section, we address health system governance, describing some of the governance and organizational features of health systems that may be associated with strengthening or weakening responses to shocks.
- In the third sub-section, we discuss the contextual factors which sit outside the health system, but which can impact upon both the health system and its ability to respond to shocks.

The use of indicators to assess resilience

Assessing a health system under pressure is a key element of testing its resilience (Rogers et al., 2021). Many established indicators that are routinely used for health system performance assessment have also been used to assess various aspects of health system resilience even prior to the COVID-19 pandemic (EU Expert Group on Health Systems Performance Assessment, 2020). Since then, however, the evidence base of resilience assessment has expanded substantially. In this section we list and describe existing indicators that can be used to operationalize resilience measurement in various contexts.

International databases, such as OECD statistics, Eurostat and WHO, are important sources of resilience indicators. They are used in the Health at a Glance report (OECD & European Union, 2022) and other HSPA initiatives. These sources aim to provide comparable and harmonized information across countries and over time, mostly focusing on Europe. Indicators collated through mechanisms such as Article 7 of the EU Regulation 2022/2371, the States Parties Self-Assessment Annual Report (SPAR), the Joint External Evaluation (JEE) or the Global Health Security Initiative can also be useful sources of information, depending on the chosen shock scenario. Many indicators contained in these resources are central to understanding health system functioning and they are an integral part of the HSPA Framework's assessment areas, intermediate and final goals.

Indicators that have been selected for illustration of resilience testing in this section are suggestions that are broadly available and would apply to a wide range of shocks and stressors. Although disruptions to health systems can vary in nature, the weaknesses in health system functioning are often common to various shocks. Like all indicators, they come with a set of limitations. First, the availability and quality of regularly collected data should be considered. Time delays and the need for validation often mean that available data lag two or more years behind. The delay is partly necessary to ensure quality and comparability; however, particularly for resilience, having more up-to-date data would be highly beneficial. Second, it is not always possible to harmonize definitions across countries, therefore interpretation needs to account for the variation in definition across countries. Thirdly, the retrospective nature of many of the indicators means that preparation for future shocks relies on assumptions based on how the health system performed or responded in the past. Broad, general metrics, such as those presented here, may be suited to regular assessment of health system preparedness and vulnerability, and therefore have value in the identification of potential areas of weakness in case of future shocks. However, they may not represent the best indicators for specific threats or be the best metrics of performance during specific stages of a shock cycle.

Although disruptions to health systems can vary in nature, the weaknesses in health system functioning are often common to various shocks.

Finally, some important aspects of resilience (for example, the ability to quickly make and implement evidence-based decisions or change of protocols, the level of coordination between various agencies involved in response) may not be subject to routine data collection or may not be easily measured in a quantifiable way. These limitations should lend themselves to consideration of the interplay between a health system under stress, the governance and organizational features of that system, and the contextual factors beyond it. Resilience involves, but is not limited to, the absence of major pre-existing health system weaknesses, the long-term stability of resources, the ability to respond efficiently and the governance capacity to steer the system quickly to new objectives and priorities (EU Expert Group on Health Systems Performance Assessment, 2020).

A list of indicators for resilience by health system function

In this sub-section we list some of the indicators, with additional information on internationally comparable information sources. These indicators relate to the resource generation, financing and service delivery functions of the health system, as well as to indicators on population health. The sub-section concludes with five detailed examples of common HSPA indicators and how they can be utilized to assess resilience.

This list has been developed by reviewing key publications on the topic by the European Observatory on Health System and Policies and WHO, the OECD, the European Commission and the World Bank. It has been supplemented by a broader literature review, and consultation with national and international experts. Recent HSPA frameworks for Belgium (Gerkens et al., 2023), Estonia (OECD, 2023h) and Czechia (OECD, 2023g) were also reviewed.

The review found hundreds of potential indicators, often addressing very similar issues. The choice in this section has been to list key indicators for each function that may be used as a snapshot and that are broad enough to assess the impact of multiple shocks.

We have not suggested specific benchmarks for indicators because of the importance of contextual factors in identifying appropriate benchmarks and interpreting country variations within the totality of the information and context (Kruk et al., 2017).

Indicators are grouped into resource generation, financing and service delivery functions according to the HSPA Framework. They aim to provide information on the assessment areas of sub-functions. In the case of service delivery, the assessment areas coincide with the intermediate health system goals. In some instances, indicators can be disaggregated further for more nuanced understanding of the impact on equity (for example, by geographical region, age, sex, socioeconomic status and so forth).

Resource generation

According to the HSPA Framework, the resource generation function includes all the required physical inputs that the health system needs to function, including the staff, devices, consumables and pharmaceuticals. Even though health systems' capacity to manage routine demand alone does not guarantee resilience, having sufficient and appropriately distributed physical and human resources is a prerequisite for effective crisis response. Table 2.3.1 shows selected indicators of resource generation that can be used to assess a health system's resilience.

Most of the listed indicators are quantitative, already widely collected and publicly available through the OECD, Eurostat and WHO databases. While focus is usually placed on the level and distribution of physical and human resources, it is also important to consider the quality and availability of these resources. For human resources, this includes their motivation, training and interoperability (ability to be reassigned if needed), as well as workforce motivation, which is discussed in more detail at the end of this section.

Table 2.3.1 Resource generation

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Number of health workers	Number of health workers (doctors, nurses, other health workers) per 1000 population. Doctors: the data for most countries refer to practising doctors, defined as the number of doctors providing care directly to patients. In many countries the numbers include interns and residents.	Increased health workforce capacity can be associated with better responses to shocks, as demonstrated during the COVID-19 pandemic.	X		X	X	**Quantitative** Widely available: e.g., OECD, Eurostat, WHO databases	• Number of pharmacists, dentists, etc • Share of all doctors that are primary care/family doctors	(OECD, 2023k) (Bigoni et al., 2022) (Buja et al., 2022) (Fukuma et al., 2017) (Bell & Nuzzo, 2021) (Neogi et al., 2022) (Giancotti et al., 2021) (Lefèvre & Gerkens, 2021) (European Observatory on Health Systems and Policies, 2022) (Oppenheim et al., 2019)

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Table 2.3.1 Resource generation *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Workforce vacancy rates	The vacancy rate of key categories (i.e., doctors, nurses) of health workers.	Healthcare workforce vacancy rates provide a real-time snapshot of staffing adequacies, impacting access and quality of care and system resilience. High rates signal immediate staffing crises and reflect on aspects of long-term system resilience which are crucial for planning and ensuring effective, responsive healthcare delivery in the face of shocks. In the short-term, these shortages cannot be resolved via the recruitment and training of new health workers, and reliance is thus on identifying additional staff.	X		X		**Quantitative** Availability will vary by country		(OECD, 2023k)

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Table 2.3.1 Resource generation *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Workforce interoperability	Ability of the health workforce to operate in multiple positions in a team or facility, especially when the shock impacts on absentee levels among existing workers.	Cross training of staff to be able to fill vacancies left during a crisis has been shown to improve the resilience of health systems.	X		X	X	**Qualitative**		(Therrien, Normandin & Denis, 2017) (European Observatory on Health Systems and Policies, 2022)
Emergency workforce planning	The presence of plans or processes that can be activated to increase the health workforce during a shock.	The ability to increase the health workforce when existing capacity is stretched, including by attaining workers from the non-public system, is an asset in responding resiliently to a shock.	X		X		**Qualitative**		(OECD, 2023k) (Therrien, Normandin & Denis, 2017) (Kruk et al., 2017) (Thomas et al., 2020)
Emergency response training	Whether the health workforce has been trained to respond to various emergency shocks, for example, mass casualty events, environmental disasters.	Training or testing responses to shocks can identify relative weaknesses and lead to more robust responses when shocks do occur.	X	X	X		**Qualitative**		(World Bank, 2022) (WHO, 2015) (Haldane et al., 2021a) (Patel et al., 2022) (Hanefeld et al., 2018)

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Table 2.3.1 Resource generation *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Workforce motivation	The extent to which the health workforce is motivated to work efficiently in the system as part of a coordinated response.	Workforce motivation influences healthcare worker performance and their capacity to perform under pressure.	X	X	X	X	**Qualitative**	**Quantitative Variations:** • Workforce vacancies • Turnover rate for medical staff • Workforce attendance/days absent from work • % of workforce experiencing burnout	(Barasa, Mbau & Gilson, 2018) (Gea-Sánchez et al., 2021) (Marques & Macedo, 2018) (Partnership for Health System Sustainability and Resilience, 2023) Absenteeism: (Mulenga-Cilundika et al., 2022) (Thomas et al., 2020) (Bowsher, Bernard & Sullivan, 2021) Turnover: (Brewer et al., 2012) Burnout: (OECD, 2023k)

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Table 2.3.1 Resource generation *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Hospital beds	Number of hospital beds per 1000 population. Includes beds in general, mental and other specialized hospitals in the country.	Quantity of beds is a proxy for potential infrastructure capacity of the health system.	X		X	X	**Quantitative** Widely available: e.g., OECD, Eurostat, WHO databases	• Number of ICU beds	Hospital Beds/capacity: (Bell & Nuzzo, 2021) (Bayraktar et al., 2021) (Bigoni et al., 2022) (Neogi et al., 2022) (Oppenheim et al., 2019) (Zhu et al., 2021) For ICU Beds specifically: (Giancotti et al., 2021) (Bigoni et al., 2022)
Essential supplies	Reserves of essential medical goods and equipment are available and accessible for use in response to a shock.	Reserves or stockpiles of essential medical goods, pharmaceuticals and equipment can aid the response during a shock, particularly if supply chains are disrupted.	X	X	X		**Quantitative** Widely available: e.g., OECD, Eurostat, WHO databases	• Number of shock-specific supplies, for example, ventilators, PPE, anti-virals or vaccines in the case of COVID-19	(Therrien, Normandin, & Denis, 2017) (Bell & Nuzzo, 2021) (Dichter et al., 2022) (Thomas et al., 2020) (Mulenga-Cilundika et al., 2022) (Partnership for Health System Sustainability and Resilience, 2023)

Financing

In the HSPA Framework, financing represents the revenue raising, pooling and purchasing sub-functions. Table 2.3.2 shows selected financing indicators that have been associated with health system resilience in various forms (see Variations column), many of them at least since the global financial crisis of 2008. As with the resource generation indicators, the majority of the quantitative financing indicators are widely reported in international databases and can be utilized for different purposes depending on the shock cycle. For example, examining the changes in government health expenditure on health compared to changes in GDP over the course of a shock could inform on the prioritization of healthcare spending or the existence of counter-cyclical mechanisms, and the financial resilience of the health system (Thomas et al., 2020). In the same way, monitoring OOP payments throughout a crisis could reveal whether health financing was sufficiently resilient to maintain public access to services (Partnership for Health System Sustainability and Resilience, 2023). As an example indicator, health coverage is discussed in more detail at the end of this section.

Table 2.3.2 Resilience indicators within financing

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Population coverage for a core set of healthcare services	The percentage of the population that is eligible for a core set of healthcare services, whether through public programmes or primary private insurance. Public coverage includes both national health systems and social health insurance.	The percentage of the population eligible for core healthcare services is vital for resilience in health systems. It is associated with accessibility of health services, indicating the system's capacity to provide essential care to all segments of the population. High eligibility signifies a robust, equitable system, better equipped to handle health crises and maintain consistent care standards, crucial for societal health resilience.	X		X	X	**Quantitative** Widely available: e.g., OECD, WHO databases	• Comprehensiveness of service coverage	(OECD, 2023k) (Thomas et al., 2020) (Steve et al., 2013) (Bell & Nuzzo, 2021)

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Table 2.3.2 Resilience indicators within financing *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Health expenditure per capita	The total consumption of healthcare goods and services per person.	Expenditure per person may reflect level of investment in healthcare for services, medicines, and infrastructure provided.	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO Global Expenditure Database	• Proportion spent on preventative care, primary healthcare, and tertiary healthcare	(Fukuma et al., 2017) (Oppenheim et al., 2019) Note: some analyses have shown that health expenditure is not always a reliable indicator of resilience (OECD, 2023k)
Percentage of GDP spent on health	The total consumption of healthcare goods and services as a percentage of GDP	The resources that a country allocate to healthcare compared to the size of the overall economy have been demonstrated to be associated with health system resilience.	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO Global Expenditure Database	• Monitoring % change in health budget compared to % change in GDP	(Giancotti et al., 2021) (Coccia, 2022) (Lefèvre & Gerkens, 2021) Proportion of government expenditure (Neogi et al., 2022) Health expenditure vs GDP % changes (Steve et al., 2013)

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Table 2.3.2 Resilience indicators within financing *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Public funding of health spending	Health expenditure from public sources as a share of total health expenditure.	Public funding is essential to cover not only the direct cost of provision of health services included in public coverage schemes, but also to financing public health and population-wide interventions, including surveillance, vaccination, and information campaigns relevant for resilience.	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO Global Expenditure Database		Proportion of government expenditure (Neogi et al., 2022) (OECD, 2023f)
OOP payments	The proportion of current health expenditure that is paid out of pocket.	High levels of OOP spending hamper access to care.	X		X	X	**Quantitative** Widely available: OECD Database	• Monitoring % change throughout the crisis • % of the population experiencing OOP costs exceeding the capacity to pay ("catastrophic costs")	(Partnership for Health System Sustainability and Resilience, 2023) (Bell & Nuzzo, 2021) (Hanefeld et al., 2018) Monitoring % changes (Steve et al., 2013)
Emergency funds	Dedicated funds within the health budget set-aside for use in response to shocks, such as health emergencies.	Indicative of preparedness and will allow flexible response to shocks.	X		X		**Quantitative**		(World Bank, 2022) (Steve et al., 2013) (Bell & Nuzzo, 2021)

Service delivery

According to the HSPA Framework, service delivery is a core health system function of the health system and is significantly influenced by the interplay between resource generation, financing and governance. It is comprised of the totality of healthcare services and its performance is assessed largely through intermediate health system objectives, such as access to and quality of services (Table 2.3.3). When assessing resilience, we stress the importance of service delivery despite a shock, and whether the system can absorb, adapt or transform. Prior to a shock these indicators provide information on readiness and vulnerability. During a crisis they may provide information on the level and extent of strain, and an early warning for upcoming challenges to the health system (for example, a backlog of elective procedures, or a population that missed preventative vaccinations). As an example indicator of service delivery, essential childhood vaccination is discussed in more detail later in this section.

Table 2.3.3 Service delivery indicators of resilience

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Curative care occupancy rate	The curative care occupancy rate is the number of beds effectively occupied (bed-days) for curative care divided by the number of beds available for curative care multiplied by 365.	Indicates the utilization rate of beds in acute facilities; routinely very high occupancy rates suggest lack of hospital capacity to absorb surge in demand in hospital care.	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO databases	• ICU Bed occupancy rate	(Therrien, Normandin & Denis, 2017) (Coccia, 2022) ICU beds: (Coccia, 2022) Waiting times: (OECD, 2023k) (Tiirinki et al., 2020)
Unmet medical needs	A self-reported measure asking people if there was a time during the past year when they did not receive the care they felt they needed due to cost, distance or waiting time.	Proxy for access, which highlights issues with people not being able to access services due to cost or lack of availability.	X		X	X	**Quantitative** Eurostat	• Unmet need for dental care, unmet need for specific healthcare services due to cost (EHIS) Eurostat allows disaggregation by income or education.	(OECD & European Union, 2022) (OECD, 2023k)

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Table 2.3.3 Service delivery indicators of resilience *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Laboratory and surveillance capacity	Ability of the laboratory and surveillance systems to meet testing and notification requirements for the response. During COVID-19, lab capacity was measured through the proxy "the proportion of COVID-19 PCR tests sequenced between a test being taken to the result being notified".	Laboratories and surveillance services play an integral role in detecting and informing the response against shocks (particularly infectious agents).	X	X	X	X	**Quantitative** Availability will vary by country	• Radiology reporting times • Other definitions could utilize average wait times between a test being taken to the result being notified	(Bell & Nuzzo, 2021) (OECD & European Union, 2022) (World Bank, 2022) (Bowsher, Bernard & Sullivan, 2021) Radiology: (Bowsher, Bernard & Sullivan, 2021)
Consultations with doctors (in-person)	In-person consultations with doctors refer to the number of face-to-face contacts with physicians, including both generalists and specialists.	Information on the number of doctor consultations per person can be used to estimate the annual number of consultations per doctor (in-person). This indicator should not be taken as a measure of doctors' productivity since consultations vary in length and effectiveness.	X		X	X	**Quantitative** Availability will vary by country OECD.	• Consultations with doctors (remote)	(OECD, 2023f)

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Table 2.3.3 Service delivery indicators of resilience *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Hospital discharge rates	The number of patients who leave a hospital after staying at least one night.	The average length of stay in hospital is an indicator of efficiency in health service delivery. Both premature and delayed discharges worsen health outcomes and increase costs: premature discharges can lead to costly readmissions; delayed discharges use up limited hospital resources.	X		X	X	**Quantitative** Availability will vary by country. OECD.		(OECD, 2023f)
Vaccination coverage for diphtheria, tetanus and pertussis (DTP) at 1 year of age	Reflects the percentage of children that receive the DTP vaccination in the recommended timeframe	Vaccines are a cost-effective tool for protecting against infectious diseases such as DTP.	X		X	X	**Quantitative** Widely available (WHO/UNICEF joint estimates)	• Percentage of children at 1 year vaccinated for measles	(OECD, 2023f)
Cancer screening rates (breast, cervical and colorectal cancer)	Reflects the percentage of women (in the case of breast and cervical cancer) or women and men (in the case of colorectal cancer) that receive the cancer screening in the recommended timeframe.	Screening is considered a cost-effective way to reduce the burden of breast, cervical and colorectal cancer.	X		X	X	**Quantitative** OECD Health Statistics, 2023		(OECD, 2023f)

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Table 2.3.3 Service delivery indicators of resilience *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Emergency Department ACSC (ambulatory care sensitive conditions) visits	The number of ACSCs over a period of time.	Efficient population health measures and accessible primary healthcare services will limit the number of hospitalization and emergency department visits for conditions that can either be prevented or routinely arrested at an early stage in primary healthcare facilities (ACSCs). Elevated ACSCs may indicate that primary health services are inaccessible, or do not cover certain geographic or demographic cohorts.	X		X	X	**Quantitative** Availability will vary by country	• Number of hospitalizations for chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), asthma or diabetes	(Runkle et al., 2012) Chronic Condition Hospitalizations: (OECD & European Union, 2022)

Note: The affected stage of the shock cycle may depend on the type of shock.

Population health status and risk factors for health

How well the individual components of the health system come together into successful service delivery influences the key health outcomes for the population. Indicators of health outcomes can be used to assess the baseline performance of the health system, and the baseline vulnerability of the population, but also the resilience of the health system if the indicators are monitored over the course of the shock cycle (Table 2.3.4). Changes to life expectancy or all-cause mortality are commonly utilized to demonstrate the sum impact of a crisis on the health of the population. While excess mortality and its variations could be useful for capturing otherwise unmeasured fragility in the system's performance, other health outcome indicators could be used to assess the burden of ill-health on the population.

Unhealthy lifestyles and poor environments contribute to premature deaths for millions. Smoking, alcohol consumption, physical inactivity and obesity lead to chronic conditions. Air pollution is also a major cause of death and disability. Addressing both lifestyle choices and environmental factors is crucial for improving population health (OECD, 2023f).

Table 2.3.4 Population health as indicators of health system resilience

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Life expectancy at age 65	How long a person at age 65 can expect to live assuming the current rate of death continues.	Gains or losses in life expectancy at age 65 are attributable to a broad range of factors. Research has identified that life expectancy at age 65 is more sensitive to the effectiveness of healthcare provision than life expectancy at birth, which is more closely associated with other factors.	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO databases	• All-cause mortality • Excess all-cause mortality	(OECD, 2023f) All-cause mortality: (Fukuma et al., 2017) Excess all-cause mortality: (Buja et al., 2022) (Magiorkinis, 2023) (Bowsher, Bernard & Sullivan, 2021)

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Table 2.3.4 Population health as indicators of health system resilience *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Healthy life years at age 65	Number of years spent free of activity limitation.	Whether extra years of life gained through increased longevity are spent in good or bad health is a crucial question. Since life expectancy is not able to fully answer this question, indicators of health expectancies, such as healthy life years, have been developed. These focus on the quality of life spent in a healthy state, rather than the quantity of life, as measured by life expectancy.	X		X	X	**Quantitative** Eurostat database		(OECD, 2023f)

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Table 2.3.4 Population health as indicators of health system resilience *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Preventable mortality (age-standardized rate per 100 000 population)	The mortality rate secondary to causes that could be avoided through effective public health and primary prevention interventions (i.e., before the onset of diseases/injuries, to reduce incidence).	Monitoring the preventable mortality rates at baseline and throughout a shock will provide information on the quality of care being delivered (including effectiveness, safety, equity and access).	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO databases		(Thomas et al., 2020) (OECD, 2023k)
Treatable mortality (age-standardized rate per 100 000 population)	The mortality rate secondary to causes of death that could be avoided through timely and effective healthcare interventions, including secondary prevention and treatment after the onset of the illness.	Monitoring the treatable mortality rates at baseline and throughout a shock will provide information on the quality of care being delivered (including effectiveness, safety, equity and access).	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO databases	• Failure to rescue • Variable life-adjusted display (VLAD) in ICUs	(Thomas et al., 2020) (OECD, 2023k) Failure to rescue: (Osorio et al., 2022) VLAD: (Salluh et al., 2022)

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Table 2.3.4 Population health as indicators of health system resilience *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Prevalence of chronic health conditions	The population prevalence of chronic noncommunicable conditions such as ischaemic heart disease, congestive heart failure, chronic airways disease, asthma and diabetes.	The prevalence of chronic health conditions in the community can both reflect baseline workload of the health system and indicate increased vulnerability should a shock occur. The population with these conditions is often the most susceptible to the direct and indirect impacts of a shock to the health system. Direct impacts could include increased susceptibility to acquiring a new illness during the shock (i.e., diabetes and COVID-19), while indirect impacts could include increased likelihood to miss medical appointments due to service impacts during a crisis.	X				**Quantitative** Eurostat (EHIS)	• Proxy measures for prevalence: Number of yearly deaths due to that type of condition, number of people on medication to manage that condition • Multiple chronic diseases among people aged 65 and over (reported in Health at a Glance series)	(OECD, 2023k) (Buja et al., 2022) (Giancotti et al., 2021)

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Table 2.3.4 Population health as indicators of health system resilience *continued*

INDICATOR	EXAMPLE DEFINITION	JUSTIFICATION	SHOCK CYCLE STAGE				FEATURES	VARIATIONS OR SIMILAR INDICATORS	REFERENCES
			1	2	3	4			
Mental health (anxiety and depression)	The prevalence of anxiety and depression.	The prevalence of anxiety and depression during and following a shock could indicate the extent of far-reaching impacts from the shock as well as the health system's ability to continue or even scale up mental health services in response to a crisis.			X	X	**Quantitative** Eurostat (EHIS)	• Suicide rate	(OECD, 2023k) (OECD & European Union, 2022)
Overweight and obesity (adults)	Adults over the age of 18 with a body mass index (BMI) greater than or equal to 30 are defined as obese, and those with a BMI greater than or equal to 25 as overweight.	During the pandemic, obesity increased the risk of severe symptoms, as well as the risk of COVID-19-related hospitalization and death. Unfavourable shifts in eating behaviours and physical activity patterns were accentuated by the mobility restrictions during the pandemic, potentially counteracting the gains made by policies promoting healthier lifestyles and accentuating the prevalence of obesity.	X		X	X	**Quantitative** Widely available: OECD, Eurostat, WHO databases	Other risk factors for health that should be considered: • Daily smoking rates • Regular use of vaping products • Opioid-related deaths • Alcohol consumption (including heavy episodic drinking) • Ambient particulate matter pollution	(OECD, 2023f; 2023k) (WHO Regional Office for Europe, 2022)

Detailed examination of some selected indicators and their use

Below we examine five potential indicators in more detail, including what element of the health system they assess and their potential use in the discussion of resilience. Through this discussion, we start to demonstrate that it is important to consider multiple indicators when assessing the resilience of an entire system. Further discussion on interpreting indicators in context can be found in the next section.

The five indicators are:

- **Hospital bed occupancy**: a well established measure of spare capacity which has been used in many assessments of resilience;
- **Motivation of the health workforce**: an important indicator for which many proxies have been used;
- **Service coverage**: an indicator for financing using the level of expenditure paid by public or compulsory sources as a proxy for service coverage;
- **Vaccination**: a measure of health service delivery; and
- **The proportion of people aged over 65 with two or more chronic diseases**: a contextual measure of potential population vulnerability.

It is important to consider multiple indicators when assessing the resilience of an entire system.

Hospital bed occupancy – curative and intensive care

What is it?

It is the proportion of the hospital inpatient capacity that has been used (Figure 2.3.1, page 77).

Where does it sit in the HSPA Framework?

Hospital bed occupancy is primarily a measure of access and efficiency of specialist care in service delivery.

Why is it important for resilience?

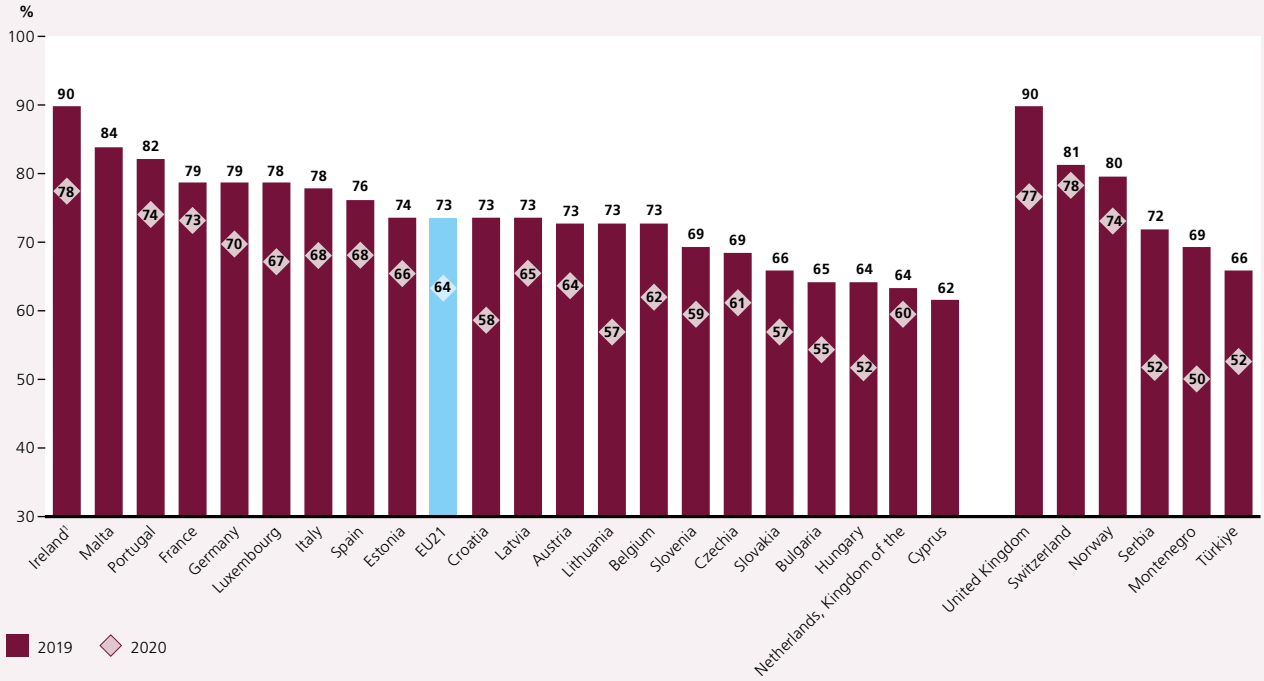
Demand for acute and critical care services is unpredictable from day to day. A degree of spare capacity is required to navigate this unpredictability. During increases in demand or decreases in available supply, this spare capacity can be overwhelmed, reducing the quality of the care received and worsening patient outcomes.

How is it measured?

Hospital bed occupancy is usually measured over time (i.e., over a year). However, it can also be monitored in real-time at the provider, local or national level as a measure of current resource use and potential spare capacity. Although there is no consensus about the "optimal" occupancy rate, a rate of about 85% is often considered a maximum to reduce the risk of bed shortages.

Capacity can also be disaggregated by the type of hospital bed, which may be important for different shocks. For example, intensive care beds and ventilated beds became important metrics of hospital capacity in the COVID-19 pandemic.

Figure 2.3.1 Occupancy rate of curative (acute) care beds, 2019 and 2020



Notes: The EU average is unweighted.[1] Data for Ireland exclude private hospitals.

Source: OECD Health Statistics 2022; Eurostat Database; United Kingdom data from NHS England.

How could it be used?

Although often seen as a measure of efficiency, in case of an adverse event, hospital bed occupancy could be interpreted as the available spare capacity in the system or how stretched it is.

As a measure of spare capacity, occupancy must be looked at in combination with the number of beds available per population (resource generation) to give a quantum. Hospital bed numbers per unit population is more commonly used as a measure of resilience but, in turn, is confounded by occupancy.

Additional context about the appropriateness of current hospital bed use may be gained from other indicators, for example length of stay, use of daily procedures and the number of preventable admissions.

Within the system, high occupancy may be a result of an inability to discharge hospitalized patients appropriately on a day-to-day basis. As a result, occupancy may depend on the adequacy of other components of the health system, for example, primary care, home care or rehabilitation. Likewise, limitations outside the health system, such as barriers to accessing social care services, may also result in delayed discharges and higher occupancy rates in hospitals. As a proxy for spare capacity, it could be used as part of a shock onset and management stages at a local or national level where increases could reflect rapidly diminishing capacity at the start and in the duration of a shock that increases demand for inpatient care.

There are strengths and weaknesses to the use of hospital bed occupancy for consideration of an acute shock. Strengths include being a measure of the available acute care capacity. More granular detail at a sub-national or hospital level may give information about the ability to increase capacity at a local level, which may be more appropriate for most shocks.

Considering the maximum occupancy, rather than the average, may give an indication of the risk of the health system being overwhelmed on a specific day with an acute shock. Weaknesses include the lack of information about the ability to surge the available capacity, which often includes measures such as the use of temporary facilities and care in areas that are not designated as beds, for example, operating theatres and recovery rooms.

Sample questions specific to the shock cycle

Stage 1: Preparedness

- Is there baseline monitoring and data collection of bed occupancy? How timely and disaggregated is this? Does it include all beds or only those in the public system?

Stage 2: Onset and alert

- Are there thresholds which immediately trigger alerts and action?
- Do these alerts occur in real-time?
- Who is informed and how can they respond?

Stage 3: Impact and management

- Can the information be given to those who need it in real-time?
- Can the data be supplemented quickly to reflect important changes, adaptations and transformations undertaken during the shock cycle? For example, temporary beds and facilities and changes in the place of care.

Stage 4: Recovery and learning

- Is there a process for improving the use and validity of the indicator?
- Have any bed occupancy thresholds been adopted because of a previous shock that increased hospital admissions?

Motivation of the health workforce

What is it?

The extent to which health professionals (doctors, nurses, assistants and other related health workers) are motivated to work efficiently in the system as part of a coordinated response. Motivation can broadly be defined as "an individual's degree of willingness to exert and maintain an effort towards organizational goals. It is an internal psychological process and a transactional process: worker motivation is the result of the interactions between individuals and their work environment, and the fit between these interactions and the broader societal context" (Garcia-Prado, 2005).

Where does it sit in the HSPA Framework?

Health workers' motivation can help to assess capacity and availability of the health workforce prior to and during the shock and therefore can serve as an indicator for assessing workforce sub-function in resource generation.

Why is it important for resilience?

Motivation has an impact on whether the staff can be present to deliver healthcare, reflecting on the intermediate and final goals of the health system, particularly: effectiveness, safety, user experience and access (Garcia-Prado, 2005). High levels of staff motivation have been shown to improve the resilience of a

health system even when other resources are stretched (Barasa, Mbau & Gilson, 2018). Considering how workforce motivation can buffer the health system during a time of crisis is only one aspect of the relationship. It is also important to recognize that over time a crisis, particularly if prolonged, can drain motivation and reduce resilience to the next event or create issues in recovery.

How is it measured?

Motivation can be difficult to measure in a comparable way as more informative indicators come from health workers' surveys indicating rates of burnout, intention to leave and level of job satisfaction (Rachiotis et al., 2014; OECD, 2023k). Levels of motivation can also be inferred from other proxy measures, such as the level of absenteeism or the turnover rate of staff.

How could it be used?

Health workforce motivation in the context of discussing a shock can provide useful information as to vulnerabilities (i.e., if the workforce is already demoralized at baseline), and potential sources of strength (i.e., a highly motivated workforce that can take on new challenges). Motivation is a useful indicator because it goes beyond looking at the number and distribution of resources available to the system and starts to look at how elements of the system interact to deliver the intermediate and final objectives. Importantly, factors that influence the level of motivation within a workforce may also influence the resilience of the system: for example, adequate levels of staffing, inclusive work culture and adequate remuneration for staff. A particular weakness of using data about motivation is that it will reflect the motivation at a certain period in the past, and not necessarily provide any information about how the motivation will continue to develop if a crisis should emerge.

Health workforce motivation in the context of discussing a shock can provide useful information as to vulnerabilities.

Health coverage

What is it?

The proportion of the population that is eligible for a core set of healthcare goods and services through government schemes, social health insurance, compulsory private health insurance or compulsory medical savings (OECD, 2023j). This does not include additional health coverage purchased through voluntary private health insurance.

Where does it sit in the HSPA Framework?

Coverage policies sit under the governance of financing sub-function.

Why is it important for resilience?

Eligibility for health coverage improves access to care and removes or reduces a major barrier, OOP expenses, for individuals who are covered. Routine access to health services affects the baseline health and resilience of the population as well as access to services should a shock occur.

How is it measured?

Measurement of eligibility to healthcare coverage varies with the type of funding mechanism. For example, in countries with national health systems, eligibility may be automatic for all citizens or residents. In social health insurance countries, and particularly those that include private insurance as a possibility of primary coverage, household surveys may be needed to complement administrative sources.

How could it be used?

Changes to who is eligible for medical services in turn changes the proportion of the population exposed to OOP medical expenses and therefore who is at risk of potential catastrophic health expenditure. While healthcare coverage is often used as a proxy for access, it does not provide information about the breadth of services covered by a country's scheme, or the quality of those services. The definition of what exactly is covered as a core service differs by location, and even amongst countries that have a very high proportion of population covered, the extent to which it covers inpatient care, outpatient care or pharmaceuticals differs considerably (see Figure 2.3.2 on page 81). Therefore, it is important to use this indicator in the context of what the coverage provides, and other indicators such as the proportion of health expenditure from OOP payments and total health expenditure.

Sample questions specific to the shock cycle

Stage 1: Preparedness

- At baseline, what proportion of the population is covered for a core set of services?
- What services or goods (i.e., inpatient, outpatient, pharmaceuticals) are covered under public schemes and does the extent of services covered provide resilience or potential vulnerability for the population?

Stage 2: Onset and alert

N/A

Stage 3: Impact and management

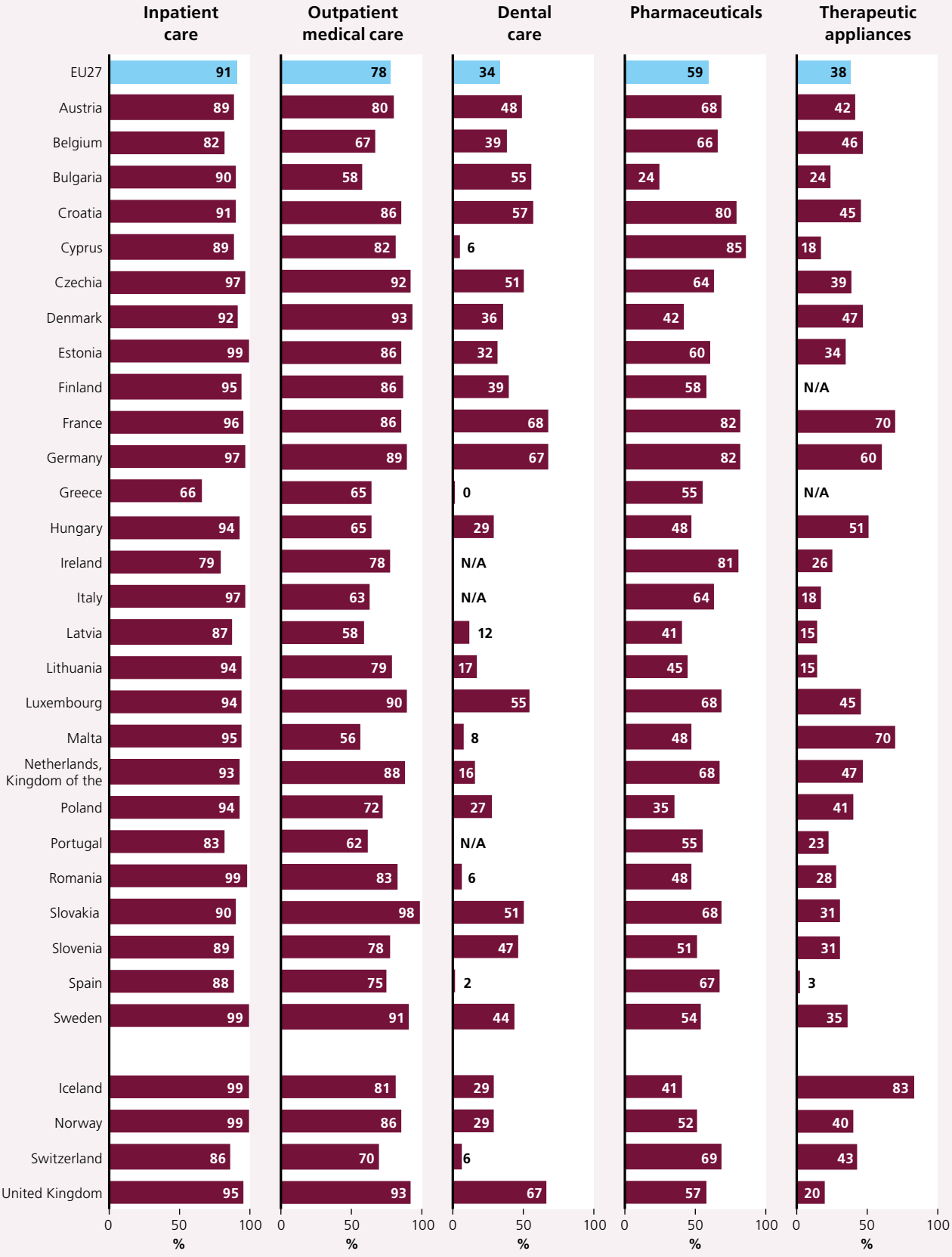
- Are policy decisions being made in response to the shock impacting the extent of services that are covered, the proportion of people who are covered, or the extent to which coverage reduces financial barriers to accessing medical services?

Stage 4: Recovery and learning

- Were public funding schemes able to be maintained during the crisis?
- Are standards of coverage better or worse since the shock?
- How could changes in coverage from the shock impact the health of the population in the future, and what can be done to improve this in the future?

Figure 2.3.2 Healthcare coverage for selected goods and services, 2020 or nearest year

Government and compulsory insurance spending as a proportion of total healthcare spending by type of service.



Notes: Outpatient medical services mainly refer to services provided by generalists and specialists in the outpatient sector. Pharmaceuticals include prescribed and over-the-counter medicines as well as medical non-durables. Therapeutic appliances refer to vision products, hearing aids, wheelchairs and other medical devices. N/A means data not available. The EU average is unweighted.

Source: OECD Health Statistics, 2022

Essential health services – childhood vaccination

What is it?

