Flagship report

Learning health systems: pathways to progress

EDITED BY KABIR SHEIKH AND SEYE ABIMBOLA

Alliance for Health Policy and Systems Research

World Health Organization

The Alliance for Health Policy and Systems Research (the Alliance) promotes the generation and use of health policy and systems research as a means to strengthen the health systems of low- and middle-income countries (LMICs). As a WHO hosted partnership, we work together with organizations around the world to:

- Stimulate the **generation and synthesis of policy-relevant health systems knowledge**, encompassing evidence, tools and methods
- Promote the **dissemination and use** of health policy and systems knowledge to improve the performance of health systems
- Facilitate the **development of capacity** for the generation, dissemination and use of HPSR knowledge among researchers, policy-makers and other stakeholders

Throughout all our work, we prioritize and promote systems thinking, which recognizes that the whole of the system is more than its constituent parts. We also recognize the need to engage diverse actors and improve equity – we target our support to ensure better inclusion of and participation by women, those in LMICs and other historically under-represented groups.

Learning health systems: pathways to progress

Flagship report of the Alliance for Health Policy and Systems Research

EDITED BY KABIR SHEIKH AND SEYE ABIMBOLA

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Foreword

This report on Learning Health Systems comes at a time when many health systems across the world are grappling with successive waves of the COVID-19 pandemic. Learning has been a key variable in their response to this crisis. Whenever health systems have learned – from the experience of the first waves, from other pandemics and from available science and knowledge – they have coped better. On the other hand, the costs of learning failures have been high – measured in the devastating loss of lives and livelihoods and the destabilization of economies and entire societies. The importance of learning is not unique to the pandemic. Throughout history, the ability of health systems to learn has made the difference between success and failure in responding to health threats, creating the conditions for better health and implementing health policies and reforms.

Health systems must do what they can to maximize their potential to learn. This will not happen overnight, nor without conscious effort and political will. Building the learning capacity of health systems takes time and the investment of resources. But the benefits far outweigh the financial costs in the form of improved health system functions, greater adaptivity to change and ability to innovate, and ultimately, greater self-reliance. All countries must invest in learning, even if the returns do not seem tangible or immediate, since this is the surest path to stronger health systems in the future.

I congratulate the Alliance for Health Policy and Systems Research on this flagship report – a landmark document that outlines the different ways in which health systems can learn, and the steps that different stakeholders can take to help build learning health systems. The Alliance has built on the World

Health Organization's legacy of thought and action on health systems to develop a report that is a significant new contribution to the knowledge and provides an actionable framework for policy and practice. The case studies of different aspects of learning health systems make rich and instructive reading.

Out of the several calls to action in the report, I would like to emphasize three that have most relevance for leaders of health systems in low- and middle-income countries where the need and potential for learning is most pressing:

- strengthen domestic research capacity (especially for health policy and systems research and the social sciences) and channel these capacities into the resolution of health policy problems;
- invest in health system innovation labs and learning sites to maximize learning from real-world experiences of practitioners and programme managers; and
- listen to and learn from communities, especially those in vulnerable conditions for whom the stakes are greatest and for whom stronger health systems can have the most tangible benefits.

The pandemic has shown us again that there is no alternative for health systems but to become learning health systems. For this, we need to work collectively towards changing the culture of health systems to become more open to analysis and critique – the best route to improvement. We cannot afford to keep repeating the mistakes of the past.

Soumya Swaminathan
Chief Scientist, World Health Organization

Preface

There is widespread consensus that learning is crucial for the performance of health systems and the achievement of broader health goals. However, this consensus is not matched by shared knowledge and understanding of how health systems learn, or of how to improve health systems learning across different contexts.

Prior discussions on learning health systems have tended to focus on clinical care, rather than the broader health systems to which clinical care systems contribute. The Alliance is committed to advancing the understanding of health systems as being people-centred, rooted in society, and including the larger set of functions and structures that are intended to improve health. The ideas and proposals in this report build on and advance this broader view of health systems.

The report is aimed at an audience of diverse stakeholders invested in strengthening health systems, and aims to achieve two things.

First, to move towards a shared language and frameworks to discuss the problems and solutions of learning, as they apply to health systems. To do this, it develops the **science** of learning health systems by building on the significant body of existing theories and frameworks of learning organizations and outlining the potential benefits of improved learning for health systems. These concepts are supported by the existing research literature and illustrated with case examples of real-world experiences of learning health systems from diverse geographies and settings.

Second, the report seeks to advance **action** on learning – by providing stakeholders with clarity on steps that they can undertake to advance learning for health systems. Change is inevitable for health systems, and never has this been clearer than now as the world deals with the massive upheavals caused by the COVID-19 pandemic. Health systems that are learning health systems embrace change. They build their internal resources of learning institutions and human capital and draw on them, not only to anticipate and tackle shocks but also to drive change through innovation and active adaptations.

This report is intended to be a starting point for gaining a shared understanding of learning health systems as an actionable agenda. The hope is that it will spur useful conversations and fuel the movement for better informed, more analytical and more self-reliant health systems – especially in the context of low- and middle-income countries. We are confident that the report will stimulate further interest on the topic and provide a basis for broader exploration, experimentation and action. We also welcome feedback on the contents of the report.

