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Partnership for Health System Sustainability and Resilience

Founded by the World Economic Forum, London School of Economics and AstraZeneca

The Partnership for Health Sustainability and Resilience

Interim Report of the Pilot Phase

July 2020 – March 2021

This report was produced as part of the **Partnership for Health System Sustainability and Resilience** (PHSSR). PHSSR was initiated by the London School of Economics and Political Science (LSE), the World Economic Forum (WEF) and AstraZeneca, motivated by a shared commitment to improving population health, through and beyond the COVID-19 pandemic. The initial phase of the partnership, of which this report is a product, was funded solely by AstraZeneca.

This report was produced on behalf of PHSSR as part of its pilot phase. It includes a summary of the findings of a series of country reports which have been used to apply and test a framework for the analysis of health system sustainability and resilience, undertaken by independent teams of researchers. The positions and arguments presented reflect the findings of those reports, and/or are the authors' own. They do not represent the views of AstraZeneca, the World Economic Forum or the London School of Economics and Political Science.

For further information on the Partnership, including the pilot phase Country Reports, please visit https://weforum.org/phssr

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1. Introduction

The COVID-19 pandemic has tested many countries' health systems to – and beyond – their limits and highlighted the interdependence of health with other sectors at both the national and global level. However, even before the pandemic, health systems faced challenges to their resilience and sustainability. Against this backdrop, the Partnership for Health System Sustainability and Resilience (PHSSR) was formed by the World Economic Forum, AstraZeneca and the London School of Economics in Summer 2020. Currently in its pilot phase, the driving purpose of the Partnership is to improve global health by providing qualitative and quantitative evidence to inform policy, and promote action at national and international levels to strengthen health system sustainability and resilience. PHSSR's objectives are as follows:

- Build knowledge, understanding, and consensus on the dimensions of, and the relationship between health system sustainability and resilience, so that they can be understood in different country contexts, enabling identification of strengths, weaknesses, opportunities, and threats.
- Guide action by generating evidence-informed solutions and policy recommendations to improve sustainability and resilience, promoting their uptake and supporting pilot implementation of the framework in each country.
- Facilitate national, cross-border and cross-sectoral learning and evidence-informed action to strengthen health system sustainability and resilience, based on the knowledge and relationships built through this partnership.

Published to coincide with PHSSR's inaugural summit, taking place on March 15 – 19 2021, this interim report of the PHSSR's pilot phase sets out how PHSSR has conceptualised health system sustainability and resilience, and presents the initial Framework that was used to guide the development of a set of system-level Country Reports in the pilot phase. It also presents a summary of the key themes and recommendations that have emerged in those reports, and a preliminary assessment of the application of the Framework, identifying areas in which it can be strengthened. Following a full evaluation of the pilot phase, this report will be followed by a final report, including an updated version of the Framework, pointing the way for the Partnership's future development

1.1 PHSSR's Pilot Phase

In its pilot phase, PHSSR has adopted the definitions for health system sustainability and resilience as in the Table below. These definitions are elaborated on in sections 1.2 and 1.3.

Table 1: Definitions of Health System Sustainability and Health System Resilience

Term	Definition
Health system sustainability	A health system's ability to continually deliver the key health system functions of providing services, generating resources, financing, and stewardship, incorporating principles of fair financing, equity in access, and efficiency of care, in pursuit of its goals of improving population health, and responsiveness to the needs of the populations it serves, and to learn and improve in doing so.
Heath system resilience	A health system's ability to absorb, adapt to, learn and recover from crises born of short-term shocks and accumulated stresses, in order to minimise their negative impact on population health and disruption caused to health services.

In pursuit of the objectives above, PHSSR's pilot phase represents an initial step towards developing rigorous and reproducible means of assessing health system sustainability and resilience in different contexts. Overseen by the PHSSR Steering Committee, a team of researchers based at LSE began by developing a Framework to guide the analysis of health system sustainability and resilience, which has been tested by research teams (the Country Teams – see table 2) in eight countries – England, France, Germany, Italy, Poland, Spain, Russia and Vietnam. There was no formal sampling design for the choice of these countries, although the aim was to have a sub-set of roughly comparable countries (this dictated the choice of a sub-set of EU countries), an Asian country and as many others as could be accommodated within the pilot phase. The choice of countries was pragmatic and opportunistic, but it is hoped that through the widening of the Partnership the developed Framework will be applied more widely and progressively refined.

The Country Teams have used the existing Framework to undertake rapid, system-level reviews of the pilot countries' health systems, highlighting critical strengths, weaknesses, and generating preliminary recommendations for reform – the Country Reports. The Partnership will work with stakeholders in each of these countries to explore how the recommendations can be further validated and developed, and the prospects for their implementation. Following an evaluation of the pilot phase, the Framework and the findings from the Country Reports will be built upon through the further development and application of means of analysing health system sustainability and resilience in different contexts, including metrics and indices for prospective assessment. In future phases of its work, PHSSR aims to provide a platform for collaboration, seeking to ensure that its work learns from and builds upon efforts towards similar goals being undertaken elsewhere, complementing rather than duplicating them.

Table 2: Country Team Research Leads

Country	Research Lead
England	▪ Mr Nigel Edwards, Chief Executive, Nuffield Trust
France	▪ Dr Zeynep Or, Research Director, Institute for Research and Information in Health Economics (IRDES), Paris
Germany	▪ Dr Wolfgang Greiner, Professor of Health Economics and Healthcare Management, University of Bielefeld
Italy	▪ Dr Americo Cicchetti, Professor of Healthcare Management, Catholic University of the Sacred Heart, Milan
Poland	▪ Dr Iwona Kowalska-Bobko, Director of the Institute of Public Health, Professor of Health Sciences, Jagiellonian University, Kraków ▪ Dr Małgorzata Gałązka, Director, Institute of Management in Health Care and the Centre of Value-Based Helathcare, Lakarski University, Kraków
Russia	▪ Dr Elena Aksenova, Director, Moscow Institute for Healthcare Organisation and Medical Management
Spain	▪ Dr Guillem López Casasnovas, Professor of Economics, Universitat Pompeu Fabra, Barcelona ▪ Mr Jesús María Fernández Díaz, Founder and CEO, HIRIS
Vietnam	▪ Dr Tran Thi Mai Oanh, Director, Health Strategy and Policy Institute (HSPI), Hanoi

1.2 Background: Why Health System Sustainability and Resilience?

The COVID-19 pandemic has brought health system resilience into focus as a matter of significant political and analytical interest.(1) While many health systems have adjusted remarkably to cope with the spread of a virus whose severity and transmissibility poses unprecedented challenges, most have been stretched to breaking point to meet needs for acute care while struggling to maintain essential services and keep staff and patients safe. Despite having crisis-response plans in place, many countries' initial responses were characterised by indecision and inaction, with delays in implementing containment measures.(1) As the crisis has developed, the global response has been characterised by inconsistency and a lack of coordination which have exacerbated the pandemic's impact.(2) The cost, in terms of lives lost, and the impact on health, wellbeing and livelihoods, is immense. Studies are beginning to show that socially and economically disadvantaged groups have suffered the heaviest toll.(3)

Health system resilience requires an ability not only to withstand shocks such as COVID-19, but also adjust to accumulated stresses.(1) A focus on resilience to shocks should therefore not obscure – indeed it necessarily implies – a need to focus on health systems' longer-term foundational sustainability, which we define as their ability to continually deliver their functions and adapt to changing contexts in order to sustain improvements in population health, amid the evolving burdens of both communicable and non-communicable diseases. The pandemic has thrown the underlying frailties of health system foundations, already struggling to cope with demand pressures, into sharp relief. Much of the world's population lacks access to essential health services and protection from the financial consequences of ill-health. Even in advanced economies and countries which are close to attaining universal coverage, the growing burden of chronic diseases poses a major challenge to the sustainability of health systems. This calls for a dual focus on health systems' sustainability and resilience, and developing means of assessing them in order to identify how they can be improved, alongside established measures of health system performance.

While the immediate focus is on the pandemic, health systems face myriad other threats and risks. As well as the threat of pandemics, health systems have had sufficient warning of the dangers of other catastrophic systems challenges such as anti-microbial resistance and the climate emergency to know that the concerted action needed to avert them is overdue. Less predictable are the risks posed to health systems by economic and political instability, and natural disasters. Given the complex interconnections between health systems, economies, political systems, and our shared natural environment, threats to health can easily spill-over between countries. Building health resilience and sustainability at a global level is a collective endeavour and will require a re-commitment to the principles of joint action and international solidarity, with national interests mediated by institutions supported by adequate resources.(2,4) The goals of universal health coverage and global health security must be pursued in tandem.(5,6)

1.3 Defining Health System Sustainability and Resilience

In order to provide foundational understanding of sustainability and resilience for PHSSR's pilot phase, a rapid scoping report was undertaken in August 2020 to clarify the concepts and develop working definitions. It was concluded that any new framework to guide the analysis of health system sustainability and resilience would need not only to offer clear definitions of these terms as separate concepts, but also to reflect the interconnections between the two. Beginning with a definition of health systems which incorporates all organisations, institutions and resources whose primary purpose is to improve health – including both healthcare and public health services, it was determined that health system sustainability and resilience would be assessed by reference to the WHO's definitions of the functions and objectives of health systems. The World Health Report 2000 defined overall health system outcomes or goals as: improving health and health equity, in ways that are responsive, financially fair, and make the best, or most efficient, use of available resources.(7) In order to achieve these objectives, they deliver certain key functions: providing stewardship of the system, generating resources, and financing the delivery of health services to meet population health needs.(8)

1.3.1 Health System Sustainability

Sustainability is a relatively new concept which lacks a settled definition. Emerging initially from the ecology movement of the 1970s, it is applied with different meanings in widely varying contexts. It is commonly understood as an agenda and an emerging consensus of what needs to be done to protect people and the planet, and allowing indefinite continuation of constructive and positive economic and social development.(9) The 1987 Brundtland Report *Our Common Future* (10) combined these notions, articulating the concept of sustainable development as the organising principle for meeting human development goals while simultaneously sustaining the ecology on which the economy and society depend, which has gained widespread traction and is embodied by the UN's Sustainable Development Goals.

Since its emergence, the concept of sustainability has been applied across a wide range of fields in the natural and social sciences, often referring to the 'triple bottom line' of environmental, social and economic system considerations. Despite the wealth of literature on sustainability, the concept has seldom been applied in relation to health systems, as opposed to specific health initiatives or programmes, with much of the literature focussing on individual dimensions such as financial sustainability, environmental sustainability, or the sustainability of programmes or interventions.(11,12) In relation to health systems, some definitions of sustainability adopt a linear perspective, defining it as an outcome where health benefits, activities or workforce capacity are maintained.(13) Others view sustainability as a recursive process that requires continuous adaptation and adjustment to meet the needs of the health system.(14,11) Viewed through this lens, sustainability has been defined as the "general continuation and maintenance of a desirable feature of an initiative and its associated outcomes as well as the process taken to adapt and develop in response to emerging needs of the system".(12)

Adopting the latter perspective, PHSSR developed the following working definition of **health system sustainability** to guide its work in the pilot phase, including specific reference to the WHO's key health system functions and objectives:

> *A health system's ability to continually deliver the key health system functions of providing services, generating resources, financing, and stewardship, incorporating principles of fair financing, equity in access, and efficiency of care, in pursuit of its goals of improving population health, and responsiveness to the needs of the populations it serves, and to learn and improve in doing so.*

This definition is deliberately general and open: it provides an account of the key functions and objectives of health systems, but not of how these are delivered and achieved. This definition is intended to accommodate the assessment of the unique characteristics of each health system and how they interact to perform their functions and achieve their objectives over time. Incorporating continuity, learning and adaptation, sustainability in this sense is a dynamic capability: it cannot be understood solely by reference to static measures of health system performance and necessitates adaptation to changing population health needs and contextual factors. However, the breadth of the concept poses significant challenges for its assessment. The definition will be reviewed in light of the findings of the pilot phase, and further research.

1.3.2 Health System Resilience

As with sustainability, resilience has been the focus of increasing interest from researchers in international health policy in recent years, but it is still coming to maturity as a concept and lacks a settled definition.(15) Early disciplinary definitions of resilience cast it as the capacity of an individual, population or system to absorb a shock, while retaining fundamental functions or characteristics.(16) However, such a definition of resilience might imply that the original state of the system is the optimal state, to which it should return after a shock, in which case the original vulnerabilities would remain.(16) A more dynamic interpretation of resilience incorporates the capability of a system to adapt and transform in order to better withstand, or reduce exposure to, future shocks. Several recent publications – for example from the European Observatory on Health Systems

and Policies – have made important contributions in advancing an understanding of how resilience in this sense can be understood and assessed, making specific reference to a health system's ability to prepare for, manage (absorb, adapt and transform) and learn from shocks.(17) Resilience in this sense has been found to be conceptually useful in that it goes further than static concepts such as access, efficiency, and quality to reflect the time-bound nature of health system performance.(15)

PHSSR determined that it was important that the definition of resilience used in the pilot phase incorporated an emphasis not only on crises resulting from short-term shocks, but also on longer-term, accumulated stresses such as financial pressures or workforce shortages, requiring an 'everyday' form of resilience.(18) In order to capture this, PHSSR developed and utilised the following working definition of **health system resilience** to inform the development of its pilot Framework:

> *A health system's ability to prepare for, absorb, adapt to, learn, transform and recover from crises born of short-term shocks and accumulated stresses, in order to minimise their negative impact on population health and disruption caused to health services.*

1.4 The Relationship Between Health System Sustainability and Resilience

Our definition of health system resilience, which incorporates a focus on accumulated stresses, therefore corresponds with the long-term foundational perspective implicit in thinking about sustainability. However, while our definitions of resilience and sustainability are closely related, they are not one and the same. In the aggregate they are mutually reinforcing: a lack of sustainability not only compromises health systems' performance in times of relative normalcy, but renders them more susceptible to long-term stresses which can grow to crisis proportions, and may make them more vulnerable to short-term shocks. For example, systems operating close to capacity in normal times are less able to absorb new pressures when a crisis hits, and, as we have seen, can be rapidly overwhelmed by spikes in demand.(19) Conversely, healthier populations, in part a product of sustainable health systems, may themselves contribute to greater health system resilience because their lower susceptibility to disease limits the impact of a shock.

However, the optimal means of improving a health system's ability to withstand shocks or stresses may not correspond with those that best secure progress towards better population health, and vice-versa.(20) Measures to improve technical efficiency, which may enhance sustainability,(21) do not necessarily connote greater resilience, for example, if they reduce a system's diversity, flexibility or redundant capacity. Furthermore, 'tunnel-vision' focus primarily on resilience to shocks, should not divert attention from efforts towards better population health in times of relative normalcy, or ensuring that the system is financially sustainable. Finally, some of the challenges health systems face are sufficiently predictable to enable adaptation, or tractable to the control of the health system itself, and thus can be offset by improvements in sustainability. However, shocks or stresses may be unavoidable or unpredictable, highlighting the importance of resilience (incorporating preparedness) as an independent concept.

Given the distinctions between the concepts, PHSSR therefore aims to develop means of assessing resilience and sustainability in tandem. This is an ambitious goal towards which the pilot phase represents a first step, and further work is needed to not only refine the definitions, but understand the interconnections between them. For example, a recent report by the EU Expert Group on Health System Performance Assessment published in the course of PHSSR's pilot phase proposes a wider definition of resilience, which includes the ability to *proactively foresee and prevent* crises resulting from both short-term shocks and longer-term stresses.(1) In its focus on foresight and preventative action to offset stresses, this definition of resilience goes beyond preparedness, and provides a clear link to our concept of health system sustainability, but may also reduce the degree of distinction between the two, and hence their usefulness as concepts when taken together. Another approach, suggested by Marchese et al.,(22) is to frame sustainability as a critical function of a project, policy, or system, which is to be maintained during and after a disturbance – the extent to which it is able to

could be seen as a function of its resilience. We envisage health systems moving towards a steady state of resilient sustainability, such that sustainability goals once achieved are maintained.