Essential health services are defined as a set of healthcare services that cannot be forgone or delayed, and that must be prioritized even during times of major shocks. These services are essential to avert indirect morbidity and mortality, as well as exacerbations of chronic conditions (WHO, 2020). They include care for vulnerable groups like infants and the elderly, reproductive health services, prevention and treatment for communicable diseases, ongoing management of chronic diseases including mental health, critical therapies, and emergency health condition management, and vital auxiliary services such as diagnostics and laboratory services. This prioritization is crucial for maintaining overall health system functionality during crises. For this example, we will explore how measuring the maintenance of childhood immunization coverage could be used as a measure of the health system delivering essential preventative services.

Where does it sit in the HSPA Framework?

Essential health services sit in the service delivery function.

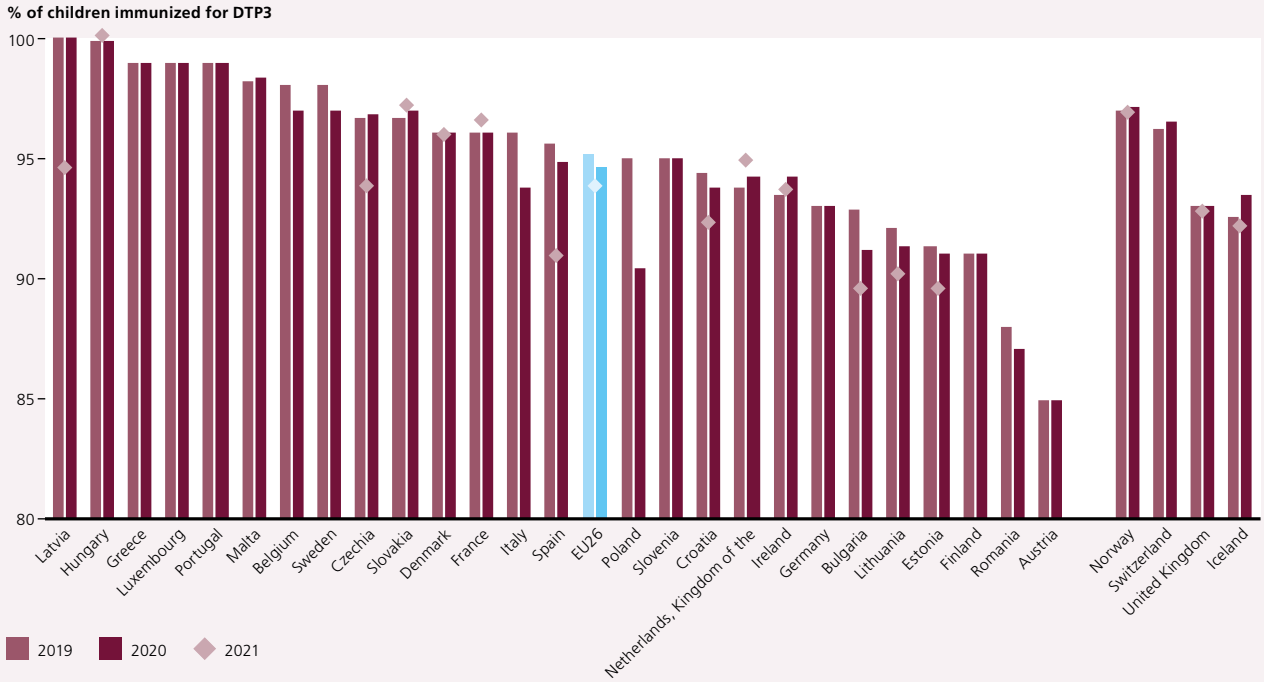
Why is it important for resilience?

Maintaining essential services while concurrently responding to a shock demonstrates that the system can function at least at the basic level. Service delays will adversely impact population health.

How is it measured?

The proportion of children being vaccinated for infectious conditions on the national immunization schedule (Figure 2.3.3).

Figure 2.3.3 Most EU countries experienced only minor disruptions to childhood immunization rates in 2020, but some countries had difficulties maintaining high rates in 2021



Note: The rate for France in 2020 is an estimation.

Source: WHO Immunization Portal

How could it be used?

Measuring the proportion of children vaccinated for conditions on the national immunization register before, during and after a shock will provide information on whether essential preventative services were able to be maintained or the extent to which they were disrupted. Service delivery indicators in general are useful because they provide insights that transcend the individual components of the health system such as workforce, supplies, coordination and financial investment. Analysing essential service delivery specifically could provide insights into the prioritization, organization and coordination of service delivery during a crisis. These data could be interpreted alongside routine service delivery figures from throughout a shock to highlight the extent of disruption caused by the shock and potentially highlight health system functions that need attention during the recovery period.

Analysing essential service delivery specifically could provide insights into the prioritization, organization and coordination of service delivery during a crisis.

Sample questions specific to the shock cycle

Stage 1: Preparedness

- In the absence of a crisis what is the proportion of children that complete the recommended vaccination schedule?

Stage 2: Onset and alert

N/A

Stage 3: Impact and management

- Is the shock impacting the proportion of children who are receiving recommended vaccinations?
- Are changes in the proportion of children vaccinated having impacts on the incidence of vaccine-preventable conditions? And can these be measured by the epidemiological monitoring system during the shock?

Stage 4: Recovery and learning

- How were childhood vaccination services able to be maintained despite the increased general demand on health services and resources during the shock?
- If services were unable to be maintained, what strategies can be put in place to perform catch-up vaccination programmes?
- If services could not be maintained, what were the barriers to continuing routine service delivery for this essential service?

Multiple chronic diseases among people aged 65 and over

What is it?

This indicator refers to the prevalence of two or more chronic diseases among people aged 65 years and over. Chronic conditions reported may include Alzheimer's disease, cancer, chronic kidney diseases, chronic lung diseases, diabetes, heart attack, hip fracture, Parkinson's disease, stroke, rheumatoid arthritis and osteoarthritis.

Where does it sit in the HSPA Framework?

Multiple chronic diseases among people aged 65 and over is a context indicator of population health and can be a measure of vulnerability of the health system.

Why is it important for resilience?

In case of a health-related shock, having a large share of people routinely relying on health services may result in limited capacity to tackle shock-related impact. Extra capacity needs to be factored in if this specific population may be extra-vulnerable to a shock (for example, an infectious disease pandemic).

How is it measured?

This indicator measures the proportion of people with two or more chronic diseases among the 65 years and over population. The Survey of Health, Ageing and Retirement in Europe (SHARE) is one example of a source of data for this indicator. The question used in SHARE to measure the prevalence of any chronic disease asks whether people have ever been told by a doctor that they have some chronic conditions. The exact question reported in the questionnaire is: "Has a doctor ever told you that you had any of the conditions on this card?"

How could it be used?

In times of crisis, having this kind of information at hand allows for better preparedness, response and management of the health system to the shock. For example, data from this indicator could be used for the preparedness stage of the shock cycle to ensure adequate supplies of medications, links with community services, or training the health workforce to be able to look after people aged 65 and above living with multiple chronic diseases. Resilience is about preserving access to health services and protecting pathways of care delivery, especially for those who are most vulnerable and likely to suffer the worst outcomes during and because of a crisis. The share of people aged 65 and above living with multiple chronic diseases gives a proxy for the level of capacity required and implications of a disruption in care continuity; in other words, it gives a good indication of how much pressure the health system might be under and can sustain. The higher the number, the more likely disruption will result in increased morbidity and mortality. Caution needs to be taken in interpreting low levels of multimorbidity, which may suggest the lack of access to timely diagnosis of chronic conditions.

Sample questions specific to the shock cycle

Stage 1: Preparedness

- Is there baseline monitoring and data collection of people aged 65 and over with multiple chronic diseases? How confident are you that the numbers reported reflect the vulnerability of the population?
- What does this information tell us about the health system and how can it be used to make changes to the health system?
- What weaknesses in the health system exist because of multiple chronic diseases and their management among people aged 65 and over?

Stage 2: Onset and alert

N/A

Stage 3: Impact and management

- How can this indicator inform our response to the crisis, and mitigate the impact of the crisis on the health system?
- Can priority groups and vulnerable groups be identified to ensure continuing care during the shock?

Stage 4: Recovery and learning

- Is this indicator and the associated indicators used to assess recovery?
- Can priority groups and vulnerable groups be identified during the recovery process for increased access to health services?
- Are there mechanisms to incorporate the experiences of people aged 65 and over with multiple chronic diseases into the post-crisis reflections and recommendations?

Governance and other institutional features of the health system

There are many features of health systems that describe their organization and how they are governed, which are relatively unamenable to short-term policy changes. These features are rarely measured on a regular basis. While many of these features sit within the governance function of the HSPA Framework they often interact and determine the performance of other functions. Governance is therefore appreciated to be essential to a resilient health system but lacking explicit assessment criteria for resilience (EU Expert Group on Health Systems Performance Assessment, 2020).

Governance is the enabling function of the health system and as such it determines much of the performance of the health system in "normal times" as well as in response to a shock. It serves as a foundation and a lever that drives the use of evidence, cooperation, coordination, adaptation and transformation that is needed during the response to a shock.

Fit-for-purpose institutions, accountability and transparency play important roles in influencing how a health system responds to a shock throughout the shock cycle. A failure of governance results in cascading problems throughout the health system.

While inferring causality is not straightforward, some aspects of the governance function and other institutional features have been associated with a more resilient response (Thomas et al., 2020; OECD, 2023k). A mixed-methods approach may need to be taken to gather information (Box 2.3.1, page 86).

Box 2.3.1 A mixed-methods approach is useful for gathering information

In the context of resilience assessment and especially during the resilience test, collecting new data may not be realistic. The resilience testing exercise accounts for this possibility and relies on the participants in the room to offer qualitative input. This process extends across all health system functions to add nuance to the information gleaned from quantitative indicators.

Options for additional data collection are listed in Table 2.3.5 using stakeholder participation as an example function. If separate interviews are conducted, focus on the systems approach to HSPA and resilience by explicitly considering how the interactions and dynamics between the various building blocks would help the interviews inform the resilience assessment (Lembani et al., 2018).

Table 2.3.5 Qualitative indicators in the governance function that would likely require separate data collection

FUNCTION/INTERMEDIATE OBJECTIVE/FINAL GOAL	INDICATOR	DATA COLLECTION OPTIONS
Stakeholder participation in policy-making	Quality of stakeholder participation	Primary data collection: interviews or focus groups
	Stakeholders involved in national health planning and review	Primary or secondary data collection using current or recent planning documents
	Mechanisms of dialogue in place to involve stakeholders in decision-making	Primary or secondary data collection using current or recent planning documents

Source: European Observatory on Health Systems and Policies, 2022

Policy and vision

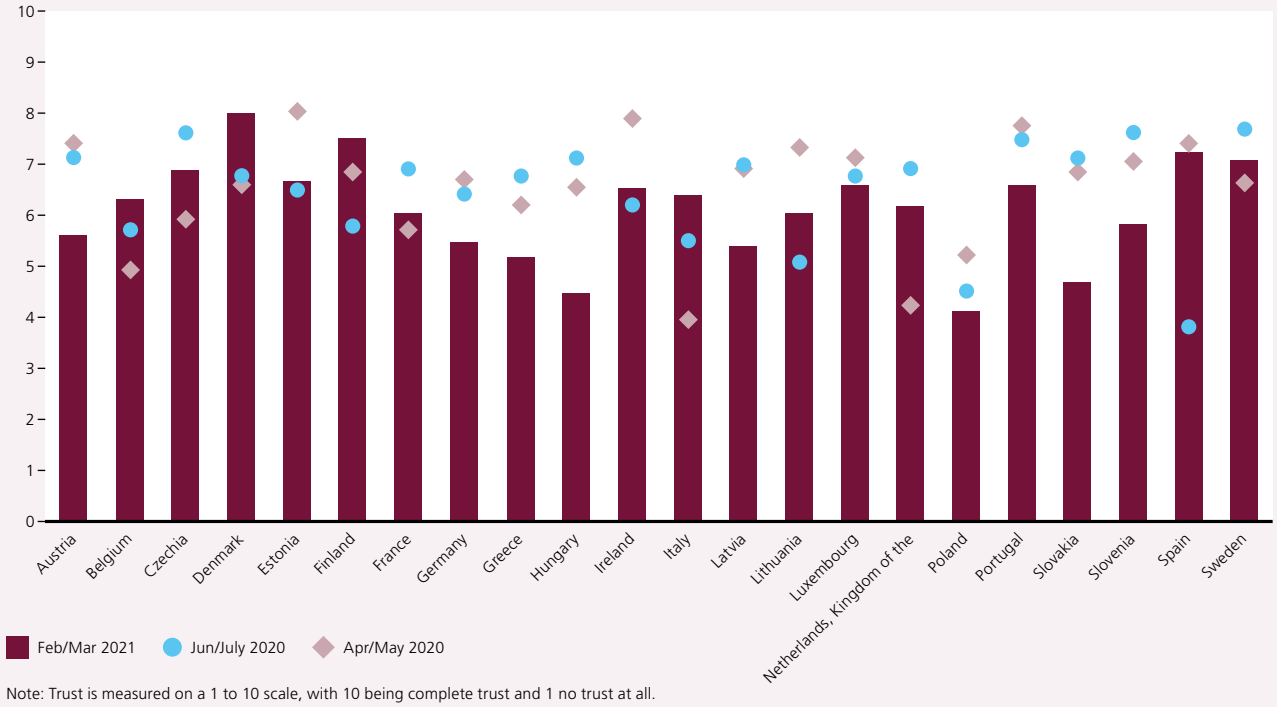
The inclusion of resilience as part of health system performance assessment may facilitate decisions being made around balancing the different objectives of the health system. Strong leadership is often cited as being a key precondition for resilience (OECD, 2023k).

Useful information to assess this may include whether there is a clear chain of command with an effective governance structure in terms of accountability, transparency and involvement of stakeholders. One measure may be the established public trust in the response agencies (EU Expert Group on Health Systems Performance Assessment, 2020) (Figure 2.3.4, page 87).

Ensuring strategic policy-making regarding health system resilience will involve consideration of plans and policies for contingency planning and action. The availability of crisis preparedness plans and risk analysis can therefore serve as an indicator. Ideally such plans would be articulated in a written and traceable form, so that they can be actionable. Additional assessment questions might include who was consulted, how often they have been updated, and what lessons were learnt and what changes were incorporated in these updates. During an actual shock, the need for crisis response plans to integrate urgent decision-making and ensure sufficient flexibility to adapt is important. Contingency planning should cover the entire shock cycle.

Contingency planning should cover the entire shock cycle.

Figure 2.3.4 Declining trust in healthcare systems, selected countries



Note: Trust is measured on a 1 to 10 scale, with 10 being complete trust and 1 no trust at all.

Source: Eurofound (2020), Living, working and COVID-19 dataset, Dublin: http://eurofound.link/covid19data

Coordination is required both within the health system and between the health system and other sectors. Both government and other sectors are essential for preventing shocks and managing the health system across the entire shock cycle. During the COVID-19 pandemic this was evident in many areas and is required for challenges such as climate change and antimicrobial resistance.

Useful information to assess coordination may include the existence and quality of multisectoral collaboration. Beyond this, measures might include describing the elements of high quality multisectoral collaboration, including the existence of agreements.

During the shock cycle, the pressures on and requirements of institutions will change and the extent to which they are able to adjust to these pressures will determine the success of the response. These challenges may not be able to be observed during the preparedness stage of the shock cycle.

Stakeholder voice

Effective communication networks allow diverse stakeholders both within and beyond the health system to participate in or influence decision-making. Indicators could include stakeholder participation, including the public and vulnerable groups, in the development and assessment of contingency planning. Additionally, it is important to put in place mechanisms to ensure stakeholder participation during the crisis.

Intelligence and information

Intelligence and information are the ability of a health information system to collect, analyse, utilize and distribute data and information, which enable evidence-based decision-making and sustainable, effective and efficient health performance. A well functioning health information system converts raw data into insightful evidence and moves it around the health system to relevant stakeholders. This is also an important public health function in the context of communicable disease control, increasingly called epidemic intelligence.

Data and information are essential resources through the shock cycle, enabling early detection of risks, interventions based on scientific advice, monitoring of the health system and a quick recovery. Data needs during a shock may be different from those required for routine management, therefore mechanisms for speeding up reporting and obtaining access to data sources from other sectors may be important. Considering country-specific contexts can help complement data collection efforts, such as divergence at the sub-national level, population characteristics and meteorological data.

Indicative measures can include:

- Type of data collected and how often it is updated;
- Capacity of the health information system to gather real-time data;
- Access to relevant data by key stakeholders;
- Digital maturity of the healthcare system and its communication infrastructure;
- Capacity of the health information system to integrate new data from different sectors quickly;
- Capacity of the health system to collect a new type of data in case of a shock situation;
- Capacity of the health system to analyse the new type of data in case of a shock situation and feed into the decision-making process;
- Capacity for timely dissemination of guidelines and protocols once the information is assembled; and
- Capacity to provide information in the advent of a cyber-attack (i.e., clear guidelines on how to continue to provide information).

Some of this information is collected irregularly in the reports on digitization and data governance (Oderkirk, 2021). Other measures could include the existence of data collections and evidence of linkages between data collections (Barrenho et al., 2022).

Indicators of the existence of early warning mechanisms can be used: for example, the existence of early detection for drug shortages. Beyond early warning mechanisms, it is important to track key indicators over the entire shock cycle to gain insight into how the system is coping with the challenges and the effectiveness of the responses.

It is also important that policy-makers are aware of the degree of sustainability and the sufficiency of their resources over time. One method of doing this is to produce mid- and long-term forecasts to understand the needs over time.

Legislation and regulation

Having an agile legislative framework that anticipates and allows for the rapid adoption and implementation of extraordinary countermeasures reduces the time required to react to shocks and engage in countermeasures.

One indicator of this may be the existence of a comprehensive set of emergency regulations and laws for use in sufficiently large crises. Another indicator is the ability to implement emergency regulation (vs. comprehensiveness) and the degree of centralization of decision-making (Saunes et al., 2022). During the COVID-19 pandemic, many regulatory frameworks had to be adjusted to ensure the provision of healthcare; consideration of what is required beforehand would allow the adjustment to occur with less disruption.

Governance of resource generation

The ability to ensure the appropriate resources, their distribution and their quality are aspects of the governance of resource generation that have a direct impact on health system resilience. Planning of the health workforce and infrastructure are also key elements to building the appropriate resources and capacity to deal with shocks over the entire shock cycle.

Continuous professional education and a learning culture are important to ensure sufficient flexibility in the workforce to adjust to changing circumstances and embed transformation.

Governance of financing

The coverage decisions of what will be financed and how will have a direct impact on access to services during a shock. How comprehensive the coverage is, how public financial management is enacted, how private organizations are financed, and the level of OOP spending are all important considerations for resilience.

Other aspects of the governance of financing which may inform an assessment of resilience include the ability to flexibly purchase and reallocate funding according to needs during a crisis. Additionally, ensuring the stability of funding through countercyclical mechanisms and the ability to reallocate and inject extra funds will improve resilience.

Governance of service delivery

The organization of the delivery of health services will have an enormous impact on the resilience of the health system, although evidence is limited (see Box 2.3.2, page 90). Among the issues that need to be considered are the extent to which decision-making is delegated to sub-national authorities, and the integration of the long-term care sector. Additionally, an organization structure that ensures the maintenance of appropriate quality and safety standards across all services is more likely to be resilient.

Box 2.3.2 There is limited evidence, but an increasing interest in the impact of governance on health system outcomes

There are several reasons why the evidence base is limited for the impact of governance on health system outcomes and resilience, including:

- **Health systems complexity**: health systems are intricate, with multiple components, stakeholders and interactions. This complexity makes it challenging to isolate the specific impact of governance from other influencing factors (Braithwaite, 2018).
- **Long time frames and system changes**: as health systems change, it is increasingly important to understand how the changes that do occur feed back into governance practices, as this will have implications for the system's ability to continue absorbing, adapting and transforming. Longitudinal and comparative case studies that use cocreation and coproduction approaches that go beyond researchers are needed to capture these effects accurately (Saulnier et al., 2021).
- **Variability across contexts**: the impact of governance can vary significantly depending on the context, including political, cultural, economic and social factors. What works in one setting may not apply to another, making it difficult to generalize findings (Saulnier et al., 2021).

In reviewing the literature, a key question is the relevance of the material to decision-making. A relevant criterion is that decision-makers must act, even if that action is to continue with the status quo. Structured and transparent systems for decision-making can help to ensure that all-important criteria are considered and that the best available research evidence is used (Rehfuess et al., 2019). One such system is the GRADE Evidence to Decision (EtD) framework (Moberg et al., 2018). The EtD framework supports systematic, structured and transparent use of evidence for recommendations and decisions. In addition, it strengthens the credibility of decisions by documenting the evidence-based decision-making process. This includes showing how judgements are made when there is a lack of evidence (Moberg et al., 2018).

Contextual factors

Factors external to health systems have an impact on health systems and their performance under stress. Contextual factors can be those associated with a country's demography, geography, infrastructure, socioeconomic profile and political organization. These factors will impact on how large-scale shocks impact society and the health system. These factors will also influence how vulnerable a society and health system are to specific shocks, the suite of potential responses – including the adaptations and transformations that are possible – and the effectiveness of these responses.

The vulnerability of a population to a shock depends on its demography – an increased proportion of elderly people or the very young may result in larger impacts for the health system. For example, the impacts of heatwaves and pandemics may be larger for those at the extremes of the age spectrum. Similarly, the density of a population may have an impact. It may create more vulnerability to certain types of shock. For example, greater population density may impact antimicrobial resistance (Vikesland et al., 2019). A higher density population, however, may make the delivery of health services more efficient and effective in some instances, especially if physical infrastructure remains largely unaffected.

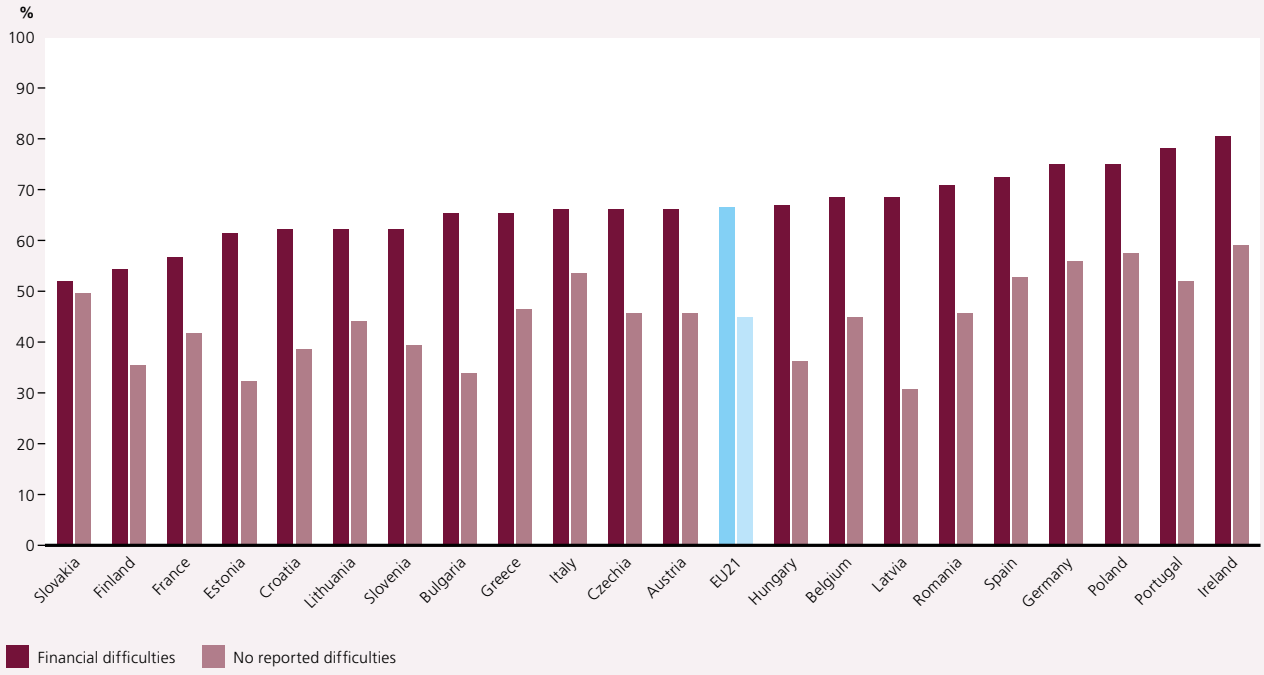
Geography also impacts on how shocks propagate and the ability of health systems to mobilize resources effectively in response to shocks. Place-based factors, such as temperature ranges, altitude and pollutants, may compound or mitigate the impact of a shock. Using a heatwave as an example, cities with

urban heat islands may experience a larger impact from this type of shock (Shimamoto & McCormick, 2017). Technology can play a moderating role – countries with a high penetration of air-conditioners and other cooling technologies may experience less impact from heatwaves. Geography and connectedness can also influence responses to shocks. Large, sparsely populated countries may find some policy options more difficult to implement in response to a shock than smaller countries with a higher population density.

The socioeconomic characteristics of a country have a substantial influence on the options and resources available to respond to a shock, and the effectiveness of these responses. For example, a country with a low debt to GDP ratio and a high GDP per capita may be able to rapidly expand public expenditure and devote further resources to the health system in response to a shock. Conversely, a country with high debt and low GDP per capita may not find this possible. Inequity differs between countries and the COVID-19 pandemic demonstrated that those in socially disadvantaged groups were impacted disproportionately (OECD, 2023k).

Greater social safety nets may increase community resilience in response to a shock and reduce reliance on the health system. Conversely, widespread social isolation may increase a population's reliance on the health system (Brooks et al., 2023). Figure 2.3.5 shows the association of the risk of depression of those aged 18–29 by their self-perceived difficulty in making ends meet. Low income has long been associated with increased risk of poor mental health (OECD & European Union, 2022). The effectiveness of decisions made in the health system depend on contextual factors. For example, the effectiveness of track, trace and isolation

Figure 2.3.5 Share of young people aged 18–29 at risk of depression (WHO-5 score <50 out of 100), by self-perceived difficulty to make ends meet, 2020–2021



Notes: Data from the first, second and third waves of Eurofound's Living, working and COVID-19 e-survey, conducted in Spring 2020, Summer 2020 and Spring 2021, have been pooled (weighted averages are presented). The share of respondents reporting financial difficulties are those who responded that their households had "difficulty" or "great difficulty" making ends meet. Data for Cyprus, Denmark, Luxembourg, Malta, the Netherlands (Kingdom of the) and Sweden have been excluded due to small sample sizes.

Source: OECD calculations, based on Eurofound, 2021

in response to a pandemic may depend on decisions about the extent to which services are covered, i.e., universal health coverage (OECD, 2023k). However, this policy can be undermined if socioeconomic circumstances require people to engage in employment that involves physical proximity during a pandemic (Smaggus et al., 2021).

Trust in governments and governmental institutions, trust in science and interpersonal trust/social cohesion are also contextual factors that may impact on health system resilience. Major disruptive policies implemented by governments in response to shocks, such as mobility restrictions and vaccination programmes, may be more likely to be complied with by populations more trusting of government, science and each other. In turn, this can reduce demand on a health system under strain. Certain measures of trust were shown to be associated with lower COVID-19 and excess mortality, although such associations do not imply causality (OECD, 2023k).

Trust in governments and governmental institutions, trust in science and interpersonal trust/social cohesion are … contextual factors that may impact on health system resilience.

The degree of misinformation and disinformation surrounding a health system or its response to a large-scale shock may alter the effectiveness of policy responses and, therefore, its resilience. The effectiveness of the COVID-19 pandemic response relied on trust in vaccines – especially the ability of governments to communicate their benefits, enhance community engagement with those who were hesitant, and actively counter misinformation and disinformation (OECD, 2023k). Leveraging the use of behavioural science to increase confidence, and the use of evidence-based public health apps, could be more effective in countries with higher levels of mobile phone penetration.

Health systems rely on a functioning infrastructure to provide their services. The provision of data services, electricity, water and transport are all required for the health system to operate (EU Expert Group on Health Systems Performance Assessment, 2020). Additionally, in times of crisis, resources can be added to the health system to increase its capacity: for example, the use of hotels for space or military and non-health workers (OECD, 2023k).

Several indices of preparedness regularly include contextual factors in their analysis:

- The Global Preparedness Monitoring Board – for example, social and economic inequality (Global Preparedness Monitoring Board, 2023)
- GLOBSEC – for example, educational attainment (GLOBSEC, 2022)
- The Global Health Security Index – for example, the adequacy of road networks (Bell & Nuzzo, 2021).

The Sendai Framework for Disaster Risk Reduction also highlights the importance of all of society engagement to reduce the impact of disasters (UNDRR, 2015).

The contextual factors identified from the literature are included in Table 2.3.6 (pages 93–94). The importance of these contextual factors is to consider how they might interact with the shock and respective possible responses and effectiveness.

Table 2.3.6 Examples of contextual factors

CATEGORY	INDICATORS	JUSTIFICATION	FEATURES	REFERENCES
Population indicators	Population size, population density, geographical distribution, urban/rural split, demography	Provides context on the scale of services that the health system needs to provide. Density, distribution and demographic characteristics can provide context on vulnerabilities and challenges faced by the system.	Widely available data: OECD, World Bank	(Oppenheim et al., 2019) (Fukuma et al., 2017) (Bell & Nuzzo, 2021) (Zhuet al., 2021) (COVID-19 National Preparedness Collaborators, 2022)
Economic indicators	GDP, income inequality, poverty rates, % employed in informal economy, % unemployed	Provides context on the resources and setting that the health system operates in.	Widely available data: OECD, World Bank	(Benítez et al., 2020) (Oppenheim et al., 2019) (OECD, 2023k) (Bell & Nuzzo, 2021) (Zhu et al., 2021) (COVID-19 National Preparedness Collaborators, 2022)
Trust in institutions	Trust in government, trust in science, government transparency and accountability, interpersonal trust	Provides context for the communication of public health messaging and mobilization of society during a crisis.	Widely available data: OECD, World Values Survey, Worldwide Governance Indicators	(Obasanjo et al., 2023) (King et al., 2022) (Wilhelm et al., 2023) (Oppenheim et al., 2019) (Kruk et al., 2017) (COVID-19 National Preparedness Collaborators, 2022)
Physical and communications infrastructure	Road quality, mobile phone access, internet access, % population with access to a safe water source, % population with access to sanitation facility, logistical capacity	Provides context for logistical challenges and vulnerabilities faced by the health system.	Widely available data: World Road Statistics, World Bank Development Indicators, Logistics Performance Index, WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation	(Macharia et al., 2017) (Oppenheim et al., 2019) (Bell & Nuzzo, 2021) (Zhu et al., 2021)

continued on next page

Table 2.3.6 Examples of contextual factors *continued*

CATEGORY	INDICATORS	JUSTIFICATION	FEATURES	REFERENCES
Institutional capacity	Corruption, vital registration, political stability, armed conflict, homicide	Provides context on the local stability, efficacy and vulnerabilities of political institutions in the country.	Widely available data: Transparency International, Worldwide Governance Indicators, UN Demographic and Social Statistics, Uppsala Conflict Data Program, UN Office on Drugs and Crime	(Odhiambo et al., 2020) (Oppenheim et al., 2019) (Bell & Nuzzo, 2021) (Kruk et al., 2017) (Martineau et al., 2017)

2.4 The impact of shocks and the capacity to respond

The previous section described some of the quantitative and qualitative indicators that could be used to assess resilience. However, as health systems are complex systems, individual indicators need to be interpreted in appropriate context. We can think about the impact of a shock propagating through the health system through "pathways" that link the core functions and the final outcomes of the system.

The relationships and pathways through the HSPA Framework can be appreciated by considering the antecedents to the observed data and the downstream consequences. Combining it with the shock cycle allows an appreciation about how decisions at one point of the shock cycle can influence how the health system responds in others. Governance is often the key function when considering the speed and effective coordination of response. The adaptation and transformation that occurs in response to the shock is influenced by the institutional features of the health system and contextual factors that surround it. Therefore, similar shocks can have very different consequences.

The first part of this section discusses the current evidence for common pathways that describe how shocks may affect the health system. The second part of this section consolidates the indicators and pathways to demonstrate how these concepts can be used to understand health system performance during a past shock: the COVID-19 pandemic.

How do shocks affect the health system?

As functions of the health system are complex and interdependent, a sufficiently large shock will transmit through the system. A given shock could start by directly affecting a single function, but the impact of the shock may have further reach. Following a shock there is a reaction which can cascade through the system, placing stresses and changes on other functions. For example, a sudden increase in demand for healthcare initially impacts the service delivery function, increasing activity. From there it impacts both resource generation and financing since an increased use of health resources will run down supplies and make the resources unavailable for other care; and increased resources use and service activity will increase the requirement for financing. So, an initial shock in service delivery results in a stress in resource generation and in financing. This cascade also occurs when the shock is absorbed by the health system.

A shock could start by directly affecting a single function, but the impact of the shock may have further reach.

Conversely, the policy options to mediate an identified weakness in the health system that impacts its resilience will also include other functions. For example, policy options to reduce an identified weakness in the resource generation function – not enough health workers – requires appropriate governance and

financing mechanisms or lie outside the health system in the education sector (European Observatory on Health Systems and Policies, 2023). Even if there are long-term plans to increase health workers numbers, a shock will still require decisions about how to distribute the available healthcare workers in a way that minimizes the harm during the shock. This requires data, governance mechanisms and the ability to alter their scope and standards of care (OECD, 2023k).

However, the health system is a complex adaptative system and during the response to a shock it may adapt and transform how it operates (European Observatory on Health Systems and Policies, 2020). With transformation and adaptation there is not a simple relationship between the change in one function of the HSPA Framework and an outcome of interest but rather innovation in how things are done based on the experiences of the shock that alters the relationship in unpredictable ways (Smaggus et al., 2021). For example, in the above example of an increase in demand resulting in a decrease in available resources, there may be the introduction of new ways of accomplishing the same task, for example changing who provides care or where it is provided (OECD, 2023k). Other absorptions, adaptations and transformations may include changes in prioritization and increasing the resources available (OECD, 2023k).

This section summarizes current understanding of how we can anticipate the pathways by which a shock transmits through the health system, and the plausible adaptations and transformations that a health system could undertake are a component of the resilience dialogue. This section also gives advice on how facilitators could approach this task.

Possible shock pathways during a financial crisis

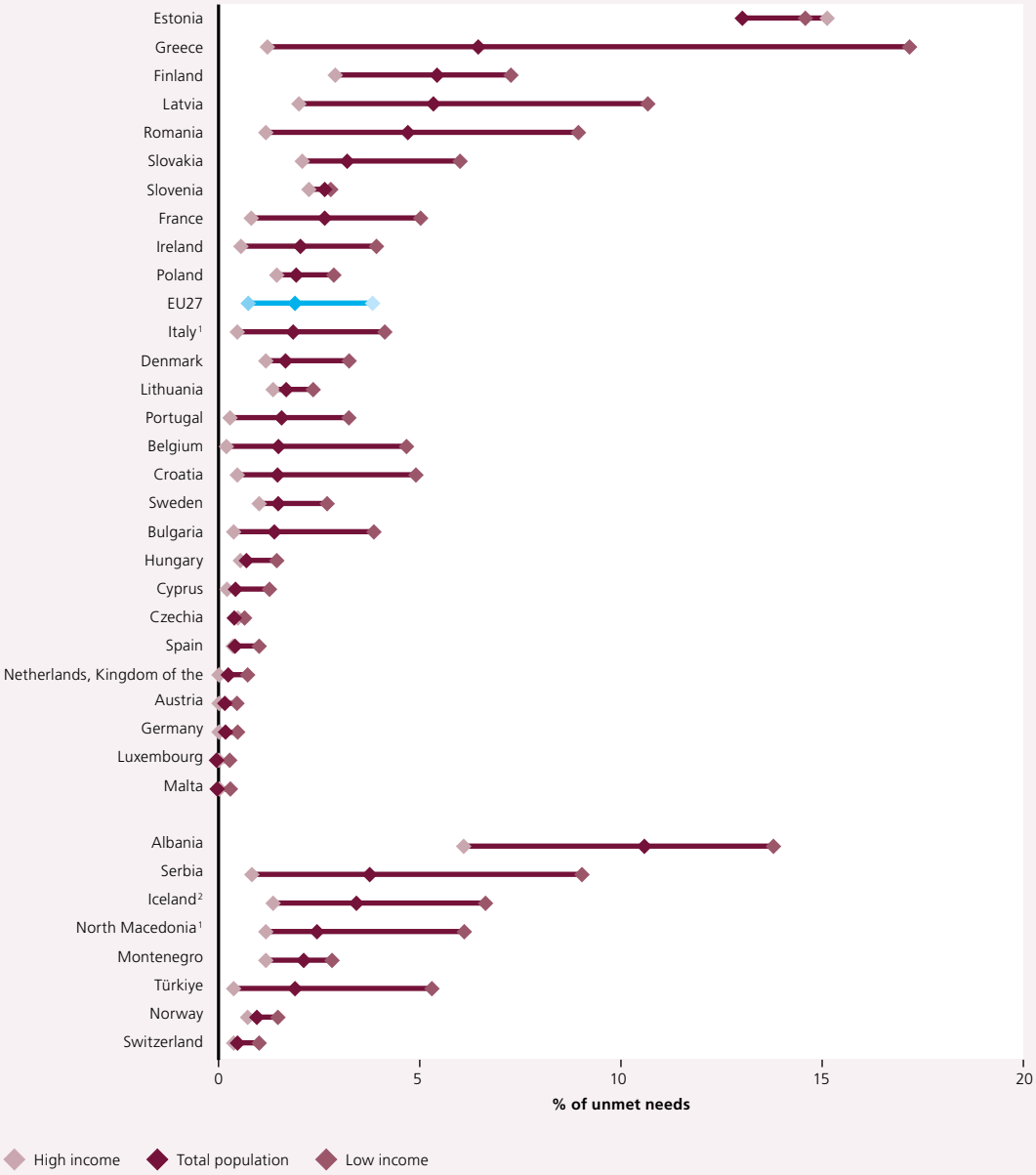
Understanding the pathways through which the shocks transmit their impacts through the health systems and the potential responses allows consideration of how to interrupt potential maladjustments of the health system.

For example, in the financial crisis scenario, the pathway is a decrease in the revenue generation function of the health system, both by a reduction in the tax revenue of the government and by a reduction in the wages of the population. This reduction in revenue flows from the financing function to the resource generation and service delivery functions and through to the final outcomes of the health system.

The impact will depend heavily on the method of revenue generation and the extent of coverage. For example, in a health system heavily funded by user charges with relatively high-income inequity, the shock may result in increasing health inequity since those not impacted by the turndown are able to continue their consumption of healthcare and their providers are able to maintain their viability. In this case, they may alter the type and variety of care offered. Even in public funded systems, inequities in the distribution of services may be increased in association with reductions in funding (Keskimäki, 2003). Many health systems already have a distribution between unmet healthcare needs across the population dependent on income (amongst other factors) (see Figure 2.4.1 on page 97).

If payments can be unilaterally set by the government or a key purchaser, then reductions could also result in reduced funding and the absorption and adaptations associated with those changes. For example, the approach could be to reduce the tariffs and payments associated with care (Clemens et al., 2014).

Figure 2.4.1 Unmet needs for medical examination due to financial, geographic or waiting time reasons, 2020



Notes: [1] Data from 2019; [2] Data from 2018; the EU average is weighted.

Source: Eurostat Database, based on EU-SILC

Absorbing this reduction in payments could be achieved by reducing the expenditure from facilities to compensate for the reduction in financing. A reduction in capital expenditure is a common approach to reducing expenses in the short-term (Clemens et al., 2014). Alternatively, expenditure can also be reduced by reducing activity. For example, renegotiating contracts for pharmaceuticals (Clemens et al., 2014), wage freezes or other methods to reduce the costs associated with staff could be introduced. These changes may result in follow-on impacts on safety and resilience. The health system running at a very high capacity would place it at risk of not being able to absorb any further shocks without failure (EU Expert Group on Health Systems Performance Assessment, 2020).