David Peters
Board Chair, AHPSR

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Chair, Flagship Report
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Executive Director, AHPSR

Contributions and acknowledgements

List of abbreviations

CHW	community health worker
GVAP	Global Vaccine Action Plan
ESPISP	Emergency Social Protection Implementation Support Project
HIC	high-income country
HMIS	health management information system
HPSR	health policy and systems research
ICD-10	International Classification of Diseases 10
LMIC	low- and middle-income country
M&E	monitoring and evaluation
NCD	noncommunicable disease
NGO	nongovernmental organization
PMTCT	prevention of mother-to-child transmission
UHC	universal health coverage
USA	United States of America

Executive summary

BACKGROUND

Learning – at individual, team, organization and cross-organization levels – is fundamental to health systems strengthening and the achievement of health goals. Yet, many health systems, especially in low-and middle-income countries (LMICs), still do not have adequate capacity to generate and use the knowledge that they need to be effective. Investments in learning activities tend to be a remarkably small proportion of overall investments in health programmes and systems, and learning-focused activities have historically not found place or favour in budgets when compared with other health system priorities.

Why is learning so neglected? One explanation is that the many pressures on health systems crowd out the "softer" work of learning, which is perceived as having less immediate or predictable benefits. Another is that the conceptualization of a learning health system, its benefits and how it can be built have not been well articulated. This report, therefore, makes the case for such systems.

HOW DOES LEARNING OCCUR IN HEALTH SYSTEMS?

The report draws on theories of learning organizations and system learning to help understand how learning occurs in health systems. Health systems are complex, adaptive and people-centred, with multiple functions that have the ultimate purpose of improving health. Learning in health systems occurs at many interconnected levels – individual, group or team levels, and at organizational and cross-organizational levels. It is characterized by three distinct learning loops – single, double and triple – and occurs through three interconnected means: information, deliberation and action.

LEARNING LEVELS

Learning at the **individual level** entails information-gathering from different sources, gaining knowledge through experience, and interpreting the knowledge acquired. Health providers and managers in LMICs, for example, draw on data from health information systems and on research evidence as well as their own information

about their staff, facility and community contexts. In contrast, **team and group-level learning** tends to involve the collective interpretation of knowledge through dialogue and exchange, and the development of shared understanding about problems and solutions. Learning at individual and team levels is not, however, enough to influence learning at **organization- and cross-organization levels**. This requires the routine integration of knowledge and understanding to facilitate wider coordinated action.

LEARNING LOOPS

The aims and results of learning depend on the type of learning 'loop': single, double or triple. **Single-loop learning** can support changes in regular actions by adapting normal routines and practices, but tends to overlook the assumptions on which these are based. **Double-loop learning** goes further to question and influence frameworks, models and assumptions around problems and their solutions, and can drive deeper shifts in objectives and policies. **Triple-loop learning**, often referred to as "learning how to learn", challenges fundamental assumptions and improves the way in which the system learns.

MEANS OF LEARNING

Learning through information includes collecting and processing information, as well as taking steps for its deployment and dissemination. Common sources for health systems include routine health-information systems

How learning occurs in health systems – three dimensions
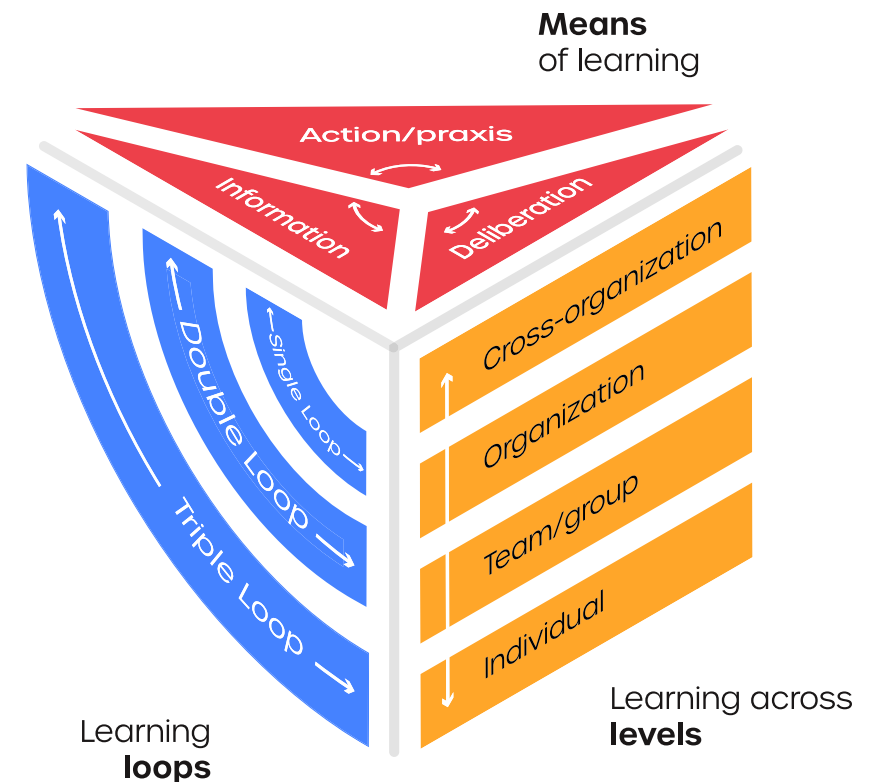
data, primary and secondary research, organizational documentation and community feedback. The resulting information can be used to inform routine or strategic decisions within the health system, for training and capacity-building, and for dissemination.

Learning through deliberation is essential to link past actions, their impact, and actions in the future. It also contextualizes problems and supports collective understanding on solutions. Within health systems, deliberation includes stakeholder consultations, collaborations and community and public engagement. The learning generated through such processes amounts to more than the sum of individual knowledge, as it is enriched by collective knowledge and insights.

Learning through action occurs when people learn through the practice and repetition of tasks and projects. Such learning often generates innovations and good practices that can be shared with other actors within or beyond the health system.

WHY DO WE NEED LEARNING HEALTH SYSTEMS?