2. The Pilot Framework

2.1 Developing the Framework

The PHSSR pilot phase set out with the objective of developing a framework to enable the undertaking of rapid, systems-level analysis of health systems in the eight pilot countries. In order to provide a common guide to this analysis, PHSSR undertook a review of existing frameworks identified during its initial scoping phase. While multiple frameworks for assessing health system resilience were identified, no frameworks for assessing overall health system sustainability (as opposed to overall health system performance, or the sustainability of particular programmes or initiatives) were identified. Furthermore, the review did not find any frameworks for assessing sustainability and resilience in tandem. Given the lack of agreed upon definitions of sustainability and resilience, it is not surprising that the actual implementation of these concepts remains in its infancy and any application is limited. It was determined that PHSSR should develop an original and practical framework for the purpose of the pilot phase.

Given the complexity involved, combining resilience and sustainability compounds the already significant methodological challenges of assessing them in a robust way. Recognising that the concepts of sustainability and resilience must reflect the diversity and complexity of health systems and that they are context-dependent, the pilot Framework was intended to serve as a guide to qualitative analysis, rather than a tool for quantitative measurement or direct comparison. Our objective was to enable rapid assessments to be undertaken, balancing rigour with practicality and speed, and providing a methodological basis on which to build.

PHSSR's pilot Framework focuses initially on five 'domains' representing fundamental components of health systems. The domains correspond closely to the World Health Organisation's health system building blocks, of Governance, Financing, Workforce, Medicines and Technology, Service Delivery and Information. The exception to this is that attributes relating to the WHO framework's building block of Information were incorporated into the other domains. A health system's characteristics in each of these domains has a strong influence over both its sustainability and resilience. It is arguable that information, as an input for each of the domains, ought to be a domain in its own right, and this will be one of the many aspects to be considered as we move beyond the pilot phase.

PHSSR's pilot Framework covers the following domains:

- **Health System Governance**: the wide range of steering and rule-making related functions carried out by governments and decisions makers as they seek to achieve national health policy objectives.
- **Health System Financing**: how health systems generate, pool and allocate financial resources and pay for health services.
- **Health System Workforce**: how health systems plan for, train, recruit, reward, and deploy their workforce, and shape the conditions in which health professionals work.
- **Medicines and Technology**: how health systems make use of medicines and technologies in the delivery of health services.
- **Health Service Delivery:** how health services are organised and delivered, including ambulatory and hospital care, and public health.

To guide the development of the Framework, PHSSR identified factors relevant to a health system's sustainability and resilience in each domain based on the findings of a rapid scoping exercise. These were

then prioritised, and provided a basis for the development of a set questions and lines of inquiry for those selected for inclusion in the pilot Framework. They were selected pragmatically to assist the Country Teams in rapidly undertaking qualitative health system-level case studies (see Section 3), and are thus not exhaustive in their coverage of the key factors identified.

In each case, the lines of inquiry in the pilot Framework for sustainability relate to questions typically associated with the ongoing delivery of health system functions and achievement of the health system objectives as defined by the WHO. The pilot Framework also includes questions relating to key trends, for example in health system financing and the strength of the workforce to enable the identification of the system's trajectory in important regards. In the case of resilience, the questions relate to health systems' ability to prepare for, absorb, adapt to, learn, transform and recover from of crises, and drew significantly on the framework for assessing health system resilience developed by the European Observatory on Health Systems and Policies.(17) Questions relating to the countries' experience of COVID-19 were included, given its relevance as a critical case affecting all countries studied. The Framework was refined through an iterative process with feedback and consultation from the Partnership's Steering Committee and from the pilot Country Teams.

Due to time and resource constraints during the pilot phase, factors which are important to resilience and sustainability but fall 'outside' the health system as we have defined it were not included in the Framework, but they are nonetheless of critical importance. Health systems are open systems,(23) influenced by myriad contextual factors (ecological, social, economic) which may directly impact population health, and are themselves influenced by the health system. For example, these contexts may be the source of (or help to mitigate) the very shocks and strains which health systems must be resilient to. A health system's sustainability can be understood as requiring it to maintain a balanced homeostasis with its environment, so cannot be understood in isolation from it. Further conceptual work will be required to understand these complex relationships and how they influence health system sustainability and resilience**.**

It should be noted that the Framework was developed specifically for PHSSR's pilot phase, in order to enable assessments to be produced by small teams of researchers within constrained timeframes. It does not provide prescriptive definitions of what constitutes resilience or sustainability in each domain, nor a strictly defined methodology as a means of producing reproducible assessments. It is intended that the findings and feedback (from Country Teams, the Steering Committee, and all other stakeholders) from the pilot phase will inform the development of more complete and methodologically advanced qualitative and quantitative approaches, building towards means of prospective assessment, including the development of metrics and indices for resilience and sustainability.

Section 3 of this report presents a summary of the key findings from the Country Reports that were produced using this Framework, and reflections on its strengths and weaknesses, as a precursor to its full evaluation.

2.2 Domain 1: Health System Governance

2.2.1 Governance for health system sustainability: key factors identified in PHSSR's pilot phase

The extent to which a health system is able to deliver its core functions, learn and improve in doing so depends in large part on its system of governance, which has myriad definitions but can be understood as the wide range of steering and rule-making related functions carried out by governments and decision-makers in pursuit of national health policy objectives.(24) Every system of governance is unique in all aspects, but each health system's structure of governance must facilitate the financing, resourcing, organisation and delivery of health services.

Of the domains in the PHSSR framework, Governance is perhaps the domain which has the greatest influence over a health system's overall sustainability and resilience, since it strongly influences each of the other domains. Based on the findings of our rapid scoping review, and further research undertaken in the pilot phase, we identified several features as being important to a health system's overall sustainability and resilience, with a particular focus on the effectiveness, accountability and transparency of governments in their role as health system stewards. Our focus was largely on structures and processes of governance, rather than the content of policy or the exercise of power, which are nonetheless important considerations.(20)

Health systems require effective leadership and evidence-based or information-driven policy-making structures and processes for developing health policy strategies that include sensible goals and priorities for the short, medium- and long-term with measurable targets. It is important, however, that this does not lead to 'tunnel vision' and a narrow focus on the attainment of targets or the obscurement of the need for processes to be optimised. Policies and programmes should be robustly evaluated over time, with measurement and evaluation frameworks and processes established which ensure that lessons learned are effectively incorporated into future decisions.

Governance is made more effective by high levels of trust in leadership which garners significant support from the public on the direction of public health policies, and the stewards of the health system should be able to demonstrate the value and importance of health as an area of public policy.(17) While all policy decisions are inherently political, policy-making processes are typically transparent and informed by evidence.(25) The quality of governance is often enhanced when a variety of stakeholders, including patients and patient advocate groups, are engaged in policy formulation and the expertise of independent expert advice is sought and heeded throughout the policy-making process.(25)

Effective governance relies on well-defined chains of command in the leadership structure of key public agencies with clearly outlined roles and lines of accountability, and mechanisms to ensure inter-and intra-institutional coordination and collaboration at all levels.(25) In this sense health system governance is best built through central authority and local authority relations. There is a need for local circumstances to be fully accounted for in central planning and initiatives. Actors in the health system should be able to respond constructively to occurring controversies, problems and conflicts in the development and implementation of policy. Government agencies should be accountable for the public health decisions they make (although this should not give rise to a 'blame game'), with robust checks and balances to prevent corruption and 'capture' of the policy-making process by sectional interests.(25)

2.2.2 Governance for health system resilience: key factors identified in PHSSR's pilot phase

Health system resilience will be influenced by the degree to which the system's governance structures have prepared it for crises, enable it to respond to the evolving challenges of an ongoing crisis and allow it to draw lessons from its crisis response and adapt its approach accordingly.(20,26)

As with their sustainability, effective leadership and decision-making are fundamental for health systems' resilience. Leadership is vital to ensuring coordination between actors in the system, and for demonstrating

that the health system is capable of preventing, or mounting an effective response to, a threat to population health, which clearly underlines the importance of action to strengthen health systems before, during and after a crisis.(17) There is a need to identify the relevant decision-makers at the appropriate levels within the chain of command, to ensure clear information flows and effective response to changing conditions. Communicating to the public consistently and transparently, creating trust and building support for public health interventions is also vital.(17)

When a crisis arises, there is often a strong need for coordinated action, which is underpinned by the availability and transparent exchange of accurate, up-to-date and reliable information.(17) Mechanisms are needed to ensure effective collaboration between different levels of government, and between government and non-government stakeholders, potentially involving the establishment or strengthening of channels for co-operation with other governments and international institutions.(17) Strong public health information systems are vital to ensure that the system is responsive.(27)

Resilient health systems have plans and protocols in place for particular crises, which specify how their implementation is to be resourced. Comprehensive emergency management plans and contingency plans to ensure the availability of essential supplies can help avoid a piecemeal approach which can result in delays and exacerbate challenges of coordination.(17) These plans will be practiced and strengthened by 'stress-testing' – playing out crisis scenarios to test the system's ability to respond; it is important that action is taken to ensure that any frailties thereby identified are addressed.

Fostering a culture to promote learning and adaptation, and facilitating timely and effective use of evidence are also important means of building resilience.(17,18) Learning from successes and failures is critical to improving the effectiveness of responses, both during an unfolding crises and in preparation for future shocks.(17,27)

2.2.3 Health System Governance: questions included in the pilot Framework

To probe assessment of the health system governance in terms of sustainability, pilot teams were asked the following questions:

Governance structure and strategic direction:

- *Who are the key actors in the governance of the health system and what are their areas of responsibility?*
- *Who is responsible for raising revenue, for setting contributions, for paying providers, and for capital expenditure? How are decisions regarding financing delegated to regions and localities?*
- *Is there a clear chain of command for key public agencies? What are the lines of accountability?*
- *Are there clear goals and priorities for the short-, medium- and long-term with measurable targets?*
- *Are these targets sensible? Do they induce 'tunnel vision' priority-setting?*
- *How stable is the strategic direction of the health system? Is planning de-linked from the political cycle and is there a continuation of policy direction even when there are shifts in leadership?*

Inclusivity, transparency and accountability of decision-making:

To ensure the scope of these questions was manageable within the resources and time available in the pilot phase, Country Teams were asked to focus specifically on decision-making in the context of HTA and defining benefits for health care, rather than decision-making in general:

- *Briefly assess inclusivity of decision-making at the national level (i.e. mechanisms for stakeholder involvement and consultation). Are any particular groups over- or under-represented?*

- *Briefly assess transparency of decision-making at the national level. Are the public able to scrutinise decisions, and what role does this have in influencing changes in policy?*
- *What mechanisms are there to hold decision-makers accountable?*

To probe assessment of health system governance in terms of resilience, pilot teams were asked to use their countries' experiences of COVID-19 to illustrate the answers to the following questions:

Preparedness: how well prepared is the health system for crises?

- *Planning: what contingency plans and protocols for crises does the country have in place? Are these practiced and reformed over time? Assess the success of the implementation of these plans.*
- *Vigilance: what epidemiological surveillance and early warning systems are in place in the country? Assess how well these perform in practice.(26)*

Response: how well does the health system respond to crises?

- *Briefly assess the quality and responsiveness of decision-making during crises (factors to consider: timeliness, use of evidence and expert insight, stakeholder involvement, transparency).*
- *Briefly assess the quality of communication and coordination between key sectors (public health, social care, primary care, community care, secondary care, tertiary care) and levels (international, national, regional, local) of the health system during crises.*
- *Is there timely development, improvement, adjustment and announcement of guidelines and protocols during a crisis?*
- *How effective is communication of critical public health messages during a crisis? Do sectors beyond public health take these messages on board?*

Learning and adapting:

- *At a national level, what mechanisms are in place to assess, audit and learn from responses to crises?*
- *How responsive is the system in adapting to lessons learned (please provide specific examples)?*

In light of the analysis, Country Teams were asked what recommendations they would make to strengthen resilience and sustainability in this domain.

2.3 Domain 2: Health System Financing

2.3.1 Financing for health system sustainability: key factors identified in PHSSR's pilot phase

Maximising the sustainability of health system financing requires action in the three main areas of health financing: revenue generation; pooling funds and allocating resources; and paying providers.(28) In terms of revenue generation, the financial sustainability of health systems relies upon their ability to generate and obtain resources at a rate equal to or greater than the rate at which they are expended, and is inextricably linked to the priority given to population health objectives, as well as the breadth of the financing base and the level of national income.(29) Funding mechanisms should be progressive, with contributions that reflect ability to pay rather than the need to access services, and pooled in order to spread associated financial risks as widely as possible so that people can access the health services they need without suffering financial hardship.(30)

All health systems face resource constraints, but there is enormous variability in the level of resources available within and between countries and global regions, which is often in inverse proportion to levels of need.(31) In most countries, health expenditure is growing faster than GDP, and thus sustainability in this domain may necessitate measures which link medium- to long-term spending projections with estimates of revenues to diagnose and monitor the system's ongoing fiscal wellbeing.(28) However, while trends in health expenditure growth will prove unsustainable if the opportunity cost of spending on health becomes too high, a narrow focus on cost-containment should be avoided: a health system's sustainability will be compromised if growing needs are not met with commensurate increases in funding or improvements in efficiency. Decisions on what proportion of public finances should be dedicated to health systems require careful weighing against other spending priorities,(30) but should optimally reflect the full value of health – in humanistic, economic and ecological terms – and, on the other hand, the cost of disease. This requires that the stewards of health systems are able to demonstrate the value of investing in health systems.

To maximise sustainability, health systems must prioritise the allocation of funding to meet population health needs, seeking to achieve both horizontal and vertical equity in access to care, and reflecting societal preferences. There should be measures in place to ensure spending across different parts of the system is proportionate to levels of need. If any areas of underfunding are identified, interventions should be made accordingly, including measures to even out disparities in the ratio of expenditure to need across regions and social groups. Provider payment mechanisms should align with health system objectives, such as enhancing productivity, efficiency and quality, and can have a significant impact on the coordination, continuity and integration of care across sectors of the system. As such, effective policies to incentivise providers to maximise quality and access to care and avoid waste are important means of improving health system sustainability. These should be accompanied by measures to control costs for essential medicines and health services, while ensuring their rapid and universal availability.

2.3.2 Financing for health system resilience: key factors identified in PHSSR's pilot phase

Ensuring that there are sufficient funds available for the health system to operate during times of stability is a pre-requisite for a health system's resilience.(17) Typically, the closer a country is to attaining universal health coverage for its population health priorities, the more resilient it will be – making it easier to rapidly deploy new services and scale up to meet needs during a crisis.(6,17) Conversely, an absence of sufficient monetary resources during a crisis may mean that access to essential services could be disrupted, or that those in need of health services may be exposed to higher out-of-pocket expenditure.(17) Thus, a resilient response may entail countercyclical mechanisms such as temporary increases in government funding to health care, potentially accompanied by temporary decreases in user fees so as to safeguard access to services.(17)

Resilient health financing systems will also enable the rapid transfer of money to where it is most needed. This may be facilitated in some countries by accumulating financial cushions – although this must be balanced against the need to ensure resources are deployed to best effect in times of relative normalcy – or by there

being rules in place that allow finances to be redirected towards the health system.(17,32) However, a resilient financing system will not re-direct funding away from essential services in order to support crisis response. When a crisis occurs, there may also be a need for changes in purchasing strategies, for example to enable increased purchasing of essential medicines, or to respond to potentially dramatic shifts in demand for certain types of medicines and care and incentivise providers accordingly.(17,32) This might entail, for example, enlisting private providers to make their capacity available to the public system to support national response efforts.(17)

2.3.3 Health System Financing: questions included in the pilot Framework

Pilot teams were asked to present a table with data on key trends in health system financing:

- *What is the share of health-care spending as a share of GDP? How has this changed in the last 10 years?*
- *How has the proportion of people over the age of 65 changed in the last 10 years?*
- *How has government debt as a proportion of GDP changed in the last 10 years?*
- *What is the share of public and private sources of funding (social health insurance, taxation, private insurance or out-of-pocket spending)?*
    - *In social health insurance systems, what proportion of funding comes from general taxation vs. payroll taxes (employer and employee contributions)?*
- *How has out-of-pocket expenditure changed as a proportion of total health expenditure in the last 10 years?*
- *How has the rate of participation in the formal labour force changed in the last 10 years?*
- *What is the distribution of spending across sectors of the health system: social care, primary, secondary and tertiary care, public health? How has this changed in the last 10 years?*

To probe assessment of the resilience and sustainability of health financing, pilot teams asked the following questions:

Sufficiency, stability and flexibility

- *Describe what processes are in place to diagnose and monitor the fiscal sustainability of the health sector. Are there spending projections, and if so, what period do they cover?*
- *Do funding decisions for health take account of broader economic benefits of health to society?*
- *If the system is funded by social health insurance, do the insurance funds run a deficit or a surplus, and are there mechanisms in place to bail them out in case of a deficit? Have these been used in the last 10 years?*
- *Are there any mechanisms for bailing out public providers? Have bailouts been necessary in the past 10 years?*
- *Is additional funding made available to the health system (including public health) to support crisis response and management? (Please use the country's experience of COVID-19 to illustrate the answer to this question)*

Coverage and fair financing

- *What are the most significant gaps in coverage, in terms of who is covered, what is covered, and what share of total costs are covered?*
- *What provision is there for coverage of people who are unemployed?*

Paying providers

- *How are the majority of primary care providers paid (through budget payments, fee-for-service payments, capitated payments, case-based payments, or another mechanism)? How are secondary care providers paid?*
- *Have value-based payment models been introduced in primary, secondary and tertiary care?*
- *Are there any additional provider payment mechanisms (such as pay-for-performance) to incentivise quality?*

In light of the analysis, Country Teams were asked what recommendations they would make to strengthen resilience and sustainability in this domain.