These changes may result in longer-term implications, for example declining wages may make staff more likely to emigrate, reducing the resources available (Clemens et al., 2014).

Alternatively, the pressures could result in positive adaptations that improve quality and patient care: for example, if the pressure resulted in a greater use of integrated care and moving appropriate treatments from hospital-based care to the community (Foroughi et al., 2022). This may be more likely if changes in the payments are aligned with incentivizing less expensive but appropriate treatment (Clemens et al., 2014).

The organization and governance structure may have an impact on the implications of the shock. For example, if the primary care services are primarily provided as solo practices, they may be more prone to becoming unviable than larger multispecialty practices. Systems in which primary care physicians are self-employed may face different pressures from those for which primary care physicians are publicly employed.

The policy responses from the health system may result in trade-offs between outcomes. For example, a policy response to repair the weakness in revenue generation in a system predominantly funded by taxation by imposing greater OOP charges may result in the unaffordability of healthcare by a section of the community, worsening inequity even if the revenue generation is maintained. Health systems which can monitor the situation in real-time will have an advantage in responding to the unintended consequences of policy choices.

The ability to introduce funds into the health system is one of the ways in which the health system can be made more resilient to financial crisis (European Observatory on Health Systems and Policies, 2020).

Pathways are likely to differ for different types of shock

The example scenarios in this handbook are based on different initial implications for the health system and the building blocks. The climate change scenario is based on a sudden increase in demand and the antimicrobial resistance (AMR) scenario on a sudden decrease in resource generation. Again, these propagate through the system, and this is influenced by the governance arrangements that exist.

For example, in the climate change scenario, the ability to contact vulnerable people when primary care facilities are closed would depend on how primary care registrations are organized and how data management is arranged. Load-sharing of the increased demand in the climate change scenario and redistributing care away from affected facilities in the AMR scenario would depend on the collaborative arrangements that exist between healthcare entities. The ability to redistribute the available workforce may differ if they are employees or if they are self-employed. The value of redeployment or having staff working in different clinical areas may depend on the legal arrangements that exist and the degree of training for emergencies and general care that the health workforce is required to undertake.

Shock pathways are often complex

Large shocks, such as COVID-19, the global financial and economic crisis of 2008 or widespread disasters, often impact the health system at multiple points in the framework. A common dual impact is increasing the demand for services at the same time as reducing the availability of resources. For example, widespread devastation from a hurricane destroys physical infrastructure and supplies, while simultaneously making staff unavailable and increasing demand for critical services (Rios et al., 2021).

The length of time a shock may last for will have an impact on the value of the expected responses and potentially feedback loops that may occur within the health system (Witter et al., 2023). For example, in the event of a localized shock with a short duration, say a passenger train derailment or collision, the use of extra effort from the available workforce may be a viable strategy. However, for longer shocks with system-wide implications, for example, the COVID-19 pandemic, increased effort may not be a useful long-term strategy and may reduce the available workforce through attrition, worsening the situation (OECD, 2023k).

The transmission of shocks and the remedial actions can be both within and beyond the health system

Large-scale shocks can have multiple pathways by which they transmit their impacts, besides the health system. As such, policy options to improve health system resilience may involve other sectors (Witter et al., 2023; OECD, 2022a; 2023k). Examples include the use of non-medical supply chains to resolve shortages and, conversely, the impact of COVID-19 lockdowns and physical distancing on disrupting supply chains (OECD, 2023k). The availability of healthcare students and the ability to deploy non-healthcare workers into some roles reduced the burden on the healthcare workers (European Observatory on Health Systems and Policies, 2020).

Large-scale shocks can have multiple pathways by which they transmit their impacts.

Multiple pathways for shocks suggest that, potentially, multiple remedial actions may be required. Exceptionally large shocks such as the COVID-19 pandemic demonstrate this – there were multiple successive points of potential failure in the health system and beyond (OECD, 2023k). And therefore, the potential list of remedial actions is also substantial, involving both the health system and the wider interconnected systems (European Observatory on Health Systems and Policies, 2020).

Decisions made about the health system may have trade-offs between goals

Resilience and efficiency trade-offs may be required, and the decisions made about the policies impacting the functions and the sub-functions should consider the unintended consequences of promoting one upon the other. On the one hand they can be complementary, reducing low-value care, and redirecting the reduced expenditure into both resilience and efficiency enhancing policies will improve both. Some resilience enhancing policies, such as widely available data to guide decisions in real-time and a culture of learning at an organization level, will enhance efficiency of the health system.

However, some will not. Ensuring that spare capacity is available may be associated with diminished efficiency in the short run (OECD, 2023k). Building excess slack into systems may be construed as fiscally irresponsible outside times of shocks (Smaggus et al., 2021).

A focus on efficiency may reduce the resilience of specific functions or sub-functions of the health system. For example, very low-cost purchasing may be related to breaks in the supply chain of consumables and pharmaceuticals, and consequently the focus on resilience and efficiency needs to be balanced to ensure supply consistency (OECD, 2023k).

Indicators and pathways applied to the COVID-19 pandemic

The data and indicators that could be used to assess the performance of a health system during a previous shock include the indicators listed in the previous section. This section uses the experience of different health systems during COVID-19 as an example of how different indicators can complement each other. The purpose of this section is not to provide a comprehensive analysis of health system responses to the COVID-19 pandemic, but to provide examples of how multiple indicators can be used in conjunction and be interpreted in context.

Service delivery

The delivery of services during the shock cycle can be used to infer the resilience of the health system. Different aspects of resilience can be assessed using different measures: for example, increasing service delivery as demand increases, maintaining essential services, or monitoring the adaptation and transformation of service delivery.

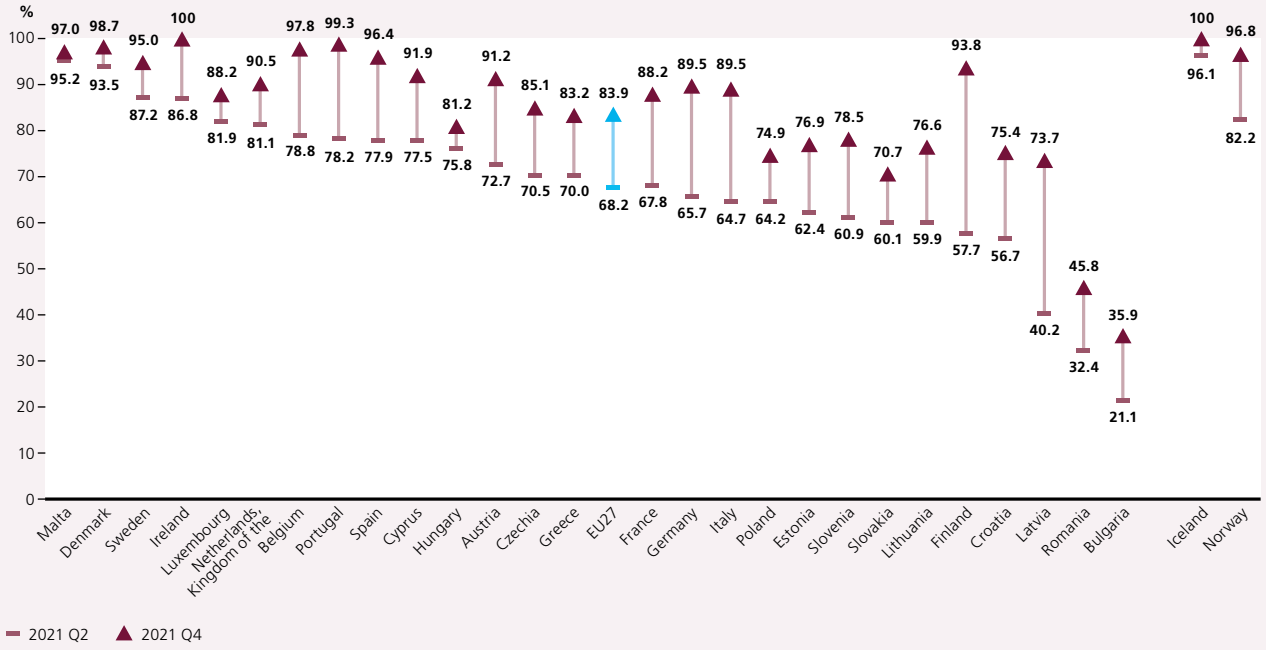
Increasing COVID-19 services

During the COVID-19 pandemic, there were widespread shortages in testing, tracing, vaccination and critical care capacity for many services, especially during the first two years of the pandemic. This resulted in health systems having to prioritize who would receive services and adapt how services were provided.

COVID-19 was associated with an increased fatality rate in the elderly unvaccinated population (OECD, 2023k), and therefore they were considered a priority group to vaccinate (OECD & European Union, 2022). For a vaccination programme targeted at a segment of the population to be successful, it is crucial for various components of the healthcare system to function effectively. There needs to be a valid approach to prioritization, a vaccine available in sufficient quantities and with adequate safety, available manufacturing resources, sufficient financing of the vaccine and its delivery, disclosure of potential adverse events, and identification of those to receive the vaccination. Moreover, the importance of public trust in the vaccine is essential (OECD, 2021a). Finally, this needs to be monitored, which requires data systems that deliver the information to all those who need it; for example, the widespread use of digital tools was part of the process of vaccination in many countries (European Observatory on Health Systems and Policies, 2021).

All countries in the European Union gave precedence to their elderly citizens for vaccination. Figure 2.4.2 (page 101) shows the speed at which countries vaccinated a key risk group, including those aged 60 and over, as an indicator of resilience. Greater vaccination coverage has been associated with decreased excess mortality during the pandemic (OECD, 2023k). During the initial six months of 2021, on average, 68% of individuals aged 60 and above received their first vaccine dose in 27 EU nations. By the close of 2021, this figure rose to 84%. However, there was a noticeable disparity in vaccination rates among countries. In the first half of 2021, Iceland, Malta, and Denmark had vaccinated over 90% of their citizens aged 60 and

Figure 2.4.2 Initial COVID-19 vaccination course completion among people aged 60 and over, 2021



Notes: Initial vaccination course was assumed to be completed with two vaccinations (or one of Janssen). The EU average is unweighted.

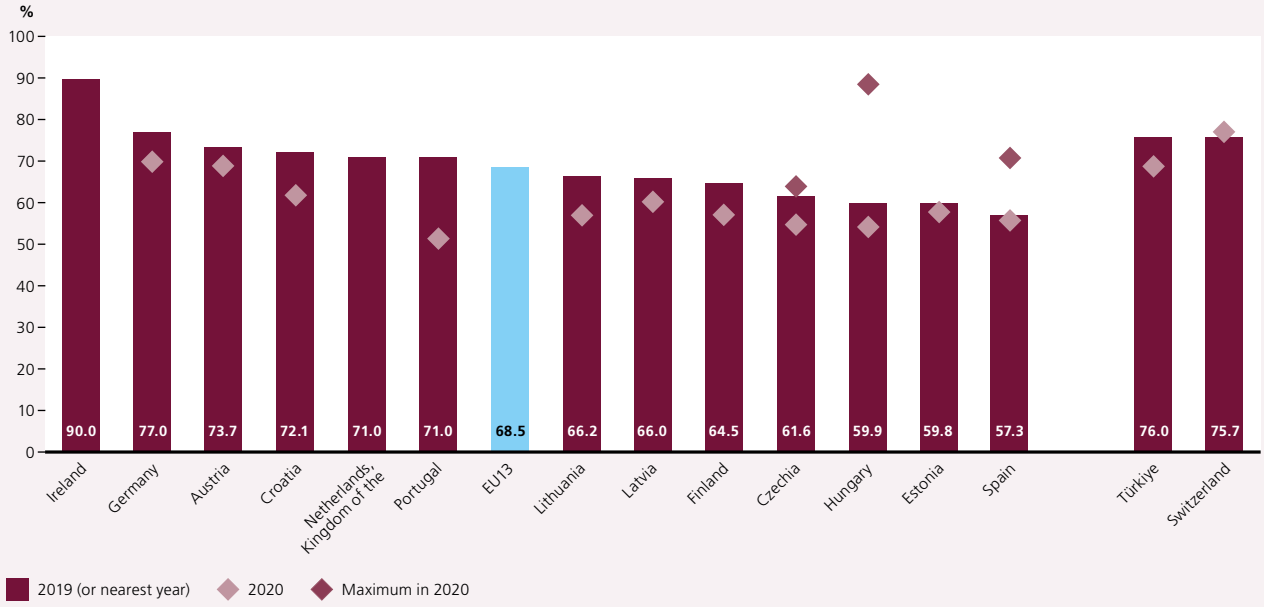
Source: ECDC, 2022

above. On the other hand, Bulgaria, Romania, and Latvia recorded the lowest rates at 21%, 32%, and 40% respectively. Based on the data from ECDC, by 2021, 68% of healthcare workers in 15 countries and 72% of long-term care residents in 11 countries had completed their first vaccine dose. (OECD & European Union, 2022).

Other services were also required to be scaled up during the COVID-19 pandemic. Indicators that could be used to measure this could include average duration between testing and results, the time required to initiate contact tracing, and the percentage of COVID-19 cases with sequencing information (OECD & European Union, 2022; Gerkens et al., 2023; OECD, 2023k). Adaptations were used in many of these services to be able to deliver them at scale. For example, in the tracing regimes, there was the widespread introduction of digital tools (European Observatory on Health Systems and Policies, 2021).

During the first two years of the pandemic, there was a reorganization of health systems to increase the available critical care capacity for a surge in COVID-19 cases (European Observatory on Health Systems and Policies et al., 2022). The more commonly collected indicator – hospital bed occupancy – and the less commonly collected indicator – intensive care capacity – can be used during a shock to assess the availability of resources and the extent to which the system is under pressure. In this circumstance, it is regarded as a measure of spare capacity but needs to be combined with the number of beds available. Figure 2.4.3 (page 102) gives an indication of the total used capacity of the healthcare system with the occupancy of intensive care beds. While occupancy is important, maximum occupancy may be a more important issue than average occupancy. The beds could be unused for a prolonged period but not in sufficient numbers when a COVID-19 surge occurred – in that case, average occupancy across the year would be low and maximum occupancy would be very high.

Figure 2.4.3 Adult ICU occupancy rate, 2019 and 2020



Source: OECD/Eurostat/WHO-Europe Joint Questionnaire on Non-Monetary Health Care Statistics, based on national sources

The indicators also need to be interpreted in their context. For most countries, the occupancy of adult ICU beds was lower in 2020 than in 2019. This partly reflects a decrease in the offering of planned procedures and associated ICU use. During the initial months of the COVID-19 pandemic, prior to the advent of vaccinations and while there was some uncertainty about the epidemiology of the SARS-CoV-2 virus, there was a need to preserve capacity for a sudden increase in patients with COVID-19 who required critical care (OECD, 2023k).

There were widespread transformations in how intensive care services were offered. Some non-COVID-19 hospital services were reduced, and staff, space and supplies were deployed to the critical care surge. High-level care, including ventilation, was offered in non-traditional spaces; centralization of services was conducted so that the scarce resources were used to deliver the most effective care. Private facilities and staff were integrated with public facilities and staff (OECD, 2023k). There were also changes in how services were funded: for example, new payments based on empty beds or compensating for income losses that might have occurred because of lower activity (Waitzberg et al., 2022). Because of the offering of care in non-traditional spaces, traditional metrics may not give an indication of the available capacity. For example, the measurement of available intensive care beds that did not consider the services offered in non traditional spaces would underestimate the available capacity.

The lessons learnt, which arose from difficulties in undertaking the required level of service delivery during the critical care surge, led to consideration of changes in several of the building blocks (OECD, 2023k). For example, in resource generation there has been the consideration of adapting the current infrastructure to ensure that it is able to meet the requirements of a critical care surge. Within the workforce component of resource generation there was the consideration of increasing the number of critical care workers and increasing the critical care training of staff not usually involved in critical care (OECD, 2023k). Arrangements around governance and the organisation structure of healthcare were also altered, with mechanisms

for improved co-ordination within health systems and between public and private sectors (OECD, 2023k). Suggestions have been made to develop more sensitive indicators of ICU strain that would allow earlier intervention to avoid poor outcomes (Dichter et al., 2022).

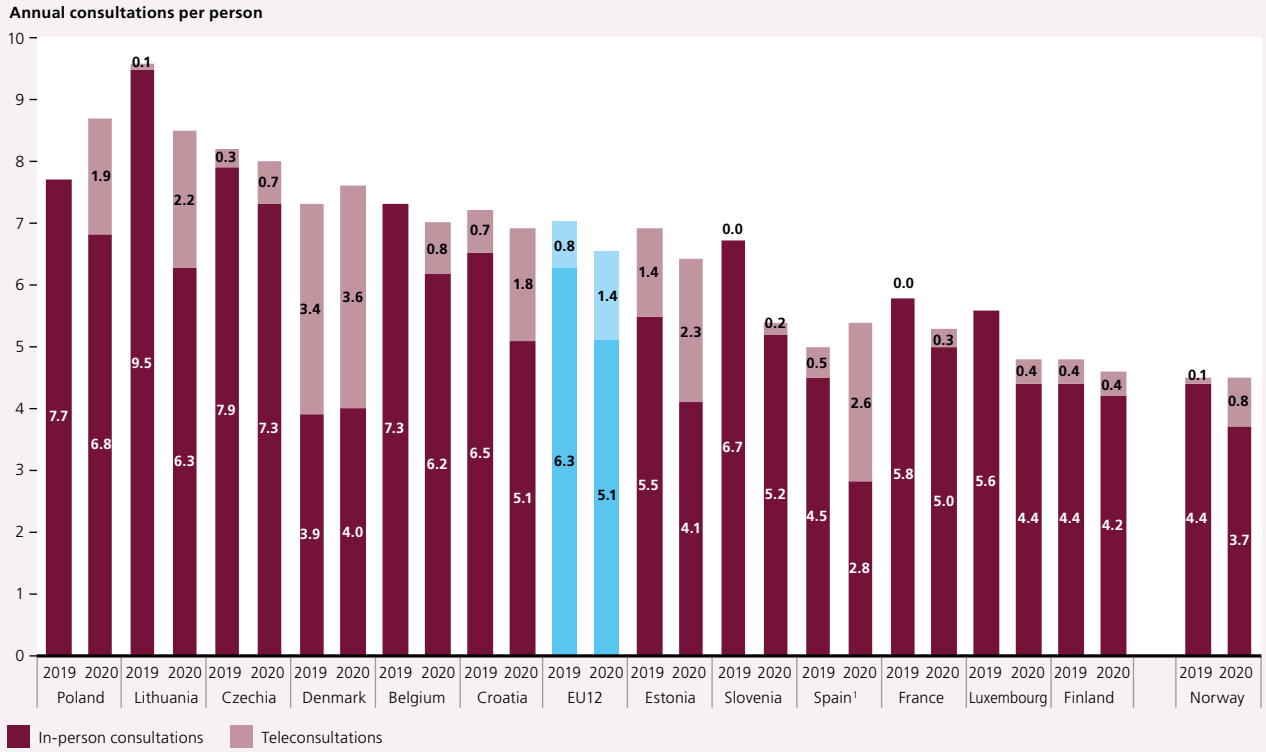
There were similar reorganizations in other aspects of service delivery. For example, in primary care there was an expanded use of multidisciplinary teams and the integration of public health and community services (OECD, 2023k).

Maintaining essential services throughout the shock

Another aspect of resilience during a shock can be the extent to which essential services are maintained. This requires an assessment of what is an essential service and consideration of the adaptations and transformations of service delivery that may occur during and after a shock. One of the most obvious was the massive increase in telehealth services that occurred during the first two years of the COVID-19 pandemic. Figure 2.4.4 demonstrates that in many countries the expansion of telehealth compensated for the reduction of in-person consultations with doctors. For example, there was widespread disruption in inpatient mental health services in several countries (see Figure 2.4.5 on page 104). However, there was – and remains – the potential for substitution by telehealth, the effectiveness of which may depend on the extent to which mental health services were already delivered in the community or not.

Childhood immunization can be considered an essential (and irrepressible) service offered by the health system and as such the change can be seen as an inference about the resilience of the health system. For some countries, maintaining the

Figure 2.4.4 In-person consultations and teleconsultations with doctors, 2019 and 2020

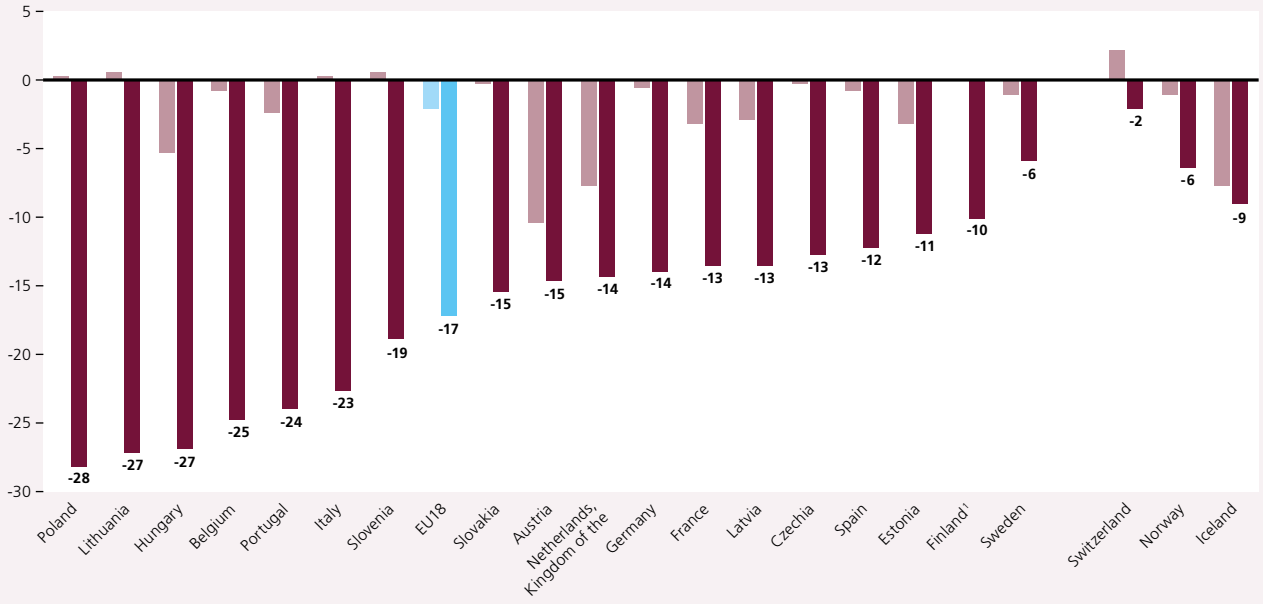


Notes: The EU average is unweighted. Data are ranked from higher to lower total number of consultations per person in 2020. Data on teleconsultations in 2019 are not available for Belgium, Luxembourg and Poland. [1] Data for Spain are underestimated as they only include consultations in primary healthcare centres of the National Health System.

Sources: OECD Health Statistics, 2022 (for in-person consultations) and national sources (for teleconsultations); Eurostat Database

Figure 2.4.5 Use of inpatient mental health services was disrupted in most countries

Annual % change in hospital discharges for mental and behavioural disorders



Notes: Data for the Netherlands (Kingdom of the) include general and university hospitals only. [1] The pre-pandemic data for Finland relate to 2017/2018.

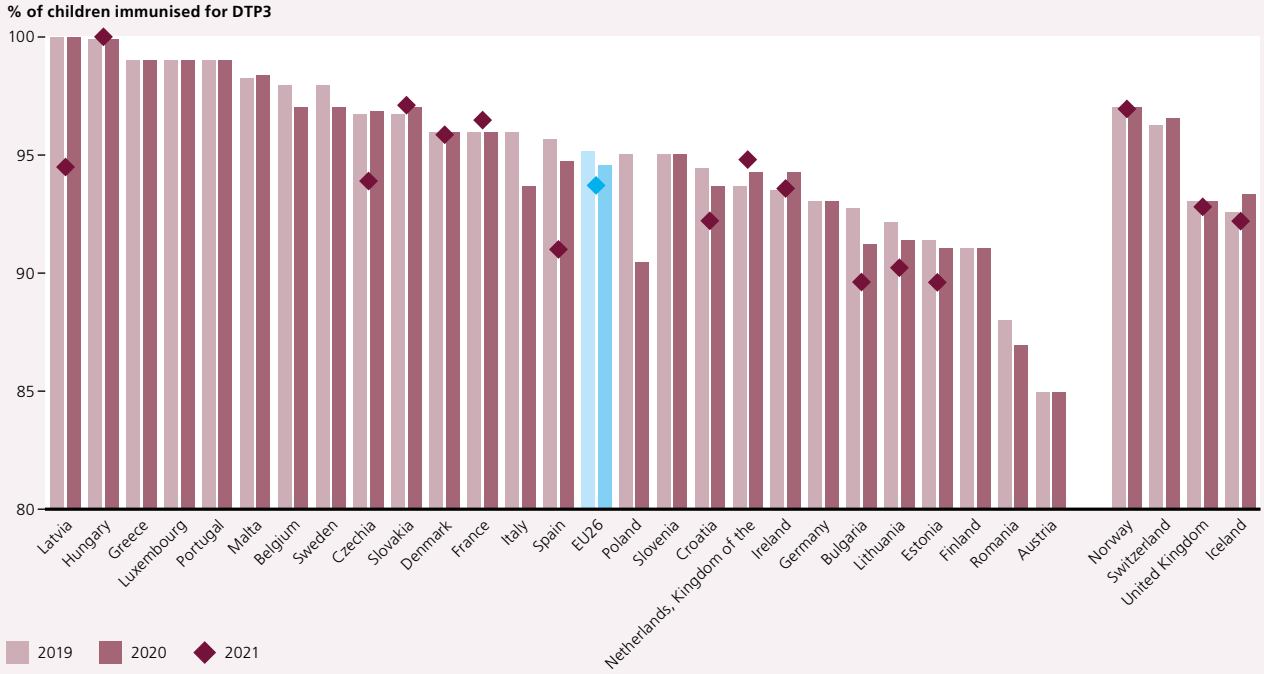
Source: OECD Health Statistics, 2022

high degree of coverage in 2020 was not repeated in 2021 (see Figure 2.4.6 on page 105). Ensuring high levels of immunization and other protective services ensures that even during a crisis, there is a degree of protection from additional or compounding crises. For example, high levels of vaccination might have reduced the impact of the increasing numbers of diphtheria cases seen in the EU in 2022 and 2023 (ECDC, 2023a).

The reduction in screening and diagnostic services during 2020 may have contributed to a reduction in the detection of invasive cancers in some countries; for example, in Belgium over 2020 and 2021 there were an estimated 2700 missing cancer diagnoses (OECD, 2023c). Figure 2.4.7 (page 105) shows the decrease in cancer-related surgery during the first year of the COVID-19 pandemic. Assessing the loss of essential screening services requires accurate timely high-quality data to be available. Without this, it is not possible to estimate the impact of a disruption on cancer (OECD, 2023d). The reduction was due to a reduction in the resources associated with service delivery for cancer screening, but also because of the assessment of safety by the public of attending services during the first years of the pandemic (OECD, 2023e).

There was a widespread reduction in hospital activity and elective surgery to support the critical care surge. This resulted in delayed and deferred care. Some of this delayed and deferred care can be observed in the monitoring of service activity data, for example, reductions in the activity of hip and knee replacement surgery (see Figure 2.4.8 on page 106). This reduction, all other things being equal, might be expected to result in an increase of the waiting times associated with replacement surgery. However, because of a reduction in ambulatory services or a fear of infection it is possible that the number of people attending GPs or specialists to be placed on a waiting list may fall.

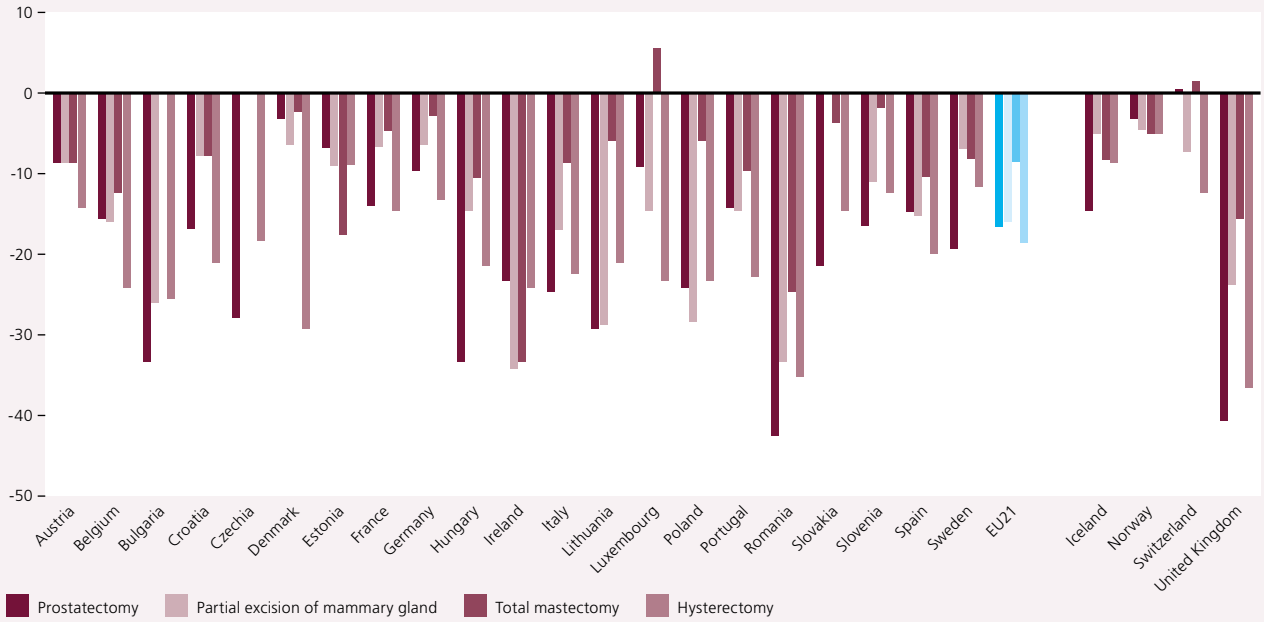
Figure 2.4.6 Childhood immunization rates for Diphtheria, Tetanus, Pertussis (DTP3), from 2019 to 2021



Note: The rate for France in 2020 is an estimation.

Source: WHO Immunization Portal reproduced from OECD/European Union

Figure 2.4.7 Cancer-related surgery dropped significantly in 2020 compared to 2019



Notes: Countries are ranked by alphabetical order. For Ireland, data pertain only to publicly funded hospitals; public patients treated in private hospitals are not included, which overestimates the decrease shown here.

Source: OECD Health Statistics, 2022

Figure 2.4.8 The number of hip and knee replacements and cataract surgeries fell sharply in 2020

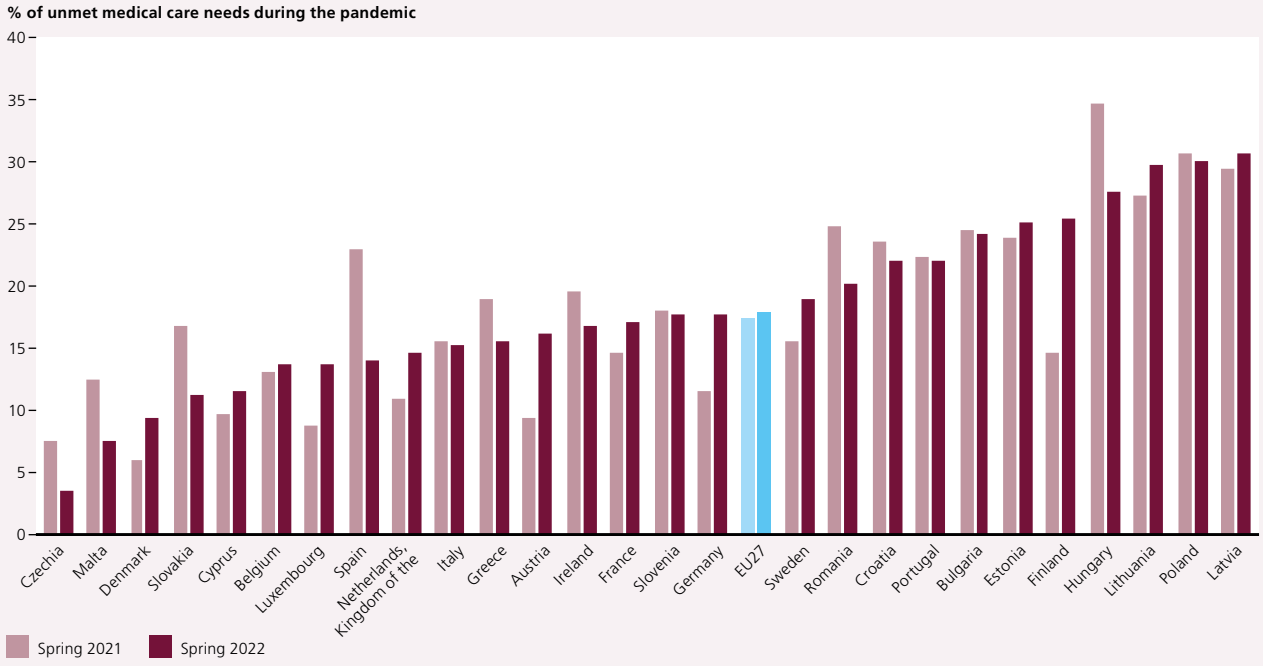


Notes: The EU average is unweighted. For Ireland, data pertain only to publicly funded hospitals; public patients treated in private hospitals are not included, which overestimates the decrease shown here. Iceland does not provide any data on knee replacement.

Source: OECD Health Statistics, 2022

Therefore, metrics such as the number of people on waiting lists may not give the true indication of demand. In this case, consideration of the unmet needs of the population may be required to correctly identify the requirements needed during the recovery of the health system from the shock (Figure 2.4.9). Unmet health needs can be assessed using survey data. Two international sources are the regular Eurostat EU Statistics on Income and Living Conditions (EU-SILC) survey and Eurofound's Living, working and COVID-19 e-survey (OECD & European Union, 2022).

Figure 2.4.9 Unmet medical care needs during the pandemic, 2021 and 2022



Note: The survey question refers to current unmet needs at the time of the survey. The EU average is weighted.

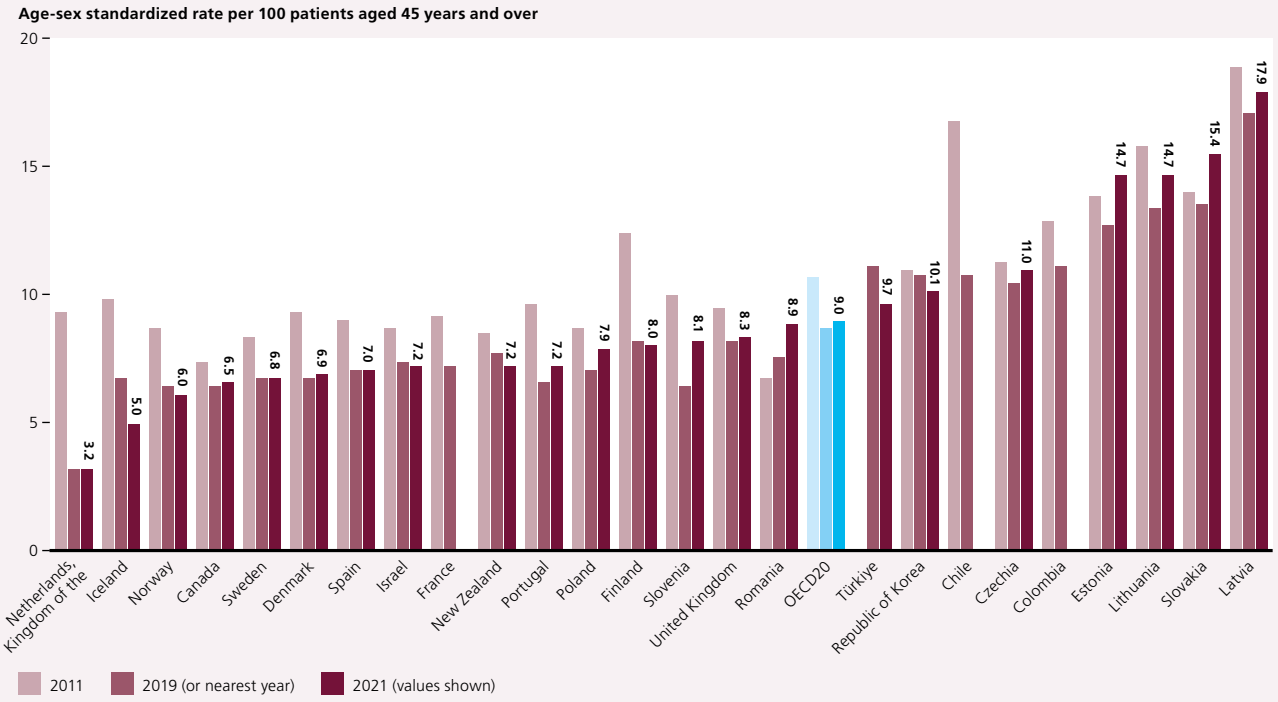
Source: Eurofound's Living, working and COVID-19 e-survey (spring 2021 and spring 2022)

Safety of services

Concerns over the safety of health services during the first two years of the COVID-19 pandemic may have contributed to some of the changes observed above, not least the balance of risk and benefit of attending with the chance of contracting an infection (OECD, 2023a).

In periods of exceptionally high patient demand, the utilization of crisis standards of care becomes necessary to accommodate the greatest number of patients. Some indicators of quality and safety of services either worsened between 2019 and 2020 or reversed a previous improvement trend. For example, thirty-day mortality after admission to hospital for an acute myocardial infarction increased slightly in 19 OECD countries (see Figure 2.4.10 on page 108). There are multiple factors that may influence this, for example hesitancy in attending treatment may increase the average severity of cases, while later presentation and greater time in initiating treatment could all have an impact.

Figure 2.4.10 Thirty-day mortality after admission to hospital for acute myocardial infarction based on linked data, 2011, 2019 (or nearest year) and 2021



Source: OECD Health Statistics 2023j

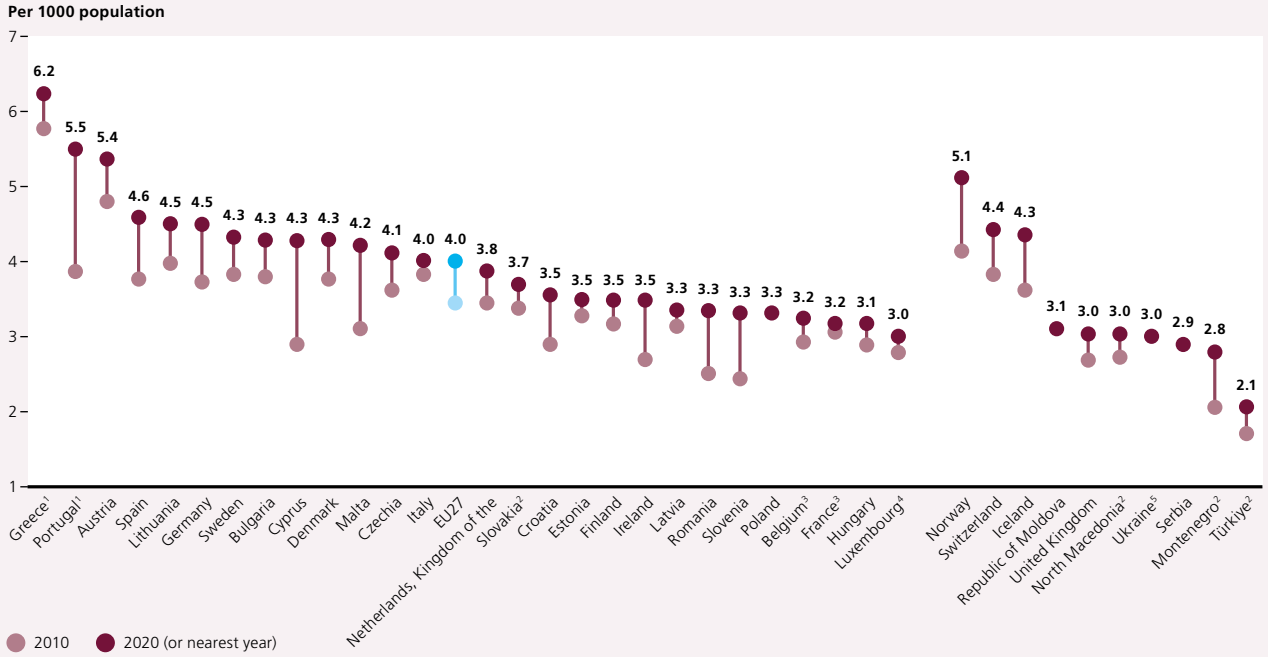
Resource generation

Many reviews and investigations in the response to the first two years of COVID-19 concluded that an adequate, well trained mental and physical health workforce was essential throughout the entire shock cycle during COVID-19 (Haldane et al., 2021a; OECD, 2023k).