First, **learning improves health systems functions** at all levels, enabling individuals, teams and organizations to enhance their regular practices and, therefore, perform their functions more effectively. Health systems that are informed by past experiences, deliberations and diverse sources of information are better equipped to adjust and modify their regular actions.

Second, **learning supports adaptation and innovation.** In an ever-changing world, the ability of health systems to anticipate and respond to change is crucial. Learning health systems that draw on available knowledge and recognize and correct mistakes are better placed to adapt their actions to meet contextual changes. Health systems that innovate successfully are often those that welcome experimentation and assess innovations for future use and scaling up.

Third, **learning supports self-reliance.** Learning health systems can set their own priorities, define their own frameworks for action, and optimize their use of existing resources, as they are less dependent on external actors.

HOW TO BUILD A LEARNING HEALTH SYSTEM

INSTITUTIONALIZING LEARNING
Institutionalization entails setting rules and establishing procedures conducive to learning at organization and cross-organization levels. Several measures can be taken to **institutionalize learning through information.** The consistent use of routine data to help guide decisions in the health system, for example, requires mainstreaming data aggregation and deployment across health system policy and service delivery. The integration of monitoring and evaluation (M&E) into different aspects of health system operations is another important step.

The use of research evidence is institutionalized by formalizing collaborative links between researchers and health system decision-makers through embedded research approaches, or by establishing policy research institutes. In some instances, specialized intelligence units may be established to help set priorities for action and investment (e.g. health technology assessment platforms), advance thinking on strategic areas (e.g. behaviour change research units), or to address priority problems (e.g. emergency prediction and response cells).

Institutionalizing deliberative learning entails different measures. Working groups and inter-ministerial committees are common examples of mechanisms to enhance understanding and promote consensual action across the health sector and other sectors. Deliberative platforms for community engagement and participatory planning, such as local health councils, are rich sources of learning from and with citizens and users of services. Communities of practice, including those using social media, can enable rapid discussion and solution-sharing among peer groups of health managers, planners or practitioners.

Finally, **institutionalizing experiential learning** involves such measures as setting up pilot schemes, learning sites and practice and innovation labs, with the potential to identify promising practices and scale up or diffuse innovations to other settings and across systems.

OPTIMIZING PEOPLE'S LEARNING CAPACITY
Building a learning health system also requires creating human skills and capacities to learn through formative or continuing education and using them effectively by engaging them in appropriate roles within the health system.

Health care providers, health managers and policy-makers, for example, need to be enabled to develop a range of relevant learning capacities, including interpreting routine data, synthesizing evidence, using the findings of M&E, team and participatory learning, identifying and scaling up innovations, and communication and knowledge management.

At the same time, strengthening the capacities of **communities, citizens and users of health services** facilitates their contributions to learning and includes health literacy. This means going beyond sharing public information on health services, rights and protections to develop the capacity of the public – particularly those from disadvantaged groups to engage with health systems in a meaningful way.

Building a learning health system also needs a critical mass of **researchers and analysts** who can contribute expertise and generate evidence on health systems and policy, as well as in specialized or strategic health system functions, and in non-technical skills such as working effectively with non-academic partners. It is crucial that the contributions of researchers are incentivized and aligned to health system priorities though relevant employment opportunities and funding.

Potential benefits of learning in health systems
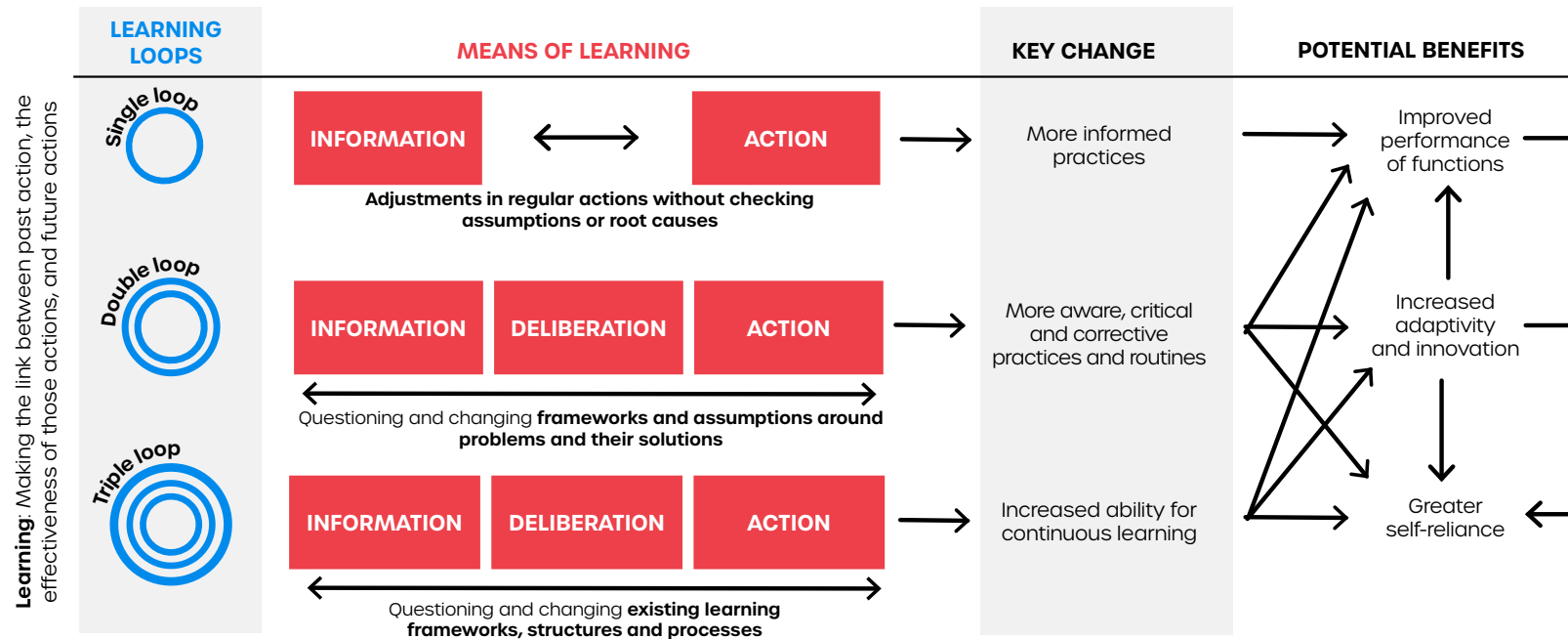
Finally, it is also important to nurture and develop the **teachers, trainers, mentors and methodologists** who will help develop capacities in these different learning arenas and continue to improve learning approaches in response to the evolving needs of health systems.