2.4 Domain 3: Health System Workforce

2.4.1 Workforce for health system sustainability: key factors identified in PHSSR's pilot phase

This domain illustrates pertinently the high degree of interconnectedness between health system sustainability and resilience. Having adequate levels of highly trained health care professionals that are well motivated and supported will boost both health system resilience and sustainability.

The provision of health care is labour-intensive, and the health system's ability to continually deliver its key functions crucially depends on having the appropriate level and quality of human resources available to provide the care needed by the population. Determining the appropriate mix of workforce required at the various levels of health care delivery is complex, and must take account of changes in population health needs, models of healthcare delivery and technology. However it is clear that a health system without a workforce that is sufficient in numbers, with the appropriate skills to address population needs, geographically equitable in its distribution, highly trained and motivated and remunerated accordingly will not be sustainable in an ongoing way nor resilient when additional strains are placed upon it during a crisis.

To increase sustainability in this domain, long-term staffing levels will be subject to careful planning and incentives will be in place to enhance training, recruitment and retainment of professionals at all levels. Long-term workforce planning will take into account future staffing needs and risks to supply, and requires monitoring of, for example, the flow of health professionals into and out of a country. Commensurate remuneration positively impacts sustainability by reducing turn-over rates and associated loss of institutional knowledge.(16) Likewise, staff support mechanisms and an appropriate working environment help underpin positive morale and job satisfaction levels which in turn help maintain the intrinsic motivation to provide high quality health care that drives many in this sector.

2.4.2 Workforce for health system resilience: key factors identified in PHSSR's pilot phase

A key aspect of resilience is ensuring that there are sufficient numbers of health care workers to meet increases and changes in demand during a crisis.(33) Countries closer to attaining appropriate staffing levels before a crisis will be in a better position to respond to surges in demand.(16) Going into a crisis with existing staff shortages is likely to hamper the response, increase pressures on staff and exacerbate existing gaps in access to care.(17)

Staff with appropriate training are likely to be more adaptable in their response to crises.(16) Health systems which are able to rapidly redeploy staff to areas of greatest need while maintaining safe staffing levels in routine services will be also more resilient. In this, the flexibility of the workforce in terms of its skill-mix and the demarcation and distribution of competencies is vital, and may be enhanced by policies to promote task-shifting between professional groups facilitated by new approaches to training and accreditation.

Crises put the workforce under enormous additional strain. Well-motivated and supported staff are more likely than poorly-motivated and supported staff to be willing and able to temporarily take on extra burdens during a crisis, thereby increasing the health system's resilience.(17) Resilience in this domain will also ensure that health care workers are kept safe while performing their duties. This may be achieved by the implementation of safety protocols and the maintenance of adequate levels of protective equipment and support for health workers' mental and physical wellbeing.(17)

2.4.3 Workforce: questions included in the pilot Framework

Pilot teams were asked to present a table with key data on the health workforce:

- *How many doctors and nurses are there per 1,000 population? How has this changed over the past 10 years?*

- *How many long-term care workers are there per 1,000 population? How has this changed over the past 10 years?*
- *How does average nursing, medical and care work pay compare to the living wage in the country?*
- *What are the vacancy rates different professional groups (doctors, nurses, care workers)?*
- *What is rate of inflow/outflow of doctors and nurses in the country?*
- *What is the rate of health worker absenteeism?*
- *What is the staff turnover rate in the health and care sectors?*

Pilot Country Teams were asked to provide a critical assessment of the sustainability and resilience of the health-care workforce, using the following questions to probe their discussion:

- *Is there a national approach to long-term workforce planning which takes into account future needs and risks to the availability of health and care workers (e.g. changes to immigration rules, brain drain, salary differentials, etc.)?*
- *Has the health system encouraged 'task shifting' between professional groups to improve flexibility and efficiency of services?*
- *Are data available on job satisfaction of health workers in the country?*

Pilot Country Teams were asked to use the experience of COVID-19 to illustrate answers to the following:

- *Can the number of health professionals, their workloads, and workforce reserves be increased/reallocated when the system faces a crisis?*
- *How is the safety and physical and mental wellbeing of the health-care workforce ensured during a crisis? For example, are there safety protocols in place and are these enforced?*
- *How many doctors, nurses and care workers have contracted COVID-19 at work? How many healthcare workers have died of COVID-19?*

In light of the analysis, Country Teams were asked what recommendations they would make to strengthen resilience and sustainability in this domain.

2.5 Domain 4: Medicines and Technology

2.5.1 Medicines and Technology for health system sustainability: key factors identified in PHSSR's pilot phase

Sustainability in this domain will be underpinned by fast, universal access to safe and efficacious medicines and medical technologies, which is a fundamental characteristic of all healthcare benefits packages. Medicines such as vaccines and prescription drugs play a vital role in maintaining and improving population health both during times of normalcy and during crises, as do technologies such as medical devices, sensors, electronic health records and virtual care platforms.(16)

Technological innovations can offer significant benefits which strengthen both sustainability and resilience and may face less obstacles to implementation relative to changes in other domains which require wider or longer-term organisational shifts. At their best, technologies can have profound, transformative positive impacts – for example in the treatment of cancer and other chronic diseases. Diagnostic technologies play a critical role in prevention and can enable early detection of disease and intervention before symptoms or complications arise, improving patient outcomes and reducing the cost of care, which can escalate dramatically in more advanced stages of some disease, underlining the importance of timely access.

Technological change can also be disruptive, and increasing costs – particularly of novel medicines and technologies – can be a significant driver of health expenditure, reducing the resources available for other uses and posing challenges to sustainability, particularly in lower-income contexts. Technologies with a negative cost-to-benefit relationship, or which are efficacious in clinical trials but ineffective in the local context (which may be due to other factors related to the health system which inhibit the effective utilisation of technology), are likely to undermine sustainability, as are the problems of inappropriate use, and low patient adherence. Furthermore, it is important that a medical model of healthcare heavily reliant on medicines and technologies does not detract from an emphasis on other beneficial interventions, for example in addressing lifestyle-related causes of disease, and the social and environmental determinants of health.

Medical and technology regulatory agencies are responsible for ensuring that rigorous quality, safety and efficacy standards are prioritised and systematically evaluated before new drugs enter the market for broader patient use. Sustainability in this domain will likely be underpinned by processes that ensure the rapid adoption of new therapies when benefits outweigh costs, guided by economic evaluations which take into account the broader economic and social effects of medical technologies, including the cost of disease, as well as the overall health budget and health system priorities.(34) Procedures will also be in place for the timely replacement of technologies which have become obsolete because they are less safe or efficacious relative to their costs compared to newer technologies, but care should be taken not to revoke access to these technologies for patients for whom they may remain the best treatment option.

Alongside this, health system sustainability can be improved through the utilisation of digital health services (e.g. remote consultations), with the potential to introduce efficiencies and expand access, but these must be well-integrated with physical services and take account of differing levels of technological literacy and access in the population.(35,36) Electronic patient records systems can enhance the quality and range of healthcare that can be provided and to improve access, timeliness and coordination of care.(37) Well-functioning and robust supply chains for medicines and medical technology are key factors underpinning the health system's ability to deliver its core functions in a sustainable way, in which digital systems play a vital role.

Finally, a health system's sustainability may be enhanced when the country has domestic capacity for research and development which brings therapeutic advances to patients, enhances clinical practice and contributes to economic growth. At a global level, sustainability will be enhanced when there are established processes for cooperation in the development and equitable distribution of vaccines and other critical supplies.

2.5.2 Medicines and Technology for health system resilience: key factors identified in PHSSR's pilot phase

A resilient health system will be able to secure the medical supplies and equipment it needs in order to respond to and recover from crises. Stockpiles of essential medicines will enable the system to respond quickly and avoid shortages,(17) but it is important that these are well-integrated with supply-chain management and do not lead to waste or inefficiency in distribution. Resilience in this domain may also depend on research and innovation capacity, the availability of domestic manufacturing capabilities and the establishment of alternative procurement channels for essential supplies (such as the Joint Procurement Agreement in the EU) that can be used to avoid shortages when supply chains and health systems face disruption in times of crisis.(17)

The use of novel technologies to manage and deliver services may also enhance resilience during a crisis. For example, the use of remote consultations during the COVID-19 crisis has helped absorb increased demand while keeping health professionals and patients safe from increased risk of infection. Protocols for accelerated marketing authorisation ensure that medicines and technologies effective against novel pathogens are brought quickly into use, without compromising on quality, safety and efficacy standards. Perhaps most strikingly in the current context, the rapid development and approval of effective vaccines for COVID-19 underlines the critical role that medicines and technologies play in enhancing health system resilience, as well as the importance of public-private and international collaboration in ensuring sufficient manufacturing capacity and equitable distribution.

2.5.3 Medicines and Technology: questions included in the pilot Framework:

To probe the assessment of sustainability and resilience of a health system's approach to medicines and technologies, pilot Country Teams were asked the following questions:

Adoption of health technologies

- *How many new cancer drugs have been adopted in the past 5-years?*
- *Do new medical technologies undergo economic evaluation by a regulatory authority before being made available, taking into account broader social and economic effects?*
- *Do economic decisions place limits on who gets access to new medicines?*
- *If these economic criteria exist (e.g. cost-effectiveness thresholds), are these regularly updated (e.g. in light of economic growth and inflation)? Additionally, are there exceptions to these criteria (e.g. orphan drugs, cancer drugs)?*
- *What are the timelines for processes of assessment and adoption of new medicines? Is there a delay in adoption beyond regulatory approval (EMA, FDA etc), and if so, for how long?*
- *Does the country have protocols in place for the de-adoption of low-value/obsolete medicines and technologies?*
- *Is there central planning and capital funding available to support the adoption of beneficial high-cost new technologies in hospitals?*

Digital health

- *How widely adopted and accessible are digital health services and innovative digital technologies (e.g. for remote consultations)? How well integrated are these with existing services?*
- *How are digital health services (e.g. digital primary care care) regulated and reimbursed vis-à-vis their in-person equivalents?*
- *Are measures in place to prevent the 'digital divide' (e.g. a lack of digital literacy among some sections of the population) from widening health inequalities?*

- *Is there a national electronic patient records system, accessible across primary and secondary care settings? If not, are different electronic patient record systems interoperable?*

Research and development

- *Does the country have domestic research and innovation capacity for developing new drugs, devices and other medical technologies?*
- *What proportion of total R&D expenditure is accounted for by pharmaceuticals and medical technology?*

Pilot Country Teams were asked to use the experience of COVID-19 to illustrate answers to the following:

Security of supply

- *Does the country stockpile emergency health supplies including essential medicines, medical devices and consumables to ensure continuity of supply during a crisis?*
- *Has the country participated in collective purchasing agreements for essential supplies with other countries during a crisis?*
- *Has the country experienced shortages of vital medical supplies (e.g. flu vaccinations, personal protective equipment)?*

In light of the analysis, Country Teams were asked what recommendations they would make to strengthen resilience and sustainability in this domain.

2.6 Domain 5: Health Service delivery

2.6.1 Service Delivery for health system sustainability: key factors identified in the pilot phase

Efficient and effective provision of health services is at the core of both the sustainability and resilience of a health system. Health services include primary, secondary and tertiary care services, public health, and may also include allied services such as pharmacies and laboratories.

To assist with the maintenance of sustainability in this domain, measures will likely be in place to monitor and improve services across a range of traditional efficiency measures (i.e. minimising unnecessary hospital admissions and hospital readmission rates etc.(26) Clinical guidelines and quality standards should be clearly defined and achievable, and providers' performance and adherence should be adroitly monitored in a way that enables corrective action to be taken when quality falls short. A holistic approach to quality improvement will enhance sustainability as it focuses finite resources to maximise health gain.

In order to ensure that every patient receives the right care, at the right time, in the right place, with the right team, with the right skills and technologies, based on each patient's unique needs and preferences, different areas of the health system must work together in a continuous and coordinated fashion, underlying the importance of holistic team-based care for patients with single and multiple chronic conditions. Integrated systems still require coordination to ensure an effective flow of services within a system.

Long-term sustainability of health service delivery may be underpinned by clear policies and programmes focused on prevention - especially of chronic diseases - delivered both through strong primary and secondary care and public health systems. In sustainable systems, the importance of prevention will often be reflected in the allocation of funding, and systems will be in place to monitor progress towards reducing the burden of chronic illnesses, with clear goals.

2.6.2 Service Delivery for health system resilience: key factors identified in PHSSR's pilot phase

Resilience in this domain will often be characterised by the ability of the health system to reconfigure services and increase capacity at short notice while at the same time maintaining the quality, safety and availability of routine services and integrating emerging evidence on best practice in order to maintain and improve services during a crisis.(16,17,38) As described in the governance section, this requires effective means of ensuring collaboration between sectors and levels of the health system. Resilient service delivery systems have responded effectively to the dramatic increases in demand (e.g. for ICU capacity) resulting from COVID-19, while mitigating the impact of the pandemic on elective care, and protecting patients and staff from infection.

Coping with surges in demand may require efficiency-enhancing responses such as shifting activity to lower-cost settings or changing the mix of health care professionals to deliver care.(17) However, the long-term pursuit of efficiency should not come at the expense of reductions to the overall resilience of the healthcare system, for example by reducing hospital bed capacity beyond safe levels required to cope with sudden surges in demand.(39)

While established care delivery pathways are important for service coordination and continuity during times of calm, if they are disrupted under crisis conditions there may be a need for the introduction of alternative pathways to ensure the accessibility of services, such as via the rapid and widespread adoption of remote consultations seen during the COVID-19 pandemic.(17)

2.6.3 Health Service Delivery: components of the pilot Framework:

To probe the assessment of sustainability and resilience of health system service delivery, pilot Country Teams were asked the following questions:

Efficiency measures

- *What are the readmission rates at hospitals across the country, and how have these changed over the last 10 years (include data on acute myocardial infarction if available)?*
- *What is the average length of stay in hospitals across the country and how have these changed over the past 10 years (include data on acute myocardial infarction if available)?*

Quality

- *Are there defined standards in place for clinical quality and patient safety?*
- *Is there a dedicated agency for monitoring quality of care across the health system?*
    - *If so, does this agency have powers to enforce quality improvements where standards fall short?*
- *Are there financial incentives in place in primary and secondary care for meeting quality standards?*

The role of primary care

- *What is the role of general practitioners in the system? (e.g. do they perform a gatekeeper function or are patients able to access specialist care directly? Do they substitute for specialist care?)*
- *Are there measures in place to promote the use of primary care as a patient's first contact point with the health system?*

Coordination of care and new care models

- *How well do different areas of the system work together and coordinate care in order to improve quality (e.g. between secondary, primary and social care to ensure timely and safe discharge)?*
- *Is there a country-wide strategy to promote new care models e.g. refocusing care away from the hospital and into the community to improve quality? Has funding shifted to promote such transformation?*

Focus on prevention and chronic diseases

- *Is there an explicit focus on preventive medicine and health promotion rather than treating problems once they arise?*
- *What national policies and programmes exist to reduce the incidence of chronic diseases? How much funding has been allocated to these?*
- *Are there targets/goals set to reduce the burden of chronic illnesses? Have these been met?*
- *Is the full cost of disease accounted for in the allocation of funding to preventative care?*

Maintaining services in a crisis

- *Have there been significant disruptions to care as a result of COVID-19 (e.g. deferred diagnostic services, surgery or other interventions)? Have any services been particularly badly affected?*
- *Did hospital capacity (and ICU and ventilator capacity in particular) have to be increased during COVID-19?*

In light of the analysis, Country Teams were asked what recommendations they would make to strengthen resilience and sustainability in this domain.