Figure 2.4.11 (page 109) shows the number of doctors per 1000 population in the first year of the pandemic and Figure 2.4.12 (page 109) shows a negative correlation between higher numbers of health and social care staff and excess mortality. Similar strategies were used across countries to address workforce shortages. These included working harder, adjusting roles and responsibilities, reallocating staff to hospitals and units with the greatest needs and mobilizing additional staff. Some of these strategies may result in vulnerabilities over the entire shock cycle (OECD, 2023k). Prolonged overtime can potentially lead to burnout and a vicious cycle of a reduced workforce resulting in greater burnout.

Some of these policies required adaptations of the governance arrangements surrounding the workforce, for example expanded roles and responsibilities and the issuing of short-term fast-track licences (OECD, 2023k).

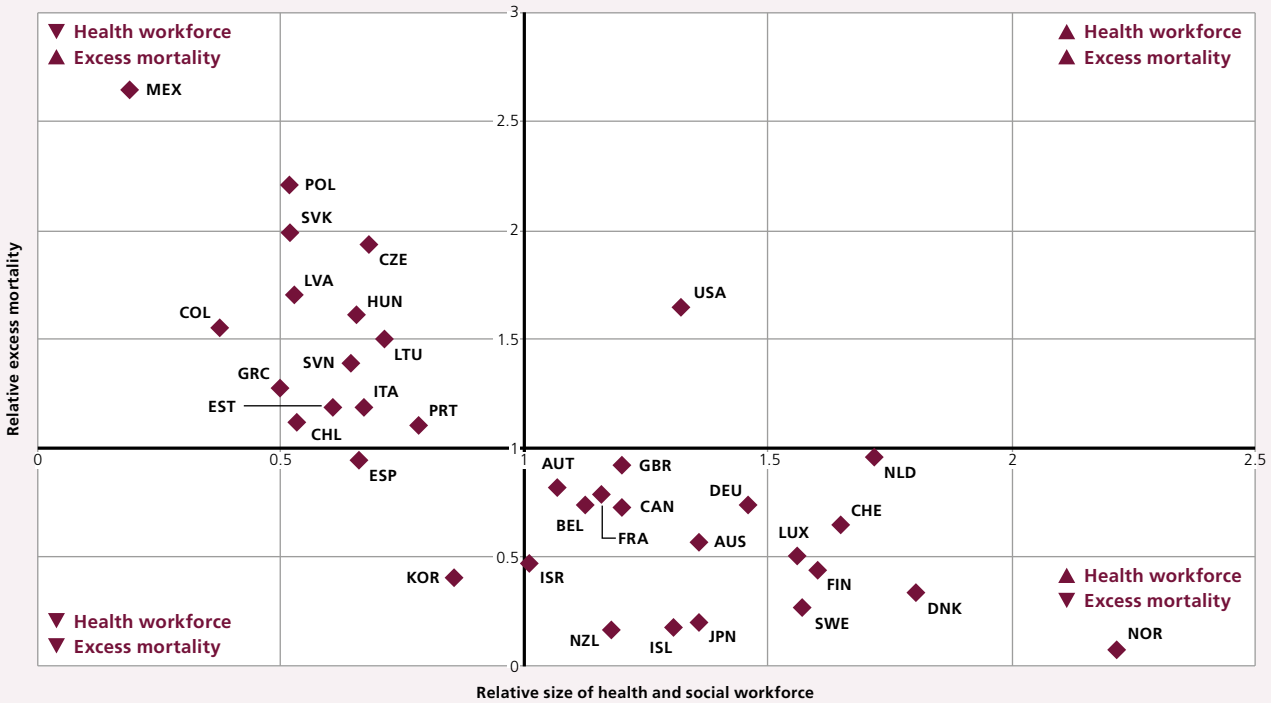
Figure 2.4.11 Practising doctors per 1 000 population, 2010 and 2020 (or nearest year)



Notes: The EU average is unweighted. [1] Data refer to all doctors licensed to practise, resulting in a large over-estimation of the number of practising doctors (e.g. of around 30% in Portugal). [2] Data include not only doctors providing direct care to patients, but also those working in the health sector as managers, educators, researchers, etc. (adding another 5–10% of doctors). [3] Medical interns and residents are not included. [4] The latest data refer to 2017 only. [5] The latest data refer to 2014 only.

Source: OECD & European Union, 2022

Figure 2.4.12 Higher numbers of health and social care employees associated with lower excess mortality



Notes: The quadrant chart shows the association between the health and social care workforce and excess mortality. The x-axis shows how much a country is above or below the OECD average for total health and social employment in 2019 (per 1000 population); the y-axis shows a country's distance from the OECD average excess mortality rate for 2020–2021. Note that this analysis does not adjust for other factors, nor does it necessarily infer causality.

Source: OECD, 2023k

Health workers were over-represented at the beginning of the pandemic in terms of COVID-19 infections. A shortage of personal protective equipment (PPE), relative to the demand, was a contributor to this (OECD, 2023k). Shortages in PPE resulted in several different types of adaptation in different functions. Examples of adaptations were the use of alternatives, such as cloth masks or face coverings instead of medical or surgical masks. Additional examples include the multiple use or re-use of respiratory protective devices (OECD, 2023k). There were widespread strategies to improve the supply of essential materials, increasing domestic manufacture, and changes in the governance arrangements around procurement (OECD, 2023k).

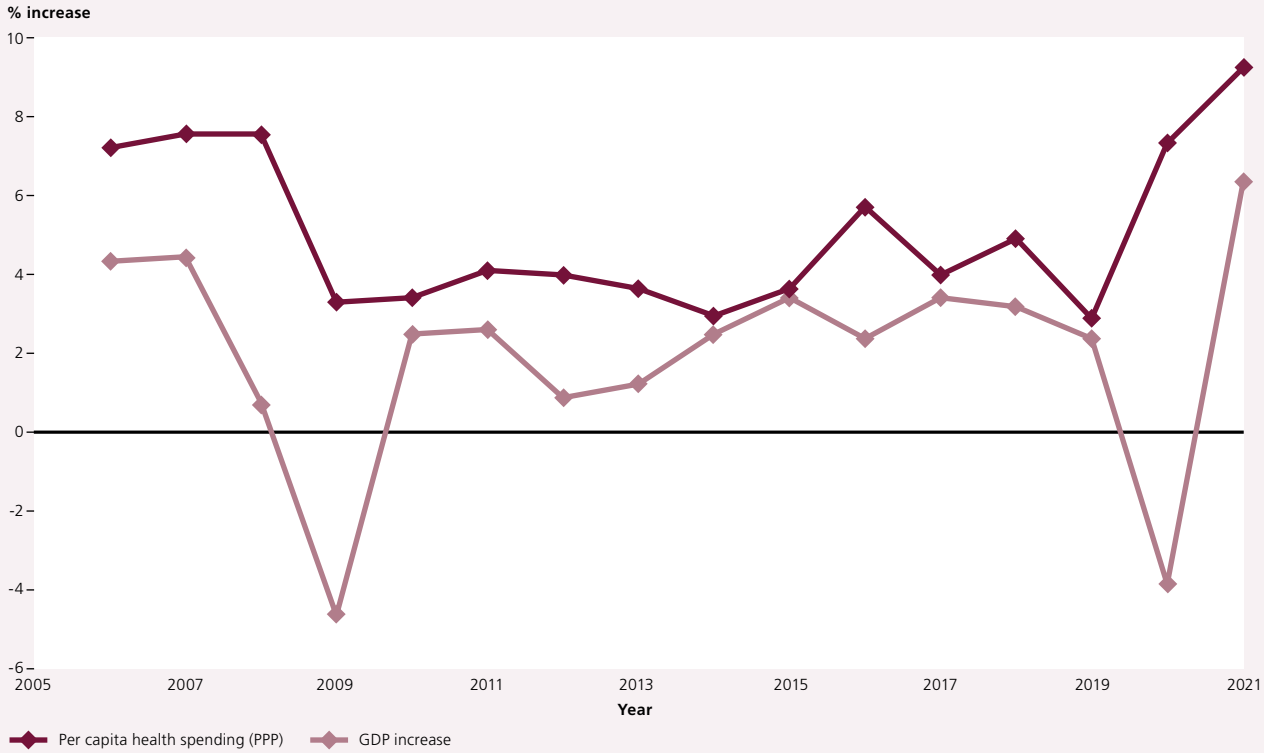
Financing

In the financing function an important contributor to resilience is the ability to mobilize financial resources during times of crisis. The potential to achieve this was evident during 2020–2021, in contrast to the period between 2007 and 2009 when increases to healthcare spending slowed (see Figure 2.4.13) (OECD, 2023k).

This also demonstrates the importance of considering distinct types of shock when assessing resilience: financial shocks have a different implication for the financing function from infectious disease shocks.

The impact of counter-cyclical financing is demonstrated in Figure 2.4.13. Despite a decrease in the GDP of countries in 2020, there was an increase in the expenditure appropriate for the increased demand generated by the pandemic.

Figure 2.4.13 Increases in health expenditure during financial and pandemic shocks



Note: Only OECD countries (20) with data for the complete series are included in the analysis. An unweighted average was calculated.

Source: OECD, 2023k

Increases in expenditure from public funds were critical to the responses to the COVID-19 pandemic. There was increased expenditure on the provision of surge capacity within health systems. As previously mentioned, this entailed enhancing critical care capacity, boosting testing and contact tracing capabilities, and implementing a widespread vaccination strategy. This occurred while central government revenues decreased in European countries (European Observatory on Health Systems and Policies, 2021).

Increases in expenditure from public funds were critical to the responses to the COVID-19 pandemic.

Beyond this, there had to be financial support to health services, healthcare innovation and a transition to greater telehealth. The strategies to support a greater number of health workers, diversifying the production of PPE and gaining vaccines required financing strategies to support them.

At an overall level, this was accomplished by securing adequate financial resources through a combination of reallocating existing funds and generating additional funding (European Observatory on Health Systems and Policies, 2021). Alongside this, purchasing and payment systems were changed. This could be undertaken to increase required activities or to compensate providers for lost revenue during the COVID-19 pandemic. For example, within primary care, many countries responded with changes in the payment models; 19 out of 26 countries responding to the OECD Resilience of Health Systems Questionnaire in 2022 adopted changes to the payment models in primary care. These included additional salary payments and additional fee-for-service payments. A small number of countries adopted new capitation or bundled payment programmes (OECD, 2023k). An example of these changes is the additional payments made for visiting patients in aged care facilities or engaging in triage, contact tracing and diagnostic tests (European Observatory on Health Systems and Policies, 2021).

Additionally, changes were made to ensure that the coverage to high quality services remained. For example, rapid coverage of new technologies associated with COVID-19, reducing OOP expenses, and extending coverage to population groups such as non-residents (European Observatory on Health Systems and Policies, 2021).

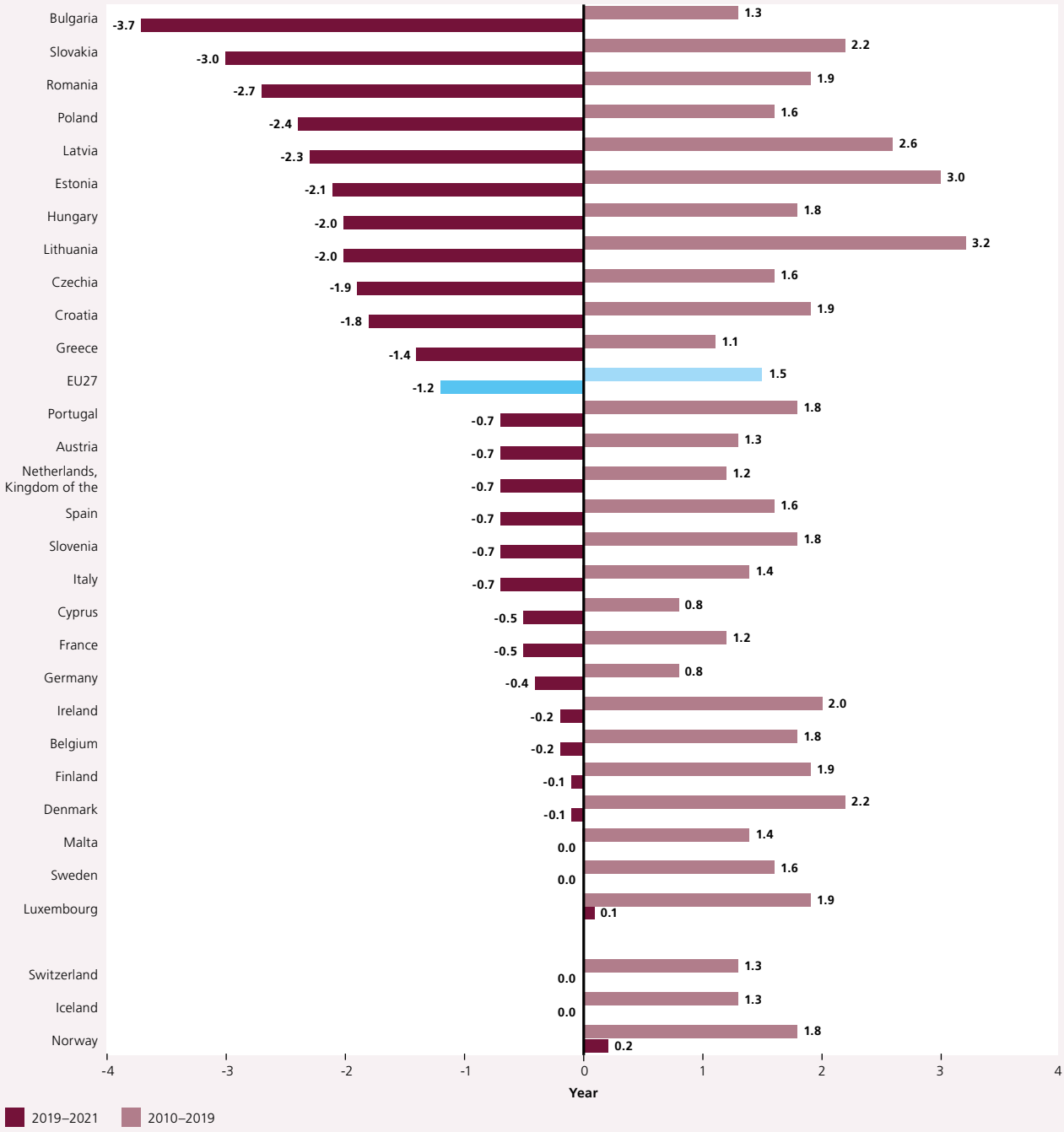
Final outcomes

Health improvement

Figure 2.4.14 (page 112) outlines the use of a commonly collected statistic – life expectancy – to assess the resilience of different health systems during the COVID-19 pandemic. The figure demonstrates the changes that occurred in life expectancy in the first two years of the pandemic in relation to the previous decade.

It must be appreciated that the differences are not solely due to the health system; important contextual factors such as socioeconomic factors, geography, demography and the coherence of the response across society should also be taken into account (OECD, 2023k).

Figure 2.4.14 Gains or declines in life expectancy, 2019–2021 and 2010–2019



Notes: The EU average is weighted. Data for 2021 in Ireland refer to 2020.

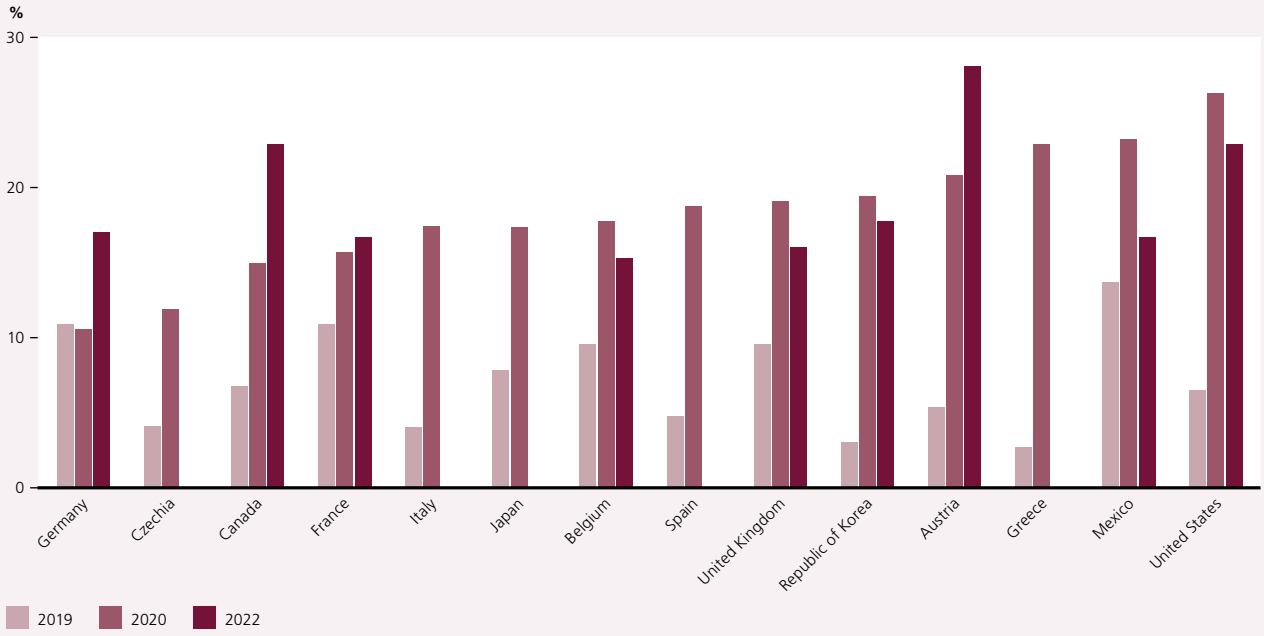
Source: Eurostat Database

Other common measures of mortality during the first two years of the COVID-19 pandemic included COVID-19 mortality and excess mortality. Each of these needed to be carefully interpreted; for example, COVID-19 mortality required a sufficient testing and coding regime to identify COVID-19 cases. Differences in testing regimes and coding will result in differences between countries that hamper comparisons (Morgan et al., 2020). Excess mortality compares the mortality that occurs to an estimate of what would have happened without the COVID-19 pandemic. It has the advantage of including both direct and indirect

deaths because of the COVID-19 pandemic, such as those associated with delayed and deferred care. However, depending on the method of calculation, it could also include other causes of excess mortality that may not be associated with the COVID-19 pandemic, for example, heatwaves (Wang et al., 2022). Moreover, there are many ways of calculating this estimate (Morgan et al., 2020).

The impact of COVID-19 on mortality rates will miss some important factors, notably morbidity and potentially morbidity outside interactions with the health system. Mental health outcomes are one estimate of morbidity, and population mental health outcomes give an indication of what is happening at a societal level. Social isolation, loss of work and financial insecurity also impact on people's mental health (see Figure 2.4.15) (OECD, 2023i). These estimates are usually collected by survey (OECD, 2023k) and may be collected either irregularly or with a sufficient gap between surveys. During the COVID-19 pandemic many countries increased the frequency and depth of population mental health data collections (OECD, 2023i; 2023k).

Figure 2.4.15 National estimates of prevalence of depression or symptoms of depression, 2019–2022 (or nearest year)

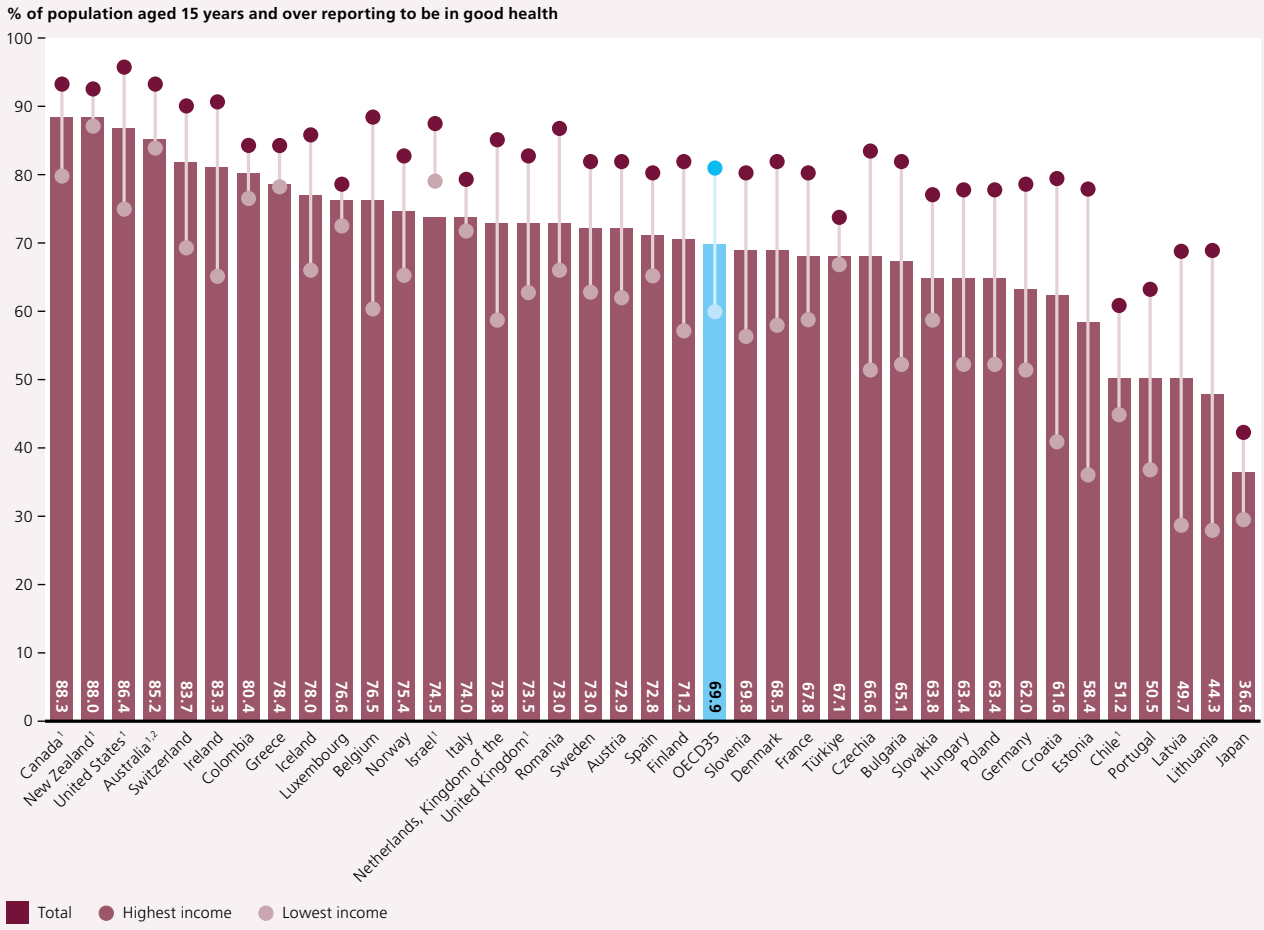


Notes: Survey instruments and population samples differ between countries and in some cases across years within countries, which limits direct comparability.
Pre-pandemic data for: Czechia is from 2017; Canada from 2015–2019; Japan from 2013; Belgium from 2018; United Kingdom from 2019–March 2020; and Republic of Korea from 2016–2019.

Sources: National data sources

The distribution of health or the gains of health can also be assessed from an equity perspective. This can be accomplished through the analysis of regularly gathered data, such as mortality, or by conducting surveys (see Figure 2.4.16 on page 114 for an example of the use of survey data). A key aspect is being able to link the information to socioeconomic information and other markers of vulnerability (see Figure 2.4.17 on page 114). Not all information systems have been able to do this (OECD, 2023k).

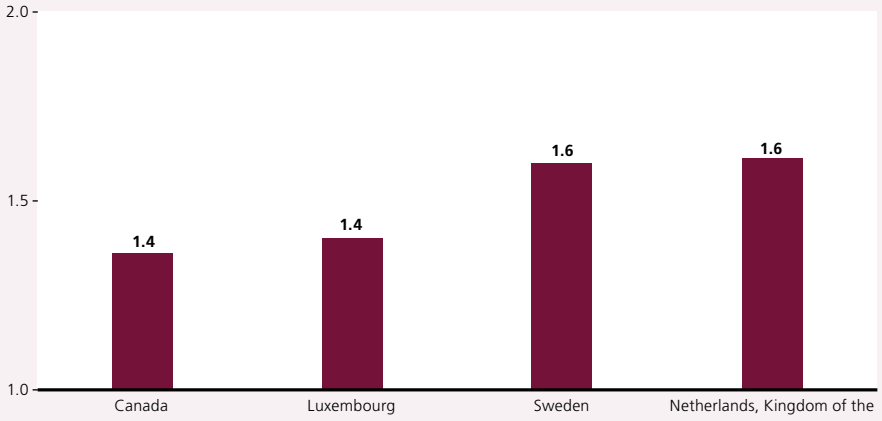
Figure 2.4.16 Adults rating their own health as good or very good, by income quintile, 2021 (or nearest year)



Notes: [1] Results for these countries are not directly comparable with those for other countries, due to methodological differences in the survey questionnaire resulting in a bias towards a more positive self-assessment of health. [2] Most recent data point corresponds to 2017.

Source: OECD Health Statistics, 2023j (EU-SILC for EU countries)

Figure 2.4.17 Rate ratio for COVID-19 mortality between people with lower incomes and high-income people



Note: Data are not directly comparable across OECD countries and regions due to different study design, methodology and timeframe of observation. The rate ratio is based on age-adjusted or multivariate methodology in Luxembourg, Sweden, the Netherlands (Kingdom of the) and Canada.

Source: Berchet, Bijlholt & Ando, 2023

Governance

Information and intelligence

Addressing large-scale, swiftly evolving shocks necessitates precise and up-to-date data that enable all participants to engage in actions that optimize a health system's functionality and minimize damage. This damage could stem from the shock itself, or from the direct and indirect consequences of the policies implemented to counter it. The COVID-19 pandemic illustrated these prerequisites.

Basic real-time data was missing for decision-makers at the beginning of the COVID-19 pandemic; for example, surveillance data on cases and deaths was often missing or misleading. The lack of real-time data on intensive care beds was also a major challenge (OECD, 2022b). Few countries were able to report the maximum occupancy for the 2022 Health at a Glance: Europe publication (OECD & European Union, 2022). Health systems rapidly improved their ability to generate timely information (OECD, 2023k). Beyond that, disaggregated information would be more useful, not just reporting the occupancy within an entire country, but occupancy at regional and/or institutional levels.

Predicting the required capacity of critical care over the short and medium term required modelling of the likely burden and then adapting the current available resources to the required burden. Based on the benefits of modelling the expected demand and the required resources, several OECD countries have been improving the ability to forecast demand in the future. Examples of these changes include common data definitions, more detailed and granular information availability, and the development of modelling capacity (OECD, 2023k).

At the individual patient and provider levels, having access to patient-specific information was valuable, considering the extensive disruption of healthcare caused by the pandemic – which included swift modifications in healthcare delivery methods, locations and providers. To direct care towards those who need it the most, relevant information must be supplied to the health system. This was not only essential during the pandemic but also in its aftermath, as addressing postponed and deferred care became crucial.

For these reasons, it is important that resilience assessments consider multiple sources of information assessing the performance of the entire system over an entire shock cycle. Box 2.4.1 on page 116 outlines how resilience test organizers and facilitators can handle data limitations. Care should be made to ensure the importance of the unobserved functions and outcomes is appreciated. These assessments give an indication of how a system is performing but not why, and do not necessarily give information about how to improve the system. In these cases, hypotheses about the relationships between the system function and sub-functions need to be made to make policy about areas for improvement.

Box 2.4.1 What if we don't have the right data? Then this reveals that managing a real-life shock analogous to the scenario will be challenging

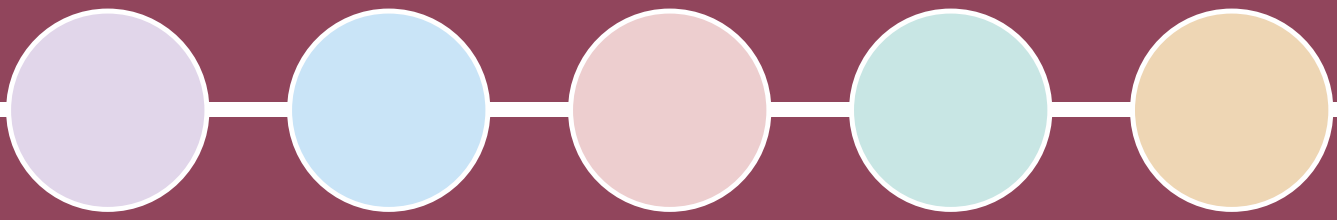
Facilitators may wish to consider both the baseline information about some indicators and the changes that may occur during the scenario to help inform themselves and the participants. It is also useful to examine previous shocks to see the availability of important information and its timeliness.

Facilitators and users should consider if the information is important but not available in a timely fashion, then how will an actual shock be managed without it. For example, in constructing a scenario impacting the health workforce, if information is unavailable on the distribution of the workforce across geographical areas or the public and private sectors, then it may not be available during an actual crisis. This may limit the effectiveness of any responses to manage the workforce.

A critical component of assessing resilience in a stress testing scenario includes keeping track of all the vital information that was not available during the scenario's construction, which is relevant to the assessment of resilience.

3

Example shock scenarios



3.1 Example scenario: Pandemic

The threat

This is a fictional example scenario for a resilience test. Its development was informed by a rapid literature review considering relevant events. Any similarity to a particular country or past event is purely coincidental. This scenario needs to be adapted to the setting of the resilience test and reviewed by an expert before it can be used as part of a resilience test (see Section 1.2).

Section 1.2: The resilience testing process page 5

The COVID-19 pandemic demonstrated how pandemics can overwhelm health systems and societies as a whole, causing rapid and widespread mortality as well as broader social and economic disruption. While many health systems demonstrated high levels of resilience during the COVID-19 pandemic, throughout Europe there were also numerous examples of failure to sustain essential services, protect healthcare workers, safeguard public health and save lives (Azzopardi-Muscat et al., 2021).

A common definition of a pandemic is "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people" (Last, 2001). Such a disease outbreak is very likely to be classified as a Public Health Emergency of International Concern (PHEIC) by the International Health Regulations (2005) and understood as a serious cross-border threat as per EU Regulation (EU) 2022/2371.

Pandemics remain a present and growing threat. In 2022 the European Commission identified pathogens with high pandemic potential as the top threat to health in Europe (European Commission, 2022a), while in 2019 the World Health Organization recognized both a Global Influenza Pandemic and High-Threat Pathogens as two of the top 10 global threats to human health (WHO, 2019). Pandemics like the COVID-19 pandemic are likely to become more common owing to a range of factors including increased global travel, urbanization, climate change and increased human–animal contact (GAVI, 2020).

The primary impact of pandemics on populations is the increased rates of morbidity and mortality. During the COVID pandemic, life expectancy at birth declined between 2019 and 2020 in nearly every EU country, falling by a year or more in Belgium, Bulgaria, Czechia, Italy, Lithuania, Poland, Romania, Slovenia and Spain (European Observatory on Health Systems and Policies, 2021). In addition to the direct health impacts of the disease itself, indirect impacts on population health include delayed care and mental health deterioration, with worse outcomes for people living in poverty (Azzopardi-Muscat et al., 2021). Furthermore, pandemics can have broader impacts on progress towards achievement of the Sustainable Development Goals, with impacts on access to education, progress

Pandemics can have broader impacts on progress towards achievement of the Sustainable Development Goals.

towards gender equality and the economy, among others (European Observatory on Health Systems and Policies, 2021).

While the management, disease control and response to pandemics is in the hands of the health system, much of the broader coordination and the political aspects of handling a large-scale shock falls outside the control of health systems. This means that health leaders have to communicate and engage with broader government and society. Also, many aspects of the response are dependent on the response of the international community. Building on changes to the international health regulations following the Severe Acute Respiratory Syndrome (SARS) outbreak, Member States of the World Health Organization have agreed to further strengthen international cooperation and draft a convention, agreement or other international instrument to strengthen pandemic prevention, preparedness and response as a response to COVID-19 (WHO, 2023b). However, while acknowledging the whole-of-society response required of a pandemic, the scope of this scenario is focused on the health system as defined by the boundaries in WHO's HSPA Framework (Papanicolas et al., 2022), with additional functions considered where this supports understanding health system resilience. When working through this scenario, it is important to remember that the purpose is to explore the resilience of the health system to an acute shock. Resilience is defined as the ability to prepare for, manage (absorb, adapt and transform) and learn from shocks (Thomas et al., 2020). Some of the required strategies to build the resilience of the health system to avoid these shocks is discussed at the end of this scenario.

The shock

This scenario was designed to be used by health system stakeholders of Country A, for the purpose of a health system resilience test. Prior to the resilience test day, participants should have been briefed on the scenario and given sufficient time to consider the background material (see Section 1.2). What follows is a short summary of the shock (Box 3.1.1), followed by a description of the example scenario, and a series of prompts to guide discussion through the four stages of the shock cycle.

Section 1.2: The resilience testing process page 5

Box 3.1.1 Shock summary

What
Pandemic caused by a new infectious disease

Where
Country A in Europe

Duration
Approximately two years

Shock at a glance
A global communicable respiratory disease that meets the criteria for a Public Health Emergency of International Concern (PHEIC) emerges and spreads to Country A. Key at-risk groups for this disease are young children (aged 6 months to 9 years) and older people (aged 70+). Working age adults are often asymptomatic but may infect others. The shock causes a major social crisis and disrupts health system functioning, affecting the delivery of essential services. The pathogen differs from the recent COVID-19 pandemic because of its strong impact on children.

The new disease occurs in late November outside Europe and spreads over a period of two weeks before the first cases are detected simultaneously in different locations in Europe. The pathogen is rapidly identified as a new virus which has not previously been detected in humans. The disease spreads across all population and age groups.

In Country A the disease is first detected in late November in a coastal town popular with tourists, which is frequented by both international and domestic visitors. The town is located approximately 3 hours travel by car from the capital city.

Within the coastal town, cases spread rapidly among visitors and workers, and then spread throughout Country A as domestic tourists return home, spreading the centre of the epidemic to the capital region.

The disease is characterized by respiratory symptoms, a short incubation period and airborne transmission. The risk of severe complications is higher in children aged 6 months to 9 years, older people aged 70+, people who are overweight, and people who have chronic pulmonary or heart disease. In the most serious cases, the disease progresses rapidly and requires intensive care and protracted respiratory support. A large portion of adults are asymptomatic.

For the first 6 months of the pandemic, no vaccinations or curative medicines are available. Therefore, only non-pharmaceutical mitigation measures are available: use of masks, physical distancing, improved ventilation, travel restrictions, and restrictions on private and public gatherings. Stocks of medicines and commodities to control symptoms (i.e., paracetamol, ibuprofen), PPE and other items needed for paediatric treatment run low owing to increased demand, both domestically and globally, and disruptions to global supply chains.

Within one month of detection in Europe, a PCR test becomes available, but testing capacity is limited and prioritization is required.

In the early stages of the pandemic, control of the spread of disease is difficult owing to a lack of understanding of the primary means of transmission, a lack of reliable identification of at-risk groups, and significant overloading of the capacity of the health system. Public health capacities, such as testing, tracing and surveillance, are stretched. In addition to increased demand for healthcare services, health systems are impacted by increased sick leave among healthcare personnel and the need for healthcare personnel to remain at home to care for children, leading to staffing shortages and overburdened staff.

Impact of the pandemic at the population level

Around 10% of paediatric patients with the new disease need hospital treatment 1 week after infection. Paediatric patients with severe disease die 3–4 weeks post infection. This results in waves of patients presenting to emergency healthcare facilities. In addition, parents' concerns about children's health may cause panic in the population, as well as a desire to find out whether the child has been infected. This places a large burden on different parts of the health system (e.g., primary care facilities) and on a wider range of services outside the health system such as schools and childcare facilities.

Hospitalization and mortality increase dramatically, and demand for care in paediatric and ICUs is very high. There are several uncertainties surrounding case mortality and hospitalization, especially in the early stages of the pandemic. It is soon clear that the disease causes increased morbidity and mortality, especially in children 9 years of age and younger. In the early stages of the outbreak, estimates of hospitalization needs and case mortality are as follows:

- In the absence of effective vaccines, potentially up to 10% of the population 9 years of age and younger will require hospitalization. Approximately 10% of children admitted to hospital will require intensive care.
- At the same time, around 4% of the population over 70 years will require hospitalization and up to 5% of adults over 70 years who are hospitalized will require intensive care.
- The mortality rate peaks at 4% (children aged 6 months to 9 years) and 0.4% (adults aged 70+).

Among other age groups (aged 10–69), severe cases are low, and adults are often asymptomatic, but infectious, carriers of the disease.

Many parents choose to withdraw their children from childcare or school, making it necessary for parents to stay at home to care for their children. Several healthcare personnel who are parents will not attend work because of fear of transmission of the disease to their children.

Using the HSPA Framework, this shock has the capacity to cause immediate disruption to all health system functions (see Box 3.1.2), in particular the resource generation and service delivery functions. In the long term, the pandemic may result in legislative changes which have a wider impact on the structure of the health system.

Box 3.1.2 A shock to all health system functions

A pandemic shock will impact on all functions of the health system. In the immediate term, the pandemic will impact on both the resource generation function, as there will be challenges to the health workforce and availability of medical equipment and pharmaceuticals (owing both to increased demand and global supply chain disruptions), and the service delivery function. In the short to medium term, the pandemic is likely to impact on the financing function, while in the longer term, policy and legislative changes will impact on the governance of the health system (Azzopardi-Muscat et al., 2021).

We are using a pandemic shock to identify strengths and weaknesses that may exist across the shock cycle and within the health system.

The health system

Goals

- Give a brief overview of the current functioning of the health system (pre-shock)
- Outline the institutional features and the contextual information about Country A relevant to its potential resilience to a pandemic.

Overview

Country A has a population of approximately 6 million people. The largest city is the capital, which is home to approximately 700 000 people.

This section contains the information that the facilitator may collect as part of the background materials. It includes information on the baseline functioning of the health system, indicators of resilience, institutional features and other contextual information. Box 3.1.3 describes why this information is important for a resilience test. Although here this information is presented in tables, ideally it would be presented in graphs, figures and infographics as needed. Key messages should be easy for participants to comprehend.

Box 3.1.3 Why is this information being considered in the scenario?