CREATING THE CONDITIONS FOR LEARNING

Leadership and culture are interdependent factors, both of which are vital for the development of a vision for learning, the establishment of learning structures and processes, and to spur collective action across organizations or systems

to identify and solve problems. A culture that is conducive to learning is characterized by teamwork and cooperation, openness to experimentation and mistakes, and an appreciation of differences and inclusivity.

System design can enable or constrain learning, with the quality of learning shaped by processes for governance and accountability, quality improvement, the deployment and mobility of personnel, priority setting and planning, communication, supervision and incentives. In a learning health system an active learning agenda and vision needs to be embedded in system design.

Learning health systems need the stable and long-term investment of **financial resources.** These need to cover the costs of establishing and sustaining the diverse mechanisms for institutionalized learning, and also of developing and deploying human capacities for learning effectively.

AN ACTION AGENDA

The learning needs of health systems are deeply contextual, with no single blueprint or framework. Even so, those needs are urgent and demand immediate action by key stakeholders.

Health policy-makers and planners can take the lead by developing and implementing a learning strategy for the health system, support it through a framework to track progress, and back it with the necessary resources. They are also best placed to strengthen the institutionalization of learning at all levels of the health system; ensure that it absorbs, deploys and retains people and teams with relevant learning capacities; and help strengthen the learning capacities of in-service personnel.

Health programmes and health workers can strengthen team-based learning and on-the-job mentoring, establish learning sites and participatory learning initiatives, and develop communities of practice and solution-sharing platforms.

Community representatives and civil society organizations can strengthen platforms for participatory planning and governance, amplify the voices of citizens and service users, and participate in and drive shared learning.

Building a learning health system
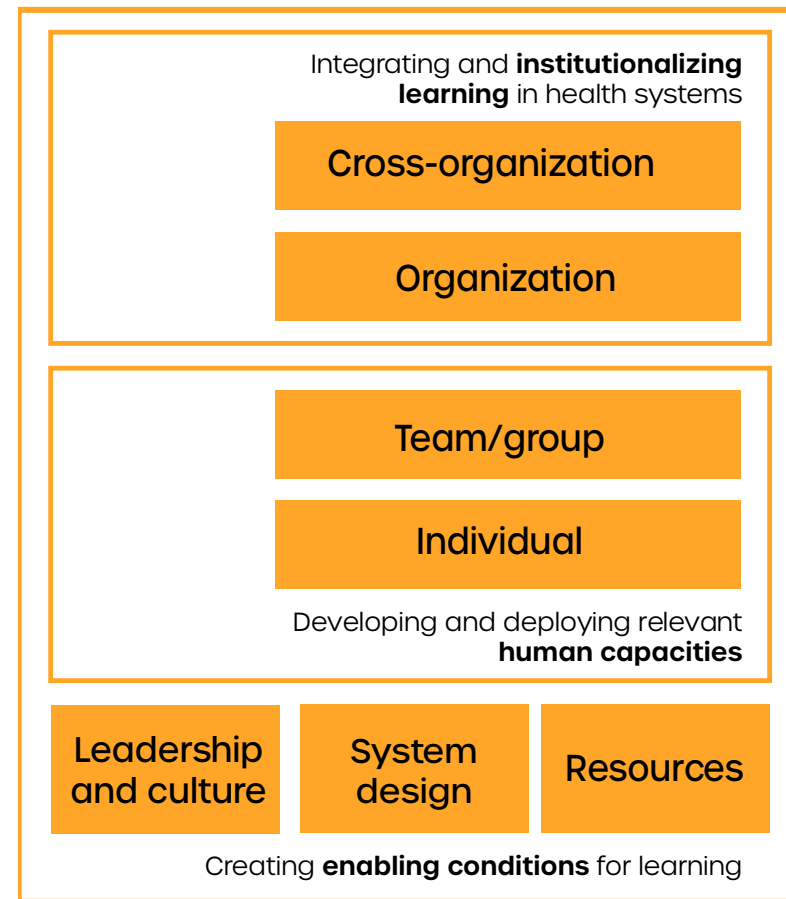
Integrating and **institutionalizing learning** in health systems

Cross-organization

Organization

Team/group

Individual

Developing and deploying relevant **human capacities**

Leadership and culture

System design

Resources

Creating **enabling conditions** for learning

Research leaders and organizations can collaborate with policy-makers to establish platforms for policy and systems research, as well as evidence synthesis and use to meet knowledge needs. Research councils and universities can widen their focus to include interdisciplinary and applied policy and systems research, building research capacity in these areas to meet the learning needs of health systems.

Educational councils and professional training institutes can build the capacities of future health professionals and health-sector personnel in key learning areas, including M&E, data management, communication and knowledge management, research methods and evidence use, innovation management, participatory learning and team-based learning.