3. The PHSSR Pilot Country Reports: summary of key findings and methodological insights

The Production of the Country Reports

Using the pilot Framework as a guide, the Country Teams were asked to produce a narrative report based on desk research and consultation with health system stakeholders. In the Country Reports, each domain concluded with a set of policy recommendations to strengthen sustainability and resilience in that area, flowing from the preceding analysis of threats and weaknesses. Developed through a combination of desk research and consultation with stakeholders, these recommendations are preliminary and will be subject to further validation and exploration via engagement with stakeholders in the countries concerned. In addition, to generate insights on specific attributes of health systems relevant to their resilience and sustainability, the Country Teams were asked to produce two case studies, one focussing on means of strengthening resilience and sustainability by enhancing the quality of care, and one on means of optimising the location of care.

The aim was not to comprehensively cover all questions included under each domain, but rather to use the questions as a guide to produce a critical assessment of the Framework methodology and to identify the given countries' most representative strengths, weaknesses, and threats to health system sustainability and resilience in the domains covered by the Framework. The flexible manner in which the Framework was applied across countries was intended to enable differing national contexts to be taken into account, and has resulted in a rich set of findings across each of the reports. The reports vary widely in their scope and coverage, and the application of the Framework presented different methodological challenges in each country - to what extent the next iteration of the Framework should be adapted for application in different contexts will need consideration.

The Country Reports: findings and methodological insights

The following sections provide a non-exhaustive extract of themes emerging in the findings of PHSSR's pilot phase Country Reports, particularly focussing on the challenges to sustainability and resilience in the health systems studied. The findings of the reports are country-specific, and the reports should be read individually with the benefit of the context they present. The pilot phase has not been an exercise in measurement and comparison, and the findings do not allow for conclusions to be formed which are generalisable across settings. While the Framework has enabled the rapid production of Country Reports, the Country Teams inevitably employed heterogenous approaches. Not all of the lines of enquiry specified in the Framework have produced meaningful findings in each country, and not all of the findings have an equivalent across each of the countries. In several areas, the Framework asks for a subjective assessment of an issue or policy, and the Country Reports reflect the perspectives of the authors and the stakeholders consulted in their development. The reports are nonetheless rich with country-specific insights, and have enabled the identification of certain common themes, important distinctions, and strengths and weaknesses across countries, to inform the development of recommendations. Some of the recommendations generated may also be relevant across settings.

The process has also yielded important methodological insights, and the findings from its evaluation and feedback from stakeholders will be applied in PHSSR's future work. In addition to the limitations already highlighted, in general, it is clear that the Framework would benefit from greater specificity in some of the questions and lines of enquiry it includes. Clear and explicit guidance on how each element of the Framework relates to sustainability and/or resilience would assist Country Teams in utilising the framework to produce critical assessments, with a lesser emphasis on description. Providing a standardised template will assist with improving the comparability of the Country Reports, as will the specification of recommended sources, units and table formats, for example for the presentation of data on key trends.

The Country Reports have also highlighted important considerations not captured in the Framework itself across each of the domains, and elements of the Framework which were less useful. These are discussed in the relevant sections below. It is important to note that the design of the Framework should fit its purpose, and so questions relating to coverage need to be balanced with pragmatic considerations which account for some of the omissions. Finally, because the assessment of health system resilience in each of the domains was based on an analysis of the countries' response to COVID-19, the relevance of the findings to other kinds of health system shock or stress is worthy of reflection, and the Framework will need to be revisited in order to provide a means of assessing resilience prospectively, taking into account the factors which lend a system 'everyday resilience' to stresses, as well as shocks. Regarding the latter, adopting the heuristic proposed by the European Observatory on Health Systems and Policies, which considers a health system's resilience to crisis in terms of four phases (preparedness, shock onset and alert, shock impact and management, recovery and learning) may provide the basis for a more systematic approach to assessing resilience across each of the domains.(17)

3.1 Domain 1: Health System Governance

3.1.1 Health System Governance: key findings for health system sustainability

Strategic direction

Several of the Country Reports point to challenges in terms of leadership and strategic direction. For example, the Poland report, which provides an extended treatment of the governance of the country's health system, highlighted far-reaching issues. The report suggests that strategic direction is a problem, with major health reforms lacking continuity even under successive governments within the same political coalition. The report observes that, although there are a plethora of national strategies and programmes in health, many of these lack specificity and are not implemented due to a lack of sufficient resources or a lack of will among stakeholders. The Spain report also noted a weakness in terms of long-term strategy and a unifying vision for the health system, with annual budgeting mechanisms bound to the political cycle, hindering the adoption of a long-term perspective in planning. By comparison, both the Vietnam and Russia reports highlighted the strong, long-term alignment of government policies, institutions and strategies, with clear lines of delegation and accountability. The report on the French health system also emphasises the stability which is granted to the health system by its underpinning strong central institutions and a commitment to the principle of equity which is enshrined in law and reinforced by all health plans.

Centralisation vs. decentralisation

The challenges of aligning central and regional responsibilities in the system were common themes, particularly in the countries which are characterised by a high degree of decentralisation. In Italy, the report found that regional autonomy has created complexity, with often conflictual central-regional relations and significant disparities between regions in terms of hospital-centric nature of the Italian health system was identified as a factor impeding the full integration of care. Meanwhile the Spain report suggested that the high levels of autonomy enjoyed by the 17 Spanish regions in terms of the planning, financing, purchasing and evaluation of health services was a strength in principle. However, it also noted that there is a significant disjuncture and sometimes conflicting relations between the centre (which retains responsibility for raising revenue) and the regions, giving rise to problems of coordination.

Germany also has a decentralised governance structure, in which the Federal Government sets major national health policies and controls national agencies, State Governments create legal frameworks and regulations, and significant governance roles are afforded to care and insurance providers. This was found to contribute positively to the delinking of health system planning from the political cycle, and increased public trust in health system decision making. However, the Germany report also highlighted issues of coordination, with cross-sectoral coordination hindered by misalignment of planning of inpatient and outpatient services, which are the

responsibilities of states and regional Associations of Statutory Health Insurance Physicians, respectively. State-level decision-makers also have their own legislative and regulatory powers in health issues, and although they may not enact policies contradicting federal health law, the report found that this regional independence creates the potential for incompatibility in planning between sectors and regions. The report on England also highlights the challenges of balancing systems of central and local governance. In particular, it observed that there are tensions between the centre and local levels of the NHS, with simultaneous moves towards greater decentralisation of management and greater centralisation of measurement and regulation. The report notes that tensions between national policy and local delivery also affect public health, which has suffered as a result of reductions in funding at both national and local levels.

Fragmentation hindering co-ordination

Several of the Country Reports highlight issues created by the segmentation of the governance of the health system along sectoral lines. For example, the French report found that the system is fragmented in its management, with the central government and underpowered Regional Health Agencies, mainly responsible for the hospital sector, and the Social Health Insurance funds, which are in charge of the ambulatory care sector. Meanwhile local authorities have part responsibility for long-term care. The report suggests that this segmented approach to the management of health and social care complicates the coordination of primary care, hospital care and social services at the local level. The report also highlighted that the system is fraught with bureaucracy, and pointed to a need for harmonised quality objectives between central government agencies and local actors including care providers, local authorities and patients' representatives. Similar issues are noted in the report on England, which highlights the gaps between the NHS, social care and public health, while noting progress made in introducing joint planning between NHS providers, commissioners and local authorities in recent years. Lines of accountability and regulation were described as complex and bureaucratic, with NHS organisations regulated in some way by as many as 126 different authorities, with gaps and overlaps in areas of responsibility of regulators.

The Poland report highlights opportunities to improve coordination between sectors, institutions and stakeholders, and politicisation of public administration. The report identifies problems of siloed policymaking, a culture of 'hard-bargaining' which gives rise to a suboptimal allocation of resources with an excessive focus on cost-cutting and lean management, and a structural misalignment between the health system and policymaking. Furthermore, the report points to a lack of deliberative know-how needed for coalition building and consensus-based strategic planning, combined with ad-hoc conflict resolution, all of which contributes obstructions to the implementation of policies, with conflict – for example in the form of strikes - playing a major role in shifting policy. An inability to effectively implement policy is a major impediment to securing a health system's sustainability.

Accountability and public involvement in decision-making

Several of the reports highlight deficits of accountability. For example, in England, the role of formal local democracy in the NHS has been limited, and the report authors recommend a strengthening of mechanisms of public accountability. Unlike some countries, citizens do not have a legally enforceable right to a defined benefit package, and the report notes that services can be withdrawn without meaningful scrutiny. While the configuration of the German health system is very different in terms of how responsibility is allocated, accountability was also found to be an issue as a result of the transfer of power to non-state entities, although patient participation in health system governance has been rising. The Poland report also notes significant issues in this regard, including a fragmented and ad-hoc implementation of consultation institutions, and a legislative process which is unresponsive to input and feedback from stakeholders. While the Poland report provides the most in-depth analysis of these issues, other Country Reports also highlight issues of transparency and public accountability. In both Russia and Vietnam, lack of public involvement in decision-making was highlighted as an issue in need of attention. Vietnam has issued a wide variety of policies and run pilot programmes to drastically improve the health system, many of which demonstrate a progressive and

patient-centric strategy. However, monitoring and evaluation efforts seem to have been inadequate and inconsistent across the system, and public participation in this process is limited. The report suggests that this results in unclear lines of accountability and missed opportunities to make timely and evidence-based course corrections.

3.1.2 Governance: key findings for health system resilience

Planning and preparedness

In terms of preparedness, several of the Country Reports highlighted the lack of comprehensive and regularly updated response plans for pandemics, despite there being apparently well-developed public health infrastructures in place. For example, the UK's pandemic plan was predicated on pandemic influenza. Historic exercises had highlighted challenges to pandemic response including the effects of re-organisations, the lack of clear accountability arrangements and the lack of integration of public health in the NHS. While the UK had run a simulation to test the system's preparedness, it was not clear whether the findings of the exercise were acted upon. The report on Italy found that the pandemic preparedness plan dated back to 2006 and was hastily revised at the beginning of the outbreak, while the variability of plans at a local level resulted in heterogeneity of responses. In France, the report notes that at the onset of the pandemic a new taskforce was set up for designing a pandemic plan given that existing plans were acknowledged as being inadequate. Issues of preparedness were also highlighted elsewhere. In Spain, the authors found that the pre-existing surveillance systems and contingency plans were insufficient to contain the virus at the beginning of the outbreak. The Poland report found that, while there were established epidemiological surveillance and early warning systems in place, which ensured vigilance of the system at the very start of the pandemic, a premature assumption of success led to the dismantling of many emergency solutions, and insufficient contingency plans and redundancies for the impending second wave.

Compared to the other countries in our sample, Vietnam has had notable success in containing the spread of COVID-19. The report attributes this in part to the fact that, since the SARS 2003 epidemic, Vietnam has increased investments in public health infrastructure and established a national Public Health Emergency Operations Centre (PHEOC) and a national public health surveillance system. Four regional emergency operations centres are also established and this network coordinates response efforts to outbreaks. Nonetheless, the report highlighted a need to further strengthen early warning systems for risks and epidemiological threats.

Neglect of Public Health

Several countries highlight chronic under-funding and under-resourcing of health authorities relative to their responsibilities, particularly in terms of public health, social and long-term care, and agencies at the local level. This has a significant impact on the ability of the health system to discharge its functions effectively in normal times, and the issues it creates have been thrown into relief by the experience of the COVID-19 pandemic, emphasising their importance to health system resilience. The Poland report highlighted that the underfunding, and understaffing of public health institutions, together with missing communication links that enable effective pooling of data led to the systemic dysfunction. Parallels may be drawn with the UK, where the report found that public health capabilities have been eroded in recent decades as a result of funding cuts at national, regional and local levels and the centralisation of responsibility for pandemic preparedness and communicable disease control under Public Health England, which reduced capacity and capability in local public health teams. The decision was taken to replace Public Health England during the COVID-19 response, and the report notes that, at the time of writing, arrangements were as yet unclear for a new National Institute for Health Protection and the wider remit of public health in the system.

The report on France found that, while strong central governance allowed the rapid rollout of national measures to be put in place at the outset of the COVID-19 pandemic, especially for protecting the population from the negative economic effects of restrictive measures, the SPF (the body responsible for public health) has been

criticised for being undersized in terms of skills and staff, and too little prepared for a pandemic. The report suggests that the agency seems to lack expertise to build up and manage strategic stocks (including protective materials), and to develop quick operational responses to a health crisis. More generally, the role of SPF in designing and monitoring the public health strategy was described as weak. In Germany, the extensive network of around 400 local health authorities has been the backbone of the country's response to the COVID-19 pandemic and implementing an on the whole successful track-and-trace system. Despite this, and in common with other of the countries studied, the report notes that the provision of necessary resources and funding to the local health authorities has not been adequate and needs to be increased to reflect the key role they have been playing in containing the pandemic.

Decision-making and coordination

Several reports also pointed to fragmented governance as contributing to a lack of coordination of responses to the pandemic. For example, in France, the report observes that primary and long-term care providers were not part of the prevention and care strategy, and, despite success in increasing ICU capacity, a hospital-centric approach neglected the needs of other providers. The report also highlights the bureaucracy of relations between the Ministry of Health and local institutions, and difficulties of articulating health and social care policies at a local level, which have undermined the implementation of an effective test, trace and isolate strategy. In the England report, the authors noted that ineffective engagement between central government and local authorities contributed to the latter not having access to local test data from centrally organised home test kits and mobile testing sites until June 2020. Similarly, the establishment of the Joint Biosecurity Centre to inform decision making in response to COVID-19 appeared to give little consideration of the devolved nations or, at the time, integration of public health bodies. Despite this, the success of the UK's COVID-19 vaccination programme illustrates the potential benefits of a highly centralised response in some circumstances. More generally rules for public procurement appear to have been stretched if not broken during the pandemic. While in Russia the report found that the country had been successful in identifying threats and taking action early in the pandemic, and that there had been good communication via state channels, a cumbersome regulatory framework had increased the burden on the management structure, and the report suggests a revision of regulations for responding to health emergencies, for example to streamline the process for updating guidelines.

The report on Spain highlights several challenges in the country's response relating to governance. It notes that, despite the system's decentralised nature, when the central government makes decisions, there is no guarantee that these will be followed through at the regional level. This seemed to affect decision-making early on and throughout the crisis, reflected in disagreements about the intensity, timing and the method of applying lockdown measures between regions. The Italy report also highlighted the importance of coordination between sectors of the system to enabling a rapid and effective response, and the disparities that emerged between Italian regions which resulted in strong pressure on hospital services in some areas, with some regions being quicker in adopting national guidelines and regulations than others. This was demonstrated by marked differences in the time taken by regions to set up plans on the reorganisation of hospitals in preparation for the second wave of the pandemic. By contrast, co-ordination and information exchange between local, state and federal actors was identified as a strength of Germany's response. Despite initial setbacks, cross-sectoral coordination was identified as successful. For example, outpatient services handled many non-severe COVID-19 cases, relieving the strain on inpatient services. The France report also highlights that an effective information system, providing local level data on specific patient groups, appears to be essential for supporting healthcare providers and patients during a pandemic and assuring the resilience of the healthcare system. The report on Vietnam highlights that, while national-level leadership and guidelines were particularly strong and effective during COVID-19, they were not always met with continual and strict adherence at the local level, leading to oversights in pandemic prevention and control.