A substantial portion of this information is common knowledge to both the facilitators and the participants. The experience during the pilots is that only a small subset of the available information is presented during the resilience test and the disseminated preparatory material. Exactly what is presented to participants depends on the invited stakeholders. In the case of this pandemic scenario, information such as the current capacity of paediatric care might be useful.

Even if not all these data are presented to participants, it is important to collect the data for the following reasons:

1. To consider observable weaknesses in the health system and the resilience of the health system.
2. So that facilitators have this information available during the day and subsequently, when producing reports and follow-up information. The use of best available information underlies the identification of weaknesses and subsequent remedial action.
3. The pathways by which the shock may travel may be mediated or influenced by these factors and explicit consideration of the importance of these factors is useful. For example, a large country with a federated structure and several advanced ICUs will have a different set of considerations from a relatively smaller country with one or two ICUs.
4. Availability or non-availability and quality of data can indicate vulnerabilities of the health system as, if data relevant to the shock scenario are not readily available, this will impact on the ability of the system to respond.

The current state of the health system in Country A

The health system in Country A is a decentralized system. Services are delivered primarily through public institutions, with an increasing number of the population accessing care through private providers. The central government has responsibility for overall health policy, setting care standards and allocating funds to regional authorities. Regional authorities are responsible for providing health services (including public health services) to their populations.

Delivery of healthcare

Primary health centres are the first point of contact with publicly funded health services. These centres provide a mix of services, including general practice, community nursing, and antenatal and counselling services. These services have strong links to early childhood education and social services. In the public system, specialist care must be accessed through referral from a GP.

Most regions have at least one central hospital providing specialized medical services. Like most health systems, physical and human resources are unevenly distributed, with a higher density and variety of services offered in the cities. The capital city and some larger cities have multiple hospitals providing specialized care. The only specialist children's hospital in Country A is in the capital city. There is a specialist paediatric centre located in a major hospital in the second largest city. Outside these cities, emergency treatment for children takes place in the same facilities as adults.

Private providers primarily provide outpatient care and are geographically concentrated in the capital city. Remote provision of care via teleconsultations and digital health services has been piloted in some healthcare settings but is not in routine use.

Financing

Health expenditure in Country A comes predominantly from public expenditure with some private spending. Public funds to pay for health services are collected through a mixture of general taxation and social health insurance contributions; private funds come largely OOP, with a small share of voluntary health insurance. Approximately 5% of the population have voluntary health insurance.

OOP payments cover co-payments for publicly funded services and medicines, purchase of OTC medicines and healthcare services not covered by the statutory system. There are certain exemptions from co-payments, and an annual cap, but it is set at a relatively high level.

Table 3.1.1 (page 124) shows some of the key figures on the status of the health system. For an in-depth explanation of commonly used indicators and how they relate to resilience please refer to Sections 2.3 and 2.4.

Section 2.3: Indicators and the assessment of resilience page 56

Section 2.4: The impact of shocks and the capacity to respond page 95

Table 3.1.1 Key figures on the status of the health system in Country A

INDICATOR	COUNTRY A	EUROPEAN AVERAGE
Number of physicians per 1000 population	4.4	4 (EU27)
Number of nurses per 1000 population	6.5	8.3 (EU27)
Hospital beds per 1000 population	3	5 (EU25)
Occupancy rates in acute beds	70%	64% (EU21)
Health expenditure per capita	5 670 euros	3 159 Euros
Population covered by public health insurance for a core set of services	100%	Unavailable

Note: All European averages from 2020 or most recent available.

Source: OECD & European Union, 2022

Contextual information on Country A

The facilitator may also choose to collect and present some demographic and contextual information that might be specifically relevant to the pandemic shock. Some of these indicators may not need to be collected for the purpose of a resilience test, if all participants are likely to already be familiar with them. In this example, Table 3.1.2 shows indicators that serve to illustrate the context of Country A.

Table 3.1.2 Contextual data on Country A

INDICATOR	COUNTRY A	EUROPEAN AVERAGE
Gini coefficient	27	29.6 (EU27)[1]
Average age of population, both sexes	41.7	44.4 (EU27)[2]
Share of population aged under 15 (%)	16.5	15 (EU27)[3]
Percentage of population aged 65+ (%)	20.6	21.1% (EU27)[4]
Percentage of population living in urban areas (%)	86	40.5% (EU27)[5]

Note: All European averages from 2022 or most recent available

Sources: [1] Eurostat, 2023a; [2] Eurostat, 2023c; [3] Eurostat, 2023b; [4] Eurostat, 2023d; [5] Eurostat, 2022

Example list of participants

As this is the first example scenario presented, Table 3.1.3 shows an example of stakeholders who could be considered for a resilience test.

Table 3.1.3 Example of stakeholders who could be considered for a resilience test using this scenario

INSTITUTION	EXAMPLE JOB TITLES
Ministry of Health	• Director • Legal adviser
Ministry of Social Affairs	• Director with responsibility for children and social care
Ministry of Education	• Director
Public Health Institute	• Senior staff member responsible for pandemic preparedness and response • Health protection/Surveillance expert • Director/expert – national reference laboratory
Local Government	• Representative with responsibility for children and social care • Representative with responsibility for public health
Regional Government	• Representative with responsibility for children and social care • Representative with responsibility for public health
Tertiary referral centre and regional secondary care hospitals	• Senior hospital manager • Procurement manager • Senior nurse • Senior paediatrician • Senior intensive care doctor • Senior lab scientist
Primary care and emergency services	• Emergency services senior manager • General practice/Paediatric primary care representative

Stage 1 of the shock cycle: Preparedness

Goals

- Discuss the general preparedness of the health system for shocks.
- Discuss the specific preparedness of the health system to this shock (pandemic).
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Overview

Now that we have had an overview of the current standing of the health system in Country A, we can turn to assessing the resilience of the health system to this shock across the four stages of the shock cycle. Tables 3.1.4–3.1.6 below and on page 127 contain a series of questions prepared for the purpose of a resilience test, to guide participants through the functions of the health system with a particular focus on whether they impacted preparedness. Many of the indicators used can provide information about how the health system might perform at various stages of the shock cycle. Some indicators may already be collected as part of a wider health security assessment (see Box 3.1.4 on page 127). It is therefore important at this stage to maintain the focus of conversation on preparedness. For example, when discussing multisectoral cooperation in Stage 1, the focus should be on whether Country A is prepared by having systems in place for this cooperation, and not about whether cooperation could take place in response to this shock.

Table 3.1.4 Questions about governance for the preparedness stage of the pandemic scenario

INDICATOR	QUESTIONS
Stakeholder voice	• Is the capacity of the system to cooperate across sectors if the pandemic described in the scenario materializes considered in preparedness planning?
Legislation and regulation	• Do the current provisions give health authorities and healthcare professionals sufficient powers to act when this scenario materializes? What are the key factors that hinder/prevent effective action?

Table 3.1.5 Questions about resource generation for the preparedness stage of the pandemic scenario

INDICATOR	QUESTIONS
Health workforce	• How would you assess the key vulnerabilities of the health system in terms of skills and the health workforce? • Does the system have enough skills to respond to the pandemic described in the scenario? Is the system prepared for a situation where professionals will need to be trained quickly to treat children (at home, in ICUs, etc.)?
Infrastructure and medical equipment	• How would you assess material preparedness for the pandemic? Is the amount of equipment (suitable for children) and other medical devices and supplies sufficient and sufficiently geographically distributed? What about hospital beds, ICU beds and isolation rooms?

Table 3.1.6 Questions about financing for the preparedness stage of the pandemic scenario

INDICATOR	QUESTIONS
Sufficient funds	• How does preparedness planning take the health financing model into consideration?
Efficient purchasing	• What are the incentives to prepare for service providers?

Reflections for preparedness

After considering the aggregate functioning and a number of specific features of preparedness in each of the functions of the health system, review the following questions with participants:

- Overall, how prepared do you think the health system is for a pandemic of this kind?
- What were the top three strengths of the health system's preparedness for this pandemic?
- What were the top three areas of vulnerability for preparedness for this pandemic?
- Are there any functions of the health system that are underperforming, or could potentially indicate a lack of resilience in the system?
- The preparedness of the health service may vary considerably from region to region. Are there any regions that you would consider particularly vulnerable to a shock in the health service?

Box 3.1.4 Health security indices and COVID-19 outcomes

Using indicators to understand pandemic preparedness is not a new concept and countries have been evaluated through mechanisms such as the Global Health Security Index or Joint External Evaluation since before the COVID-19 pandemic. The impact of the COVID-19 pandemic was used to understand the performance and the predictive ability of these index measures. Several studies have found that some countries with a high index performance had poor COVID-19 mortality and morbidity outcomes (Abbey et al., 2020; Aitken et al., 2020; Haider et al., 2020; Khalifa et al., 2021). The Joint External Evaluation was revised as a result of these findings and a third edition of the methodology has been published (WHO, 2022e). Recent studies have found that the paradoxical outcomes may have been the result of an oversimplified analysis that, among other factors, did not appropriately adjust for population age and misclassification of a COVID-19 death (Markovic et al., 2022). For example, when adjusting for these factors Ledesma et al. (2023) found an association between greater preparedness and lower excess mortality. While countries can be held accountable to one another to build and maintain health security capacities, this is not the case for effective political leadership and wider societal factors that influence whether or not health security capacities are used effectively (Stoto, Nelson & Kraemer, 2023). Recommendations to improve aggregate preparedness measures include adding additional sociodemographic, political and governance variables (Rose et al., 2021) and indicators on gender inclusion (Smith et al., 2022), while maintaining transparency, veracity and accountability (Kentikelenis & Seabrooke 2022).

Stage 2 of the shock cycle: Onset and alert

Goals

- Assess the health system's ability to detect the initial outbreak, including:
  - the quality of surveillance, and early warning systems
  - the ability to collect a range of broad, high-quality information from diverse sources, and use it effectively to inform all stakeholders and their decisions.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Overview

In Stage 2 of the shock cycle the resilience of the health system can be explored by discussing the ability of the system to identify and respond to potential threats.

In Stage 2 the new disease occurs in late November outside Europe and spreads globally over a period of three weeks before the first cases are detected simultaneously in different locations in Europe. The pathogen is rapidly identified as a new virus which has not previously been detected in humans. The disease spreads quickly across all population groups, although not all are symptomatic.

In Country A the disease is first detected in a coastal town, frequented by both international and domestic tourists. Within the town, cases spread rapidly among visitors and workers, and then spread throughout Country A as domestic tourists return home. The centre of the epidemic then shifts to the capital region.

Tables 3.1.7–3.1.9 below and on page 129 list questions on different health system functions for Stage 2 of the shock cycle.

Table 3.1.7 Questions about governance for the onset and alert stage of the pandemic scenario

INDICATOR	QUESTIONS
Information and intelligence	• How would you assess the health system's ability to identify a new communicable disease that is rapidly spreading? Are there any differences in preparedness within the country? Is there a mechanism for organizing data collection to provide an overview of the situation? How can different actors in the health system and at different levels access information about the outbreak?
Legislation and regulation	• How will cross-sector collaboration be launched and what structures are in place to do so? Do you identify vulnerabilities? Is it easy to identify key actors? Are the responsibilities for triggering a crisis response clear at the beginning of the crisis? What are the main vulnerabilities?

Table 3.1.8 Questions about resource generation for the onset and alert stage of the pandemic scenario

INDICATOR	QUESTIONS
Health workforce	• How would you assess the health system's readiness to rapidly increase the capacity of paediatric departments? What about intensive care and testing capacity? How are we prepared to support staff moving to medical care and intensive care for children, whose ethical and emotional burden/load may increase significantly (e.g., decisions on intensive care for children, contact with the child patient and their family)?
Infrastructure and medical equipment	• How would you assess the health system's readiness to increase the redistribution of equipment, supplies, medicines and consumables for the treatment of paediatric patients within the country of the purchase of new equipment or supplies abroad? What happens in the event of significant disruptions of supply?

Table 3.1.9 Questions about service delivery for the onset and alert stage of the pandemic scenario

INDICATOR	QUESTIONS
Cross-sub-functions	• How are service prioritization decisions taken? How are health professionals and decision-makers supported in these decisions?

Key questions and reflections for shock onset and alert

After considering the aggregate functioning and several specific features of this stage of the shock cycle in each of the functions of the health system, review the following questions with participants:

- Overall, how well do you think the systems in place for the early detection and warning would function in the setting of this pandemic scenario?
- How would the location of the initial outbreak (far from the capital city) impact on Country A's ability to manage the initial outbreak?
- What were the top three strengths of the health system's ability to detect and trigger the broader response to the pandemic?
- What were the top three areas of vulnerability or weakness regarding the ability to detect and initiate response to the pandemic?

Stage 3 of the shock cycle: Impact and management

Goals

- Discuss the potential impacts of the shock on the health system.
- Discuss the ability of the (public) health system to manage the pandemic and the decisions that could be taken to absorb, adapt or transform the health system at this stage.
- Identify the connections between functions of the health system, and how a shock could propagate through them.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Shock impact

In Stage 3 of the shock the disease spreads rapidly and no vaccinations are available. Therefore, only non-pharmaceutical mitigation measures can be used to mitigate the spread and severity of the disease, including use of masks, physical distancing, improved ventilation, travel restrictions, and restrictions on private and public gatherings.

Stocks of medicines for symptomatic treatment (e.g., paracetamol, ibuprofen), PPE and other items needed for paediatric treatment run low owing to increased demand, both domestically and globally, and disruptions to global supply chains.

Within one month of detection, a PCR test becomes available, but testing capacity is limited and prioritization is required.

For the first 6 weeks of the pandemic, control of the spread of disease is difficult owing to a lack of understanding of the primary means of transmission, and a lack of reliable identification of at-risk groups.

For the first 6 months of the pandemic there is significant overloading of the capacity of the health system. In addition to increased demand for healthcare services, health systems are impacted by some increases in sick leave among healthcare personnel and the need for healthcare personnel to remain at home to care for children, leading to staffing shortages and overburdened staff.

A vaccine becomes available 6 months after the initial outbreak. This needs to be procured and distributed to the population, ending the acute phase of the pandemic.

Tables 3.1.10–3.1.13 on pages 131 and 132 contain example questions on different health system functions in the impact and management stage of the shock cycle. The health system may need to be transformed at short notice to be able to adapt to the pressures encountered at this stage of the shock cycle. Box 3.1.5 on page 133 signposts options for transformation that were observed during the COVID-19 pandemic.

Table 3.1.10 Questions about governance for the impact and management stage of the pandemic scenario

INDICATOR	QUESTIONS
Stakeholder voice	• With whom would health system actors work together to maximize children's rights to safe schooling and early childhood education in the context of this scenario? With whom would health system actors work to maximize the rights of the elderly to safe care in the context of this scenario? How would the different generational interests be balanced against each other when deciding on public health measures and allocating resources?
Evidence-based decisions	• Is the evidence base for decision-making transparent? Is there sufficient epidemiological evidence and evidence on health service capacity available? Which other pieces of evidence would need to be considered for decision-making, and would these be readily available and up-to-date?
Capacity to legislate	• Is it possible to make decisions in a timely manner? Are emergency legal provisions flexible enough to suit a rapidly evolving situation? What checks and balances are in place during the crisis and are these appropriate?
Information and intelligence	• Are data integrated and made available for analysis on a timely basis? Are data integrated across a sample, a sub-set or the entire population? • Are the public informed about the use of their data in times of emergency along with the data protections that are in place?

Cascading effects

Considering these and other important activities of governance, how do you believe poor performance in this function during this crisis could lead to disruption in other parts of the health system? For example, how will challenges with information-sharing affect resource generation or service delivery?

Table 3.1.11 Questions about resource generation for the impact and management stage of the pandemic scenario

INDICATOR	QUESTIONS
Pharmaceuticals and other consumables	• Are there processes to ensure successful procurement in the event of the replenishment of depleted stocks after the crisis has started/is prolonged? Either national plans or agreements at EU level? Who coordinates cooperation at national/EU level in these procurements? How is the supply chain managed? Have reliable suppliers been identified in anticipation of a potential strain on the supply chain?
Health workforce	• In the context of the scenario, how can the other functions of the system be maintained? Which parts or functions of the system are more vulnerable to resource or labour shortages when the scenario materializes? How can this be addressed?
Distribution of resources	• Are resources distributed equitably? Are agreements in place to redistribute resources or patients if needed?

Cascading effects

Considering these and other important elements of resource generation, how do you believe poor performance in this function during this crisis could lead to disruption in other parts of the health system?

Table 3.1.12 Questions about financing for the impact and management stage of the pandemic scenario

INDICATOR	QUESTIONS
Purchasing goods and services	• How would you ensure adequate funding of the health system and its effective targeting within the service system? • Are there specific financing mechanisms in case of an emergency laid down in legislation (if legislation is required for these)? At what point are emergency financing mechanisms triggered?
Administrative efficiency	• How do you ensure emergency funds are not subject to fraud?

Cascading effects

Will the financial state of the health system add resilience to the response, or does it add a potential source of vulnerability during a crisis?

Table 3.1.13 Questions about service delivery for the impact and management stage of the pandemic scenario

INDICATOR	QUESTIONS
Public health	• How can communication be directed towards and involve the broad population? What is expected from them, and what methods are employed to inform them about it? • Are all population groups considered when public health messaging is communicated? Which population groups are unlikely to be reached through common communication channels and what would be done to reach them?
User experience	• How to assess the social impact and impact of the response to the pandemic on different population groups? Are there obvious gaps in the availability of routinely collected data?
Access to services	• How to ensure that vulnerable groups are considered in the response to the pandemic? • How to ensure access to services according to need given a dual public and private health system?
Governance of service delivery	• Are there plans for how to maintain public health, primary and secondary services during the crisis response? • Is information on waiting lists/times for secondary care services being collected and made publicly available?

Cascading effects

How do you expect the impact of this shock to affect health outcomes? How might it impact upon the effectiveness, safety, efficiency and equity of the health system, and access to and patient experiences of the health system?

Could increased utilization of health infrastructure (bed occupancy, for example) lead to disruptions in service delivery?

Box 3.1.5 What are the options for transformation?

The major impact of this scenario is on resource generation as reductions in the supply of health workers and consumables are expected. At the same time, service delivery at all levels (public health, primary, secondary and tertiary care) will be stretched, and repercussions will ultimately impact on all health system functions and sub-functions.

Similarly, the COVID-19 pandemic also primarily impacted resource generation and service delivery and ultimately affected all functions and sub-functions of the health system. Many countries devised policies to upscale health system capacity at short notice to be able to provide the level of health system service delivery required by the pandemic (Stoto et al., 2023). Health at a Glance reviews these early policy responses of European countries to the COVID-19 pandemic. In addition to a review of the different public health policies that countries implemented, policies that aimed to support the entire health system are listed and evaluated. These include policies to increase health system financing, support the health workforce, boost hospital capacity and strengthen supply chains (OECD & European Union, 2020). While some policies may have been context-dependent or not deemed successful, others may be drawn upon to support health systems during the next pandemic.

Key questions and reflections for shock management

After considering the aggregate functioning and a number of specific features of this stage of the shock cycle in each of the functions of the health system, review the following questions with participants:

- How well do you think the health system would operate in this type of scenario?
- Which patients/populations will be most affected by the impact of this outbreak and what can be done to mitigate this?
- What are the top three strengths of the health system in responding to the pandemic?
- What would be the top three challenges of the health system to absorb, adapt or transform in response to the pandemic?

Stage 4 of the shock cycle: Recovery and learning

Goals for recovery

- Discuss the transition from the shock ending and the return of the health system to a new steady state.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Goals for learning

Discuss if Country A has a process to review and apply the learnings.

Overview

In Stage 4 of the shock cycle it is important to consider recovery and learning equally. Both aspects of this stage will require different goals and different questions (Tables 3.1.14–3.1.17, below and on page 135), as demonstrated by the scenario.

Progress

In Stage 4 of the shock cycle, the pandemic progresses through the population. After successful roll-out of the vaccine, which became available 6 months after the initial outbreak, the acute phase of the pandemic ends.

As Country A's health system begins to recover from the pandemic, it faces a number of challenges, including:

- Continued strain on the health system posed by the pandemic, including the continued need to test, track and trace infected individuals
- Mental health impacts on the health workforce, as well as high levels of exhaustion and burnout
- Backlog of healthcare (both elective surgeries and routine healthcare) that had been postponed during the acute phase of the pandemic due to resource reallocation as well as a reluctance of individuals to travel to clinics
- Financial strain on the health system owing to increased expenditure.

Table 3.1.14 Questions on governance for the recovery and learning stage of the pandemic scenario

INDICATOR	QUESTIONS
Information and intelligence	• Are delays to reporting other diseases likely as the pandemic has been prioritized? Is it possible to determine who has been left behind in healthcare receptions or surgery? What other information is needed to plan the post-pandemic recovery and is it readily available for decision-making?

Table 3.1.15 Questions on resource generation for the recovery and learning stage of the pandemic scenario

INDICATOR	QUESTIONS
Health workforce	• At what stage and on what grounds should it be possible to reallocate healthcare staff to their usual tasks? How will they be supported?

Table 3.1.16 Questions on financing for the recovery and learning stage of the pandemic scenario

INDICATOR	QUESTIONS
Governance of financing	• How to ensure that additional funding is allocated to address the consequences of the pandemic? How will the level and allocation of funding be assessed?

Table 3.1.17 Questions on service delivery for the recovery and learning stage of the pandemic scenario

INDICATOR	QUESTIONS
Public health, primary and secondary care	• How to ensure that the emergency measures designed to deal with the crisis are not maintained after the acute phase of the pandemic? How to decide which aspects of the emergency response are helpful to maintain in the long term?

Key questions for recovery

After considering the aggregate functioning and a number of specific features of this stage of the shock cycle in each of the functions of the health system, review the following questions with participants:

- What are the triggers to start shifting resources back to their usual allocations?
- How will finances be reallocated to manage any care backlogs and top up the emergency reserves for the next crisis?

Key questions for learning

- Are lessons learned in multiple sectors systematically recorded and acted on to improve the responses in the future?
- How to organize the systematic collection and summary of the lessons learned from the pandemic? How to collect the experiences of children and families and support families/children? What about staff?
- What is the process of designing and conducting a review of the public health response?
- How did this process work during the COVID-19 pandemic and how could it be improved?
- Do reviews include input from multidisciplinary teams (i.e., patients, researchers, healthcare workers, government and civil society organizations)?
- How are findings from reviews collated and distributed?

Assessment

Assessing top three strengths and vulnerabilities

During voting, participants are asked to choose the top three strengths and top three weaknesses of the health system. The choices given should be developed through consultation of the HSPA Framework and should be selected by facilitators in advance of the vote to reflect the context of the shock scenario (see Section 1.2 for more detail on voting). Table 3.1.18 shows how an example set of results from Country A could be presented, although different visualizations are possible.

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Table 3.1.18 Example assessment results for Country A

	PRE-TEST	PHASE 1 (OPTIONAL)	PHASE 2 (OPTIONAL)	PHASE 3 (OPTIONAL)	PHASE 4 (OPTIONAL)	OVERALL ASSESSMENT
Cross-sectoral cooperation	S1	S1	S1	S3	S1	S3
Informed decision-making	S2			S1		
				W2		
Patient safety	S3					
Collection of information to support the situational picture			S2		S2	
Security of supply of medicines and supplies		S3				
Fairness of services			S3			S2
Training of the workforce		W3				
Security of supply of premises and equipment						
Efficiency of services						
Ability to develop legislation					S3	S1
Plans to ensure adequate resources		S2				
Effectiveness of services						
Adequate level of funding	W3	W2	W3		W2	W2
Appropriate distribution of funding						
Clearly defined and adequate powers			W2	W3		
Cooperation between different service levels				S2		
Availability of labour	W1	W1	W1	W1	W1	W1
Ensuring effective procurement						
Availability of services	W2				W3	W3

Key

Strength (S)	Most votes	Second most votes	Third most votes
Weakness (W)	Most votes	Second most votes	Third most votes

Discussion

Facilitators use the final sessions of the day to discuss with participants 1) the resilience of Country A's health system and 2) any possible remedial action that could be taken, with a focus on what is feasible within the context of Country A.

Questions for plenary discussion include:

- What are the most important weaknesses in the system that need to be addressed?
- What are reasonable next steps to improve health system resilience to this shock?
- If the proposed steps were implemented, what else would need to change to ensure implementation is successful?

Broader strategies to address the impact of pandemics on the health system

Goals

- Review learnings from the COVID-19 pandemic
- Contextualize this scenario in the broader pandemic preparedness challenge
- Briefly discuss the current direction of pandemic preparedness in Europe

Health systems have learned many lessons from the COVID-19 pandemic.

As the COVID-19 pandemic has shown, the functioning of the wider health system is important for good population health outcomes. Health systems have learned many lessons from the COVID-19 pandemic, and the process of recovery and learning is not yet fully concluded. At an international level, key overarching publications have summarized health system-specific lessons learned in relation to sustainable development (European Observatory on Health Systems and Policies, 2021), health system resilience (Azzopardi-Muscat et al., 2021), and general emergency preparedness (WHO, 2023a). Common themes that these publications identify include the need for health systems have to clear, decisive, strategic direction and coordination, and early warning systems, as well as safe and scalable care with a focus on the health workforce. Beyond these overarching lessons, learnings have been identified that cover most, if not every, function of the health system.

Part of the health system that is most challenged by a pandemic are functions responsible for providing public health services. The principles of a public health response to an emerging infectious hazard include identifying the pathogen, monitoring its spread in the community and identifying those exposed to it, as well as preventing further transmission and communicating risk to the public (Fisher & Carson, 2020). A strong public health system is a core component of pandemic preparedness (Haldane et al., 2021b). In order to support public health systems, and guide updates to pandemic and emergency preparedness plans across the European Union, the ECDC has summarized lessons learned from COVID-19 that were identified by public health stakeholders. Identified lessons fall into the following categories (ECDC, 2023b):

- Lesson Area 1: Investment in the public health workforce;
- Lesson Area 2: Preparing for the next public health crisis;
- Lesson Area 3: Risk communication and community engagement; and
- Lesson Area 4: Collection and analysis of data and evidence.

The ECDC also provides guidance on conducting COVID-19 after-action reviews specific to the public health response. The series of exercises aims to analyse gaps and identify areas for improvement in preparedness and response activities: Conducting after-action reviews of the public health response to COVID-19: update (europa.eu).

In terms of future pandemic preparedness, the World Health Organization has recently launched a preparedness and resilience for emerging threats initiative (PRET), which guides countries in pandemic planning using a mode of transmission lens: Preparedness and Resilience for Emerging Threats (PRET) (who.int). The approach fosters better coordination and cooperation across sectors, given that many capacities and capabilities are common among groups of pathogens, and follows the learnings and proposals to strengthen the global architecture for health emergency preparedness, response and resilience (WHO launches new initiative to improve pandemic preparedness). At a European level, the ECDC provides guidance for risk assessment and preparedness planning aimed at both the national and local context. Available tools include a multicriteria decision-support tool to understand the priority of infectious disease threats (ECDC tool for the prioritisation of infectious disease threats (europa.eu)), a presentation to understand the requirements for full pandemic preparedness (ECDC model for national pandemic preparedness (europa.eu)) and a self-assessment tool for national policy-makers (ECDC Pandemic Preparedness Self Assessment Indicators (europa.eu)). Further guidance is also available for specific infectious diseases. For example, the ECDC provides guidance on pandemic flu preparedness: Assessment tool for influenza pandemic preparedness in European countries (europa.eu).

3.2 Example scenario: Antimicrobial resistance

The threat

This is a fictional example scenario for a resilience test. Its development was informed by a rapid literature review considering relevant events. Any similarity to a particular country or past event is purely coincidental. This scenario needs to be adapted to the setting of the resilience test and reviewed by an expert before it can be used as part of a resilience test (see Section 1.2).

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Antimicrobial resistance (AMR) is a global health priority and a growing challenge, posing a major threat to human health, safety and the prosperity of economies. AMR occurs when bacteria, viruses, fungi or parasites develop characteristics that make them more resistant to the antimicrobials used to treat them (WHO, 2021b). If not addressed urgently, common infections may once again cause serious morbidity and mortality, as they did before the widespread availability of antibiotics (WHO, 2016b). Recognizing this, in 2019 the World Health Organization named AMR as one of the top ten threats to human health (WHO, 2019) and in 2022 the European Commission identified it as one of the top three threats to health in Europe (European Commission, 2022b). AMR is also specifically mentioned in both the EU regulation on cross-border health threats (Regulation (EU) 2022/2371) and the revised ECDC mandate.

Globally, an estimated 4.95 million deaths associated with bacterial AMR occurred in 2019, of which 1.27 million deaths were specifically attributable to bacterial AMR (Antimicrobial Resistance Collaborators, 2022). There are wide geographic differences in the mortality burden of AMR, with resource-constrained settings such as western Sub-Saharan Africa having the highest levels of AMR-related mortality. In the European Union, Iceland and Norway, more than 35 000 people are estimated to die due to AMR each year (ECDC, 2022). Over the last two decades, there has been a worrisome rise in resistance to 3rd-line antibiotics – commonly referred to as last resort drugs – in Europe and beyond (OECD, 2023b). Considering the complex drivers of AMR across sectors and the health and economic burden of AMR, a multisectoral strategy to tackle AMR is the most effective and cost-effective approach.

An estimated 4.95 million deaths associated with bacterial AMR occurred in 2019.

Resistant infections acquired in healthcare settings are a serious concern. The latest OECD analysis suggested that approximately one out of every three resistant infections in Europe are acquired in healthcare settings, with substantial cross-country variation (OECD, 2023b). In certain countries such as Romania, resistant infections acquired in healthcare settings account for about 73% of all resistant infections. Healthcare-associated infections pose a substantially higher risk of death compared to resistant infections acquired in community settings (OECD, 2023b).

In particular, infections caused by multidrug resistant organisms (MDROs) in healthcare settings deserve attention. MDROs refer to pathogens that have been shown to develop resistance to one or more classes of antimicrobial agents, causing outbreaks that can result in a strong and immediate surge in demand on laboratory, public health and infection control services and staff, and cause serious disruptions to health service delivery by reducing the available health workforce and clinical space. To date, infections caused by MDROs have been shown to stress and shock the resilience of health systems, as measured by increases in the length of stay in ICUs and hospitals, and to inflate costs and exacerbate AMR-related mortality (Oxman et al., 2020; European Antimicrobial Resistance Collaborators, 2020).

Considering the far-reaching consequences of resistant infections acquired in healthcare settings, this scenario focuses on an outbreak caused by a MDRO. The scope of this scenario is focused on the health system as defined by the boundaries of the HSPA Framework (see Section 2.2). When working through this scenario, it is important to remember that the purpose is to explore the resilience of the health system to an acute shock. Resilience is defined as the ability to prepare for, manage (absorb, adapt and transform) and learn from shocks (European Observatory on Health Systems and Policies, 2020). Some of the required strategies to build the resilience of the health system to avoid these shocks is discussed at the end of this scenario.

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The shock

This scenario is designed to be used with health system stakeholders of Country B who participate in the resilience test. Prior to the resilience test day, participants should have been briefed on the scenario and given sufficient time to consider the background material (see Section 1.2). What follows is a description of an example scenario, and a series of prompts to guide discussion through the four stages of the shock cycle. This shock is designed to initially impact upon the function of resource generation (Box 3.2.1).

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Box 3.2.1 A shock to the resource generation function

Improving the resilience of health systems to AMR is best achieved by taking preventative measures and ensuring adequate infection control and monitoring (discussed at the end of this scenario).

We are using an outbreak to test how the initial shock (to the resource generation function) spreads through the health system to identify weaknesses that may exist across the shock cycle and within the health system. The same weaknesses may be found in similar shocks that impact on the resource generation function, for example a biological attack or a loss of infrastructure.

We have kept some specific features of AMR in the scenario: for example, surveillance, transmission of the infectious organism and the need to use antibiotic treatments. Those using the scenario may wish to decrease the importance of these elements to test the resilience of the health system to a more general set of threats.

A newly detected MDRO breaks out in four hospitals in the capital city of Country B, including the country's largest acute care facility. This MDRO has not previously been isolated in the country. Multiple patients who are critically ill in the ICUs of these hospitals have acquired the infection during their admissions. So far, at least fifteen patients have died directly as a cause of their hospital-acquired infection. The National Reference Laboratory reports that the MDRO is not sensitive to any antibiotics in the current formulary for the hospital but is sensitive to an expensive new antimicrobial which has only been used in Country B a few times when imported under emergency rules.

This scenario commences in a relatively constrained manner before rapidly expanding in size. In the shock impact and management stage, the rapid spread of the MDRO is considered to cause significant worries when it is later confirmed that colonization in healthcare personnel exacerbated the spread of the outbreak, necessitating the closure of facilities and isolation of staff. Although the number of deaths is relatively small compared to other scenarios discussed in this handbook, there is a loss of specific critical care capacity and widespread disruption resulting in the need for careful consideration of the recovery.

Using the HSPA Framework, this scenario has the capacity to shock multiple functions of the health system and boundary systems (i.e., procurement and supply chains, aged care and social care). Before diving into an analysis of the potential disruption this MDRO could cause across the shock cycle, this scenario will first review some indicators of the current state of the health system, and then review its preparedness to detect and deal with this shock.

The health system

Goals

- Give a brief overview of the current functioning of the health system (pre-shock).
- Outline the institutional features and contextual information about Country B relevant to its potential resilience to a MDRO.

Overview

This hypothetical European country has a Mediterranean climate, and a population of approximately 10 million people. The largest city, the capital, is home to approximately 2 million people.

This section contains the information that the facilitator may collect as part of the background materials (see Box 3.2.2 on page 142). It includes information on the baseline functioning of the health system, indicators of resilience, institutional features and other contextual information. Although here this information is presented in tables, ideally it would be presented in graphs, figures and infographics as needed so that key messages are easy for participants to comprehend.

Box 3.2.2 Why is this information being considered in the scenario?

A substantial portion of this information is common knowledge to both the facilitators and the participants. The experience during the pilots is that only a small subset of the available information is presented during the resilience test and the disseminated preparatory material. Exactly what is presented to participants depends on the invited stakeholders. In the case of the AMR scenario, information about the specifics of the prevalence and monitoring of AMR might be useful.

This step is needed for several reasons in the process of resilience testing. The first is to consider observable weaknesses in the health system and in the resilience of the health system. The second reason is so the facilitators have the information available during the day and subsequently in the production of reports and follow-up information. The use of the best available information underlies the identification of weaknesses and subsequent remedial action. The third reason is that the pathways by which the shock may travel may be mediated or influenced by these factors and explicit consideration of the importance of these factors is useful. For example, a large country with a federated structure and several advanced ICUs will have a different set of considerations from a relatively smaller country with one or two ICUs. Finally, availability or non-availability of data can indicate vulnerabilities of the health system. If data relevant to the shock scenario are not readily available, this will impact on the ability of the system to respond.

The current state of the health system in Country B

The health system in Country B is centrally governed, and services are delivered through a mix of public and private institutions. There is a single national public health insurance fund. Citizens are entitled to access primary and tertiary medical services through this fund, and it covers a "core set of services" comparable with the rest of Europe. It does not, however, cover the complete cost of prescription medications and a patient co-payment is required. Like most health systems, physical and human resources are unevenly distributed with a higher density and variety of services offered in the cities and more affluent citizens having greater access. Table 3.2.1 on page 143 shows some of the key figures on the current standing of the health system and Table 3.2.2 presents figures specifically relevant to the AMR scenario.

For an in-depth explanation of commonly used indicators and how they relate to resilience, please refer to Sections 2.3 and 2.4.

Section 2.3: Indicators and the assessment of resilience page 56

Section 2.4: The impact of shocks and the capacity to respond page 95

Table 3.2.1 Key figures of the status of the health system in Country B

INDICATOR	COUNTRY B	EUROPEAN AVERAGE
Number of physicians per 1000 population	4.2	4 (EU27)
Hospital beds per 1000 population	5.5	5 (EU25)
Occupancy rates in acute beds	65%	64% (for EU21)
Health expenditure per capita	€1800	€3159 (EU27)
Unmet medical needs	16%	18% (EU27)
Preventable mortality	150 per 100 000 population	176 per 100 000 population (EU27)
Treatable mortality	90 per 100 000 population	104 per 100 000 population (EU27)

Note: All European averages from 2020 or most recent available.

Source: OECD & European Union, 2022

Table 3.2.2 MDRO reporting in Country B

INDICATOR	COUNTRY B	EUROPEAN AVERAGE
Enrolment in GLASS-AMR Is the country enrolled and submitting data to the WHO's global surveillance programme for AMR, GLASS-AMR? (WHO, 2022a)	Yes	–
Enrolment in EARS-Net and GLASS-AMR Does the country report data both to EARS-Net and the GLASS-AMR? (WHO, 2024)	No	–
Third-generation cephalosporin-resistant *Escherichia coli* Proportion of bloodstream infections due to *E. coli* that are resistant to third-generation cephalosporins. (OECD, 2023b)	39%	16%
Methicillin-resistant *Staphylococcus aureus* (MRSA) Proportion of bloodstream infections due to *S. aureus* that are methicillin-resistant. (OECD, 2023b)	47%	15%

Stage 1 of the shock cycle: Preparedness

Goals

- Discuss the general preparedness of the health system for shocks.
- Discuss the specific preparedness of the health system to this shock (MDRO outbreak).
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Overview

Now that we have had a quick overview of the current standing of the health system in Country B, we can turn to assessing the resilience of the health system to this shock across the four stages of the shock cycle. What follows is a series of questions that the facilitator could prepare for the purpose of a resilience test (see Tables 3.2.3–3.2.6 on pages 144–147), to guide its participants through the functions of the health system with a particular focus on whether they impacted preparedness. Box 3.2.3 on page 147 signposts other sources of information specifically relevant to the AMR scenario.

Table 3.2.3 Questions about governance for the preparedness stage of the AMR scenario

INDICATOR	QUESTIONS
National action plan (NAP) for AMR (WHO, 2022g; OECD, 2023b)	• Is there a NAP on AMR? • Is the NAP fully financed? Is the financing on an appropriately long-term scale? • Does the NAP coordinate activities between the human health, animal health, agri-food systems and environment sectors? • Does the NAP include policies to promote prudent use of antibiotics in human, animal and plant health (i.e., improving population health literacy; limits on antibiotics use without prescription; computerized decision support and prescriber education)?
Infection prevention and control (IPC) measures in line with the WHO Core Components (WHO, 2016a)	• Are there national-level IPC programmes with clearly defined objectives, functions and infection preventionists (e.g., nurses or doctors)? • At the facility-level, are there IPC programmes with dedicated teams comprising trained health professionals with a minimum ratio of one full-time infection preventionist per 250 beds? • Are there national- and facility-level IPC guidelines for the purpose of tackling healthcare-acquired infections? • Are there national- and facility-level activities to support IPC education and training for all health workers? • Are there national- and facility-level arrangements with high-quality microbiology and laboratory capacity in place for effective surveillance of healthcare-acquired infections, detection of clusters and outbreaks? • Are there national- and facility-level arrangements to support the implementation of multimodel strategies to promote best practices in IPC, and reduce the burden of healthcare-acquired infections?

continued on next page

Table 3.2.3 Questions about governance for the preparedness stage of the AMR scenario *continued*

INDICATOR	QUESTIONS
Infection prevention and control (IPC) measures in line with the WHO Core Components *continued*	• Are there national- and facility-level arrangements to facilitate regular monitoring and auditing of IPC practices by healthcare professionals? • Are there standards in place in acute care facilities for bed occupancy rates (e.g., one patient per bed with adequate spacing between patient beds) and the workload of healthcare professionals? • At the facility level, are the built-in environment, available WASH infrastructure and services and IPC equipment in healthcare facilities able to facilitate a hygienic environment?
National coordination centre (WHO, 2022a)	• Is there an active national coordination centre for AMR surveillance?
Policy and legislation	• What policy or procedures are in place to evaluate the effectiveness of past public health responses? • How are lessons from previous public health responses incorporated into preparedness planning?
Emergency coordination (ECDC, 2018)	• Is there a tested command and control structure with clear roles and responsibilities? • Are public health surveillance systems and laboratories at local, national, regional and international level well coordinated, with functional lines of communication? • Is this routinely practised?
Multisectoral collaboration	• In the absence of a crisis, is there any formal coordination between the public health system, national authorities responsible for agriculture and animal health, and the private or NGO provided services? • Are there populations that you are worried are not adequately covered by public, private or NGO health services? • Are there populations that, although they are covered by services, are not easily able to be engaged by mainstream health services?