IN CONCLUSION

To paraphrase a well-known saying: a system that does not learn from history is condemned to repeat it. Learning is a forward-looking and actionable lens through which to view the agenda of strengthening health systems. Ultimately, learning represents a means for progress and empowerment for health systems - especially those in low- and middle-income countries – by developing the inbuilt ability to generate and use the knowledge and skills they need to constantly improve and perform.

Case studies illustrating different aspects of the learning health systems concept

Case study	Individual and team	Organization and cross-organization	Single loop	Double loop	Triple loop	Information	Deliberation	Action and praxis	Improved system functions	Adaptivity and innovation	Self reliance	Institutionalizing learning	Optimizing learning capacities
Barbados — Co-developing a climate-informed dengue early warning system		X		X		X				X		X	
Benin and Guinea — Using digital tools to advance learning among health district management teams	X		X		X								X
Burkina Faso — Learning from experience for the abolition of user fees for women's and children's health care		X					X			X			
China — A learning approach to strengthen neonatal care in poor counties				X			X			X			
Georgia — Deployment of evidence in the national response to COVID-19		X				X			X			X	
Ghana — Health systems learning at sub-national level to establish nurse anaesthesia training		X						X		X	X		
Guatamala — Learning for participatory governance in the national health system	X			X			X						X
India — Learning from the Nipah virus outbreak to inform the COVID-19 response in Kerala	X		X						X				X
Indonesia — Learning for health equity: the DaSK dashboard for universal health coverage			X			X						X	
Lebanon — Learning to get a fair deal for hospital care								X				X	
Mozambique — Addressing neonatal mortality through a peer-to-peer learning intervention at district level	X							X	X				X
Nigeria — How experience with Lassa fever helped the country prepare for COVID-19				X		X					X	X	
Republic of Korea — Learning from the MERS experience for a rapid response to COVID-19				X				X	X				

CHAPTER 1.
An introduction

INTRODUCTION TO THE REPORT

Learning – at individual, team, organizational and cross-organizational levels – is fundamental to the strengthening of health systems and the achievement of health goals. Discussions on what makes a learning health system first emerged in the 2000s – beginning with the report on such systems published by the Institute of Medicine (2011) (now the National Academies of Medicine) of the United States of America (USA). However, these discussions were initiated and continue to take place predominantly in high-income countries (HICs) (Fig. 1), and with a narrow focus on clinical care contexts. The need for learning health systems in low- and middle-income countries (LMICs) has not been adequately addressed.
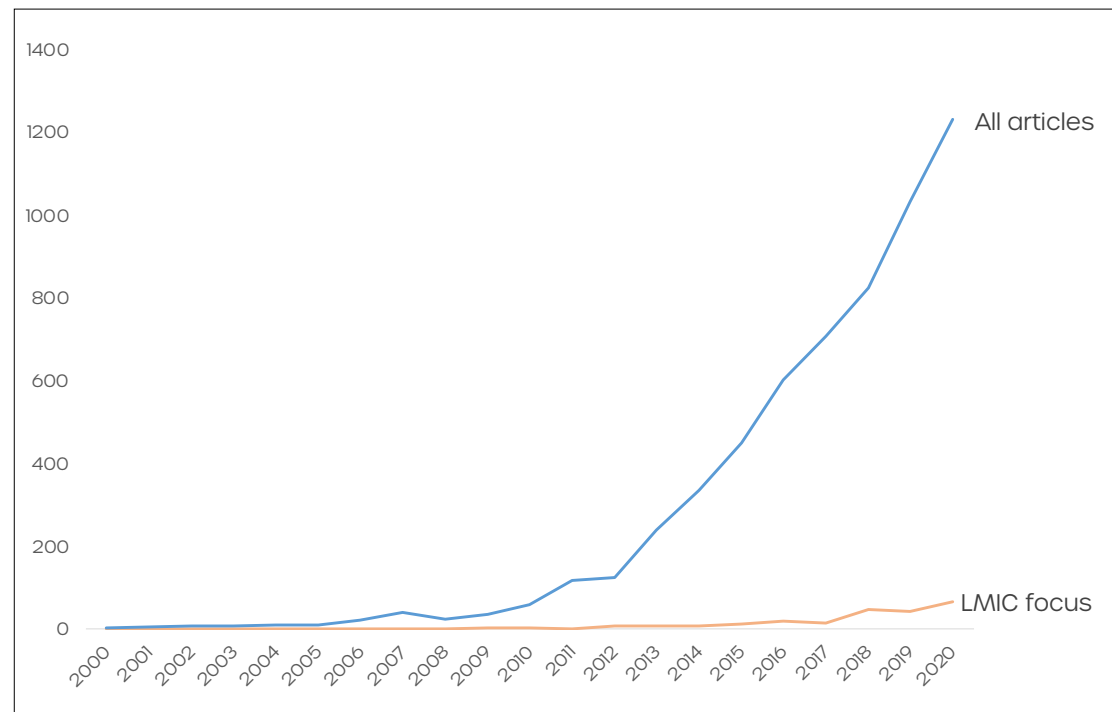
Fig. 1. Peer-reviewed publications with "learning health system(s)" in the title or abstract (2000–2020)[1]

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[1] Based on a search of Google Scholar performed in July 2021. Excludes citations and publications for which there was no year of publication available. An "LMIC focus" is defined as an article that has a title or abstract containing any variation of the term "LMIC" or containing any country name from a country listed by the World Bank as a low- or middle-income country.

Health systems the world over have suffered from the many adverse effects of policies and practices that were not adequately based on relevant knowledge and experience (Dunlop, 2017). The future will bring new and testing challenges and continuing to neglect learning will have severe consequences for health systems and people's health and well-being. There needs to be a radical increase in the prioritization of learning in the context of health systems so that they can better respond to current and future challenges. Equally, health systems – particularly in LMICs – need to develop the inbuilt capacities to continue to learn for the future, i.e., to become learning health systems (Sheikh et al., 2020).