Scientific advice, transparency and communication

In Germany, the report found that health officials at the state and federal level sought and valued scientific expertise and implemented public health measures based on expert input. While there were some early policy failures, guidelines and regulations were regularly updated to reflect new knowledge and developments which have usually been communicated transparently to the German public. The quality and frequency of public and interagency communications were also praised in Russia and Vietnam. By contrast, while the Poland report found that there was a political will within the government to follow scientific consensus, the use of evidence and expert insight seems to have been unclear due to lack of transparency and consistency in decision-making. Notable was a dominance of politicians and administrators over experts in early pandemic responses. Without effective coordination mechanisms for decision making, resource deficits were amplified and public communications were inconsistent. The report suggests that there were large discrepancies in the number of COVID-19 cases reported between counties and regions, and that this led the government to a policy of informing the public only based on data collected at the central level. The England report also notes that the level of transparency and influence of advice and pandemic planning in policy decisions has also been criticised, and issues of transparency, communication and coordination have extended to the devolved administrations of the UK. Inconsistency of public communications were also highlighted as a weakness of the French and Spanish response.

Given the complexity of the issues, their context-dependent nature, and the diversity of governance arrangements in place in the countries studied, the recommendations are country-specific. It is clear that there is no single formula to address the issues highlighted. In terms of sustainability, they suggest that countries should pay particular attention to the harmonisation of objectives and the potential for greater collaboration and alignment of planning and management between regions, levels and sectors of the system. This should be matched by an emphasis on enhancing transparency, and democratic involvement and accountability in decision-making. Finally, it is vital to ensure that public health authorities – particularly at the local level – receive funding commensurate with their roles, the lack of which has been laid bare during COVID-19. While all countries have made constant adaptations to their approach to the crisis, France has demonstrated a commitment to learning the lessons of its response, with several public committees having been set up to investigate management of pandemic by the government. The reports on England and Italy make recommendations that similar inquiries be launched to identify lessons learned.

3.1.3 Health System Governance: considerations for the development of the Framework

The Governance domain of our Framework focuses on structures and processes rather than the content of policy affecting different health system functions in terms of financing, workforce, medicines and technologies and service delivery, the implications of which are explored in more depth in the respective domains. Governance of the health system is also heavily influenced by contextual factors which reside ‘outside’ the health system as we have defined it, such as political support and public acceptability; the fact that these were out of scope in the pilot phase is an obvious limitation.

The questions relating to governance structures and strategic direction in our pilot Framework have provided for insightful analyses by the Country Teams. Many of the issues highlighted in the Country Reports in terms of on-going sustainability relate to the complexity of health systems which require systems of governance capable of coordinating activities at multiple levels – national, regional and local – and across public health, primary, secondary and tertiary care, and social care. Several reports pointed to fragmentation and bureaucracy of governance arrangements, giving rise to challenges of coordination and accountability, in particular between central and regional or local health authorities, and between providers and regulators. While the Framework appears to have provided a useful guide to analysis in these respects, it does not include explicit questions on how the system of governance helps or hinders coordination between levels or sectors of the system, or questions of bureaucracy and administrative burdens, which could be added in a future iteration.

Although it emerged strongly as a theme in the Country Reports, the Framework does not include specific questions on the degree of centralisation or decentralisation of the health system or its implication for sustainability or resilience. Furthermore, the Poland report in particular demonstrates the importance of processes of policy-making and implementation which are not captured in the Framework, such as how rules of the system can prevent effective collaboration. While the Framework includes questions focussing on long-term vision and strategic direction which have been well addressed in the Country Reports, the Framework did not include questions relating to how policies and programmes are designed and evaluated, and how lessons learned are incorporated into future planning – nonetheless, several of the Country Teams emphasised the importance of this in their analyses. In general, how health systems make use of information warrants greater emphasis in the Framework.

The selection of questions relating to the quality of decision-making, in which Country Teams were asked for an assessment of how decisions are made in defining benefits (intended as a proxy for the overall quality of decision-making), was a pragmatic one intended to ensure the feasibility of producing the Country Reports within the timeframes available. Despite this, several Country Teams considered arrangements for ensuring accountability and transparency more broadly. Indeed, it cannot be argued that decision-making in HTA processes, is representative of decision-making across a health system as a whole. These questions will need to be revisited in order to identify indicators and questions that provide a more representative picture and provide a more explicit link to how decision-making processes in general contribute to health system sustainability and resilience.

The utilisation of COVID-19 as a critical case study in health systems resilience appears to have been an effective means of drawing out critical strengths and weaknesses of the systems of governance of each health system studied. Our reviews highlighted several lessons to learn from the countries' responses to COVID-19 in terms of both preparedness and the resourcing, coordination and communication of responses, and learning and adaptation. Significantly, several of the reports highlight a neglect of public health bodies, leaving them inadequately funded and resourced to mount an effective response: the adequacy of funding and support for public health was not an explicit consideration in the Framework, and future iterations should seek to better account for this. In addition, while several of the Country Reports discuss the impact of political factors on the quality of decision-making during the crisis, the Framework did not include explicit questions on this. Although difficult to measure, future iterations will seek to better take this into account.

3.2 Domain 2: Health System Financing

3.2.1 Key findings for Health System Financing: sustainability

Cost pressures and sufficiency of health care financing

Generally, insufficient funding for health systems to meet changing and growing population needs is a significant concern in many countries. Cost pressures arising from demographic change, medical innovation and novel treatments, and growing burdens of non-communicable diseases were identified as challenging the sustainability of health care financing in Germany, Russia and Vietnam Country Reports. For example, Germany has an older population than many comparable countries and since the statutory health insurance system depends on the taxes levied on employment, the health system's financial sustainability is particularly challenged by demographic change, but it is far from alone in facing these issues.

While such rising needs and cost pressures are pervasive, several of the Country Reports placed greater emphasis on the underfunding of the health system as posing a challenge to health system sustainability. For example, the UK report highlighted that between 2010 and 2016, cuts to the NHS tariff prices by 4% (in real terms) contributed to significant shortfalls in hospital revenue and led to 66% of NHS hospital trusts producing

a deficit in 2015/16 – and in 2018/19, just under half of the NHS trusts still produced an annual financial deficit. Under some circumstances, hospitals will receive bailouts from the government. A recent, high profile example was the announcement in April 2020 that the government intends to write off £13.4 billion of debt from over 100 hospitals. Although NHS frontline services have been protected from real-term cuts, there have been real-term cuts in spending to public health, social care, clinical training, capital, and research and development. The reports on Italy, Poland and Russia also noted the overall underfunding of their health systems. For example, in Italy since 2011, the NHS budget has grown less than the EU average, below inflation, and has not kept pace with growing healthcare needs. The Italy report suggests that this discrepancy has led to excessive pressures to contain costs and resulted in a lack of adequate provision of hospital beds, staff and technologies.

While each of the countries studied include some measure of user charges in the overall financing mix, Vietnam faces challenges of a different order to the other countries included in our sample. Despite efforts to increase the level of coverage of Vietnam's population by social insurance, out-of-pocket spending still accounts for 45% of overall health expenditure in the country. A lack of financial protection leaves the much of the population lacking access to needed care or exposed to significant risk of catastrophic expenditure. Partly as a means of generating additional finance for the health system, public-private partnerships (PPP) are being encouraged by the Vietnamese Government and Ministry of Health in numerous areas. Its aim is to simultaneously reduce burden on the public sector and ensure broad access to quality treatment in the context of growing healthcare needs. The report suggests that this shift in national strategy is a positive development, as cross-border, cross-sectoral and public-private cooperation is crucial to support Vietnam in achieving its health objectives. The Russia report also suggests the introduction of public-private partnerships as a means of alleviating pressures on state budgets. There may be lessons to draw from the experience of other health systems in our sample, for example the use of private capital as a means of financing healthcare infrastructure development in England's NHS.

Allocation of financial resources

Many of the issues highlighted by the Country Reports in the financing domain relate to how health care funding allocation decisions are made. The UK, Spain and Poland reports found that resource allocation decisions depended on central government spending priorities, and that there was a lack of transparency around these decisions. For example, in the UK, HM Treasury is responsible for managing competing demands for funding from sectors such as health and care, education and defence. The UK report found the underlying assumptions made by the HM Treasury in making resource allocation decisions were not clear and lacked a long-term view. As a result, there have been calls for greater transparency as well as independent assessments on the implications of health spending on the economy. In Spain, the Autonomous Financing System regulates the allocation of funds to the autonomous regions. The Spain report identified that the current system of allocation drives differences in per capita health expenditures of up to 50% between the best and worst funded region, and that there is an element of political discretion in funding decisions influenced by the political cycles. Similar regional health care funding imbalances were noted in the Russia report. The Poland report also noted issues related to suboptimal allocation of funding stemming from 'structural egoism' - rules of the system forcing actors to behave egoistically – leading to a breakdown of cooperation between the National Health Fund and providers.

Several Country Reports noted that the allocation of funding did not adequately take account of local need. The Italy report, for example, discussed how the regional distribution of national funds for health does not take account of local conditions such as deprivation, education, employability, and house and family conditions. The France report noted unintended consequences resulting from the segmented approach to health care where the division of budgets between providers – ambulatory care managed by statutory health insurance, and health care facilities monitored by the Ministry of Health – fails to account for the fact that expenditure decisions made in one sector have consequences on others. For example, care provision in the community may impact on the need for hospital care. The Germany report detailed a similar issue where the split between state government covering capital expenditure and health insurers covering operating costs has

led to inadequate investment in hospitals. Inadequate capital investment was also noted in the report on England, with capital budgets having been utilised to cover budgetary revenue shortfalls in the past.

Aligning financial incentives

The misalignment of incentives to improve efficiency in health care spending was also emphasised in several Country Reports. The Poland report elaborated on the detrimental system of financial incentives. For example, it was suggested that the overpricing of some health care services has led to highly specialised small local providers, reducing efficiency. Spain lacks a central agency to conduct economic evaluations on new medicines and technologies and the Country Report noted the lack of systematic evaluation of health system performance and outcomes. Similarly, the Italy report also identified the lack of focus on value-based care or integrated health care services. In France the introduction of a tailored DRG-based payment system in the mid-2000s was found to have boosted productivity, but it has also created new problems related to quality and appropriateness of care. The France report also highlighted the lack of coordination between expenditure targets and quality and efficiency objectives – payment mechanisms for health care providers that are paid based on volume tend to compensate for reduced revenues by increasing the volume of services provided. The UK report, however, identified more comprehensive financial incentives in place for quality improvement but recognised further room for improvement to support integration of care and prevention, suggesting greater experimentation and evaluation of reimbursement mechanisms which can promote population health while still retaining mechanisms to promote efficiency, responsiveness and quality.

3.2.2 Key findings for Health System Financing: resilience

Financial planning and risk management

The PHSSR countries reviewed the extent to which the current health care financing structures enabled them to respond to the COVID-19 pandemic. Issues related to financial planning were the most commonly discussed in the Country Reports. The UK report identified shortcomings in healthcare financial planning stemming from short-termism. In particular, the relatively low level of capital spending was highlighted. The report highlights that the UK's levels of capital expenditure in healthcare are significantly lower as a proportion of GDP compared to other OECD countries and this trend has been driven in part by NHS hospitals utilising capital budgets to address revenue pressures. This underinvestment has left the NHS with little excess capacity in terms of hospital beds, critical care capacity and diagnostics. Similar concerns were also raised in the France report, where the lack of funding rules for investment and prevention has led to underinvestment in public hospital infrastructure. Inadequate investment in capital was also noted as a limitation for health care resilience in the Germany and Italy Country Reports.

Improving healthcare finance risk management was also identified as a key factor to strengthen resilience. The Germany and France Country Reports identified strengths within the current system to mitigate financial risks. The France report viewed the current diversity of revenue sources as a factor that helps to reduce financial risks while the Germany report noted that the regulations requiring both individual statutory insurance providers and the National Heath Fund to hold financial reserves have enhanced financial resilience. German law requires funds to be held in reserve by both individual statutory insurance providers and the National Health Fund.

Financial flexibility and adaptation

Several PHSSR pilot countries were able to rapidly reallocate funding in response to the COVID-19. The France report noted that the Statutory Health Insurance funds (SHI) responded quickly in a flexible manner in response to COVID-19. The SHIs played a key role in facilitating and sustaining telehealth consultations by covering the full cost (no co-pay). In addition, SHIs introduced several measures to facilitate access to care to vulnerable groups such as people who are chronically ill, homeless or migrants on state medical aid, as well as protective mechanisms to help health workers faced with reduced income due to restrictions impacting

patient demand. The Germany report also noted that the SHIs were able to act quickly and flexibly in response to COVID-19 by utilising the funds' financial cushions. For example, in the first six months of 2020, over €7 billion Euros from the Health Fund reserve were spent on reimbursing hospitals for reserving beds, increasing intensive care capacities and other pandemic response measures.

The Spain, Italy, Russia and UK reports all noted that significant emergency funding was made available by the government for health services in response to COVID-19. For example in Italy, some estimations show how the Italian NHS has spent more than €12.5 billion in the crisis, while in the UK, HM Treasury's Summer Economic Update stated that a total of £31.9 billion additional funding has been approved for health services in response to the COVID-19 pandemic. In total, the Office for Budget Responsibility (OBR) estimates that the cost of policy interventions to combat COVID-19, including support to individuals and businesses through, furloughing, grants and loans during the pandemic is around £190 billion. This raises the question of whether greater investment in non-crisis times may have reduced the need to inject extra funds into the system, and thus overall spending, highlighting the tension between policies aimed at cost-containment and health system resilience, and suggestive of a need to avoid a short-term perspective in terms of health system efficiency.

3.2.3 Health System Financing: considerations for the development of the Framework

The questions in the Financing domain of the Framework focussed primarily on the characteristics of the system of financing itself in three main areas: revenue generation; pooling funds and allocating resources; and paying providers. While the application of the Framework has generated insights across each of the countries in these regards, it also guided the Country Teams towards an emphasis on description, not making explicit enough the linkage between each question and the concepts of sustainability and resilience. For example, while the Framework calls for the presentation of key data on financial trends, it does not prescribe means of assessing these trends in order to draw conclusions about health system sustainability in particular. The strength of the Country Reports is reflective of the skill of the Country Teams in applying their critical lens to these questions. In addition, the Framework did not provide a means of assessing the value delivered by health expenditure in terms of direct outcomes, or the relationship between investment in health systems, the health of the wider economy and wellbeing more generally. The next iteration of the Framework will seek to address these issues.

As with the Governance domain, COVID-19 provides an ideal critical case for the study of a health system's financial resilience. However, while the Framework included consideration of a health system's financial flexibility in times of crisis, in terms of its ability to make extra funding available, the Country Reports went beyond this, highlighting questions of financial planning and risk management. In particular, several of the reports highlight how a short-term focus on efficiency gains or cost-containment preceding the crisis had undermined the health system's resilience when the crisis hit. These appear to be of vital importance and will be considered as the basis for indicators in the next iteration of the framework. Furthermore, the Framework did not direct Country Teams towards a consideration of how well health systems are able to maintain funding for essential services during a crisis. Nonetheless, this theme came through clearly in several of the Country Reports and is a further consideration for the next Framework iteration. In addition, the Framework does not prompt consideration of the costs – in health, wellbeing, or economic terms - of implementing stringent measures to control infectious disease outbreaks.

3.3 Domain 3: Health System Workforce

3.3.1 Key findings for Health System Workforce: sustainability

The Country Reports each offer localised perspectives that together bolden the outlines of unfolding global concerns for healthcare staffing. With sudden rises in demand, these issues are brought into sharp relief: the experience of the pandemic has brought yet greater public and policymaker attention to existing fragilities in

staff capacity and distribution, and heightened longstanding concerns including the wellbeing of healthcare workers.

Workforce inflow and outflow: ageing workforces, workforce planning and training, and migration

In particular, the Country Reports suggest that ageing workforces, migration of (typically younger) clinicians, and workforce planning and training should occupy significant policymaker attention. Beneath these principal themes, the reports discuss a range of dynamics related to clinician deployment and distribution. First, maintaining an appropriate concentration level of specialist expertise for modern healthcare is an area of common concern. Many countries reported increasing levels of specialist physicians, and stagnating or declining rates of generalist and family doctors (general practitioners). A second theme intensifies this dynamic: regional disparities in healthcare staffing levels. Several reports note higher concentrations of clinical staff in urban areas, leaving rural areas underserved – particularly with respect to family doctors. The findings suggest that policymakers should redouble efforts to ensure equity of service outside regional population centres. Finally, many reports evaluate the relative success of task-shifting between different professional groups as a means of addressing imbalances, and explore the working conditions of healthcare workers and their job satisfaction levels.