Table 3.2.4 Questions about resource generation for the preparedness stage of the AMR scenario

INDICATOR	QUESTIONS
Personal protective equipment (PPE) stores	• Are there emergency stores of PPE for unexpected events such as a MDRO outbreak? If so, how much and where? • Are these supplies adequate to cover usage in tertiary care, primary care and social care settings such as aged or disability care facilities? • Are there plans for distribution to where PPE could be needed, including in community centres? • Have reliable suppliers been identified in anticipation of potential strain on the supply chain?
National reference laboratory (NRL) (WHO, 2022a)	• Is there a dedicated NRL? • Does it undergo external quality assurance? • Can the NRL test for extended susceptibilities in MDROs of international interest (in 2023 examples of these are enterobacterales susceptibility to ceftazidime-avibactam, meropenem-vaborbactam and imipenem-relebactam)? • Is antimicrobial susceptibility testing (AST) done to either EUCAST or CLSI standards in the NRL?
Local laboratories and sentinel surveillance sites (CDC, 2022)	• How comprehensively can the local laboratory network test for priority pathogens and MDROs? • Do laboratories that contribute to national surveillance undergo external quality assurance? • Is there a mechanism in Country B that can help ensure the continuation of laboratory services in case of stock-outs of consumables for diagnostic tests? • Can the local laboratory test for extended susceptibilities in MDROs of international interest (e.g., enterobacterales susceptibility to ceftazidime-avibactam, meropenem-vaborbactam, and imipenem-relebactam)? • Is AST done to either EUCAST or CLSI standards in local laboratories?
Health workforce (WHO, 2022a)	• Are current levels of public health, laboratory and emergency response staff adequate to respond to daily needs in the health system? • Are there adequate levels of these staff to respond to sudden surges in demand? • Are there any protocols in place for generating surge capacity of health workforce in the event of a crisis?

Table 3.2.5 Questions about financing for the preparedness stage of the AMR scenario

INDICATOR	QUESTIONS
Financial reserves	• Are there funds able to be dedicated to the health system in times of crisis? • How much?
Insurance coverage	• Is the coverage of the population for a core set of services sufficient to ensure health is maintained during shocks? • Are there any particularly vulnerable groups that are not covered?

Table 3.2.6 Questions about service delivery for the preparedness stage of the AMR scenario

INDICATOR	QUESTIONS
Safety and IPC standards	• How well and how often do health facilities and laboratory staff perform IPC audits? • Are IPC standards measured using standardized and well recognized tools?
Public health integration	• How integrated into primary and hospital care are the bodies responsible for delivering population health? • Do public health groups have relationships with community health groups or NGOs serving populations that face barriers to access care (i.e., indigenous groups, culturally and linguistically diverse groups, people living in rural and remote communities, or those with socioeconomic disadvantages)?

Key questions and reflections for preparedness

After considering the aggregate functioning and several specific features of preparedness in each of the functions of the health system, review the following questions with the participants:

- Overall, how prepared do you think the health system is for a large MDRO outbreak?
- What are the top three strengths of the health system's preparedness for a MDRO outbreak?
- What are the top three areas of vulnerability for preparedness for a MDRO outbreak?
- Are there any functions of the health system that are underperforming, or could potentially indicate a lack of resilience in the health system?
- The preparedness of the health service may vary considerably from region to region. Are there any regions that you would consider particularly vulnerable to a shock in the health service?

Box 3.2.3 Additional sources of internationally comparative information

The ECDC has a dashboard on antimicrobial consumption. The ECDC also has a section on its website on laboratory capacity and capability that contains information about comparative laboratory capacity, which is periodically updated. The section on antimicrobial resilience contains data on surveillance, antimicrobial consumption and the consequences of AMR, such as healthcare-associated infections.

The OECD/EU series Health at a Glance: Europe (OECD & European Union, 2022) regularly includes information about laboratory capacity and there is a section on the OECD website that is regularly updated with AMR information. The Observatory regularly updates its website on AMR.

The OECD's latest report on AMR, *"Embracing a One Health Framework to Fight Antimicrobial Resistance"* provides key analyses of historical trends in the consumption of antibiotics in human and animal health, time-series analysis on AMR levels in recent years, including by priority bug-drug combinations, and projections to the future up to 2035 in OECD, EU/EEA and Group of Twenty countries. For 34 OECD and EU/EEA countries, the report provides estimates on the health and economic burden of AMR and presents results on the effectiveness and cost-effectiveness of 11 One Health interventions and 3 policy-packages (OECD, 2023b).

Stage 2 of the shock cycle: Onset and alert

Goals

- Assess the health system's ability to detect the shock (MDRO outbreak):
  - the presence and quality of surveillance, and early warning systems
  - the ability to collect a range of broad, high-quality information from diverse sources, and use it effectively to inform all stakeholders and their decisions.
- Comment on the applicability of detection to a wider variety of shocks.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Overview

Some concerns from local health management staff start to surface that the outbreak may have spread to other facilities in the region but have not yet been detected. In Stage 2 of the shock cycle the resilience of the health system can be explored by discussing the ability of the system to identify and respond to potential threats. AMR surveillance is broad and multidisciplinary, and stretches beyond the limits of the health system into both animal health and food production. The focus of this scenario is on human health, and specifically the short-term ability of the health system to prepare for, detect and deal with a crisis such as a MDRO outbreak. As such, the questions in Tables 3.2.7 and 3.2.8 (below and on page 149) concentrate on aspects of AMR surveillance critical to preparing for, detecting and responding to a MDRO outbreak, rather than assessing the comprehensiveness of the intersectoral surveillance system. Resources such as the European Commission's NAP against AMR Review Tool offer broader and more in-depth assessments of AMR monitoring and surveillance systems (see Annex 2 of *Overview Report: Member State's One Health National Action Plans against AMR*) (European Commission, 2022b).

Table 3.2.7 Questions about resource generation for the onset and alert stage of the AMR scenario

INDICATOR	QUESTIONS
Surveillance and public health workforce	• Can public health surveillance services, including the public health workforce, adapt to the evolving shock at short notice and scale up activity as needed?

Table 3.2.8 Questions about service delivery for the onset and alert stage of the AMR scenario

INDICATOR	QUESTIONS
Public health infectious disease surveillance reporting (ECDC, 2018)	• Can the surveillance system provide real-time reporting of surveillance data? • Is the surveillance system sensitive and flexible, and able to detect initial cases or events? • Does the surveillance system obtain information from a broad range of different and reliable resources? • Does the surveillance network include information from veterinary, entomological and environmental surveillance systems? • Does the surveillance system meet EU and WHO standards regarding epidemiological data on all diseases under EU surveillance, their case definitions and reporting protocols? • Are surveillance data systematically and regularly reported to the relevant sectors and stakeholders? • How quickly can laboratory notifications reach public health authorities? How long does it take for these to reach state and national representatives if needed?
Public health risk assessments (ECDC, 2018)	• Are alerts and early warnings assessed based on a joint analysis of the surveillance and other available data? • Is a risk assessment team assembled to assess the risks of a (possible) event of public health concern? • Does the risk assessment team include additional expertise (i.e., toxicology, animal health, food safety)? • Are risk assessments used to identify at-risk populations? • Are risk assessments used to identify and engage operational partners? • Are risk assessments used to identify and engage key policy partners?

Key questions and reflections for shock onset and alert

- Overall, how well do you think the systems in place for early detection and warning would function in the setting of a MDRO outbreak?
- Do detections or clusters of detections of MDROs trigger warnings or communication from the surveillance system back to front-line health service providers?
- What are the top three strengths of the health system's ability to detect and trigger the broader response to the outbreak?
- What are the top three areas of vulnerability or weakness regarding the ability to detect and warn of the outbreak?

Stage 3 of the shock cycle: Impact and management

Goals

- Discuss the potential impacts of the shock (MDRO outbreak) on the health system.
- Discuss the decisions that could be taken to absorb, adapt or transform the health system at this stage.
- Identify the connections between functions of the health system, and how a shock could propagate through them.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Shock impact

The outbreak has come to the attention of the Ministry, not only due to concerns from local health management staff, but also from reports from staff at the National Reference Laboratory, and the department of public health. Retrospective testing of samples from other patients in the ICU have returned further positive results for this MDRO. At least 180 individuals are now believed to have acquired this MDRO in the ICUs of the first four hospitals where cases occurred. Many of the patients that have yielded positive samples for this MDRO in the last two weeks have since been stepped down to general medical wards, and some have even been transferred to other hospitals elsewhere in the capital and neighbouring regions. Of the ten major hospitals that service the capital and surrounding neighbourhoods, eight have received patients known to be infected with the MDRO. News about the outbreak starts appearing in the press and the public is concerned. There are reports of patients and families attempting to obtain prescriptions and secure courses of antimicrobials, which affects supplies of pharmaceuticals, even those that are ineffective against the MDRO.

After briefing infectious disease, infection prevention and public health experts on the outbreak, they suggest the following course of action:

- A comprehensive outbreak investigation, including the extent of colonization across healthcare professionals.
- The entire ICUs of the two largest hospitals that first detected the MDRO (facilities with 70 and 50 beds, the largest two ICUs in the capital) should be closed immediately for deep cleaning. This is estimated to take a week.
- Attempts will be made to procure sufficient supply of the required antimicrobial, despite the high cost.
- A public information campaign should be put in place immediately.

These recommendations are expected to have a major impact on the ability to provide critical health services in the capital city. Below is a series of questions to guide the discussion through the potential impacts to different functions of the health system.

Tables 3.2.9–3.2.12 (pages 150–153) contain questions on different health system functions relevant to this stage of the shock. There also are prompts to consider how effects on one function could affect adjacent health system functions, and Box 3.2.4 (page 154) discusses options for health system transformation at this stage of the shock.

Table 3.2.9 Questions about governance for the impact and management stage of the AMR scenario

INDICATOR	QUESTIONS
Emergency coordination and leadership (ECDC, 2018)	• How quickly can established command and control structures be made operational to direct the emergency and public health response? • Are responses in public, private and NGO health services able to be coordinated?
Health system metrics (general health system) (ECDC, 2018)	• What up-to-date information about the rest of the health system is accessible to inform decisions throughout the response (i.e., bed occupancy rate, emergency room waiting time, staff capacity)?
Metrics on response (ECDC, 2018; WHO, 2023c; European Commission, 2023)	• Have international AMR reporting requirements been fulfilled (e.g. WHO Tracking Antimicrobial Resilience Country Self-Assessment Survey (TrACSS) and Article 7 (EU) 2022/2371 AMR reporting requirements) and what do these reports show? • Can data on the public health response (the outbreak investigation) be collected and monitored to adapt the response as needed? • Are there any capabilities to monitor the capacity of the National Reference Laboratory and other laboratories?
Quality of information-sharing (ECDC, 2018)	• How will the information be distributed to stakeholders during this crisis? • Is the communication strategy coordinated? • Are the communication tools being used standardized? • What can be done to communicate to the public in a way that is transparent, credible and easy to understand?

Cascading effects

Considering these and other important activities of governance, how do you believe poor performance in this function during this crisis could lead to disruption in other parts of the health system? For example, how will challenges with information-sharing affect resource generation or service delivery?

Table 3.2.10 Questions about resource generation for the impact and management stage of the AMR scenario

INDICATOR	QUESTIONS
Health workforce	• Is there sufficient capacity at other ICUs to accommodate a shift in patients? • Can the health workforce be redistributed to other ICUs and other hospitals as needed? • Are there workforce reserves that can be called upon in a shock? • How will workforce motivation and well-being be maintained during the response?
Health infrastructure	• How far could the bed occupancy rates of other hospitals be increased to compensate for the closure? • How long could they sustain this increased occupancy? • How can the health infrastructure respond to the crisis (adapt, absorb or transform)?
Personal protective equipment	• 5–10 hospitals in the capital city require a sudden increase in their usual PPE supplies. How will stockpiled supplies be distributed equitably and rapidly? • The winter months are approaching and the WHO has forecast a severe flu season. Will the current crisis affect the system's ability to adequately prepare for concurrent respiratory outbreaks?
Emergency operations staff (ECDC, 2018)	• How quickly can personnel trained in emergency response set up and Emergency Operations Centre or similar centre?
Laboratory response (local and NRL) (CDC, 2022)	• What is the capacity of NRL and local laboratories to quickly take on prospective and retrospective surveillance on biological samples? • What is the capacity for testing environmental samples from potentially contaminated wards and common spaces?

Cascading effects

Considering these and other important elements of resource generation, how do you believe poor performance in this function during this crisis could lead to disruption in other parts of the health system?

- Could disruption in staffing lead to financial implications? For example, a reduction in staff resulting in reduced income for medical services and therefore the potential reduced purchasing of resources resulting in reduced resilience of the health system; or running down inventories, reducing the ability to mitigate an unexpected occurrence.

Table 3.2.11 Questions about financing for the impact and management stage of the AMR scenario

INDICATOR	QUESTIONS
Financial reserves	• Can financial reserves be allocated for the response to this crisis? • If yes, how much is there? How long could it last for?
OOP payments	• Will OOP expenses rise as a result of increased demand for the public health system? • If yes, what can be done during the crisis to prevent (or if it is inevitable, minimize) the rise?
Financial stability of the private system	• MDRO outbreaks frequently prolong lengths of stay in hospital. If the length of stay in private hospitals suddenly lengthens, will the private system have sufficient funds from private health insurance, or will public resources be required to cover the financial gap?

Cascading effects

Will the financial state of the health system add resilience to the response, or does it add a potential source of vulnerability during a crisis?

Table 3.2.12 Questions about service delivery for the impact and management stage of the AMR scenario

INDICATOR AND DEFINITION	QUESTIONS
Infection prevention and control (IPC) capabilities in hospitals (CDC, 2022)	• How well can contact precautions or enhanced barrier precautions be instituted in the hospital facilities? • How quickly can hospital staff be screened for a MDRO? • Can IPC standards continue to be assessed using standardized tools during a surge in demand like this outbreak?

Cascading effects

How do you expect the impact of this shock to affect health outcomes? How might it impact upon the effectiveness, safety, efficiency and equity of the health system, and access to and patient experiences of the health system?

- Could the increase in utilization of health infrastructure (bed occupancy, for example) lead to disruptions in service delivery?
- Could the public reaction and fear delay the decision to seek hospital care even in cases of high need?
- Could lack of complete information lead to a proliferation of disinformation, affecting supplies of a larger set of drugs?

Box 3.2.4 What are the options for transformation?

The major impact of this scenario is a reduction in supply of hospital services, especially those associated with advanced critical care. What are the options for transformation in the health services to help deliver equivalent services or mitigate the impact?

Transformation and adaptation could revolve around moving the place of service delivery and who delivers it. For example, an expansion of telehealth and digital services could reduce the risk for patients and staff. A virtual hospital system may be able to provide care. For staff no longer able to deliver care in intensive care and hospitals, are there options to deliver care at patients' homes or in community centres?

Key questions and reflections for shock management

- How well do you think the health system and emergency response would operate in this type of scenario, where the city's largest ICU is shut down, and many critical-care staff (doctors and nurses) are awaiting colonization results before they can return to work?
- Which patients/populations will be most affected by the impact of this outbreak and what can be done to mitigate this?
- How will the funding arrangements for medications impact which patients have access to last-line antibiotics being imported? Will it be possible to supply all infected patients, or only those who can pay out of pocket for the medication?
- What are the top three strengths of the health system in responding to the MDRO outbreak and disruption to the capital city's largest ICU?
- What would be the top three challenges of the health system to absorb, adapt or transform in response to the shock?

Stage 4 of the shock cycle: Recovery and learning

Overview

In Stage 4 of the shock cycle, it is important to consider recovery and learning equally. Both aspects of this stage will require different goals and different questions, as demonstrated by the scenario.

Goals for recovery

- Discuss the transition from the shock ending and the return of the health system to a new steady state.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Goals for learning

- Discuss if Country B has a process to review and apply the learnings.

Progress

After a one-week closure, the two largest ICUs in the capital city are able to reopen and return to full capacity. Over the next six months, the MDRO outbreak, which had spread via affected patients who were transferred to rehabilitation and other step-down facilities, is gradually brought back under control. Patients with active infections from the MDRO are treated with last-line antibiotics, obtained for a high cost. Some localized shortages and disruptions in the supply of other antimicrobials persist.

Because of the reduction in available facilities and staff, many procedures and other activities have been delayed or cancelled. The backlog of surgery will have to be addressed. Prioritization of those waiting will be required.

Health system stakeholders have once again gathered to discuss the outbreak, the remaining challenges it poses, and what can be done to increase the resilience of the health system should this occur again.

Key questions for recovery

- How can patients be prioritized and will it be equitable? Are there available resources to surge treatment for the backlog of patients?
- Although no single cost was catastrophic during the outbreak, increased utilization of PPE, cleaning services, overtime remuneration for clinical and laboratory staff, and prolonged lengths of stay for patients resulted in considerable costs. How will finances be reallocated to top up the emergency reserves for the next crisis? How long would it take to reallocate healthcare funds to replenish the emergency reserve?

Key questions for learning

- How are lessons learned from handling an AMR crisis systematically documented and utilized across various sectors in Country B to refine future responses? Can you provide specific examples or case studies where such learning has led to significant improvements in crisis management?
- What are the key steps involved in designing and executing a thorough review of the public health response to this crisis? How has this process worked in the past and how could it be improved? Additionally, what strategies are implemented to ensure that the findings of such reviews are given adequate attention and priority in a post-crisis context?
- In what ways does the review process ensure the inclusion and participation of multidisciplinary teams, including patients, researchers, healthcare workers, government officials and representatives from civil society organizations? How are these diverse perspectives integrated into the final analysis and recommendations?
- What methodologies are employed for collating and disseminating the findings from these reviews? How does the health system ensure that these insights are effectively communicated to all relevant parties and contribute to policy development or procedural changes?

Assessment

Goals

- Consider the results of the analysis of all four stages of the shock cycle for an overall assessment of resilience to an AMR crisis.
- Decide on overall weaknesses and relative strengths in health system resilience.

Key questions for the overall assessment

- Overall, do you think the health system in Country B is adequately prepared, ready to detect and ready to provide a timely response to an AMR shock large enough to cause serious health service disruptions?
- Which health system function, at which stage of the shock cycle, is likely to be least resilient?
- What are the most important gaps/weaknesses in the system that need to be addressed?

Broader strategies to address AMR

Goals

- Contextualize this scenario in the broader AMR challenge.
- Discuss the longer-term strategies to address AMR globally and in Europe.
- Briefly discuss the future direction of AMR mitigation in Europe.

The above scenario focuses on important aspects of a health system's ability to detect and mitigate the impact of a disruptive MDRO outbreak and strengthen its resilience in recovering and learning from the outbreak. Nonetheless, the themes discussed form only a small part of the broader One Health approach to tackling AMR and the broader framework of resilience.

WHO and the European Commission have called on Member States to address AMR through multisectoral collaboration across the human health, animal health, environmental and agricultural sectors (European Commission, 2017; WHO, 2022g). This approach includes targeting the causes that drive AMR, coordinating activity between scientific agencies and Member States, enhancing our ability to detect and characterize resistant organisms, and developing new technologies to treat or prevent infections from MDROs.

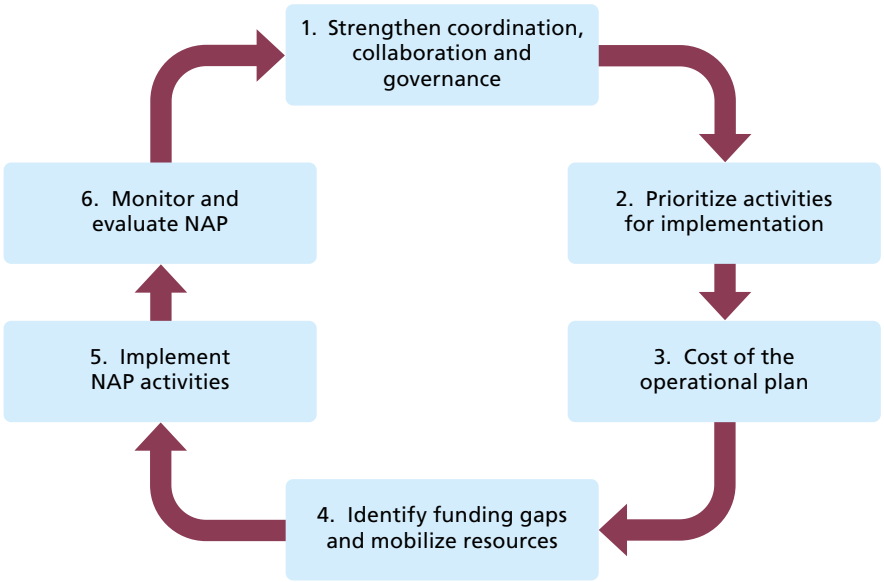
We have long known that there are two powerful drivers of AMR. The first is our use and overuse of antimicrobials in human health, animal health and food production. This exerts pressure on microorganisms and accelerates the emergence and selection of resistant characteristics (ECDC, 2008). The second driver is the cross-transmission of resistant organisms between animals, humans and the environment (ECDC, 2008). Humans can be exposed to resistant organisms through food, direct contact with animals, visiting healthcare facilities, or even environmental exposure as wastewater can become contaminated with antibiotics from healthcare facilities, pharmaceutical factories and agricultural areas (Expert Panel on Effective Ways of Investing in Health, 2022). Recognizing the threat, the World Health Assembly adopted a Global Action Plan (GAP) on AMR in 2015 which includes five key objectives to mitigating the impact of AMR (WHO, 2016b):

- Improving the understanding and awareness of AMR through education, training and communication.
- Increasing the strength and comprehensiveness of research and surveillance programmes.
- Strengthening sanitation and infection prevention procedures.
- Optimizing the use of antimicrobials in both animals and humans.
- Developing an economic case for increased investment into new medicines, vaccines and diagnostics.

These objectives are designed to address AMR by reducing the number of infections, reducing the use of antimicrobials, and by developing new ways to diagnose and treat infections (Expert Panel on Effective Ways of Investing in Health, 2022).

In Europe, the objectives outlined in the GAP are translated into regional and national strategies through the EU One Health Action Plan against AMR and the respective National Action Plans (NAPs) of Member States. EU Member States have dedicated reporting requirements on AMR as part of their prevention, preparedness and response planning in relation to serious cross-border threats to health in accordance with Article 7(1) of Regulation (EU) 2022/2371. Comprehensive NAPs on AMR cover the key objectives in the GAP, through a continuous cycle of improvement rather than a "one size fits all" set of strategies (see Figure 3.2.1). The cycle begins with establishing and strengthening the multidisciplinary governance bodies responsible for combating AMR and ensuring that they have a budget and accountability frameworks in place (WHO, 2022g). The cycle continues, by identifying, prioritizing and addressing local drivers of AMR, monitoring progress and ultimately restarting the cycle. See the WHO Implementation Handbook for National Action Plans on Antimicrobial Resistance for more detailed information on this process (WHO, 2022g).

Figure 3.2.1 National action plans on AMR: cycle of implementation



Source: WHO, 2022g

To date, NAPs are in place in all EU Member States (European Commission, 2022b). These NAPs generally have comprehensive visions and strategies but contain a high degree of variability between them (European Commission, 2022b). Most NAPs within Europe have a heavy focus on human health, and strategies focusing on the environment are underrepresented (European Commission, 2022b).

The Expert Panel on effective ways of investing in Health (EXPH), an independent group established by the European Commission to provide independent advice on increasing the resilience of health systems, is calling on Members to strengthen their NAPs and to investigate at the sub-national level the policies and practices in their regions which are contributing to AMR (Expert Panel on effective ways of investing in Health, 2022). At the international level, the expert panel is calling on the European Commission to develop new indicators and data collection mechanisms to measure the progress in tackling AMR in Europe (Expert Panel on effective ways of investing in Health, 2022). In addition, the panel is calling for

European Union treaties on human and animal health to be united, consistent with a One Health approach (Expert Panel on effective ways of investing in Health, 2022).

The overview report on Member States' One Health National Action Plans against Antimicrobial Resistance (European Commission, 2022b) shows that considerable progress has been made. The European Council recommendation from June 2023 on stepping up EU actions to combat AMR in a One Health approach and the June 2023 European Parliament resolution on EU action to combat AMR show that AMR remains high on the political agenda. However, if we do not continue to make progress and address the gaps identified by the EXPH, we may face an era where common infections can cause serious morbidity and mortality.

3.3 Example scenario: Financial crisis

The threat

This is a fictional example scenario for a resilience test. Its development was informed by a rapid literature review considering relevant events. Any similarity to a particular country or past event is purely coincidental. This scenario needs to be adapted to the setting of the resilience test and reviewed by an expert before it can be used as part of a resilience test (see Section 1.2).

Section 1.2: The resilience testing process page 5

Economic crises can affect any country and all aspects of society. While there are specific definitions of important concepts like economic recessions and economic depressions, any downturn in the economy can have implications for health and health systems.

A variety of factors can contribute to or cause an economic crisis (or be caused by an economic crisis) – the following is not intended to be comprehensive. Structural causes could include financial market instability, speculative bubbles or supply shocks, which may be caused by an underlying geopolitical shock. Public sector causes or effects, including high debt and/or deficits, or currency crises could lead to unsustainable increases in borrowing costs, resulting in public expenditure cuts.

There are manifold ways in which an economic downturn impacts on health systems, and different economic shocks will have different effects. All economic shocks will, to some extent, squeeze demand and supply, while also increasing some elements of need (such as mental health care). For example, unemployment may increase due to a decline in aggregate demand. Inflation may rise as well, perhaps due to supply chain constraints. High rates of unemployment can have both fiscal repercussions – for example, due to lower revenues associated with income tax and higher expenditure on unemployment benefits – and impacts on household finances caused by lower earnings. Rising unemployment may further cause serious challenges for the sustainability and sufficiency of public funding for healthcare, particularly social health insurance systems that rely heavily on payroll taxes and contributions for financing. Rising prices may also mean a health system must purchase less volume at the same budget, or face pressure for wage increases, with consequences for access to, and the availability of, health services.

There are manifold ways in which an economic downturn impacts on health systems.

The financial crisis in the first decade of this century demonstrated how an economic crisis can reverberate for health (Thomson et al., 2015; van Gool & Pearson, 2014). The implications for health and health systems in this crisis occurred through multiple pathways (Karanikolos et al., 2013). Governments faced severe fiscal constraints due to reduced economic activity, high debt and high borrowing costs; some were required to reduce public spending as a condition for external funding. In many cases, healthcare budgets were reduced as part

of broader fiscal consolidation. This led to reductions in health worker wages in some countries, causing health workers to leave the sector. At the same time, in many countries households faced financial constraints due to job losses and wage reductions, yet they also shouldered more of the OOP costs of paying for healthcare. The stress of the crisis had its own adverse health effects, particularly for mental health.

Although economic crises affect all of society, the scope of this scenario is focused on the health system as defined by the boundaries of the HSPA Framework (see Section 2.2). When working through this scenario, it is important to remember that the purpose is to explore the resilience of the health system to an acute shock, not the mechanism by which economic stability is regained. Resilience is defined as the ability to prepare for, manage (absorb, adapt and transform) and learn from shocks (Thomas et al., 2020). Some of the required strategies to build the resilience of the health system to avoid these shocks are discussed at the end of this scenario.

Section 2.2: The HSPA Framework page 43

The shock

This scenario is designed to be used with health system stakeholders of Country X who participate in the resilience test. Prior to the resilience test day, participants should have been briefed on the scenario and given sufficient time to consider the background material (see Section 1.2). What follows is a description of an example scenario, and a series of prompts to guide discussion through the four stages of the shock cycle. The scenario is an economic shock as defined in the typology of shocks (see Section 2.1). This shock is designed to initially impact upon the function of financing.

Section 1.2: The resilience testing process page 5

Section 2.1: Resilience, shocks and the shock cycle page 30

In this shock, oil prices skyrocket due to an embargo placed on the main oil exporter. As a small economy, Country X has no strategic oil reserves and is faced with a 200% increase in energy prices. This reverberates throughout the economy and over a short period of time inflation hits 25%. Consumers cannot afford to pay high prices and begin to reduce their consumption. This leads to a sizeable decline in aggregate demand, which in turn leads to real per capita GDP declines of 10% that are sustained for the duration of the crisis. Businesses begin to lay off workers and the government attempts to step in to cover unemployment benefits and support businesses, but deficits increase dramatically due to the higher public spending and reduction in tax revenues caused by the economic crisis. At the same time, driven by interest rate increases, borrowing costs increase and the government becomes locked out of international financial markets. A bailout is unlikely and the crisis needs to be managed domestically.

This scenario occurs rapidly, and the health system struggles to cope, ultimately leading providers to go into arrears. Many health workers decide to leave the country as their real wages fall and they feel powerless and detached from decision-making that prioritizes cost control, causing moral distress (Fleming et al., 2023).

Using the HSPA Framework, this scenario has the capacity to shock multiple functions of the health system and boundary systems (see Box 3.3.1 on page 162). Before diving into an analysis on the potential disruption this could cause across the shock cycle, this scenario will first review some indicators of the current state of the health system.

Box 3.3.1 A shock (primarily) to the finance function

An economic crisis has its initial effects on the financing function of the health system, largely due to its effects on revenue generation. This in turn may affect procurement and supply chains, the health workforce and other areas of the health system.

We are using a cost-of-living crisis which turns into a wider economic crisis to test how the initial shock (to the financing function) spreads through the health system to identify weaknesses that may exist across the shock cycle and within the health system. While different economic shocks affect the health system differently, there may be some common weaknesses in similar shocks that impact on the financing function, such as a fiscal crisis or a currency devaluation.

The health system

Goals

- Give a brief overview of the current functioning of the health system (pre-shock).
- Outline the institutional features and the contextual information about Country X relevant to its potential resilience to the shock.

Overview

This hypothetical European country has a population of approximately 2 million people. It has only recently become a high-income country, since accession to the EU. The largest city, the capital, is home to approximately 1 million people.

This section contains the information that the facilitator may collect as part of the background materials (Box 3.3.2). It includes information on the baseline functioning of the health system, indicators of resilience, institutional features and other contextual information. Although here this information is presented in tables, ideally it would be presented in graphs, figures and infographics as needed. Key messages should be easy for participants to comprehend.

Box 3.3.2 Why is this information being considered in the scenario?

A substantial portion of this information is common knowledge to both the facilitators and the participants. The experience during the pilots is that only a small subset of the available information is presented during the resilience test and the disseminated preparatory material. Exactly what is presented to participants depends on the invited stakeholders. In the case of a cost-of-living or economic crisis scenario, information about the state of the economy and public finances may be useful and beyond the remit of many of the stakeholders.

This step is needed for several reasons in the process of the resilience test. The first is to consider observable weaknesses in the health system and in the resilience of the health system. The second reason is so the facilitators have the information available during the day and subsequently in the production of reports and follow-up information. The use of the best available information underlies the identification of weaknesses and subsequent remedial action. The third reason is that the pathways by which the shock may travel may be mediated or influenced by these factors, and explicit consideration of the importance of these factors is useful. Finally, availability or non-availability of data can indicate vulnerabilities of the health system. If data relevant to the shock scenario are not readily available, this will impact on the ability of the system to respond.

The current state of the health system in Country X

The health system in Country X is centrally governed, and services are delivered by public institutions. There is a single purchaser, which is largely financed through contributions from employers and employees, mirroring revenue raising in a social health insurance-type system. Citizens are entitled to access primary, secondary and tertiary medical services through this fund, and it covers a "core set of services" comparable with the rest of Europe. Co-payments are required for all services other than emergency care. Like most health systems, physical and human resources are unevenly distributed, with a higher density and variety of services offered in the cities and more affluent citizens having greater access. Tables 3.3.1–3.3.3 below and on page 164 contain some of the key figures on the current standing of the health system in the context of this scenario.

For an in-depth explanation of commonly used indicators and how they relate to resilience, please see Sections 2.3 and 2.4.

Section 2.3: Indicators and the assessment of resilience page 56

Section 2.4: The impact of shocks and the capacity to respond page 95

Table 3.3.1 Key figures on the status of the health system in Country X

INDICATOR	COUNTRY X	EUROPEAN AVERAGE
Number of physicians per 1000 population	3	4 (EU27)
Hospital beds per 1000 population	4.5	5 (EU25)
Occupancy rates in acute beds	85%	64% (for EU21)
Unmet medical needs	20%	18% (EU27)
Preventable mortality	190 per 100 000 population	176 per 100 000 population (EU27)
Treatable mortality	150 per 100 000 population	104 per 100 000 population (EU27)

Note: All European averages from 2020 or most recent available.

Source: OECD & European Union, 2022

Table 3.3.2 Health expenditure indicators for Country X

INDICATOR	COUNTRY X	EUROPEAN AVERAGE
Total health expenditure per capita	€1500	€3159 (EU27)
Health expenditure from public sources as a share of total health expenditure	80%	81% (EU27)
Health expenditure as a share of GDP	7.6%	10.9% (EU27)

Note: All European averages from 2020 or most recent available.

Source: OECD & European Union, 2022

Table 3.3.3 Economic and fiscal indicators for Country X

INDICATOR	COUNTRY X	EUROPEAN AVERAGE
GDP per capita	€26 000	€35 430 (EU27)
Tax to GDP ratio	40%	41.2% (EU27)
Debt to GDP ratio	90%	83.5% (EU27)
10-year bond rate	0.62%	1.25% (EU20)
Annual inflation rate	20%	9.2% (EU27)

Note: All European averages from 2022, annual inflation rate measured through the Harmonized Index of Consumer Prices (HICP)
Source: Eurostat, 2022c

Stage 1 of the shock cycle: Preparedness

Goals

- Discuss the general preparedness of the health system for shocks.
- Discuss the specific preparedness of the health system to this shock (cost-of-living/economic crisis).
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Overview

Now that we have had a quick overview of the current standing of the health system in Country X, we can turn to assessing the resilience of the health system to this shock across the four stages of the shock cycle. Tables 3.3.4–3.3.6 below and on page 165 contain a series of questions that the facilitator could prepare before the test to guide its participants through the functions of the health system with a particular focus on whether they impacted preparedness. Box 3.3.3 on page 166 outlines some of the impacts past financial crises have had on health.

Table 3.3.4 Questions about governance for the preparedness stage of the financial crisis scenario

INDICATOR	QUESTIONS
Policy and legislation	• What policy, procedures or analysis are available to evaluate the effectiveness of responses to past economic shocks? • How are lessons from previous economic shocks incorporated into planning?
Multisectoral collaboration	• In the absence of a crisis, how are health budgets determined? Who are the main actors and what are their roles?

Table 3.3.5 Questions about financing for the preparedness stage of the financial crisis scenario

INDICATOR	QUESTIONS
Financial reserves (Mladovsky et al., 2012)	• In the past five years, were healthcare expenditure levels adequate? For example, were extra budgets needed during the year or was the system running deficits (is the purchaser allowed to run deficits)? • What is the level of public debt in the country? What percentage of public expenditure goes towards interest payments on debt? What is the country's ability to borrow money? • Are there counter-cyclical provisions or other funds able to be dedicated to the health system in times of crisis?
Healthcare coverage (Regional Committee for Europe, 2011)	• What proportion of the population is covered by the statutory health system? By voluntary health insurance? • Are there any groups that are not covered by the statutory health system? • Are contributions made for economically inactive people to the health system? How are these determined? • How broad is the statutory health system benefits package? • What is the level of OOP spending? • What percentage of households have catastrophic and/or impoverishing health spending?
Purchasing	• How are prices determined in the health system (e.g., for labour, goods)? • How are providers paid? • Are pharmaceuticals expensive by international standards?

Table 3.3.6 Questions about resource generation for the preparedness stage of the financial crisis scenario

INDICATOR	QUESTIONS
Pharmaceuticals and consumables	• Is the current supply of pharmaceuticals and consumables sufficient for the daily needs of the system? • Are plans in place to ensure sufficient pharmaceuticals and consumables to respond to surges in demand? • What percentage of pharmaceuticals are domestically produced?
Infrastructure and medical equipment (ECDC, 2018)	• How old is the hospital infrastructure? • How many buildings are due for major repairs or replacements over the duration of the crisis? • What are the consequences of delaying infrastructure upgrades?
Health workforce	• Are current levels of primary and secondary care staff adequate to respond to daily needs in the health system? • How old is the health workforce and what proportion of the workforce is approaching retirement age? • Are they geographically well distributed across the country? • Are there adequate levels of staff to respond to sudden surges in demand? • Are wages in the health sector comparable to other professional sectors in the country? Are wages in the health sector comparable to health sector wages in neighbouring countries? • How motivated and engaged is the health workforce?

Key questions and reflections for preparedness

After considering the aggregate functioning and a number of specific features of preparedness in each of the functions of the health system, review the following questions with participants:

- Overall, how prepared do you think the health system is for a large economic shock?
- What are the top three strengths of the health system's preparedness for an economic shock?
- What are the top three areas of vulnerability for preparedness for an economic shock?
- Are there any functions of the health system that are underperforming, or could potentially indicate a lack of resilience in the system?

Box 3.3.3 Economic shocks and population health

Downturns can damage health through reductions in household financial security, particularly because of job losses and reductions in government resources. Many individual-level studies from a wide range of high-income countries find an association between becoming unemployed and increased mortality. Some previous economic downturns have resulted in positive changes in health behaviour and resulted in overall reductions in mortality, but no positive effect on mortality has been found when analysing more recent crises.

In 2009 the financial crisis was characterized by a marked increase in mental ill health and suicide. Other health effects of this financial crisis are more mixed, with limited evidence of increased alcohol consumption and increased transmission of communicable diseases in some European countries. It is likely that aggregate data mask the extent to which the health of vulnerable populations was negatively affected by this crisis. In addition, vulnerable populations are often hard to reach, both for medical and research purposes (Thomson et al., 2015).

Stage 2 of the shock cycle: Onset and alert

Goals

- Assess the health system's ability to detect the impact of a wider economic shock on the health system.
  - the presence and quality of early decision-making mechanisms when confronted with a potential economic shock.
  - the ability to collect a range of broad, high-quality information from diverse sources, and use it effectively to inform all stakeholders and their decisions.
- Comment on the applicability of detection to a wider variety of shocks.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Overview

In Stage 2 of the shock cycle, the resilience of the health system can be explored by discussing the ability of the system to identify and respond to potential economic shocks (Tables 3.3.7 and 3.3.8).

Table 3.3.7 Questions about governance for the onset and alert stage of the financial crisis scenario

INDICATOR	QUESTIONS
Policy and vision	• At the beginning of the crisis, how would the government recognize that it is facing an economic shock that is likely to impact the health system? • How would the government decide when intervention is required?
Information and intelligence	• Is relevant economic data being collected and made available for decision-making in a timely manner? • Are health system financial data being collected and made available for decision-making in a timely manner?

Table 3.3.8 Questions about financing for the onset and alert stage of the financial crisis scenario

INDICATOR	QUESTIONS
Sufficient and stable funds	• How quickly can the government draw on any emergency funds? Is there legislation for emergency budgets? • How quickly would a decline in contributions affect actual financial resources for the purchaser?
Allocation according to need	• How quickly can the government reallocate in-year and future-year funding according to need?