But what does it actually mean to be a learning health system? Learning is a complex concept, and constructive discussions and action on learning health systems are held back by the lack of a shared and comprehensive understanding of the issue. This report seeks to fill this gap.

The learning health systems concept set out in this report is new and unprecedented, and reflects an attempt to develop a comprehensive, cohesive and sound framework for further thought and action on a topic of critical importance. This introductory chapter outlines the rationale and objectives of the report, clarifies key terms, and elaborates on the report's focus on people and equity. Chapter 2 draws on theories of learning systems and learning organizations, and frames learning across three dimensions – levels, loops and means of learning. Chapter 3 outlines the key potential advantages for health systems that improve their learning. Chapter 4 sets out what is needed to build learning health systems by institutionalizing learning, optimizing people's learning capacities, and creating enabling conditions for learning.

Finally, Chapter 5 outlines the broad actions that different groups of stakeholders can take to advance learning health systems (in a country, province or district).

THE USE OF "HEALTH SYSTEMS" IN THIS REPORT

Before elaborating on theories and concepts of learning, and how they can be applied to understand learning health systems, it is important to clarify what is meant by the term "health systems" in this report. All too often, health systems have been taken to be synonymous with health care systems or health services (Institute of Medicine, 2011; Smith et al., 2013). Some initiatives that use the terminology of learning health systems have focused on decision-making in health care settings, reflecting the conflation of "health systems" with "health care systems" or "health services" (Olsen et al., 2007; Institute of Medicine, 2011; Smith et al., 2013). This report, however, adopts a broader understanding of health systems.

The global health and development community has, for the past 30 years, advanced and applied an understanding of health systems that extends beyond health care services, to include *multiple functions* that provide mutual support for each other (WHO, 2000, 2007, 2011). Furthermore, the "health system" is not synonymous with the health sector. A health system promotes, restores and maintains health (WHO, 2000), not only through direct efforts to improve health but also through efforts to improve the determinants of health, many of which lie outside the health sector itself (WHO, 2000, 2007, 2011; Witter et al., 2019a, Witter et al., 2019b). A health system is most simply described as being made up of component parts (e.g., stakeholders and organizations), and interactions (e.g.,

functions) that promote, restore and maintain health and that, taken together, form a unified whole (WHO, 2000).

Health systems are ultimately *social systems* that reflect the way in which societies organize themselves and are, in addition to the tangible structures and functions mentioned above, driven by their *software* – the "ideas and interests, values and norms, and affinities and power" (Sheikh et al., 2011:2) that shape all human behaviour. People are central to the functioning of health systems — as policy-makers, implementers, managers, providers, community members and service users. Health systems operate through complex and interlinked webs of relationships among different actors — and their performance depends on the nature and quality of these relationships (Abimbola et al., 2014; Sheikh et al., 2014a, 2014b; Whyle & Olivier, 2020).

Finally, health systems are *complex and adaptive*. In other words, they self-organize, change, adapt and evolve with time. They are *complex* in that they have multiple interacting structures and functions that are tightly linked and interconnected, and are, therefore, governed by both positive and negative feedback. Health systems are *adaptive* because their structures and functions communicate with one another, and because they change and adjust on the basis of feedback and experience. This means that change and adjustment are non-linear and unpredictable, and may sometimes be counter-intuitive (De Savigny & Adam, 2009).

In summary, health systems (as referred to in this report) span many functions and structures that aim to improve health, are embedded in society and reflect its dynamics, and are both complex and adaptive.

A FOCUS ON PEOPLE AND EQUITY

Just as health systems are rooted in society and in people, learning in health systems is people-centred. It involves people first and foremost – as individuals, in groups or teams, and as part of organizations within the larger system. Learning in people-centred health systems must, therefore, be informed by people-centred values such as equity, justice and solidarity (Sheikh et al., 2014b; WHO, 2015). It is important to recognize that not all learning leads to positive change in health systems. Some types of learning may lead to maladaptive change and to undesirable outcomes, and it is important to identify the values of a learning health system and emphasize the need to learn to advance those values. A focus on people and equity underpins the concept of learning health systems throughout this report, expressed as follows:

- by recognizing and promoting the role of people – with diverse roles in health systems – in creating and benefiting from learning;
- in broadening the scope of kinds of learning that are recognized and valued by health systems – embracing codified information as well as deliberative and experiential means of learning based on human relationships and experiences; and
- by identifying health equity as a key goal of learning health systems – advancing ways and types of learning that improve policies and practices that, in turn, advance health equity.

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CHAPTER 2.
Conceptualizing learning in health systems

LEARNING DIMENSIONS

While health systems are constantly adjusting and changing, they are not always learning. All learning entails change, but change does not necessarily entail learning. True learning has been defined as "the development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions" (Fiol & Lyles, 1985:811).

Learning in health systems can, therefore, be said to occur by **making the link between past actions, the effectiveness of those actions, and future actions**. In making that learning link, the knowledge within a system (or knowledge held by individuals, teams and groups, or organizations) is restructured or enhanced as they anticipate, prevent or solve problems (Stiglitz, 2001).