In France, around 5.3% of the population work in the healthcare sector. The picture appears relatively healthy: there is an overall 4.5% increase in physicians since 2012, and the Ministry of Health is assured that there will not be any shortage issues in the nursing profession, with numbers of nurses per-person rising even in spite of the ageing population. Over the past twenty years, places in medical schools have steadily increased, and the same is true for training places for other clinical professions. Nevertheless, the report highlights that the ageing of the workforce is of some concern too: half of practising physicians are over 55 years old. An ageing workforce is also an identified problem in Poland**,** where the average age of a physician or nurse is 51. The Poland report describes studies demonstrating job satisfaction is lower among doctors with less experience, who are also more likely to consider moving abroad.

Ensuring inflow of new trainees exceeds numbers reaching retirement requires co-ordinated workforce planning. The Germany report reflects that effective workforce planning system is complicated by overlapping governance structures: different aspects of regulating and financing medical education are overseen by federal and state governments, and professional organisations. Frustrations with workforce planning are drawn out in the UK report too. Workforce planning is fragmented, localised and not sufficiently responsive to changing needs; a limited focus on compensating numbers leaving the profession with new trainees means it lacks sophistication in combining the range of supply- and demand-based factors; and there is a skew towards the NHS, with less focus on social care. As a result, solutions have been largely reactive rather than forward looking: a high reliance on foreign staff, with more non-UK trained doctors joining the register than UK graduates; high levels of temporary staffing; and a multiplicity of adaptations in skill-mix for the existing workforce.

The UK's high reliance on foreign staff to address its shortages is part of a global trend for migration of healthcare staff, which may be leading to imbalances. Spanish medical training is highly recognised across Europe, and there is a steady increase of professionals migrating to other European destinations, particularly to the UK and France. While the gap is currently being filled with other foreign professionals (often Latin American), there is a time lag in certifying professionals from outside the EU for practice in Spain. In Russia, for most of the past ten years, inflow has tracked slightly below outflow of staff, at least in the state sector. Recent policy initiatives have focused on creating of a single register for professional staff to facilitate better planning, and there is further scope for authorities to introduce a system for monitoring internal and external migration. Schemes for specialists to practice internships at top foreign hospitals allows them to broaden their skillsets and expertise on a time-limited basis, and to bring these back to practice in Russia.

Despite progress in expanding the health workforce in the last 10 years, the number of health staff per 100,000 people in Vietnam continues to be low by international standards. The Vietnam report notes that although the country did not face a shortage during COVID-19 owing to the effective mobilisation of human resources from other provinces and sectors, chronic understaffing issues impact not only the workforce's well-being, but also the success of key programmes such as grassroots healthcare strengthening and digitisation.

Regional disparities

Regional disparities in the healthcare workforce are outlined in the reports of France, Germany, Italy, Poland, Russia and Vietnam, and several describe policies including financial incentives for (especially younger) clinicians to practice in rural areas. With self-employed professionals free to choose their location of practice, the healthcare workforce in France is unequally spread across the country – leaving rural areas in particular underserved by both primary and specialist care. In Italy, southern regions under financial recovery plans typically see higher turnover rates of staff, while in Poland the greatest staff shortages are to be found in smaller counties located nearer to large cities where more attractive salaries are offered. The president of the National Health Fund (NHF) has introduced a range of measures, including financial incentives for more junior doctors to take up practice in underserved areas.

Similar measures in place in Germany as part of major legislative and regulatory reforms to combat under- and overprovision of care in rural areas since 2012. These have represented a significant step forward, but were limited in their overall effectiveness by flaws in the needs planning process. A case study on rural healthcare in the report on Germany offers a particularly focused evaluation of national policy that addresses many of the dynamics described above. Regional and urban imbalance is also pronounced in Russia, where good progress has been made through national programmes to attract clinical staff (particularly doctors and paramedics) to underserved regions, with 10,000 staff granted new housing under the programme in 2019. There is limited data on health workforce movement in-country in Vietnam, but the report authors note a tendency for movement from rural to urban areas. The government has targeted special medical training programmes for professionals in rural and remote areas, provided financial incentives, and even co-ordinated staff rotations at district and commune levels for staff.

Concentration of specialist vs. generalist expertise

The UK report in particular notes an increasing shift towards specialism among doctors in the past few decades, which may not be in step with the system's increasing requirement to manage the more complex needs of ageing patients with multiple long-term conditions. The report identifies an increasing tension between disease focused specialism and the generalist needs of the population, with smaller hospitals facing challenges due to fewer physicians with a generalist skillset. Nationally, while there has been an increase in hospital consultants, there are fewer general practitioners, with a shortfall of 7,000 GPs projected by 2023-24. This theme bears further international comparison. Since 2012, France has seen a total increase in its number of physicians by around 4.5%, but this is again driven mostly by hospital and specialist clinicians, with numbers of general practitioners stagnating. In Germany it is suggested that high workloads and the lower prestige of non-specialised medicine may be to blame for a lack of general practitioners in some areas, and the Spain report also describes a high number of vacancies in training places for general practitioners, geriatricians and public health workers.

Working conditions and job satisfaction levels

Working conditions and job satisfaction levels are a major contributor to sustainable healthcare systems. In France, a survey conducted before the pandemic outlined striking psychological distress among resident physicians. The report links difficult working conditions and low salaries with difficulties in attracting and retaining the healthcare workforce, with conditions particularly hard for nurses and long-term care workers. In Germany, despite high numbers of staff, caseloads remain high compared to the European average, and

while rates of job satisfaction are increasing for physicians, they are declining for nursing staff. The topic has gained some public interest, and policymakers have consequently introduced measures including removal of education fees for nursing trainees. Russia has in recent years raised the salaries of its clinical workforce, in an attempt to maintain inflow to these professions. The Italy report cites two relevant recent studies: one demonstrating an annual cost of workforce absenteeism at around €3 billion, and another showing differing sentiments between older and younger healthcare workers on conditions: while 51% tenured workers are convinced of the optimality of working conditions, the figure is slightly higher for young workers at 65%. The picture contrasts with research from Poland, where older doctors report higher levels of satisfaction – although only 8% reported a high level of satisfaction. Remuneration for specialist doctors here is the lowest in the OECD. In Spain, doctors and nurses also receive relatively low salaries compared to other developed health systems, and again this is cited as a factor in low levels of satisfaction and insufficient productivity. In Vietnam, the basic salary of the healthcare workforce is roughly equal to pay in other sectors, but data on job satisfaction levels are not currently collected in a systematic way. Several reports also describe a loss of professionals from the public sector to the private sector owing to higher salaries.

Task-shifting between healthcare professionals

To mitigate limitations in capacity and to tailor professional skillsets to the more complex care needs of ageing populations, task-shifting between nurses and physicians is a common area of policy focus. In Russia, this has been developed through its polyclinic programme, where nurses provide preventive, primary and outpatient care as well as rehabilitation and palliative assistance. The Spain report cites trials in hospitals of new models of staffing which promote and increase in nurses and healthcare support workers increase and in their clinical responsibilities (i.e. an inversion of the typical “top-heavy” pyramid with higher numbers of physicians at the top). Collectively the reports speak to a range of cultural, regulatory, and other structural barriers to facilitating shared responsibilities between nurses and physicians, and related professions including pharmacists and care workers. The report on Germany also notes significant legal hurdles to delegation, while the report on France suggests that flexibility is disincentivised by a task-based rather than competency-based definition of health professionals, remunerated on a fee-for-service basis. The England report includes a case study on skill-mix, highlighting how the the NHS used skill-mix and existing workforce flexibility to generate surge workforce capacity, and makes recommendations for its incorporation in future planning based on evidence-based guidelines. However, the case study also highlights that workforce flexibility is not an adequate replacement for a fully resourced health and care system, and notes its limitations as an effective policy response in a social care: a sector with the most severe shortfalls in low-paid, people-facing caring roles, and there is limited scope for substitution. In these circumstances, improving terms and conditions of employment is the only viable and sustainable option to addressing shortfalls.

3.3.2 Key findings for Health System Workforce: resilience

As drawn out by the reports, the experience of COVID-19 has brought into relief a number of issues central to the experience of health system resilience. Workers’ safety and wellbeing has been a primary area of concern, owing not least to the moral imperative of health systems to protect this, but also to the practical necessities of maintaining the required workforce numbers to care for people admitted to hospitals. Among policymakers, a primary area of concern has also been the rapid expansion of the workforce, and enabling the redeployment of staff at pace. This has necessitated a range of sweeping changes in regulation and policy, and placed immense demands on healthcare workers. In practical terms, the response has required emergency training to be organised to equip staff for working in new roles, and adhering with infectious safety protocols.

Wellbeing, infectious safety, and compensation

On the frontline of the pandemic response, health and care workers are placed at significant risk relative to the general population. The primary risk is that of infection. By late October 2020, the German Robert Koch Institute reported over 18,700 infections among employees of medical facilities. Towards the end of 2020, the Italian Istituto Superiore di Sanità had calculated that over 60,000 healthcare workers had contracted

COVID-19 at work. UK research showed that healthcare workers were more likely to develop severe symptoms than the general population, and the members of staff who have died with the disease signifies a disproportionate effect on people from a black or minority ethnic background. Russian healthcare workers who have died with COVID-19 are being commemorated within a national memory list project. Aside from the risk of exposure to the virus itself, caring for high volumes of very sick patients is detrimental to staff mental wellbeing. Programmes of support have been rolled out in many countries, including virtual access to counselling and telephone helplines. In Vietnam, staff were offered recovery in hotels after periods of intensive work, and the limited spread of the virus allowed for a degree of rotation for staff providing intensive treatment.

Policymakers in some countries have sought to address the effects of this heavy burden on frontline workers. In France, where workers in many public hospitals were already on strike before the outset of the pandemic, a national consultation was launched in May 2020 that offered some promise of improving care organisation and remuneration – though there has so far been little eventuating further investment in wages. In Poland too, the government has proposed large bonuses linked to salaries for workers who were redeployed to management of the pandemic, though the policy has had some challenges in its administration.

Expansion and redeployment of the workforce: policy and regulation relaxations

Rapid workforce expansion and redeployment of staff has required sweeping policy and regulatory changes, in many countries representing a significant break from business-as-usual guidelines. In some cases (e.g. mass adoption of telephone consultations, task-shifting between professionals), changes in practice happened overnight that until then had been progressing at gradual pace through modernisation programmes. UK regulators of clinical practice provided assurances to professionals working in new settings that investigations of adverse clinical events would be considered in light of the unprecedented circumstances. In Italy, as in several countries, regulatory barriers to practice were hurriedly dismantled in regions in urgent need of additional staff. This included the recognition of international qualifications, the permanent employment of all staff on fixed-term contracts, and permission for all medical graduates in possession of their licence to begin practice with immediate effect. Spain, the UK, and France sought to mobilise recently retired professionals to reinforce their workforce; in Poland a private enterprise developed a platform for retired physicians to practice remotely through telephone consultations, while nurses on career break were offered streamlined routes back into work. In France, there was some dissolution of competition between private and public healthcare, and staff from private facilities (particularly those without ICUs) were redeployed to public facilities. Eventually this gave way to further private-public collaborations in service delivery.

Rapid training and skill-mix

Targeted training in infectious disease, intensive care and crisis management was vital to repurposing and redeploying the existing workforce (and indeed, to assimilate medical students and returning retired professionals). The redeployment of staff was highlighted as a particular strength of the English response, something which is explored in particular detail in a case study on using skill mix in response to the COVID-19 pandemic. The capacity of the NHS in England was not exceeded in the first wave of COVID-19, as initially feared, and staff redeployment provided a clear contribution to that end. One clear success was the maintenance of capacity in ICUs – a key area of concern at the beginning of the pandemic. This would not have been possible if staff to patient ratios had not been maintained ahead of the pandemic, or if the nursing workforce (amongst others) had a more limited range of transferable skills. However, there is concern that this extreme change in staffing ratios compromised safety and left many working beyond their licence, rather than at the top of it. Moreover, the psychological strain of working in higher stress, less safe environments has been well-documented. However, there is emerging evidence that those who experienced redeployment feel confident in new skills. From a nursing perspective, if non-specialist nurses can maintain and apply the critical care skills developed when redeployed to ICU to their normal working environments, this may improve their capabilities and confidence in managing unwell patients. In primary care, it is possible the pandemic has empowered many nurse and allied health professionals, therefore accelerating nationally led efforts to adapt

skill-mix in primary care to better meet patient demand. It is important that post pandemic new skills are not lost, and that the NHS does not revert to the status quo.

A case study in the report on Poland also highlights a strengthening of the skill-mix approach during the COVID-19 pandemic. A lack of confidence in the idea of sharing of competences – which was prevalent in stable times – gave way to the need to build teams working together to guarantee professional patient care and mutual professional support during the health crisis. However, there have also been flaws in the response, for example, a study of new medical graduates working in healthcare in Poland showed that very few had prior training in crisis management. In Russia, a mobile simulation centre was developed to offer rapid in-situ training to medical professionals in practices of infectious safety relevant to covid-19 – an initiative drawn out in the accompanying case study. Rapid training for nurses redeployed to ICUs was also organised in France. Ensuring that emergency training is effective and scalable should be a priority area for policymakers to review - research shows that training efforts in Germany were subject to some disparities in provision, with inpatient staff and physicians offered more COVID-19 training than nursing staff.

3.3.3 Health System Workforce: considerations for the development of the Framework

The Country Reports each offer localised perspectives that together bolden the outlines of unfolding global concerns for healthcare staffing. With sudden rises in demand, these issues are brought into sharp relief: the experience of the pandemic has brought yet greater public and policymaker attention to existing fragilities in staff capacity and distribution, and heightened longstanding concerns including the wellbeing of healthcare workers. To facilitate this analysis, the Framework included questions on key trends relating to the long-term development of the healthcare workforce. While not presented uniformly in the Country Reports, this enabled the identification of workforce pressures and shortfalls in certain staff groups across countries and laid the basis for critical analysis by the Country Teams. A more developed Framework could guide the interpretation of these trends, making explicit the link to workforce sustainability.

In addition, the Framework enabled each Country Team to produce a strong analysis of how countries plan their workforces, and the inclusion of specific questions on task shifting, wages, job satisfaction and working conditions contributed to a rich analysis in each of the countries. However, several of the Country Reports also go further in highlighting geographic disparities in the distribution of the healthcare workforce, a lack of parity of esteem and reward for different categories of healthcare workers as important challenges to sustainability. Furthermore, several of the countries explored the implications of the balance of generalists to specialists in the healthcare workforce. These factors were not explicitly included in the Framework, and will be assessed for potential inclusion in the next iteration.

In terms of resilience, the Framework focussed on flexibility in terms of the ability to increase the overall size of the workforce, the availability of support mechanisms for staff, and staff safety. The Country Reports went further: considering how health systems had been able to rapidly train and flexibly deploy staff, for example, highlighting the importance of skill-mix in enabling a flexible response. A future iteration of the Framework could include a specific focus on this, and more granularity in terms of the strategies and policies available to strengthen workforce resilience. Utilising COVID-19 as a critical case study has underlined important strengths and weaknesses, but the Framework in its current form does not allow for prospective assessment.

3.4 Domain 4: Medicines and Technology

3.4.1 Key findings for Medicines and Technology: sustainability

Adoption of new medicines and technologies

Ideally, access to beneficial medicines and technologies should be quick, universal and stable over time. Technology confers no benefits if it is not adopted or accessible. However, given resource constraints and competing demands, a key question for health systems is how they make decisions on the adoption of new interventions (both technological and otherwise), and whether this assessment takes into account how they can help to build health system sustainability and resilience relative to other investments in other areas.

There are contrasting approaches to the adoption of novel drugs and technologies in the PHSSR sample of pilot countries with differing implications for sustainability in this domain. Many assessments of new technology today focus primarily on the effects of adoption. For example, in England all newly licenced drugs and medical technologies undergo an economic evaluation by the National Institute of Health and Care Excellence (NICE) which determines whether it should be adopted – and reimbursed – by the NHS. Depending on how it is applied, this process has potential advantages for increasing sustainability as only technologies with sufficient evidence of positive clinical benefit and cost-effectiveness will receive a positive appraisal. However, particularly since the 2008 financial crisis, many systems in Europe have focused on cost-containment, which may have led to a systematic under-valuation of health interventions, and decisions not to fund medicines even where societal benefits outweigh costs. Moving forward after the pandemic, health systems may be faced with greater budgetary constraints and austerity measures, which could pose challenges to the adoption of medicines and medical technology (especially for health systems which have been historically underfunded).