Key questions and reflections for shock onset and alert

- Overall, how well do you think the systems in place for early detection and warning would function when facing an economic shock?
- Overall, how well do you think the systems in place for deciding whether government action is required would function when facing an economic shock of yet uncertain scale?

- What are the top three strengths of the health system's ability to detect and trigger a response to an economic shock?
- What are the top three areas of vulnerability or weakness regarding the ability to detect and trigger a response to an economic shock?

Stage 3 of the shock cycle: Impact and management

Goals

- Discuss the potential impacts of the economic shock on the health system.
- Discuss the decisions that could be taken to absorb, adapt or transform the health system at this stage.
- Identify the connections between functions of the health system, and how a shock could propagate through them.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Shock impact

As Country X's health system is predominantly financed through social insurance contributions linked to the labour market, the increase in unemployment brought on by the rapid fall in aggregate demand and GDP affects the health system directly. It affects the system by decreased contributions, declines in overall government revenue and increased public spending. The fiscal space for health is particularly challenged due to the spike in demand for unemployment benefits. As borrowing costs increase, the government's existing debt becomes harder to service, adding additional pressure to the government budget. The government's capacity to raise revenue is extremely constrained as Country X becomes locked out of international financial markets and a bailout is not an available option. The government looks to the health system as a source of savings to maintain solvency.

At the same time, health providers rapidly go into arrears because of the steep increase in energy prices. Coverage of arrears by the government is no longer guaranteed, which means that some health facilities start to ration electricity use. Inflation also affects the price of consumables and pharmaceuticals. This affects providers, insurers and patients (who pay a percentage for each outpatient prescription).

Overall, demand is increasing for public primary and mental health care services. At a population level, sales of alcohol and tobacco rise. The demand for mental health care has quadrupled within a few months. As waiting lists for mental health services increase, the incidence of suicide is also increasing.

Many health workers decide to leave the country as their real wages fall and they feel powerless and detached from decision-making that prioritizes cost control. The workforce feel challenged by the shift in values, struggle to provide safe, high-quality care and feel moral distress as a result.

Tables 3.3.9–3.3.12 (pages 169–170) contain example questions on different functions of the health system for this stage of the shock cycle. Box 3.3.4 on page 171 outlines options for transformation that were implemented during the 2009 financial crisis.

Table 3.3.9 Questions about governance for the impact and management stage of the financial crisis scenario

INDICATOR	QUESTIONS
Stakeholder participation in decision-making	• How are stakeholders chosen and engaged in decision-making during the crisis?
Health system metrics	• What up-to-date information about the health system is accessible to inform decisions throughout the response (for example, the financial position of health insurance and providers, the financial burden on patients, the medical needs of the population, access to care, staffing)?
Quality public financial management	• How quickly can budget plans be changed in crisis times? • How quickly can budget plans be revised and adapted to suit the evolving situation?

Cascading effects

Considering these and other important activities of governance, how do you believe poor performance in this function during this crisis could lead to disruption in other parts of the health system? For example, how will challenges with stakeholder participation affect financing, resource generation or service delivery?

Table 3.3.10 Questions about resource generation for the impact and management stage of the financial crisis scenario

INDICATOR	QUESTIONS
Pharmaceuticals and consumables	• Are pharmaceuticals and/or consumables at risk of sudden price changes? Is there scope for the purchaser to regulate prices?
Infrastructure and medical equipment (ECDC, 2018)	• Will ongoing infrastructure projects be fully deliverable given inflationary pressures? How will choices be made to slow or stop projects? • Given providers can no longer afford to run all current infrastructure because of the energy price rises, how will decisions to ration energy affect available health services?
Health workforce	• What happened to health workforce pay in the last economic shock and is it likely that similar measures will be taken in this economic shock? • Are there any mechanisms to ensure health workers are retained during the crisis? Are there mechanisms to understand workforce morale and the effects on health workforce retention?

Cascading effects

Considering these and other important elements of resource generation, how do you believe poor performance in this function during this crisis could lead to disruption in other parts of the health system? For example, are declines in health workers likely to lead to rising waiting times or reductions in quality of care?

Table 3.3.11 Questions about financing for the impact and management stage of the financial crisis scenario

INDICATOR	QUESTIONS
Revenue raising	• Are there budgetary mechanisms that allow an increase in general government transfers to compensate for the decline in social contributions? Is this likely to happen in practice? • Can financial reserves be allocated to respond to this crisis? • If yes, how much is available? Who holds those reserves? How long could it last for?
OOP payments	• Is OOP spending likely to rise because of increased demand on the public health system (i.e., through direct payments for privately provided services or because of increased user charges to raise revenues)? • Will greater OOP spending likely prevent access to necessary health services or lead to financial hardship? • If yes, what can be done during the crisis to prevent or minimize the rise of OOP expenses?
Coverage	• Are any groups at risk of losing coverage? Is it possible to make additional provisions to provide access to care for those who cannot make social contributions due to job loss/wage loss? • Are any essential health services at risk of being excluded from the benefits package that is covered by public health insurance as a result of budget cuts?

Cascading effects

How will the fragile financial state of the health system impact resource generation and service delivery? Are there any strengths to the health financing system? What are the top three weaknesses and how will they impact other health system functions?

Table 3.3.12 Questions about service delivery for the impact and management stage of the financial crisis scenario

INDICATOR	QUESTIONS
Access to care	• How quickly can health services be adapted to changing population health needs, particularly given fewer health workers?
Quality	• Is Country X able to monitor changes to health service quality in real-time?

Cascading effects

How do you expect the impact of this shock to affect health outcomes in Country X? How might it impact upon the effectiveness, safety, efficiency and equity of the health system, and access to and patient experiences of the health system?

Box 3.3.4 What are the options for transformation?

The major impact of this scenario is a sudden and rapid reduction of financial resources in the health system driven by a rapid reduction of fiscal space for health. The rapid and sharp contraction in GDP means that government revenue is reduced, while demand for health services and overall government expenditure is increased. This means that the main health system functions affected by the shock are financing, service delivery and resource generation. Many health services faced a similar situation to that described by this example scenario during the 2009 financial crisis. Lessons from this crisis include that health systems that prioritized spending on high-value health services, and saved on low-value health services, fared comparatively well. Also, financial protection and access to health services for people at risk of poverty, unemployment, social exclusion and ill-health were important as many people found themselves in a particularly vulnerable situation owing to the crisis. Other policy options focused on efficiency, such as strengthening pharmaceutical procurement and substitution policies, reducing inflated service prices and salaries, reducing the administrative burden of the health system (for example, by merging insurance funds) or stepping up the implementation of planned hospital restructuring (Thomson et al., 2015). Other policy options that may be available in future include task-shifting, stepping up care integration to reduce duplicate assessments and increase service efficiency through telemedicine and other digital solutions.

Key questions and reflections for shock management

- How well do you think governance, priority setting and health system finance would operate in this type of scenario? Would additional resources become available and be directed towards the health system? Would decisions be made in partnership with a wide range of stakeholders?
- How quickly would additional funds/financing measures become available? Who holds the financial risk in the system?
- Where have cuts been made in past crises and are similar decisions likely to be repeated?
- Which patients/populations will be most affected by the economic shock? How will vulnerable populations be protected/ensured access to services?
- What would be the top three challenges of the health system to absorb, adapt or transform in response to the shock?

Stage 4 of the shock cycle: Recovery and learning

Goals for recovery

- Discuss the transition from the shock ending and the return of the health system to a new steady state.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Goals for learning

- Discuss if Country X has a process to review and apply the learnings.

Progress

After a two-year period of sustained high energy prices, inflation and falling GDP, global energy prices are lowering, inflation is reducing and GDP starts to recover in Country X. The labour market and wider economy will, however, take another eight years to fully recover from this shock. Many families have taken a substantial financial hit and some were pushed into poverty and homelessness during the crisis.

The reduction in available health facilities and the decline in the size of the health workforce have meant many health procedures have been postponed. Furthermore, some people have forgone healthcare because they can no longer afford co-payments. This has created a small backlog. Demand for mental health services remains higher than pre-shock, i.e., before the financial crisis.

Key questions for recovery

- How will the health system attract workers following the emigration of health workers during the crisis? How will remaining staff be retained; how will the impact of burnout, moral distress and high demand for services be managed?
- How can health services ensure equitable treatment of patients who may have forgone care during the peak of the crisis?
- How will finances be reallocated to top up the emergency reserves for the next crisis? How long would it take to reallocate healthcare funds to replenish the emergency reserve?
- How will decisions be made to decide which measures to keep and which to roll back?
- Has the mechanism for decision-making changed and at which point in the recovery will this need to be rolled back?

Key questions for learning

- Are lessons learned in the health sector systematically recorded and acted on to improve the government response to an economic shock in the future? What evidence is there for this from the last economic shock?
- What is the process of designing and conducting a review of the government response to the economic shock and the impact decisions have had on the health system?

- How has this process of learning from shocks worked in the past and how could it be improved?
- What are the key legacies of the crisis? What can the health system learn about them to prepare for the next crisis?

Assessment

Goals

- Consider results of the analysis of all four stages of the shock cycle for an overall assessment of resilience to a financial crisis.
- Decide on overall weaknesses and relative strengths in health system resilience.

Key questions for the overall assessment

- Overall, do you think the health system in Country X is adequately prepared, ready to detect and ready to provide a timely response to an economic shock large enough to cause serious health service disruptions?
- Which health system function, at which stage of the shock cycle, is likely to be least resilient?
- What are the most important gaps/weaknesses in the system that need to be addressed?

Broader strategies to address the impact of economic shocks on the health system

Goals

- Review learnings from the 2008–2009 financial crisis
- Contextualize this scenario in the broader challenge of an ageing population
- Briefly discuss the importance of the wider ecosystem in the response to an economic shock

The financial crisis in the first decade of this century saw public spending on health in European countries fall between 2007 and 2012. In most EU countries the change in both absolute spending and the share of government spending was small, but in some countries public spending on health was lower in 2012 than it had been in 2009. Evaluations showed that some health systems were better prepared than others to cope with the shock. Preparedness factors that supported a resilient crisis response included (Thomson et al., 2015):

- counter-cyclical fiscal policies;
- adequate levels of public spending on health;
- no major gaps in health coverage;
- relatively low levels of OOP payments;
- a good understanding of areas in need of reform;

- information about the cost-effectiveness of different services and interventions;
- clear priorities; and
- the political will to tackle inefficiencies and to mobilize revenue for the health sector.

During the crisis response, most countries introduced changes that both managed the crisis and brought wider benefits. Many countries were resourceful in mobilizing public revenue for the health sector. Examples of successful policies include the introduction of public health taxes or measures to make health financing fairer. The crisis also prompted action to enhance financial protection, including extending health coverage to new groups of people and reducing or abolishing user charges. Faced with growing fiscal pressure, countries often took steps towards greater efficiency. Efforts to strengthen pharmaceutical policy were common.

On the other hand, a handful of countries responded to the crisis with a sharp and sustained reduction in public spending on health. In these countries there is some limited evidence of increases in unmet need for healthcare, increases in the incidence of catastrophic OOP spending and in mental health disorders (Thomson et al., 2015).

In addition to a hypothetical acute economic shock, a common concern when it comes to health system financing is the underlying impact of an ageing population. Policy-makers expect greater costs of health and social care and, in turn, expect reduced government revenue because of a population with a greater proportion of older people. Modelling undertaken in 2019 by the European Observatory on Health Systems and Policies shows that, isolated from other factors that increase health expenditure, population ageing is expected to contribute a comparatively small share to rising health costs. Other factors, such as price growth or technological innovation, are expected to have a much larger impact on future costs (Williams et al., 2019). Carefully crafted policies can reduce the costs of healthcare for older people and enhance their economic contribution through paid and unpaid work. For example, policies to promote cost-effective health interventions, such as through innovative technology or health and social care integration, may help health systems use funding more wisely and support patients to make better choices as they near the end of life (Cylus, Figueras & Normand, 2019).

The above hypothetical shock scenario focuses on important aspects of a health system's ability to detect and mitigate the impact of a disruptive economic shock and strengthen its recovery and learning. It is important to note that, contrary to some other shocks, managing the source of the crisis is beyond the remit of the health system. However, the health system is put under pressure because of the crisis, and in some cases because of policy actions attempting to mitigate it. The health system can help absorb the effects of the shock on the population by, for example, maintaining population health, improving access to health services where needed, and adapting or transforming to suit changing needs. The themes discussed in this scenario form only a small part of the wider determinants of health that will have been impacted by the economic shock and the consequences for health and the health system (Ollila et al., 2006). Beyond the remit of this exercise, a Health in All Policies approach applied to wider crisis management may help manage determinants beyond the scope of the health system that affect population health (Mccartney et al., 2021).

3.4 Example scenario: Climate change

The threat

This is a fictional example scenario for a resilience test. Its development was informed by a rapid literature review considering relevant events. Any similarity to a particular country or past event is purely coincidental. This scenario needs to be adapted to the setting of the resilience test and reviewed by an expert before it can be used as part of a resilience test (see Section 1.2).

Section 1.2: The resilience testing process page 5

The European Council has labelled climate change an "existential threat" (European Commission, 2021). Climate-related shocks, such as floods, storms, extreme temperatures, droughts and sea level rise, are already impacting countries in Europe. Although these shocks create a wide array of health impacts, heatwaves have the largest impact on morbidity and mortality in this region (European Environment Agency, 2022). For example, the death toll for the 2003 European heatwave alone is believed to have topped 70 000 (WMO, 2021). More recently, it is estimated that over 60 000 people died due to extreme heat in Europe in 2022, and the largest summer heat-related mortality rates were found in countries near the Mediterranean Sea, which included Italy, Greece, Spain and Portugal (Ballester et al., 2023). While the precise threshold at which temperature represents a hazardous condition varies by region and country, heatwaves are understood to be periods of unusually hot and dry or hot and humid weather that have a duration of at least two to three days (WMO & WHO, 2015).

It is estimated that over 60 000 people died due to extreme heat in Europe in 2022.

Heatwaves can have significant direct and indirect impacts on society, and it is the vulnerable individuals or sectors of society that experience these the most. Although the main factors of vulnerability may vary across societies, there are some commonalities in terms of heat-risk factors, including age (being elderly or very young), having pre-existing medical conditions (including respiratory and cardiovascular diseases, diabetes mellitus and renal disease) (van Daalen et al., 2022) being homeless, being unable to perform self-care interventions (WHO, 2022f), not having access to heat-health information and warning messages (such as limited access to radio, television, social media), working outdoors, and being poor. Migrants and displaced people are also disproportionately affected. Individuals possessing multiple risk factors are at higher risk of heat-related illness and death (WMO & WHO, 2015).

Further to the direct effects, heatwaves also have an important indirect health effect. Heat conditions can alter the transmission of diseases, impact health service delivery, worsen air quality and disrupt critical infrastructure, such as energy, transport and water. In addition, the indirect health impacts of heatwaves are expected to worsen over the coming decades due to an increased frequency

of events and an increased vulnerability with ageing and urbanizing populations (European Environment Agency, 2022). As a result, having a health system capable of preparing for, managing and learning from the acute strain of a heatwave will be of growing importance in the future.

A brief discussion of the broader strategies to tackle climate-related health risks is included after the scenario. When working through this scenario, it is important to remember that the purpose is to explore the resilience of the health system. Resilience is defined as the ability to prepare for, manage (absorb, adapt and transform) and learn from shocks (European Observatory on Health Systems and Policies, 2020). While this scenario will focus on only one type of climate-related shock, the same process could be followed to test health system resilience in response to other climate-related shocks.

The shock

This scenario was designed to be used with health system stakeholders in Country Y, who participate in a resilience test. It is designed to be easily adapted to different country contexts or to other climate-related shocks (Box 3.4.1, page 177).

Prior to the resilience test day, participants should have been briefed on the scenario and given sufficient time to consider the background material (see Section 1.2). What follows is a description of an example scenario, and a series of prompts to guide discussion through the four stages of the shock cycle.

Section 1.2: The resilience testing process page 5

The hypothetical European Country Y has a temperate climate, and an ageing urbanized population of between 10 and 13 million people. A heatwave hits Country Y. Temperatures are high, with both daily minimum and maximum temperatures higher in comparison to the last years. A standard heatwave is associated with a negative human response to heat and puts a strain on health systems (i.e., hospitals also risk losing power in situations when the power grid is overtaxed, disrupting care and exposing highly vulnerable persons to elevated temperatures) (WMO & WHO, 2015). The heatwave is projected to last for 15 days. At its onset it causes a sudden increase in demand on health services (experts are estimating an increased demand of approximately 30% but there are concerns it could be larger). In line with previous heatwaves, this demand includes ambulance requests, presentations to emergency departments and admissions to hospital (Mason et al., 2022) with an increased duration of stay (Kegel, Luo & Richer, 2021]). Demand for health services relates to a broad range of conditions:

- **Direct heat-related illness**: dehydration, hypotension, heat stroke (Mason et al., 2022).
- **Decompensated chronic medical conditions**: cardiovascular, respiratory, renal, neurological (Mason et al., 2022).
- **Respiratory** presentations associated with decreased air quality.
- **Psychological and behavioural disturbances** (Mason et al., 2022), injuries from self-harm and violence (Basu et al., 2018).

In addition, the prolonged heatwave has two main effects on the health workforce. Firstly, the proportion of staff presenting for work decreases due to their own health concerns. Secondly, the staff that come to work function less

efficiently due to the oppressive conditions. On the 10th day of the heatwave the city power grid, responsible for powering the largest hospital in the capital, fails. Engineers estimate that it will take at least seven days until the grid can be repaired. This blackout results in the following:

- The main city hospital (and any other health facilities in the same grid) must switch to back-up power sources if these are available.
- The general population in the same electricity grid no longer has access to fans or air conditioning, resulting in an increased number of health service utilizations that are directly and indirectly related to the heat.
- Hospital patients being managed in the community (Hospital in the Home, or via telehealth appointments) are unable to be managed remotely and visit local hospitals and clinics.
- Community patients reliant on oxygen concentrators, ventilators or electric mobility devices can no longer remain at home, and many come to the local emergency department for assistance.
- Local pharmacies in the area have to close, and patients requiring essential medications present to local health services.
- Community services are concerned for patients with reduced mobility, as all the elevators in the area are switched off and people may be trapped at home without support.

Using the HSPA Framework, this scenario causes an immediate shock to resource generation and service delivery functions. Before diving into an analysis on the potential disruption this heatwave could cause across the shock cycle, this scenario will first review some indicators of the current state of the health system, and then review its preparedness to detect and deal with this shock.

Box 3.4.1 A scenario that can be applied to another climate-related shock

This scenario can be modified to make it contextually relevant to your institutional features and context. This heatwave scenario has a short duration and is highly disruptive to resource generation and service delivery functions. This serves as a platform to explore how these areas of the health system may cope with this type of shock, how other areas of the health system could be impacted, and how resilient the health system may be to shocks more broadly. In this sense, the variables, including the temperatures, duration of the heatwave, and the timing and duration of the power outage, are not required to be specific, so long as they are large enough to sufficiently stress the health system while still being plausible.

In addition, the same goals could be achieved with a different climate-related shock such as a period of extreme cold temperatures, extreme precipitation or flooding, if they are more relevant to your audience. Likewise, the secondary consequences of the shock, in this case a power outage, can also be customized. In the case of a heatwave, this could involve adding complexity through a concurrent wildfire, disruptions to transport infrastructure (road and rail), or disruptions to medical supply chains, particularly cold chain.

Extensive lists of how climate events can disrupt health facilities are in the WHO Checklist to assess Vulnerabilities in Health Care Facilities in the Context of Climate Change (Sena et al., 2021).

The health system

Goals

- Give a brief overview of the current functioning of the health system (pre-shock).
- Outline the institutional features and the contextual information about Country Y relevant to its potential resilience to a heatwave.

Overview

This section contains the information that the facilitator may collect as part of the background material. It includes information on the baseline functioning of the health system, indicators of resilience, institutional features and other contextual information. Although here this information is presented in tables, ideally it would be presented in graphs, figures and infographics as needed. The criterion is that the key messages are easy to comprehend. Some ideas for the presentation of this information are contained in Appendix 3.

The current state of the health system in Country Y

Country Y's health system is modern and is characterized by a strong network of primary health providers and tertiary-level hospitals. These are, however, centred in the metropolitan areas, with reduced access to specialist services for those in the regional areas. Funding for the public health system, which accounts for 90% of services delivered, is provided by the national government, but managed by the state governments in a decentralized model. Tables 3.4.1 and 3.4.2 show some of the key figures on the current standing of the health system and Box 3.4.2 discusses why the information is being considered for this scenario.

For an in-depth explanation of commonly used indicators and how they relate to resilience, please refer to Sections 2.3 and 2.4.

Section 2.3: Indicators and the assessment of resilience page 56

Section 2.4: The impact of shocks and the capacity to respond page 95

Table 3.4.1 Key figures on the status of the health system in Country Y

INDICATOR	COUNTRY Y	EUROPEAN AVERAGE
Number of physicians per 1000 population	3.2	4 (EU27)
Hospital beds per 1000 population	5.5	5 (EU27)
Occupancy rates in acute beds	62%	64% (for EU21)
Number of hospitals per 1 million people	14.1	25.7 (EU19)
Health expenditure per capita	€3764	€3159
Population covered by public health insurance for a core set of services	98%	Unavailable

Source: Figures from 2020 (OECD & European Union, 2022). For an example of a slide layout please see Appendix Figure 3.2

Contextual information on Country Y

The facilitator may also choose to collect and present some demographic and vulnerability information that might be specifically relevant to a shock related to a heatwave (Table 3.4.2, page 179).

Table 3.4.2 Contextual information on Country Y

INDICATOR	COUNTRY Y	COMPARISON
Gini coefficient	0.262	0.297 (EU20)[1]
Percentage of population in urban areas	83%	48.2% (OECD Average)[2]
Percentage of population older than 65	19%	20.98% (EU21)[3]
Percentage of people aged 65 and over with limitations in daily activities	35%	26% (EU25)[4]
Percentage of people aged over 65 with at least two chronic conditions	45%	36% (EU25)[4]
National heat vulnerability index The index is calculated by "taking the mean of proportion of the population over 65 years; the prevalence of cardiovascular, diabetes and chronic respiratory diseases among the population over 65 years from the Global Burden of Disease study 2019 estimates and the proportion of the population living in urban areas as a measure of exposure to urban heat islands. The index ranges from 0 to 100 and is a measure of potential vulnerability of a country to heat exposure." (van Daalen et al., 2022)	44	33–47 (Range in Europe)[5]

Sources: 1 Eurostat, 2022b; 2 World Bank, 2021b; 3 World Bank, 2021a; 4 OECD & European Union, 2022; 5 van Daalen et al., 2022.

Please see Appendix Table 3.1 for additional indicators that could be chosen, and Appendix Figure 3.2 or Appendix Figure 3.3 for an example layout for presenting these data as part of the background materials of a resilience test (see Section 1.2, Step 1.3).

Section 1.2: Step 1.3: Agree resilience test objectives page 8

Box 3.4.2 Why is this information being considered in the scenario?

A substantial portion of this information is common knowledge to both the facilitators and the participants. The experience during the pilots is that only a small subset of the available information is presented during the resilience test and the disseminated preparatory material. Exactly what is presented to participants depends on the invited stakeholders. In the case of a cost-of-living or economic crisis scenario, information about the state of the economy and public finances may be useful and beyond the remit of many of the stakeholders.

This step is needed for several reasons in the process of resilience testing. The first is to consider observable weaknesses in the health system and in the resilience of the health system. The second reason is so the facilitators have the information available during the day and subsequently in the production of reports and follow-up information. The use of the best available information underlies the identification of weaknesses and subsequent remedial action. The third reason is that the pathways by which the shock may travel may be mediated or influenced by these factors and explicit consideration of the importance of these factors is useful. Finally, availability or non-availability of data can indicate vulnerabilities of the health system. If data relevant to the shock scenario are not readily available, this will impact on the ability of the system to respond.

Stage 1 of the shock cycle: Preparedness

Goals

- Discuss the general preparedness of the health system for shocks.
- Discuss the specific preparedness of the health system to this shock (heatwave).
- Decide on key weaknesses and relative strengths in health system resilience for this stage of the shock cycle.

Overview

Now that we have had a quick overview of the current situation of the health system in Country Y, we can turn to assessing the resilience of the health system to this shock (heatwave) across the four stages of the shock cycle. Tables 3.4.3–3.4.7 on pages 181–182 contain a series of questions that the facilitator could prepare for the purpose of resilience testing, to guide participants through the functions of the health system with a particular focus on whether they impact preparedness. Many of the indicators used can provide information about how the health system might perform at various stages of the shock cycle. It is important at this stage to maintain the focus on preparedness. For example, when discussing possible emergency funds in Stage 1, we want to focus on whether Country Y is prepared by setting aside these funds, and not ask question about their use in response to a shock (Stage 3). Box 3.4.3 discusses the importance of clear definitions with the health workforce as an example.

Box 3.4.3 Defining health workforce

There isn't a single definition of health workforce. The International Labour Organization (ILO) defines health workers broadly, to include those working both within and outside the health and social sectors, whether paid or unpaid. OECD's definition and data capture all people working in specific health occupations in the health and social sectors. This is narrower than the ILO definition in that it does not include unpaid workers. The World Health Organization defines health workers as all those engaged in action whose primary intent is health (High-Level Commission on Health Employment and Economic Growth, 2016). When implementing the scenario, the facilitators need to be clear about which definition the participants should focus on.

Table 3.4.3 Questions about governance for the preparedness stage of the climate change scenario

INDICATOR AND DEFINITION	FIGURES AND QUESTIONS
Type of governance model The type of governance model used in managing the health system.	• How is the health system managed at the macro-level? • Could it be described as a top-down approach? • Does the approach foster resilience? How does it foster/not foster resilience? (Khayal, 2022; Smaggus et al., 2021)
Emergency coordination Existence and quality of national emergency coordination and leadership in times of crisis.	• In the absence of an emergency, are emergency bodies maintained or are they completely dissolved? • Do they need to be established each time there is an emergency? What is the process for this?
Multisectoral collaboration The quality of multisectoral collaboration in the delivery of healthcare (public, private, non-governmental organization).	• In the absence of a shock (heatwave), is there any formal coordination between the public health system and private or NGO providers of health services?
Feedback loops The presence and quality of feedback mechanisms for patients, health workers, researchers, and the broader public to give feedback to policy-makers when interventions are designed and implemented.	• In the absence of a shock, how are perspectives from different stakeholders incorporated to guide health policy decisions?

Table 3.4.4 Questions about resource generation for the preparedness stage of the climate change scenario

INDICATOR AND DEFINITION	FIGURES AND QUESTIONS
New medical or nursing graduates per 100 000 population Number of students who have graduated in medicine or nursing from medical faculties or similar institutions in a given year.	• Is the number of new graduates enough to replace those leaving the profession? • Are new graduates being distributed appropriately (i.e., considering imbalances in occupation/specialty; geographical representation; demographics; institutions and service needs)? • What work is being done to ensure the future health workforce is sufficient to deal with the health needs of the population?
Supply chain redundancy and resilience Redundancy in supply sources for commonly needed medical supplies, i.e., pharmaceuticals, equipment and consumables.	• Is the health system supplied by numerous channels or only a few key suppliers? • Are there emergency suppliers or emergency stockpiles that can be used if the usual supply chains are disrupted?
Health infrastructure flexibility The presence of plans for rapid temporary expansion of healthcare facilities, such as expansion of wings, overflow areas, temporary structures.	• Are there dedicated plans for temporary healthcare facilities that can be rapidly established if needed?

continued on next page

Table 3.4.4 Questions about resource generation for the preparedness stage of the climate change scenario *continued*

INDICATOR AND DEFINITION	FIGURES AND QUESTIONS
Health workforce adaptability The presence of processes for the redistribution of the public health workforce (i.e., doctors, nurses) after shock onset.	• Are there processes for rapidly redistributing the health workforce after shock onset? • Is there the notion of a "health workforce reserve" that could be mobilized easily?

Table 3.4.5 Questions about financing for the preparedness stage of the climate change scenario

INDICATOR AND DEFINITION	FIGURES AND QUESTIONS
Financial reserves The presence and quantity of dedicated financial reserves for the purpose of funding emergency surges for the health system.	• Are there funds dedicated to the health system for use following shock onset? • How much? How quickly can these funds be distributed? • Is there a legal framework for additional budget funding (i.e., supplementary budgets; external grants; expenditure reprioritization)?
Insurance coverage Percentage of the population with public or voluntary private health insurance that covers "consultations with doctors, tests and examinations, and hospital care" (OECD & European Union, 2022).	• What proportion of the population is covered by a core set of services? • Are there any particularly vulnerable groups that are not covered? • Is there a mechanism in place to provide services for uncovered people in emergency situations?

Table 3.4.6 Questions about service delivery for the preparedness stage of the climate change scenario

INDICATOR AND DEFINITION	FIGURES AND QUESTIONS
Unmet medical needs Measure by asking people if there was a time during the past year when they did not receive the care they needed, and about the main barriers, including availability (such as waiting times and distance to providers, and affordability (costs)).	• 13.5% in Country Y in spring 2022 • 17.8% in EU27 in spring 2022 • What could these figures tell us about the current system and how prepared it is for a shock?
Preventable mortality The rate for causes of death that can be mainly avoided through effective public health and primary prevention interventions (i.e., before the onset of diseases/injuries, to reduce incidence).	• 142 per 100 000 population in Country Y • 176 per 100 000 population in EU27 • What could these figures tell us about the current system and how prepared it is for a shock?
Treatable mortality The rate for causes of death that can be mainly avoided through timely and effective healthcare interventions, including secondary prevention and treatment (i.e., after the onset of diseases, to reduce case-fatality).	• 65 per 100 000 population in Country Y • 104 per 100 000 population in EU27 • What could these figures tell us about the current system and how prepared it is for a shock?

Specific preparedness for a heatwave in Country Y

While the above indicators could be used for any shock scenario, there are also some scenario-specific indicators that the facilitator could choose to include in this specific resilience test, due to the vulnerabilities that a heatwave can expose. Vulnerability to the impact of climate change is defined as the increased propensity to be adversely affected by a climate risk (IPCC, 2022a). In the case of heatwaves there are many population, socioeconomic, geographical and biological factors that can modulate this vulnerability. Some potentially useful indicators to contextualize the local situation and specific vulnerabilities of Country Y are presented below.

Table 3.4.7 Questions specific to heatwave preparedness for the climate change scenario

INDICATOR AND DEFINITION	QUESTIONS
Vulnerability mapping The presence of detailed vulnerability maps showing the areas where residents are more likely to have poorer outcomes during a heatwave or other crisis. These can be done through numerous indicators of vulnerability.	• Is vulnerability mapping for heatwaves undertaken in your country? • What indicators of vulnerability are collected and what data are available? What measures of vulnerability do you use? • To what level do they provide information: suburb, state, region, etc? • Are these maps used to inform the responses during heatwaves (or only for research)?
Energy impact mapping The presence of detailed maps showing the areas most at risk of energy disruptions during heatwaves.	• Is vulnerability mapping undertaken specifically for the risk of electricity outages? • Are these maps used to inform the responses during heatwaves (or only for research)?
Public awareness Extent of public awareness of the actions to take to mitigate the health impacts of heatwaves.	• Are the public usually responsive to public health messaging during a heatwave (including reaching care homes, homeless people, etc.)? • To what extent have public health messaging campaigns been successful in the past?
National heatwave coordination Formal memorandums of understanding between the Ministry of Health and other relevant national stakeholders (ministries of the environment, agriculture, energy, transport) with specific roles and responsibilities for protecting people's health from a heatwave or other climate-related shock.	• Are there formal arrangements outlining roles and responsibilities (such as a memorandum of understanding) with other government and national stakeholders for the response to heatwaves? • How well have these worked in the past? How well do the different organizations coordinate their efforts?

For more ideas on possible indicators, see Appendix Table 3.2.

Key questions and reflections for preparedness

- Overall, how prepared do you think the health system is for this hypothetical heatwave?
- What does the baseline functioning of this system and the presence of any vulnerabilities tell you about preparedness for a heatwave?
- Before we introduce the shock to the system, are there any areas of the system that you believe are particularly vulnerable?
- Were there any discussion points that revealed strengths, weaknesses or opportunities for reform in this stage of the shock cycle?

Stage 2 of the shock cycle: Onset and alert

Goals

- Assess the health system's ability to detect the shock (heatwave):
  - the presence and quality of surveillance and early warning systems
  - the ability to collect a range of broad, high-quality information from diverse sources, and use it effectively to inform all stakeholders and their decisions.
- Comment on the applicability of detection to a wider variety of shocks.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Surveillance and early warning systems

In Stage 2 of the shock cycle, the resilience of the health system can be explored by discussing its ability to identify and respond to potential threats. Box 3.4.4 outlines characteristics of early warning systems specific to a climate-related shock. For early warning and surveillance systems that sit within the health system, the ability to identify and respond to potential threats primarily corresponds to the governance function of the HSPA Framework. According to the United Nations Office for Disaster Risk Reduction, there are four components required for an efficient early warning system to operate (UNDRR, 2022).

1. Systematic collection of data and the undertaking of risk assessments
2. A hazard monitoring and early warning service
3. The dissemination and communication of warnings
4. The ability to respond to early warning.

Box 3.4.4 Early warning system that can be applied to any climate-related shocks

In the case of a heatwave or other climate-related shock, the early warning system may be separate from the health system depending on the country or region where the scenario is being run. If the early warning system for your scenario is primarily the responsibility of the health system, it may be relevant to undertake a deeper analysis to understand the effectiveness of the warning system. In this case, the key attributes of an effective surveillance system given by the Centres for Disease Control and Prevention (CDC) (i.e., data quality, flexibility, timeliness) could be a useful guideline to work through (CDC, 2001).

Key questions for shock detection

Systematic collection of data and the undertaking of risk assessments

- What data are collected in Country Y that could alert the health system to the impending heatwave?
- Is there a sound scientific basis for the forecasts or projections that your monitoring system detects or predicts (UN & ISDR, 2006)?
- What data are collected during the heatwave that could indicate a potential strain on the health system?

  Examples include (WHO, 2009):

  - Heat-related mortality total (with various lag times)
  - Cause-specific heat-related mortality (with various lag times)
  - Heat-related morbidity – emergency hospital admissions
  - Number of ambulance calls.

A hazard monitoring and early warning service

- How are the collected data and forecasts monitored?
- Can accurate and timely warnings be issued from these data or predictions (UN & ISDR, 2006)?

The dissemination and communication of warnings

- Who are the warnings communicated to (UN & ISDR, 2006)?
- If the warnings are generated outside the health system (such as meteorological forecasts), how is this information entering the health system?
- Is there a harmonized system across the country or does it differ by region how warnings are communicated (i.e., to disability homes, care homes)?
- Are the risks and warnings well understood by members of the health workforce and the public (UN & ISDR, 2006)?
- How rapidly do triggers for early warnings result in action within the health system?

Key questions and reflections for onset and alert

- Overall, how well do you think the systems in place for early detection and warning would function in the setting of this hypothetical heatwave?
- Do the early warning systems for heat-related events trigger any responses for other related challenges the health system might face (i.e., energy availability, supply chain disruption)?
- What are the top three strengths of the health system's ability to detect and trigger the broader response to the heatwave?
- What are the top three areas of vulnerability or weakness regarding the ability to detect and warn of the heatwave?

Stage 3 of the shock cycle: Impact and management

Goals

- Discuss the primary and secondary impacts of the heatwave on the health system.
- Explore the decisions that stakeholders and the system could take to manage (absorb, adapt and transform) the health system.
- Identify the connections between functions of the health system, and how a shock could propagate through them.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Shock impact and management

By day 10 of the heatwave the increase in demand and decrease in availability of health staff are impacting noticeably on the system's ability to function. In addition, the power for the city grid that supplies the largest hospital in Country Y's capital city has just failed and is not expected to be operational again for another seven days. What options are available?

Governance

The impact of the heatwave on governance of the health system

How would a shock like this affect the activities of governance within the health system of Country Y (Table 3.4.8, page 187)? For example, look at the areas of i) policy and vision; ii) stakeholder voice; iii) information and intelligence; and iv) legislation and regulation.

Resilient governance

What features of resilience that map to the activities in governance would Country Y display (see Box 3.4.5)?

Box 3.4.5 Discussion with outcomes for a more resilient health system

There are potentially dozens of indicators of resilience that align to each of the functions of the HSPA Framework. How the facilitator chooses the resilience test questions may differ depending on the context and audience. Regardless of the questions chosen, we recommend covering three conceptual areas to ensure the resilience test has the intended impact:

1. How will this specific scenario impact this function (i.e., governance, resource generation) of the health system?
2. What qualities or features do the participants believe the health system exhibits, using indicators, that could represent resilience in this part of the health system?
3. How can failure of this part of the health system cascade to other parts of the system, or create negative feedback loops with itself?

Table 3.4.8 Questions about governance for the impact and management function of the climate change scenario

INDICATOR AND DEFINITION	QUESTIONS
Health system metrics Mechanisms and capacity to measure the function of the health system at baseline, and during shocks (number of beds, occupancy, etc). The quality of the information, and how quickly it is available.	• What health system data are collected to manage the shock and promote evidence-based decision-making? • Is there a significant lag time in collecting and accessing these data?
Quality of information-sharing How effectively and rapidly information is shared across the health system.	• How well does information flow from one part of the health system to other parts of the health system to manage the shock (i.e., public health professionals to primary healthcare providers)? • How well has information-sharing worked in managing previous shocks?
Emergency coordination and leadership Existence and quality of national emergency coordination and leadership in times of emergency.	• How is the emergency response for the health system coordinated to manage the shock? • Have these responses worked well in the past? • What decisions can be made to adapt or alter the healthcare system during the shock? • Is it possible to make the system more efficient with the same resources or quickly inject in new resources?
Feedback loops The presence and quality of feedback mechanisms for patients, health workers, researchers and the broader public to give feedback to policy-makers when interventions are designed and implemented.	• In managing this shock, how are perspectives from different stakeholders incorporated to make health policy decisions?

Cascading effects

How could poor performance in governance during the heatwave lead to issues in other functions of the health system (i.e., resource generation, financing and service delivery)? How might these other affected functions alter health outcomes?

Resource generation

The impact of the heatwave on resource generation

How would a shock like this affect the activities of resource generation within the health system of Country Y (Table 3.4.9, page 188)?

- Health workforce.
- Health infrastructure.
- Pharmaceuticals and consumables.

Resilient resource generation

What features of resilience that map to the activities in resource generation would Country Y display (Box 3.4.5, page 186)?

Table 3.4.9 Questions about resource generation for the impact and management function of the climate change scenario

INDICATOR AND DEFINITION	QUESTIONS
Health workforce The numbers of doctors, nurses or other health staff per 1000 population, and where they are located, are useful indicators, but the focus is now on what can be done, not what the baseline figures are.	• How well could the current health infrastructure absorb an increase of demand of approximately 30% while simultaneously losing power (+/- closing) the largest hospital in the capital? • How can the health workforce respond to the surge in demand and drop in availability of staff? • Are additional human resources available in reserve that can quickly be redirected into the health system? • Are these resources accurately mapped (distribution, competencies, availability)? • How many can be called on? • Of what type? • From what sources (i.e., private sector, NGO sector)? • If these workers are from non-public sources, can funds be allocated to them rapidly? • How quickly can they be added to the health workforce? • Has the reserved workforce been integrated into the main workforce previously? • Are there ways to ensure that reserve staff can be distributed to areas of need equitably?
Health infrastructure The number of beds per 1000 population and the number of healthcare facilities, where they are located, and how occupied they are, are useful indicators but the focus is now on what can be done, not what the baseline figures are.	• How far could the bed occupancy rates of the other hospitals be increased to compensate for the closure? • How long could they sustain this increased occupancy? • How can the health infrastructure respond to the heatwave (i.e., open additional centres, transform spaces, close non-emergency care)? • How would the system specifically deal with the electricity issue at the capital city's largest hospital? • Is there a clear set of triggers to decide to close a major healthcare facility? • Are there plans in place to complete mass transfers of patients, or set up temporary medical facilities in cooler areas? • If such a plan of action is decided on, how is that information disseminated to all stakeholders involved? • If there were a mass transfer of patients, are their records available in the other healthcare facilities?