Theories of organizational and system learning have value in conceptualizing how learning occurs in health systems. First, Crossan and colleagues' *4Is* model of organizational learning (Crossan et al., 1999) helps us to understand how learning occurs at multiple interconnected levels – individual, group or team level,

Fig. 2. How learning occurs in health systems – three dimensions
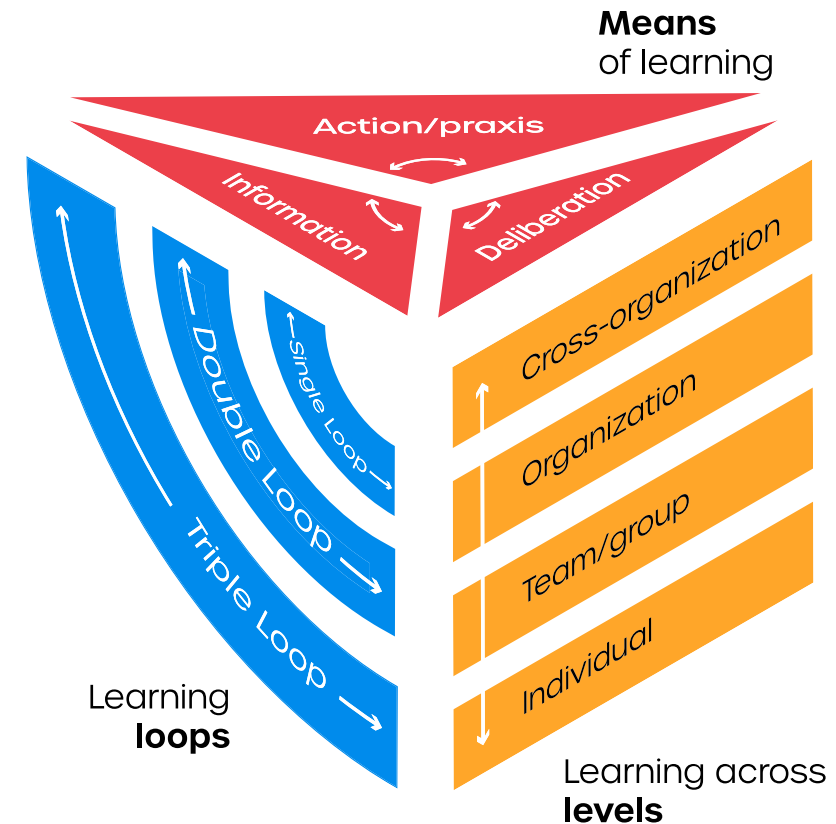
and at the organizational and cross-organizational level (also Jenkin, 2013). Second, seminal work by Argyris and Schön (1996), Senge (1997), Marsick and Watkins (2003), Rushmer et al. (2003) and Tosey et al. (2012) characterizes distinct learning loops – single, double and triple – each of which is associated with distinct types of aims and outcomes. Third, as theorists of learning organizations and development scholars have observed (Crossan et al., 1999; Stiglitz, 2001; Jenkin, 2013), learning occurs through distinct but interconnected *means,* which can be identified broadly as information, deliberation, and action or praxis (Paina, 2021).

These three dimensions – the levels, learning "loops", and means of learning – help to clarify and elaborate how learning occurs in health systems (Fig. 2). Each of these is explored in turn in the sections that follow.

LEARNING ACROSS LEVELS

Learning, which is, as noted by Fiol and Lyles in 1985: *"the development of insights, knowledge, and associations between past actions, the effectiveness of those actions, and future actions"* – occurs at all levels of health systems. At each of these levels, it is people who learn – either as individuals or as groups of various sizes (Fig. 3):

- **individual level:** as health workers, professionals and managers; members of the public, community and service users; and as researchers, analysts and educators;
- **team or group level:** as groups of actors within a health system, such as community groups, management teams, teams of health workers, research teams, sanitary inspectors or educators;
- **organization level:** in a primary health care facility, a hospital, a district health department, a ministry of health, a school of public health, a civil society organization or a nongovernmental organization (NGO); and
- **cross-organization level:** e.g., between different organizations within a national, provincial or district health system, or across sectors and geographies.

Fig. 3. Learning across levels of the health system
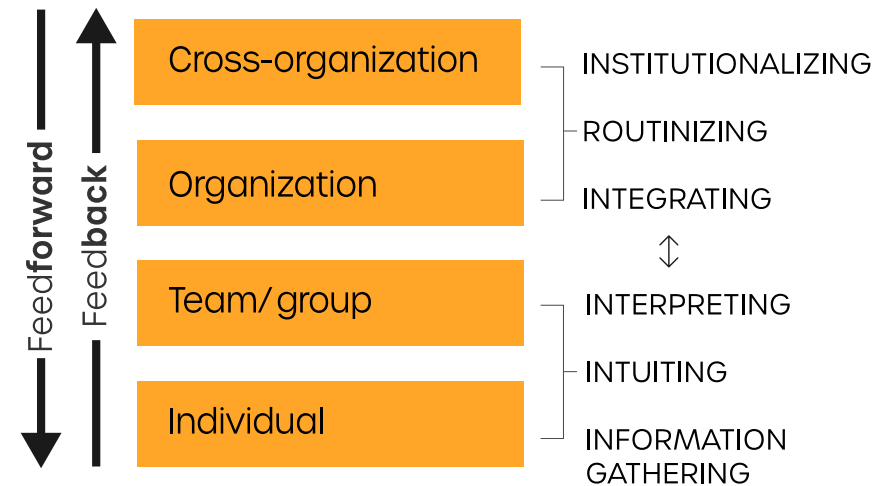
Source: Adapted from Jenkin (2013).

INDIVIDUAL AND TEAM/GROUP LEVELS

Theories of organizational learning, such as the influential 4Is framework set out by Crossan et al. (1999) and its subsequent refinement by Jenkin (2013), and Marsick and Watkins' Dimensions of Learning Organizations (2003), shed light on how learning occurs across multiple and interconnected levels of the system, with feedback and feedforward links across each level. In general, learning at the individual level entails information-gathering from different sources, gaining tacit knowledge through experience, and interpretation of these knowledge inputs. Health providers and managers in LMICs use a range of data from health information systems, reviewing evidence and scanning research literature, despite the barriers to their access to such information resources (Pathmanathan & Liljestrand, 2003; Gatero, 2011; Jeremie et al., 2014; Teklegiorgis et al., 2014; Dagnew et al., 2018; Witter, 2019a).