A closer examination of the case of England highlights the challenges involved. The report on England highlights that since foundation, NICE has used an incremental cost per quality-adjusted life-year (QALY) threshold to guide its decisions. Many argue that QALYs do not capture all the relevant external benefits from therapy, and may favour those with more treatable conditions and greater capacity to benefit. NICE does vary its threshold in certain circumstances, however, the baseline cost per QALY threshold of £20,000 to £30,000, set in 1999, has not increased with inflation, leading to a progressive devaluation (and undervaluation, relative to that in many comparable economies) of investment in new medicines, technologies and other interventions, out of keeping with methodologies for valuing investment in other areas of public spending. Furthermore, the process of assessment introduces a time lag of 2 years between marketing approval and the NICE appraisal, after which time the technology must be available to patients within 90 days.

Similarly, France subjects all novel medicines to a health technology assessment (HTA) which takes into account the added clinical benefit and the cost-effectiveness of the drug, as well as the price of comparable treatments. While the report highlights the strengths of a value-based approach to the adoption of new medicines, a drawback of the French system appears to be the length of time it takes for products to become available to patients following marketing approval. In recent years the process has taken an average of 500 days – more than twice the recommended 180 days target set by the EU. Poland meanwhile uses an explicit cost-effectiveness threshold of three times the per capita value of GDP which adjusts as GDP grows, and has established pilot programmes for hospital-based HTA. In 2019 it took an average of 989 days between EMA marketing approval of a novel active substance to its being reimbursed in Poland.

Such delays can have deleterious consequences for patients with conditions requiring time-critical treatment, suggesting a need to explore the potential for more flexible approaches to facilitate rapid access to new treatment options, which de-risk investment without compromising on evidential standards in terms of clinical effectiveness and safety. In this regard, France has mechanisms in place to ensure quick access to innovative drugs which have not yet been authorised on the market, called temporary access for treatment. This process has been identified as a potential source of inequity in access to innovative drugs, and an action plan has been

put in place to both increase equity of access and long-term accountability. This action plan made a number of recommendations, such as utilisation of conditional medical evidence reviews in the short-term, long-term monitoring of medications using real-world evidence, a focus on the extent of the added value and systematic involvement of patients' perspectives.

In terms of timely access, Germany is at the other end of the spectrum. For new medications, after regulatory approval, the manufacturer may take it to market in Germany immediately at a freely chosen price. This allows rapid access to new treatments without access limitations based on economic decisions, with evident benefits to patients. Within the first year after approval, an HTA process takes place in order to determine the relative effectiveness and appropriate pricing of the new medication. If an additional benefit is found, a price is negotiated based on the size of and scientific evidence for this, as well as prices in other European countries and the costs of the comparative therapy. If no additional benefit is found, the price is set at the level of the costs of the comparative therapy. Should these negotiations fail, the price is decided on by an arbitration board. Should one of the negotiating parties reject the price set, they may request an economic cost-benefit evaluation of the new medication. However, these evaluations must be financed by the requesting party, and no economic evaluations have been conducted through this process, creating space for the improvement of sustainability through the incorporation of regular, systematic economic evaluations into the HTA process. While new medications are adopted through this process, new and innovative non-pharmaceutical treatments and operating procedures may be adopted by hospitals without an HTA process, which the report suggests may encourage cost-effective innovation, as these new procedures are reimbursed according to existing DRGs.

Also included in our study was a cluster of countries which do not systematically undertake formal health technology assessment. Italy for example, enters into a price negotiation with the manufacturer of the new treatment to determine its price, and no formal cost-effectiveness thresholds are set. Despite this, the average time between the marketing authorisation and reimbursement for oncology drugs was found to be 248 days. In Spain, several of the autonomous regions have health technology assessment agencies, but these cannot make binding policy recommendations, and are limited to assessing clinical effectiveness as opposed to cost-effectiveness. It can take between 3 and 4 years between marketing approval and treatments becoming available. Russia takes into account cost-effectiveness in decisions on whether to adopt new drugs or not but does not adhere to fixed pre-established cost-effectiveness thresholds for economic evaluation, providing it with greater flexibility. Adoption of new drugs is relatively speedy, with average adoption times of 160 working days. HTA is still at an early stage of development in Vietnam, and the report highlighted unnecessary delays in the drug registration process affecting patients' access to new treatments, and lack of transparency in the establishment of the Reimbursement Drug List (RDL).

Digital health services and infrastructure

Progress towards the widespread implementation of digital health solutions varies markedly across each of the countries studied, but the challenges of keeping staff and patients safe during the COVID-19 pandemic has acted as a catalyst – particularly for solutions to providing services remotely (although it should be noted that many remote consultations take place by telephone). For example, Germany had included remote consultations into the statutory insurance benefit package in mid-2017, but a tiny proportion of consultations were delivered remotely in the first 21 months of the scheme. However, following a large number of patients making use of remote consultations during the pandemic preferences may have changed permanently. France also experienced exponential growth in online consultations during the pandemic following the health insurance funds' decision to fully reimburse remote consultations until the end of 2021. Teleconsultations increased from 1% of all consultations prior to the pandemic to 30% by April 2020. Uptake of "virtual" primary care consultations in England was also vastly accelerated by the pandemic. Meanwhile, the Russian health system had already seen a doubling in telemedicine consultations between 2018 and 2019, with demand increasing even more during the pandemic. Five Country Reports (including England, Italy, France, Poland, and Russia) recommended prioritising investment in digital health through international benchmarking and investment in the national telehealth infrastructure.

Several of the country reports identify underlying challenges to the full adoption and integration of digital solutions, despite significant investments in digital health and electronic health records. For example, in Vietnam, the development of telemedicine, electronic medical records and grassroots-level health information system have been prioritised. Although positive results have been achieved, there lacks an overarching national e-Health strategy that regulates and ensures the inter-operability of existing fragmented IT systems and databases. The report suggests that a comprehensive and regularly updated national health information system as well as national workforce database system are urgently needed to allow for more timely insights and long-term planning. The report on England notes that the health system suffered from poor integration and interoperability between the digital systems in primary, secondary, and tertiary care facilities. The report on Germany observed that it has very stringent data protection laws and has been slow in the adoption of digital tools. From 2021 new legislation will support the uptake of electronic patient records, and pharmacies, hospital and outpatient physicians will be required to connect to the new digital healthcare infrastructure. The Russia report highlights the need to resolve issues relating to security risks for data privacy and the need to provide internet access to small villages in order to avoid digital exclusion. Spain had already made major investments in shared medical record systems, personal health folders and other clinical management systems. The Italian report highlights the challenges around equitable access to digital health services due to a lack of familiarity with information technologies and limited internet availability in certain areas of the country. The Polish report also raises issues related to access to information technologies among certain sections of the population.

3.4.2 Key findings for Medicines and Technology: resilience

Security of supply: the need for smart stockpiles

Stockpiling of essential medical supplies can be vital to ensuring adequate supplies in a crisis, but can also introduce waste and inefficiency if they are not managed well. Almost all countries in our sample did not have adequate stockpiles of essential medicines and medical technologies at the beginning of the COVID-19 pandemic. Germany, for example, whose pandemic preparedness plans included recommendations for emergency health supply stockpiles did not have any at the onset of the pandemic. This may have contributed to shortages of PPE the country experienced during the first wave of the pandemic. The UK had stockpiles, but these were found to be insufficient, in some instances had expired, and lacked certain essential items such as fluid-repellent gowns. The response of the NHS Supply Chain to rectify the initial shortages was found to have been slow and confused. Following a decade of relatively generous stockpiles that were never used, Spain entered the pandemic with no essential stockpiles and also experienced shortages of PPE and other inputs.

The report on France notes that the country faced a similar situation having had large stockpiles since the 2009 H1N1 pandemic that were never utilised, it entered the pandemic with critical shortages in PPE, and reliance on international providers (especially China) prevented the country from quickly increasing national stocks. However, in a positive sign of resilience, France acted quickly to avert shortages of drugs used for induced comas and resuscitation by stepping up domestic manufacturing capability. Italy, which was the first country in Europe to experience a major outbreak of COVID-19, faced extremely serious shortages of vital medical supplies including PPE, ventilators and medicines. Meanwhile, Poland and Russia despite having some stockpiles found that these were not adequate to meet needs. One observation of the Germany report was that stockpiles may best be managed through an approach combining central and decentralised reserves to balance flexibility and preparedness, thus enhancing resilience.

Pharmaceutical R&D and manufacturing capacity

The Country Reports highlight the potential value of having domestic manufacturing capacity in upholding supply of vital medicines and equipment during a crisis, although whether or not domestic manufacturing capacity and a relative independence from international pharmaceutical supply chains are significant contributors towards sustainability and/or resilience will need to be pinned down by future research. For

example, France is Europe's third largest pharmaceutical manufacturer, with the industry generating revenues of €60 billion in 2019, with half of this consisting of exports. The France report notes that domestic manufacturing capabilities helped stem the tide of shortages of drugs used to induce comas and for resuscitation required for intensive care COVID-19 patients at the beginning of the pandemic. In Italy, France, and Germany, specific recommendations were made to support the production of health supplies and develop stockpiles for essential drugs and personal protective equipment. The Germany report, for example, calls for financial incentives to be put in place to keep pharmaceutical production in Europe, lessening dependence on other countries and global developments – such as disruptions to the supply of PPE experienced during the beginning of the pandemic.

A significant portion of the countries in the pilot phase retain important pharmaceutical research and development capabilities as well as pharmaceutical manufacturing capacity. In Italy total R&D expenditure was around 1.4% of GDP in 2018, with pharmaceutical R&D accounting for 7% of this total. The report on Russia notes that the government champions national discovery and production of pharmaceuticals with state support in place to finance costs from early R&D stage through to clinical trials and mass production. In 2018, Russia filed 2,000 patent applications for inventions in the field of medical technologies, 1,200 of those were in pharmaceuticals and 500 in biotechnologies. A 2016 review of the changing UK drug discovery landscape found that large pharmaceutical companies, which account for around 75% of total employment in the sector have been significantly decreasing their employment in drug discovery in the UK.

Development and joint purchasing of vaccines

Three of the countries in our sample have developed vaccines for COVID-19. German company BioNTech announced in November 2020 that its COVID-19 vaccine candidate had been proven to have over 90% efficacy. Germany is bringing new production centres on stream to increase its manufacturing capacity of COVID-19 vaccines. Similarly, England boasts the development of the Oxford University and AstraZeneca vaccine approved for use in the UK in December 2020. Russia is also among the countries to have rapidly developed and deployed a vaccine for COVID-19. If domestic development and manufacturing of vaccines allows a country to rapidly deploy vaccination programmes this will have evident benefits for its ability to protect its own population, but global health resilience relies upon international collaboration to ensure their equitable distribution.

Learning from the early setback around inadequate stockpiles and personal protective equipment shortages, European countries were quick to partner and establish a pooled purchasing agreement for vaccines under the stewardship of the European Commission. This was one the first multinational collaborations during the pandemic, after national priorities predominated during the early months of the crisis (for example in cases where exports of PPE were halted). By contrast, the UK decided to push ahead with an emergency national approval (through the UK's Medicines and Healthcare Products Regulatory Agency) to become the first country to authorise the BioNTech-Pfizer vaccine for COVID-19 in December 2020. Experience has shown that joint purchasing agreements can be extremely political and complex, which can undermine timely agreement and distribution. However, in order to reach an equitable solution such multi-country agreements are crucial.

3.4.3 Medicines and Technology: considerations for the development of the Framework

Emerging from the research there are evident challenges across the countries studied in harnessing the potential of medicines and technologies to enhance heath system sustainability and resilience, particularly in terms of the timeliness and likelihood of their adoption. While our Framework included several questions relating to how these decisions are made (for example whether economic evaluations of new medicines and technologies take place), it does not fully capture the nuance involved or a means of assessing which adoption strategies are most likely to contribute to a health system's sustainability. For example, while inclusion of a question regarding the adoption of new cancer drugs was intended to serve as a proxy for adoption of new medicines, the Framework could better reflect the health system's ability to adopt and make available a much

broader range of beneficial technologies, and could also explore the uptake of generics and biosimilars. It is important to consider how assessment methods can best answer this question, and avoid systematic bias or error – either in under- or over-valuing new interventions. This requires not only consideration of an intervention's budgetary impact and acquisition costs, but also the cost implications of non-adoption, taking into account the full value of health and cost of disease. This will be an important consideration for the next iteration of the Framework. Furthermore, the pilot Framework does not provide a means of assessing the actual utilisation of medicines and technologies in a health system, other than digital health services.

In terms of resilience, the Framework focusses predominantly on security of supply during a crisis. This is clearly vital, but the Framework lacks an emphasis on distributional questions which emerged in the Country Reports, or, for example, the extent to which different health systems are positioned to rapidly roll-out vaccination programmes. The question on stockpiling could be refined to better reflect the importance of the management of stockpiles being integrated with national supply chains to avoid waste, as was highlighted in the Germany report. Finally, while the Framework includes questions on digital health and the use of electronic patient records, the importance of telemedicine in enabling access to services to be maintained during a crisis, and the critical role of technology in ensuring that health systems have access to real-time data in order to inform their responses was not included – nonetheless these emerged as important themes in the Country Reports. As with the other domains, the utilisation of COVID-19 as a critical case study has enabled the Country Reports to surface many important considerations, but the Framework will need to be adapted if it is to allow for prospective assessment.

3.5 Domain 5: Health Service Delivery

3.5.1 Key findings for Health Service Delivery: sustainability

What stands out from the analysis of service delivery arrangements in our pilot countries is the high degree of overlap in the areas that represent the greatest challenges to sustainability across countries. By far the most commonly cited problem-area relates to the lack of continuity of care and poor co-ordination of care between different parts of the system. Notwithstanding this, most countries in our sample are experimenting with new care models in an attempt to improve the co-ordination of care with greater and lesser degrees of success.

A large subset of countries concludes that their systems are hospital-centric, a feature that negatively impacts on overall sustainability. Another problem area flagged by most of the countries are insufficiencies related to the organisation, funding and provision of preventive medicine, with most systems emphasising curative care rather than health promotion and prevention. Quality of care is monitored and assessed to varying degrees in the different country settings, but in a majority of the countries studied there are no enforceable measures or financial incentives to improve patient outcomes.

Co-ordination of care

In Germany, cross-sectoral co-ordination of care is complicated by different financing and remuneration systems and differing regulations enacted by various governance actors. Recent policy attempts to overcome this, such as novel care programmes for rare or complex diseases and integrated care contracts which aim to make provision of care between sectors more flexible, have met with limited success. Both Germany and France whose health system are based on free choice of provider have begun to experiment with offering a voluntary 'GP as gatekeeper' scheme. Partly, the aim of these gatekeeper programmes is to ensure better co-ordination of care.

In France there are a number of recent policy initiatives aimed at increasing local co-ordination between healthcare providers, and through the introduction of multidisciplinary group practices in primary care, which are coupled with new payment models allowing for costs to be shared between primary care providers and hospitals with the overall aim of improving the continuity of care along patient care pathways. The report

includes a case study on Nephrolor – an innovative, patient centric approach to the early diagnosis and coordination of care for patients with chronic kidney disease, which demonstrates how an effective information system, providing local level data on specific patient groups, can underpin collaboration and support healthcare providers and patients both during normal times and during a crisis.

While noting the challenges of co-ordination of care across the system, the report on England highlights the already extensive current practice of multi-disciplinary GP practices working together with community services such as mental health, voluntary services and others. In Italy, the report notes that co-ordination of care is not sufficiently developed, and highlights the shortcomings of primary care in what remains a highly hospital-centric system. However, it also notes that there are some positive examples of new care models being implemented in some of the regions: the report includes a case study on the management of patients with multiple chronic conditions through multi-disciplinary primary care centres, emphasising the potential benefits of this approach. Likewise, since 2015, Poland has implemented several co-ordinated care programmes for specific disease areas and multi-disciplinary primary health care hubs co-ordinating care pathways. Meanwhile, the Russian report highlights the fact that most of the onus of navigating through the system lies on the patient although some guidance is provided by primary care physicians.