Cascading effects

How could poor performance in generating resources lead to issues in other functions of the health system?

Financing

The impact of the heatwave on financing

How would a shock like this affect the activities of financing within the health system of Country Y (Table 3.4.10)?

- Revenue raising
- Pooling resources
- Purchasing goods and services.

Resilient financing

What features of resilience that map to the activities in financing would Country Y display (see Box 3.4.5 on page 186)?

Table 3.4.10 Questions about financing for the impact and management function of the climate change scenario

INDICATOR AND DEFINITION	QUESTIONS
Flexible use of financial resources The ability for the health system to rapidly reallocate large amounts of financial resources when responding to a shock.	• Is there a mechanism for the health system to rapidly reallocate financial resources during this shock? • How does this work? • How quickly can these funds be made available for either purchasing or paying the workforce? • How well have such mechanisms worked in the past?
Financial reserves The presence and quantity of dedicated financial reserves for the purpose of funding emergency surges for the health system.	• If you discussed the presence of reserves in Stage 1, then you can follow with these questions: • In this type of shock, what would you estimate to be the rate at which you would use your reserves? • How long do you think the reserves would last?
Remuneration of the health workforce during shocks Clear rules for the overtime of normal employees or for the remuneration of reserve or external staff pulled in to manage a shock.	• Are there clear predetermined arrangements for the emergency work of healthcare staff?
OOP costs Does the amount of OOP costs increase during the response to a shock?	• During previous shocks, have OOP costs for health services increased? • What can be done during this shock to mitigate this, especially for vulnerable populations?

Cascading effects

How could poor performance in financing during the heatwave lead to issues in other functions of the health system?

Service delivery

The impact of the heatwave on service delivery

How would a crisis like this impact the activities undertaken within service delivery (Table 3.4.11)?

- Public health
- Primary care
- Specialist care
- Long-term care

Resilience within service delivery

What features of resilience that map to the activities in service delivery would Country Y display (see Box 3.4.5 on page 186)?

Table 3.4.11 Questions about service delivery for the impact and management function of the climate change scenario

INDICATOR AND DEFINITION	QUESTIONS
Trust in healthcare workers The extent to which members of the public trust the advice and opinion of healthcare workers	• During this shock, how would people in Country Y likely react to advice or directions from healthcare workers? • In past crises, did trust increase or decrease?
Trust in the public actors responding to the crisis The extent to which members of the public trust the advice and opinion of political leaders in charge of the health/emergency response	• During this shock, how would people in Country Y react to advice or directions from political leaders? • In past shocks, did trust increase or decrease? • How did this impact the coordination and execution of plans?

Cascading effects

How could poor performance in service delivery during the heatwave lead to issues in other functions of the health system?

Key questions and reflections for shock management

- How well do you think the health system and emergency response would operate in this type of scenario, where demand for health services is expected to rise at least 30% and the largest metropolitan hospital in the capital will likely need to close?
- How long do you think the health workforce can cope with such additional pressure/measures? What options would you consider to make work conditions more manageable and boost morale among the health workforce?
- Which groups will be most affected by the impact of the heatwave on the health system, and what can be done to mitigate this? Examples include the very young, elderly, marginalized, pregnant and the poor.
- What are the top three strengths of the health system in responding to the heatwave and the power outage?
- What would be the top three challenges to the health system to absorb, adapt or transform in response to the shock?

Stage 4 of the shock cycle: Recovery and learning

Overview

In Stage 4 of the shock cycle, it is important to consider recovery and learning equally. Both aspects of this stage will require different goals and different questions, as demonstrated by the scenario.

Goals for recovery

- Discuss the transition from the shock ending and the return of the health system to a new steady state.
- Decide on key weaknesses and relative strengths in health system resilience for this stage.

Goals for learning

Discuss if Country Y has a process to review and apply the learnings.

Progress

The heatwave has ended, and power has been restored to the main hospital in the capital city. Despite this, there may still be significant changes to the system that are a legacy of the heatwave (as revealed by participant discussions during previous stages of the test). Now stakeholders meet to discuss two upcoming challenges:

1. How will we transition back to "normal" functioning of the health system?
2. What can be done in the future to mitigate the impact of future shocks?

Key questions for recovery

- What are the triggers to start shifting resources back to their usual allocations?
- The disruptions from the heatwave caused the cancellation of many outpatient and elective appointments.
  - Can you easily identify who has missed out on appointments or surgeries?
  - How will you prioritize which of these to address first?
  - Is there an active process for catching up on delivering these services?
- How will finances be reallocated to top up the emergency reserves for the next crisis?

Key questions for learning

- In what ways does Country Y systematically evaluate and integrate lessons learned from major shocks, such as extreme heatwaves, into future strategies? Can you provide specific examples of how this process was effectively utilized during recent heatwave events?
- How inclusive is the review process in terms of incorporating perspectives from various stakeholders, including patients, researchers, healthcare workers, government officials and civil society organizations? What mechanisms are in place to ensure these diverse inputs are effectively integrated?
- What methods are employed to collate and disseminate findings from post-event reviews? How does the health system ensure that these findings are accessible and understandable to all relevant stakeholders?
- To what extent do insights from post-event reviews lead to tangible policy changes aimed at enhancing preparedness for extreme heatwaves? Are there examples where these policy changes have been successfully sustained over time, and what factors contributed to their longevity?

Assessment

Goals

- Consider results of the analysis of all four stages of the shock cycle for an overall assessment of resilience to a climate change crisis.
- Decide on overall weaknesses and relative strengths in health system resilience.

Key questions for the overall assessment

- Overall, do you think the health system in Country Y is adequately prepared, ready to detect and ready to provide a timely response to an extreme weather shock (such as a heatwave) large enough to cause serious health service disruptions?
- Which health system function, at which stage of the shock cycle, is likely to be least resilient?
- What are the most important gaps/weaknesses in the system that need to be addressed?

Broader strategies to address climate change-related health risks

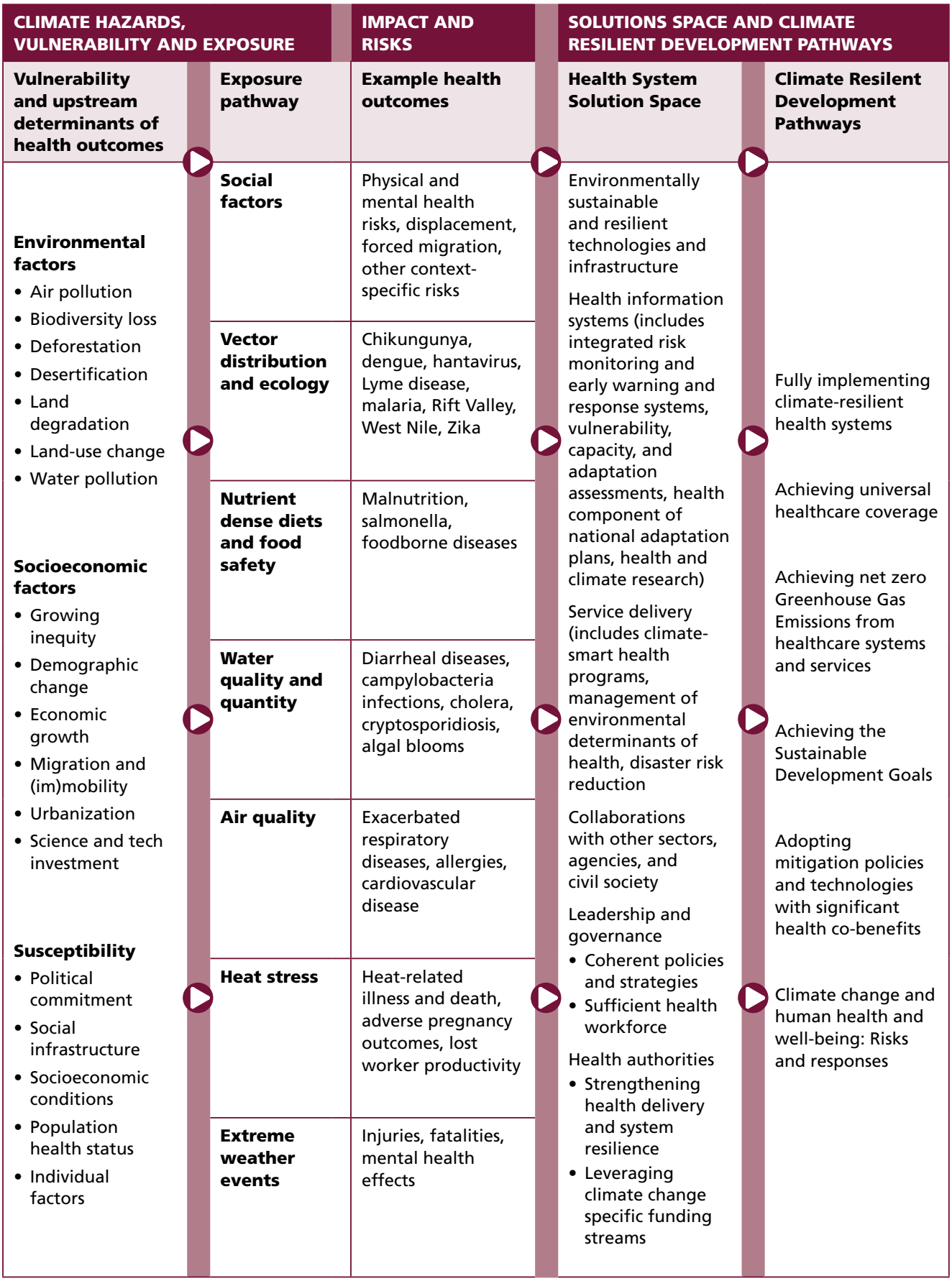
Climate change is increasingly recognized as a threat to human existence.

Climate change is increasingly recognized as a threat to human existence. The available evidence suggests that climate change has already adversely affected the physical and mental health of people globally, while projections suggest an increasingly negative balance of effects on health (see Figure 3.4.1 on page 193). Climate change has contributed to the expansion of vector-borne, waterborne, and climate-sensitive foodborne diseases (Lawrance et al., 2021). Globally, an excess of 250 000 deaths per year by 2050 attributable to climate change is projected due to heat, undernutrition, malaria and diarrheal disease. Mental health impacts are expected to arise from exposure to extreme weather events, displacement, migration, famine, malnutrition, degradation or destruction of health and social care systems, and climate-related economic and social losses and anxiety and distress associated with worry about climate change. Moreover, climate change will also affect the ability of health systems to function effectively, particularly when confronted by climate extremes (IPCC, 2023).

The severity of the current and projected impacts of climate on health in Europe and worldwide calls for stepping up policy action (European Environment Agency, 2022). As shown in Figure 3.4.1 on page 193, building climate resilience and responding to climate change requires integrated strategies for **mitigation** (defined in the climate change literature as reducing and preventing greenhouse gas emissions) and **adaptation** (defined in the climate change literature as managing the risks of climate change impacts) (IPCC, 2023).

In the context of health systems, mitigation refers to strategies to reduce emissions associated with the delivery of healthcare (OECD, 2023k). These include a broad range of actions, including ensuring that health facilities use energy from sustainable sources and are built and maintained according to green building standards; that supply chains of medical products and inputs are based on solutions to minimize emissions; and even that the design of clinical pathways favours solutions with lower emissions, such as emphasis on primary care services closer to communities, among other strategies.

Figure 3.4.1 Climate change and human health and well-being: risks and responses



Note: Multiple socioeconomic environmental factors interact with climate risks to shape human health and well-being. Achieving climate-resilient development requires leveraging opportunities in the solution space within health systems and across other sectors.

Source: IPCC Sixth Assessment Report, Climate Change 2022: Impacts, Adaptation and Vulnerability

Strong public health policies can also contribute to mitigation through an advocacy role that extrapolates health systems themselves, such as urban planning that favours green spaces or encourages physical activity, or food systems that favour consumption of fruits and vegetables (EASAC, 2019; IPCC, 2022b).

Also, in the context of health systems, adaptation refers to strategies that will help prepare healthcare services and public health interventions to respond to the changing epidemiological profile (OECD, 2023k) associated with climate change, while also ensuring that health systems respond effectively to climate-related natural disasters and emergencies (i.e., infrastructure updates, disaster management and healthcare continuity) (IPCC, 2023).

Despite acknowledgement of the importance of building climate resilience and resilient health systems, a significant gap exists between human health and actions that reduce emissions and manage the risks of climate change impact. Globally, health systems and healthcare delivery can still improve on their resources and capacity to respond to climate change-related health hazards, particularly with mental health support. Therefore, adapting to the existing and emerging health threats arising from climate change requires better preparedness of the health sector, including (Roland, Kurek & Nabarro, 2020; IPCC, 2023):

- **increasing awareness**, building climate-health literacy and political literacy among government representatives, public health and healthcare workforce, and intensifying the investment in interdisciplinary education and training for these professionals in existing curricula.
- **increasing the resilience of healthcare facilities to climate change.** Healthcare facilities in European cities can be more severely affected by heat because of their location in densely built urban environments (EASAC, 2019). In addition, flooding poses a threat to one tenth of healthcare services across Europe (European Environment Agency, 2022). This calls for more consideration of the effect and possible actions for climate hazard impacts in healthcare facilities, including the health workforce and patients. This consideration should also extend to home, community and residential healthcare and long-term care providers (including informal caregivers), ensuring continued access to care.
- **adaptation planning and assessment.** The health impacts of climate change vary by geographical location and population (van Daalen et al., 2022). Location-specific vulnerability and adaptation assessments are an essential first step for identifying, formulating and implementing national health and climate change adaptation plans.
- **monitoring, evaluation and dissemination of knowledge on the effectiveness of solutions.** Knowledge of what works best, and in which context, is crucial to support decision-making in the public, private and third sectors, particularly if upfront investment is needed.
- **more action on the mental health and emotional well-being arena** (Lawrance et al., 2021). Greater action is required to proactively address predicted mental health impacts while building resilience; to mitigate and respond to the impacts on mental health and emotional well-being already occurring; and to innovate through evidence-based interventions for policy and practice.

Appendix 1: Starting questions

Appendix Table 1.1 shows a list of basic questions about each sub-function of the HSPA Framework. These questions may serve as a starting point to develop a set of questions suitable for a resilience test (see Section 2.1). Each question should be unpacked and focused on the specific shock scenario and the health system context before it can be used as part of a resilience test. The questions are colour-coded according to different stages of the shock cycle. Questions that are not colour-coded can apply to more than one stage of the shock cycle.

Section 2.1: Resilience, shocks and the shock cycle page 30

Please see the description of how to develop and iterate questions in Section 2.1 and background information about the HSPA Framework and the shock cycle framework in Part 2 of this handbook. Part 3 of this handbook contains example worked scenarios with dedicated example questions that can further guide question development.

Key to colour-coding

- Stage 1: Preparedness
- Stage 2: Onset and alert
- Stage 3: Impact and management
- Stage 4: Recovery and learning
- Questions applicable to two or more stages

Appendix Table 1.1 List of starting questions to iterate to develop a set of questions for a resilience test

FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Assessing governance		
Policy and vision	Whether a strategic vision exists in written and traceable form (through documents, directives, regulations, guidelines, etc.)	Is there a strategic vision for the health system? When was the current strategic vision last reviewed? Does the strategic vision align actions in the health system?
	Whether the strategic vision is of good quality viewed in terms of ability to implement the vision	To what extent has the strategic vision been broken down into operational, achievable plans?

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Appendix Table 1.1 List of starting questions to iterate to develop a set of questions for a resilience test *continued*

FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Policy and vision *continued*	Whether the strategic vision considers wider societal goals	Are wider societal goals, for example environmental sustainability, named and considered by the strategic vision?
Multisectoral collaboration	Whether national health policies, strategies, plans, guidelines or laws are developed with the broad participation of relevant stakeholders outside the health system	To what extent is health considered in wider governmental policy-making? Are standard consultation processes in place that identify when health policy issues require multisectoral collaboration? To what extent does the government collect, understand and consider the main issues for joint policy-making and implementation?
	Quality of multisectoral collaboration: whether the collaboration leads to improved policies	To what extent do consultation outcomes influence policy-making?
Information and (digital) knowledge	Whether a government is committed to collecting relevant health data for decision-making	How do data and digital infrastructures work across health organizations, regions and the nation to ensure timely access to quality data for assessments and evidence-based decision-making? What rules exist to govern the aggregation of data for use in evidence-based decision-making? Within regions? Across regions? Are the data available to a wide range of health stakeholders? How good is the quality of data available to the government for decision-making? Are there any mechanisms to validate health data? Are there any obvious gaps in the availability of data during the last crisis? Is there a mechanism to learn lessons from the last crisis?
	Whether decisions are largely data-driven and evidence-based	Are key decisions supported by data? How is the impact of a reform evaluated?

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Appendix Table 1.1 List of starting questions to iterate to develop a set of questions for a resilience test *continued*

FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Population and civil society engagement	Relating to the possibility for key stakeholders to contribute meaningfully to health policy decisions	Can the government initiate, steer and sustain long-term participatory processes to engage the population to participate in decision-making? How clear are the requirements/rules/conventions for when consultation is required? Does the government consult a wide range of stakeholders for policy-making? Does the government specifically support population groups with less power to contribute to these processes? Does the government invest in health literacy?
Legislation and regulation	Whether the capacity exists to develop and enforce laws and regulations to govern the behaviour of actors towards protecting and improving public health	Was legislation delayed in the last crisis? Could crisis laws and regulations be easily adapted in the last crisis? In the last crisis, were crisis laws and regulations reviewed after the crisis situation had improved?
	Whether compliance with those rules, laws and regulations is ensured	Is there an assurance process to check compliance with laws and regulations? If compliance is not as expected, is there a process that ensures improved performance? To what extent does this process improve compliance?
Assessing resource generation		
Health workforce	Health workforce availability (e.g., health workforce stock and density)	How many doctors work in primary care? In secondary care? Nurses? Allied health professionals? Have any planned measures in the last five years not been implemented/failed due to lack of staff? Was the health system able to increase workforce numbers temporarily during the COVID-19 crisis?
	Health workforce mix/ distribution (i.e., by geography, gender, facility type, age, group)	Are there any parts of the country with very high or very low proportions of doctors/nurses/allied health professionals per population? Which ones? To what extent does the health system have less qualified professionals that take on less complex tasks otherwise done by fully qualified doctors/nurses? What is the demographic distribution of health workers? What proportion are within five years of retirement age? What is the difference in staffing/vacancy levels between primary and secondary (tertiary) care?

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Appendix Table 1.1 List of starting questions to iterate to develop a set of questions for a resilience test *continued*

FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Health workforce *continued*	Education, including pre-service and in-service training, as well as continuing education	Do workforce education and training numbers consider projected needs? How well defined is the educational curriculum for undergraduate and postgraduate medical education? How well defined is the educational curriculum for nurses and allied health professionals? How many hours continued professional education do fully qualified health professionals need to undertake? At what interval is this reviewed?
Infrastructure and medical equipment	Availability of health infrastructure and medical equipment in terms of inventory stock	How many beds does the health system have? What is the trend of bed numbers in recent years? Have any measures/policies/plans in the last five years not been implemented/failed due to lack of beds? How many CT, MRI and PET scanners are there per population?
	Infrastructure and medical equipment distribution/mix (i.e. by geography, facility type)	How far do people in rural areas need to travel to get to the nearest primary/secondary care facility? How much unmet need is attributable to travel/distance? Are there any areas of the country with a high/low proportion of beds per population? Are CT/MRI/PET scanners distributed well across the country?
	Infrastructure and medical equipment maintenance and repair	How old is the average health facility building? When was the average health facility building last renovated? Are there plans and sufficient funds to replace consumables needed to run capital investments?

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Appendix Table 1.1 List of starting questions to iterate to develop a set of questions for a resilience test *continued*

FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Pharmaceuticals and other consumables	Pharmaceutical and other consumable availability (i.e. availability of unexpired drugs or consumables available for ready use)	Have there been any reports of pharmaceutical shortages in the last five years? Where in the supply chain was the issue? Which medications were affected? Are there emergency provisions for pharmaceuticals and medical equipment? If yes, how many drugs/types of equipment are stockpiled? How large is the stockpile? How many stockpiled drugs expire without use?
	Pharmaceutical and other consumable distribution/mix	How far do people in rural areas need to travel to get to the nearest pharmacy? How many and what type of pharmaceuticals expire before they are dispensed?
Governance of resource generation	Setting quality standards: whether realistic and effective quality standards for health workforce, infrastructure and medical equipment, and pharmaceuticals and consumables, are in place	Are quality standards readily accessible for: • Individual health workers • Infrastructure • Equipment and consumables • Pharmaceuticals • Health facilities or health services?
	Resource planning: whether forward planning and projections for the health workforce, infrastructure and medical equipment, and pharmaceuticals and consumables, are undertaken regularly	How far in advance do you plan resources for: • Health workforce (active workforce rather than incoming students)? • Infrastructure and other capital investment? • Pharmaceuticals, consumables and other operative investment?
	Assessment area #3: Assessing quality standards: whether functional monitoring and evaluation processes check existing quality of resources against standards	Are individual health workers assessed against quality standards? To what extent do these processes lead to improved clinical practice? Is the quality of equipment monitored against standards? Is the quality of pharmaceuticals monitored against standards? Is the quality of infrastructure monitored against standards? Is the quality of an individual health service or health facility monitored against standards? To what extent does the monitoring in the above categories lead to improved outcomes?

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Appendix Table 1.1 List of starting questions to iterate to develop a set of questions for a resilience test *continued*

FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Assessing financing		
Revenue collection	Whether funds are adequate and sufficient	How much (% GDP and per capita) is spent on health? Does health system/government revenue cover health system costs without additional borrowing in non-crisis times?
	Whether funding flows are stable and predictable	To what extent are funding flows stable and predictable? Are sufficient counter-cyclical provisions in place that ensure health system funding in case of an economic downturn?
	Whether revenue raising is equitable in terms of distribution of revenue sources among different population groups	How equitable is revenue collection?
Pooling	Whether pooling is equitable in terms of the distribution of financial risk across population groups	How equitable is the distribution of financial risk when pooling funds?
	Whether administrative efficiency is in place in terms of limiting fragmentation of funding pools	How many funding pools are there?
Purchasing goods and services	Whether resources are allocated according to health need	Does budget setting consider need (projections) and deliverability? Through what mechanism are resources allocated? How quickly would this change in a crisis? Would resourcing change to accommodate changed health needs?
	Whether purchasing is strategic and creates efficiency	To what extent is purchasing efficient? To what extent is purchasing strategic?

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Appendix Table 1.1 List of starting questions to iterate to develop a set of questions for a resilience test *continued*

FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Governance of financing	Whether coverage is comprehensive in terms of benefit packages	What proportion of people are not covered? Are there many informal payments? How broad is the range of services covered? How high are co-payments?
	Whether public financial management is of quality in terms of PFM processes and mechanisms enabling effective health spending	To what extent is financial reporting transparent within all levels of the health system? Are annual financial statements at all levels of the health system available publicly? To what extent are in-year underspends identified early, and repurposed lawfully and efficiently? To what extent are in-year risks identified early and managed appropriately? How frequently are financial forecasting models reviewed and adapted to refine accuracy? To what extent is the level of financial risk held by the system appropriate?
Assessing service delivery		
Health services (e.g., public health, primary care, specialist care, long-term care, mental health care)	Effectiveness Safety User experience Efficiency Equity (Of service delivery overall or specific types of service)	To what extent does service X achieve the desired clinical outcomes? To what extent are safety measures for delivering service X implemented? To what extent does service X consider user experience? To what extent does service X produce equitable outcomes? Is service X working efficiently? Is service X available and accessible in a timely manner that does not undermine financial protection? How quickly have public health services changed their priorities to suit changing public health needs in the last crisis? How quickly have XX health services changed their priorities to suit changing population health needs in the last crisis?

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FUNCTION AND SUB-FUNCTION	ASSESSMENT AREA	STANDARD QUESTIONS
Governance of service delivery	Whether the level of autonomy and decision-making authority is accorded to service delivery bodies responsible for organizing service delivery at the national/ regional/ local level	To what extent do authorities responsible for service delivery at national/regional/local level have autonomy to make decisions on how these services are run?
	Whether services are integrated, i.e. people receive a continuum of care over time and across different service delivery levels	To what extent are primary and secondary/tertiary services integrated vertically? To what extent are different primary/secondary/ tertiary care providers integrated horizontally if patients move between providers? To what extent are health and social care services integrated? To what extent is the integration of services efficient?
	Quality assurance mechanisms, i.e. monitoring and evaluation mechanisms to ensure that health service quality is upheld	Do quality assurance mechanisms exist? To what extent do quality assurance mechanisms accurately pick up on health service quality issues?

Appendix 2: Summary of the shock cycle and HSPA Framework

The health systems resilience testing methodology is based upon two frameworks: 1) the four-stage shock cycle (Appendix Figure 2.1), and 2) the HSPA Framework (Appendix Figure 2.2). These frameworks will be used to guide the discussion throughout the day.

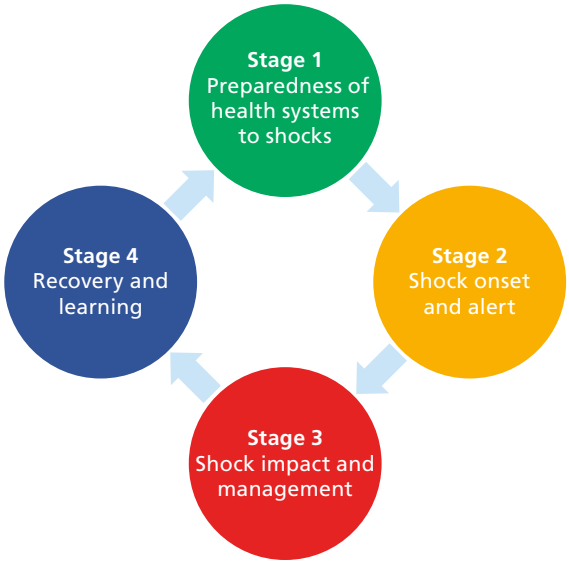
The shock cycle

The shock cycle is used to illustrate how a health system experiences a shock. It comprises four stages:

1. Preparedness
2. Onset and alert
3. Impact and management
4. Recovery and learning.

During the resilience dialogue, discussion will be structured around the four stages of the shock cycle. Each session will focus on how different health system functions are able to respond to a shock at each stage of the shock cycle.

Appendix Figure 2.1 Four-stage shock cycle



1 https://apps.who.int/iris/handle/10665/332441
2 https://www.who.int/publications/i/item/9789240042476

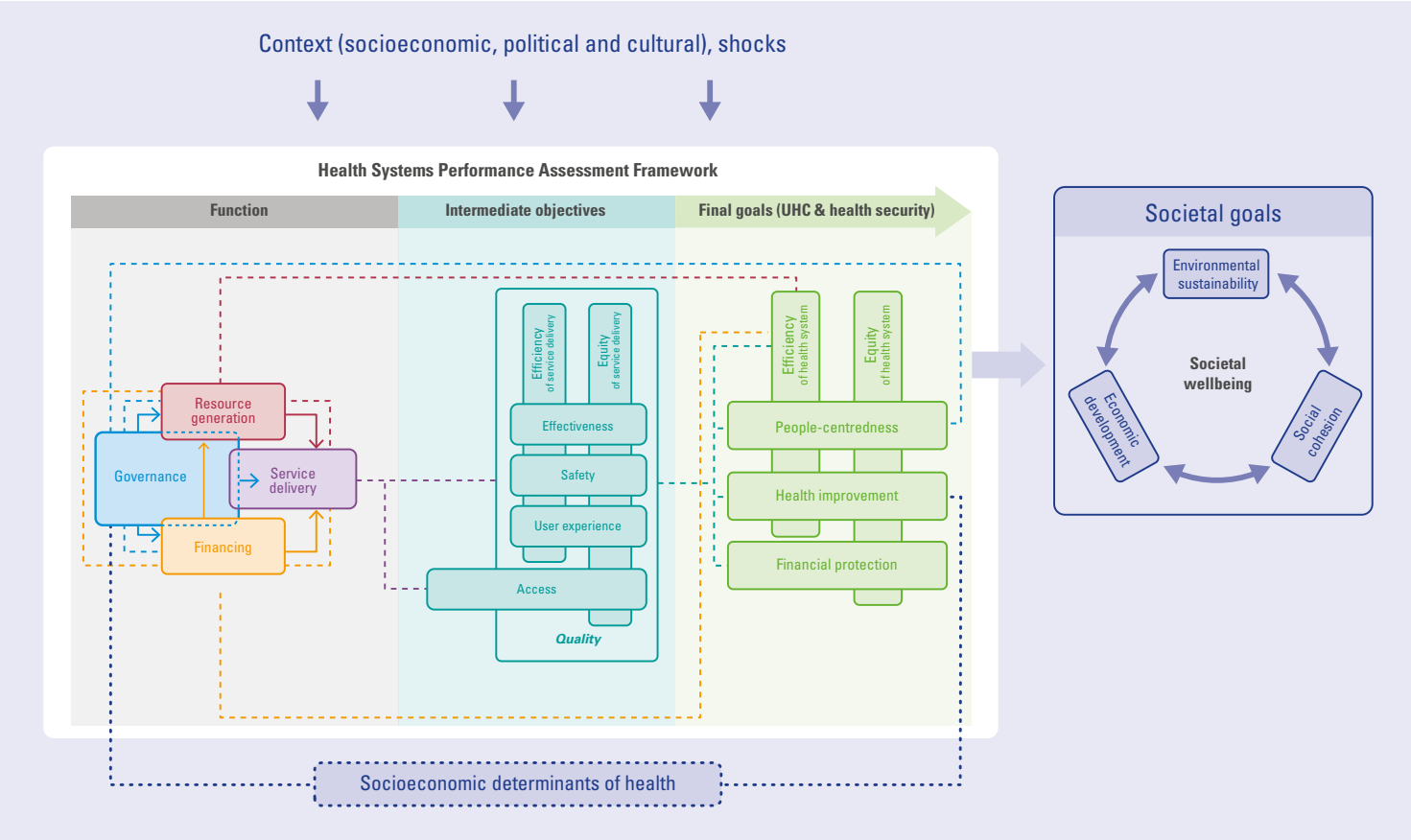
The HSPA Framework

The HSPA Framework divides the health system into four functions:

- Governance
- Resource generation
- Service delivery
- Financing

The HSPA Framework is used to illustrate how achievement of the final goals of the health system is dependent upon the performance of the four core functions of the system. It also takes account of how the functioning of the system as a whole is influenced by contextual factors such as social, economic, political and cultural factors.

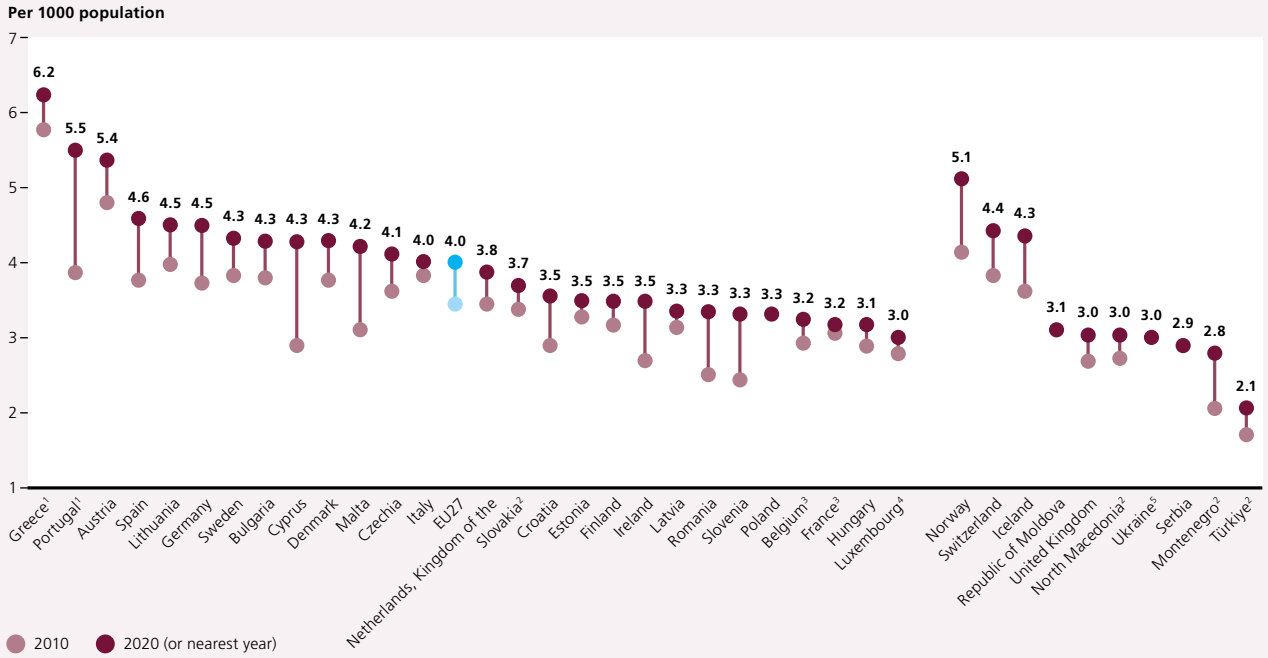
Appendix Figure 2.2 The HSPA Framework



Source: WHO / European Observatory on Health Systems and Policies / UHC2030 HSA TWG

Appendix 3: Additional information for the climate change scenario

Appendix Figure 3.1 Practising doctors per 1000 population, 2010 and 2020 (or nearest year)



Notes: The EU average is unweighted. [1] Data refer to all doctors licensed to practise, resulting in a large over-estimation of the number of practising doctors (e.g. of around 30% in Portugal). [2] Data include not only doctors providing direct care to patients, but also those working in the health sector as managers, educators, researchers, etc. (adding another 5–10% of doctors). [3] Medical interns and residents are not included. [4] The latest data refer to 2017 only. [5] The latest data refer to 2014 only.

Source: OECD & European Union, 2022

Appendix Table 3.1 Additional measurements for contextual discussion

INDICATOR	COUNTRY Y	EUROPEAN AVERAGE
Percentage of households experiencing catastrophic health spending in the latest year	3.8%	6.8% (EU24)[1]
Demonstrated urban heat island effect	Yes	N/A
Presence of a national heatwave plan	Yes	N/A

Source: [1] OECD & European Union, 2022

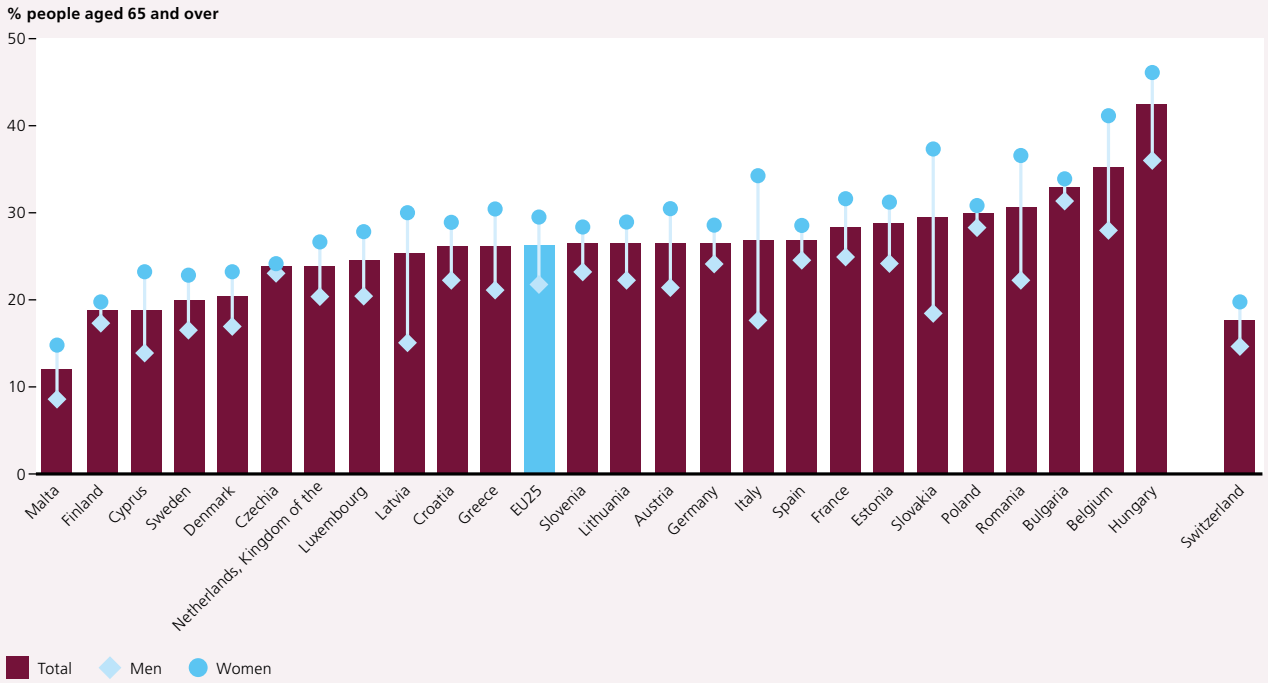
Appendix Figure 3.2 Example layout for pre-shock demographic information

	Elderly population	Urban population	Gini coefficient
Country X	18%	83%	0.26
Comparison	21%	75%	0.29

Note: Country X is close to the EU averages for the proportion of the population that is elderly and lives in urban areas, and regarding the degree of income inequality.

Source: based on OECD Health Statistics, 2022

Appendix Figure 3.3 Limitations in daily activities among people aged 65 and over, by gender, 2020



Note: The EU average is unweighted. The prevalence does not include people living in long-term care facilities. This is an example layout for pre-shock vulnerability information; other figures could be considered or might be more relevant considering the type of shock.

Source: Survey of Health, Ageing and Retirement in Europe (wave 8)

Appendix Table 3.2 Additional heatwave-specific preparedness topics

INDICATOR AND DEFINITION	QUESTIONS TO CONSIDER
Heatwave-resistant healthcare infrastructure The extent to which the healthcare infrastructure has been developed or modified to deal with heatwaves	• Has the current healthcare infrastructure been assessed for vulnerabilities to heatwaves? • Are there standards for all new healthcare infrastructure to be built to standards for withstanding heatwaves?
Heatwave-specific training The presence of training for healthcare professionals specific to dealing with patients suffering from either primary or secondary heat-related illness	• Do healthcare professionals such as doctors and nurses receive training specifically for the management of heat-related illnesses (i.e., presentations to monitor for, medications to avoid, how to manage heat stroke)?
Heatwave shelters Shelter locations for vulnerable individuals (whether part of the health system or not)	• Are shelters available for vulnerable people during the heatwave?

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In an era marked by pandemics, natural disasters and geopolitical tensions, the resilience of health systems has never been more crucial.

This handbook is a comprehensive toolkit designed for health system leaders, managers, policy-makers and planners ready to fortify their systems against any shock. It contains the strategies and insights needed to assess vulnerabilities, develop robust responses, and safeguard population health.

At its core, the handbook describes a pioneering resilience testing methodology – a structured, collaborative approach inspired by stress tests used in other sectors, scenario planning and health system performance evaluations.

Strengthening Health Systems: A Practical Handbook for Resilience Testing is organized into three distinct sections and serves as a comprehensive companion:

- Section 1 is a hands-on guide, explaining each step of the resilience testing process.
- Section 2 gives an outline of the foundational concepts driving resilience testing.
- Section 3 is a carefully curated collection of example shock scenarios that can be adapted for use in diverse country contexts.

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