Stemming from a lack of co-ordination across the system, the report on Vietnam notes a wide quality and accessibility gap between upper-level service providers in major cities and primary care facilities at the grassroots level. Many patients are thus inclined to bypass their registered local primary care centres and self-refer to hospitals, resulting in an overstretched public hospital system and high out-of-pocket spending, amongst various other issues that impact the health system's sustainability and resilience. Besides strengthening grassroots/primary healthcare, which is already high on the Government's list of priorities, ensuring an integrated cross-level collaboration between all stakeholders in the healthcare sector will be vital.

Lack of focus and funding of prevention and health promotion

A large subset of Country Reports highlights the fact that not enough attention and funding goes into preventive services. In Germany, for example, chronic disease prevention efforts are characterised by a wide array of actors with overlapping areas of responsibility, leading to an uncoordinated patchwork of preventive services. France has also suffered from a lack of focus on preventive care, and the report recommends that prices paid to hospitals should be reformed reflect the costs of best practice in integrating prevention and care coordination. Italy spends just 4% of health expenditure on prevention. As discussed elsewhere in this report, the chronic underfunding of public health in England and a misalignment of financial incentives has eroded the health system's capacity for prevention. However, some of the Country Reports also point to recent progress in strengthening prevention. Poland has instigated a preventive health programme which, among other things, provides free screenings for the early detection of a defined group of diseases. Similarly, Russia has multi-year programmes in place to strengthen early detection and diagnosis as well as policies to encourage healthy lifestyles.

Lack of incentives to increase quality of care

While a majority of countries in our sample have mechanisms in place to monitor quality of care, most highlight the fact that there is a general lack of enforcement powers. The France report, for example, highlights the fact that data on costs of providers are rare and benchmarking of efficiency and care quality is discouraged even where data is available. This limits the country's capacity to identify problem areas to improve care quality and efficiency. Germany's quality monitoring agency does not have any enforcement powers and the large amounts data collected on quality are not actively exploited for quality supervision and control. By contrast, Italy's National Outcomes Programme (PNE) has developed a sophisticated evaluation tool analysing 175 indicators on processes, outcomes and volumes of activity among others, to monitor and give impulse for corrective measures should regions fall behind with national or international benchmarks. No economic incentives are at play. Meanwhile the NHS in England has been under such funding pressures since the

beginning of austerity measures introduced in the wake of the global financial crisis that the focus has been almost exclusively on process efficiency at the expense of quality improvement and outcomes for patients, despite there being financial incentives in place such as via the Quality and Outcomes Framework (QOF) in primary care. On the other side of the spectrum, Spain does not systematically monitor or evaluate quality of care. Poland has an agency dedicated to monitoring the quality of care which monitors medical and quality of life indicators as well as more subjective indications relating to patient satisfaction surveys. Vietnam has a government agency dedicated to monitoring quality, but this does not have any enforcement powers. The Russia report highlights problems around patchily applied incentives to improve quality of care.

Even though the factors impacting negatively on sustainability in the service delivery domain cluster around these themes, the strengths described by the different Country Reports are mostly unique to each country. For example, several of the countries have policies in place to reduce hospital readmission rates. Reducing unnecessary readmissions has the potential to improve quality of care as well as reduce costs and therefore impact positively on sustainability. Average lengths of stay have fallen in several of the pilot countries over the past couple of decades. However, while this measure is often used as an indicator of efficiency, to what extent it boosts service delivery sustainability is unclear. England's strong emphasis on efficiency drives has led to average length of stay to decline to just 4.5 days by 2018/19. Meanwhile, France, Germany and Poland, are relative newcomers to the use of DRG's. France made changes to its DRG system starting in the mid-2000s and this has boosted productivity and has led to a significant decline in the average length of stay. In Germany, the average length of stay has fallen from 9.7 days in 2000 to 7.3 days in 2018. In Poland, the average length of stay had fallen to 5.3 days in 2019.

Both Germany and France considered patients' free choice of healthcare provider as a strength of their systems. However, both countries have since 2004 implemented voluntary GP-centred care programmes which obliges participating patients to use their primary care doctor as a gatekeeper. The extent to which these programmes have led to improvements in co-ordination and continuity of care warrants further analysis, but they appear to provide the benefits of both free choice and GP-centred care within the same system.

Several countries highlighted difficulties in ensuring the equitable distribution of healthcare providers across territories. Germany has implemented several policies in recent years to incentivise doctors to practice in under-served – often rural areas – while disincentivising away from overserved areas. Notwithstanding this, the German report highlights the fact that these policies have had little tangible impact on the distribution of physicians. Similarly, Russia has programmes in place to raise access to healthcare in rural areas, but a comprehensive review of the impact of these has not been published.

3.5.2 Key findings for Service Delivery: resilience

The pilot reports also examined the extent to which countries were able to respond to the extraordinary challenges posed by the pandemic. In particular, their ability to reconfigure services and increase capacity to deal with surges in demand while maintaining the quality, safety and availability of routine services were analysed through the lens of COVID-19. Mirroring the findings from the service delivery for sustainability section, the main challenges as well as resilient strategies to deal with them were neatly clustered around several themes. In particular, almost all countries in the sample had to scale down routine service to a greater or lesser extent in order to free up capacity for dealing with COVID-19 patients. Coupled with that, most countries actively increased capacity – in particular ICU capacity – as well as reconfiguring services to relieve pressure on inpatient facilities. Many countries faced initial PPE shortages which may have posed serious challenges for keeping healthcare staff safe from infection (see Workforce section).

Scale-back and realignment of routine services

While each country's particular setting is unique, the degree of overlap in terms of the way in which countries' service delivery capabilities were impacted by and reconfigured in response to the pandemic is striking. With the possible of exception of Vietnam, which was very successful in containing the outbreak of COVID-19 early

on, all the countries were forced to scale back elective procedures and saw a reduction in treating urgent non-COVID-19 cases. This is reduction has been associated with a backlog of cases that may take years to clear up and may require additional service delivery capacity to be built up in the coming months. Not all countries provided comparable data for the scale back of services, therefore it is difficult to draw direct comparisons. Germany experienced a relatively mild reduction in elective procedures thanks to effective cross-sectoral coordination which allowed outpatient services to take the strain off inpatient care services by handling many of the non-severe COVID-19 cases. Notwithstanding this, Germany saw a sizeable reduction in emergency treatments during the country's first lockdown (March and April 2020) – treatment for heart attacks, strokes, and transient ischemic attack was down by 31%, 18% and 37% respectively. England, by contrast went into the pandemic with an already overly stretched service delivery capability and was forced to cancel two million non-urgent surgeries and GPs were advised not to make routine referrals. By October 2020, more than 111,000 people had been waiting for routine hospital treatment for over a year. The NHS also increased its reliance on the private sector to allow it to continue to provide elective care. This disruption to services has led to a waiting list of 10 million patients waiting for elective care by the end of 2020, and the NHS is planning to agree a multi-year, multi-billion-pound contract with the private sector to help work off the backlog.

In contrast to Germany's success in relieving inpatient care by shifting non-urgent COVID-19 cases to the outpatient sector, France's primary care doctors at the beginning of the pandemic were left without case work due to a lack of protocols in dealing with non-urgent COVID-19 patients. Notwithstanding this, France was able to quickly develop public-private collaboration in order to relieve the strain on the public sector. These networks have allowed for referrals of patients (including COVID-19 patients) from public to private hospitals and for some private hospitals to take over routine surgery appointments. Italy also reported significant reductions in non-COVID-19 urgent care. Poland also put non-urgent elective surgeries on hold and saw a drop in patients accessing health care services for fear of catching the virus. A similar picture emerges from Russia where routine medical services, including preventive medical care, were put on hold during the first wave of the pandemic. Non-urgent elective surgeries were postponed but more urgent care including cancer care continued to be provided. Meanwhile Vietnam shifted to providing some medical assistance at home to patients considered to be highly vulnerable to a Sars-Cov-2 infection. For instance, follow-up medicines were delivered to homes of patients suffering from chronic diseases.

Increased capacity

Going hand-in-hand with the cancellation of or delays to non-urgent care, several countries in the sample decided to increase their ICU capacity in order to avoid the system being overwhelmed by the wave of COVID-19 patients. Whether or not these new facilities increased resilience is open to further investigation and research. While the German health system had been criticised in the past for having an excessive amount of vacant critical care beds, this relative oversupply stood the country in good stead during the first wave of the pandemic. The country drastically increased its supply of critical care beds further by reconfiguring existing facilities. France was able to quickly increase ICU capacities through extended authorisations for public and private hospitals to open new beds.

England, which had seen its hospital bed numbers more than halve over the last thirty years decided early on to rapidly increase its critical care capacity through the creation of temporary "Nightingale" hospitals. However, only a small number of patients were eventually treated in these facilities as staffing the extra beds became the constraining factor. Similarly, Poland repurposed the National Stadium in Warsaw into a temporary hospital. However, due to limited infrastructure, its services were limited to less severe non-symptomatic cases of COVID-19 many of which preferred to recover at home, which led to an under-utilisation of this temporary hospital. From the analysis provided in our Country Reports, it appears critical to balance the efficiency loss of vacant capacity against the benefits of instant surge capacity in the event of a crisis such as the COVID-19 pandemic.

Reconfiguration of service delivery - Telemedicine

In a positive sign of resilience, it is interesting to note that most countries drastically reconfigured delivery of healthcare services, with most countries significantly increasing remote consultations, often taking up the slack in reduced face-to face consultations. All countries studied experienced a sharp rise in remote consultations including online or via-telephone. Further research will be needed to establish whether the apparently resilient shift to remote consultations has had any beneficial or adverse effect on patient outcomes and unintended consequences such as excluding more vulnerable and less technologically-literate patients. On a related note, the UK report makes a recommendation that NHS England investigates the cost implications of providing services to different populations who prefer face-to-face versus remote consultation and vice-versa for primary care, and to adjust reimbursement mechanisms accordingly.

3.5.3 Health Service Delivery: considerations for the development of the Framework

In general, while the Framework has enabled the Country Reports to draw out many important strengths, weaknesses, opportunities and challenges in service delivery which are important in determining a health system's performance, the link to longer-term sustainability is not sufficiently explicit. In particular, there is a need for greater consideration of a health system's capacity to adapt how it delivers services to meet (and pre-empt) changing population health needs, and how it makes use of information to guide its decisions in this respect. Elements of our Framework employed to good effect by the Country Teams included those focusing on the role of primary care, coordination of care, implementation of quality standards and prevention. The questions relating to the efficiency of care were narrowly focused on readmission rates and length of stay: while this was a pragmatic choice, these questions yielded few significant insights and will need revisiting. Other factors warranting greater emphasis in the Framework included factors relating to utilisation, equity of access across geographies and socioeconomic groups, which were nonetheless explored to varying degrees by the Country Teams. The Framework will need further development to ensure that these can be systematically accounted for through its application. Whether or not the Framework should be developed further to include measures of population health or health outcomes will also need to be considered.

In the Framework, the questions relating to the resilience of health systems in terms of service delivery focused primarily on the extent to which countries had been able to maintain services during the COVID-19 pandemic. In particular it asked for Country Teams to explore whether there had been significant disruptions to care, and whether ICU capacity had to be increased. Clearly, these questions provide only a partial measure of a health system's underlying resilience, because they are closely bound to the extent of the pandemic's spread within a country. The latter is of course itself partially a reflection of the health system's resilience, in its ability to effectively respond to and contain the pandemic, but the pre-existing capacity and ability of a health system to ramp up capacity in acute care without negatively impacting other aspects of service delivery should be considered independently from the factors which might necessitate it. In other words, the developed Framework might ask not whether a health system had to increase capacity during COVID-19, but rather enable assessment its existing level of capacity and whether there are clear mechanisms in place to safely increase capacity when necessary. A further factor which was highlighted as of critical importance in the Country Reports was the extent to which health systems had been able to adapt their models of care delivery – for example through the introduction of telehealth, in order to maintain access to essential services. This was not an explicit consideration in the Framework, but the emphasis on this in the Country Reports suggests that it warrants inclusion in future iterations.

4. Conclusions

This is a pilot phase of work which aimed at developing a policy-friendly methodology to apply to the assessment of health care system resilience and sustainability accompanied with a number of case-studies to test the approach across a number of opportunistically sampled countries. The pilot phase was therefore as much concerned with the basic methodological approach as the country case-studies, although the latter are of course useful in their own right. Initial progress was aimed at agreeing practical definitions of resilience and sustainability that could be used within a methodological Framework. Having settled on definitions, this allowed a Framework to be developed based upon relevant domains and indicators. This Framework was then used to structure a questionnaire that formed the basis of each case study's descriptive analysis and policy prescriptions associated with the individual country's features of resilience and sustainability. The aim here was to allow a general Framework to be applied to differing health care systems which would highlight strengths and weaknesses of individual systems in terms of the characteristics of resilience and sustainability.

Reviewing the concepts of health system resilience and sustainability from first principles is itself a useful exercise. The initial finding that there is no agreed upon definition of these terms as applied to health systems, allowed some freedom to develop these concepts. There are obvious aspects of resilience and sustainability that should be included within any definition, but in seeking to be as general as possible to give as wide as possible policy application we focussed on five initial domains: Health System Governance; Health System Financing; Health System Workforce; Medicines and Technology; Health Service Delivery. For each of these we then populated the characteristics of these domains. This allowed development of qualitative descriptive aspects of each country's system in terms of resilience and sustainability which we pursued through a semi-structured approach across eight, opportunistically drawn countries: England, France, Germany, Italy, Spain, Poland, Russia and Vietnam. This allowed both testing of the relevance of the Framework and descriptions of the resilience and sustainability of these specific countries' heath care systems to be analysed. The process has highlighted both strengths and weaknesses in the Framework approach, in terms of its coverage, the relevance of the indicators questions it includes, and the practicability of its application. In particular, because of the Framework's emphasis on assessing health system resilience in terms of countries' responses to COVID-19, further development will be needed to develop means of prospective assessment.

The descriptive results of the Country Reports developed through the application of the Framework confirm that the majority of health systems studied were not adequately prepared in terms of our definitions of resilience and sustainability to cope with the shock to their systems imposed by the COVID-19 pandemic. Many were not adequately financed, given the persistent influence of the banking crisis of 2009 on public sector finances. But other worrying aspects were also at play. Governance systems were shown in many cases to lack leadership and clear strategies. In terms of COVID-19 pandemic responses perhaps this is an expected outcome, given that many systems are still "firefighting" in terms of their response. But it does highlight that existing strategies, in some of our case studies, had little specificity in terms of policy definition and/or implementation. In some countries the chains of command are far from clear when facing a systemic shock, with tensions between central and local authorities which impede responsiveness. Workforce shortages and clear statements of workforce planning seem to be absent in most countries, while workplace wellbeing appears to be a secondary consideration in a number of countries. In several of the countries studied there appears to be limited investment in aspects of health system capital, including in digital health and health technology assessment agencies. Finally, even within health care systems described as integrated such as England's NHS, coordination at various levels and across different aspects of service delivery were found to be lacking.

Such conclusions are indicative rather than authoritative in at least two ways. First, this is a pilot phase of work and we are still developing and improving our Framework and extending our case-studies, which were undertaken in a sample of countries which are not globally representative. This preliminary report will be followed by a full evaluation of the pilot Framework, and the presentation of an updated version, refined in light

of the findings of the pilot phase. Future work will further develop the qualitative approach by adding to the Framework domains and indicators, ensuring that they fit the needs of policy makers. We also wish to develop complementary indices of resilience and sustainability at the country level to allow aggregate relative performance in attaining and maintaining health care system resilience and sustainability to be measured. Second, this work was initiated largely as one of many responses to health system reactions to the COVID-19 pandemic. However, the pandemic acts only as a catalyst in raising awareness of health system resilience and sustainability. The characteristics that define health system resilience and sustainability will remain important to the fulfilment of health system objectives as countries move beyond the pandemic. Our on-going aim is to develop our partnership to build global cooperation across researchers, policy makers and implementors to further develop the Framework and other tools for the analysis of health system resilience and sustainability in a manner that allows the incorporation of empirically defined, best-practice in health system policy.

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