In addition, health managers and frontline providers also access a wide range of experiential information about their staff, facility and community context, beyond that available in the formal health information system, based on interactions with staff, clients and peers (Scott et al., 2014; Witter et al., 2019b).

In contrast, team and group-level learning tends to involve the collective interpretation of knowledge through dialogue and exchange, and the development of shared understanding about issues, problems and solutions (Crossan et al., 1999). In Uganda and the United Republic of Tanzania, for example, national-level health policy analysis teams engage with national and regional health policy networks and consult development partners and community networks to guide their recommendations to ministries of health (Jones et al., 2018). In Thailand, a close-knit team of health systems researchers at national level relies on their long-term relationships with public sector leaders to address complex questions related to the implementation of universal health coverage (UHC) (Pitayarangsarit & Tangcharoensathien, 2009). In Sri Lanka, monthly national meetings of provincial, regional and national managers jointly review performance of the health system and discuss new initiatives (Pathmanathan & Liljestrand, 2003).

Box 1 presents a case example of individual- and team-level learning in Benin and Guinea. It describes how a user-friendly web-based platform helped district health managers visualize health data, and learn collectively by sharing insights and comparing analyses across districts. The full case study can be found at the end of this document.

Box 1. Individual- and team-level learning in Benin and Guinea: visualization and collective interpretation of district health management data

In Benin and Guinea, a user-friendly web-based platform, *District.Team*, was used to enhance information sharing (including on 'good practices') among Health District Management Teams (HDMTs). Its local data visualization and peer-to-peer discussion features helped improve the capacity of district health systems to respond quickly to emerging health issues. HDMTs benefited from data visualization on *District.Team*, which enabled them to see the situation in other districts and learn which ones have developed specific skills and competencies. As a result, they could identify both strengths and weaknesses in their own districts and learn how to address those weaknesses, drawing on the experience of their counterparts as they engaged with the data and insights from other settings during online peer-to-peer discussions.

The *District.Team* learning model consisted of five steps:

- identification of a health issue or challenge to investigate;
- development of the tailored online tool of enquiry (survey questionnaire);
- completion of the questionnaire by HDMTs;
- analysis, visualization and publication of the results on a custom-made web platform; and
- online discussion of results (on the same web platform) and synthesis of lessons learned.

Emails, SMS and phone calls were used to invite HDMTs to participate in the various steps and send them reminders. A District Medical Officer (DMO) from Benin described the experience, saying: "Thanks to data visualization, we identified weaknesses in our districts and try to address those that are under our responsibility". DMOs felt that the engagement with peers from other settings during the online discussions was critical to improve their response to routine health systems issues and challenges.

The virtual and user-centred nature of *District.Team* was its main strength, as each member could access it through the Internet at any time and in any location that suited them. As a learning platform, *District.Team* not only served as a horizontal link among subnational health system actors (e.g., district health systems) within a country (i.e., within Benin and within Guinea) and across countries (i.e., between Benin and Guinea), it also served as a platform to spread and exchange insights between lower levels (i.e., subnational health systems) and higher levels (i.e., national health systems). Learning was enhanced by having a facilitation team to guide learning, as well as occasional face-to-face meetings to build trust between that team and the different HDMTs.

Table 1 is a guide to the case studies at the end of this document that provide further examples of individual- and group/team-level learning in different health system contexts.

Table 1. Case studies that demonstrate individual- and group/team-level learning

Benin and Guinea	A user-friendly web-based platform helped district health managers visualize health data and learn collectively by sharing insights and comparing analyses across districts.
Guatemala	Training and continuous education for community representatives on health rights and laws facilitated an increased and constructive role in local health governance.
India (Kerala)	Following an earlier epidemic, master-trainers were trained and outbreak working committees were established, which proved useful in preparing for future outbreaks.
Mozambique	District health system managers underwent repetitive cycles of peer-led skill-building and performance review to improve their performance in managing child health services.

ORGANIZATION AND CROSS-ORGANIZATION LEVELS

Continuous learning at the individual and team levels is necessary. However, as Marsick and Watkins (2003) and Watkins and Kim (2018) have pointed out, this is not enough to influence broader changes at organization and cross-organization levels. Learning at these levels happens when knowledge and understanding to facilitate wider coordinated action are integrated and become routine. This takes place through the formalization of rules and procedures that are conducive to learning. Organization-level (and cross-organization-level) learning is more than the sum of learning of its members (Crossan et al., 1999). Ultimately, it is important that learning is integrated and institutionalized so that it can be shared and used on a regular basis to drive improvements throughout the system in a sustained manner (Marsick & Watkins, 2003).

In the Islamic Republic of Iran, for example, a hospital created a patient safety reporting platform that supported nurses and hospital administrators to privately identify priority concerns for collective improvement (Mohammadreza et al., 2010). In South Africa, the development of central dashboards and trackers to integrate diverse data systems proved to be a valuable step in supporting organizational learning and

innovation among social enterprises that provide public services across the country (Urban & Gaffurini, 2018). Also in South Africa, a learning centre established jointly by local universities and health offices set up a process for collaborations on action research and for managers to pause and reflect in structured and unstructured ways to ensure that all voices were heard (Gilson et al., 2014; Cleary et al., 2018). In the Thai health sector, cross-organizational learning is facilitated by establishing points of integration at the district level.

Here, under the country's UHC scheme, resources are pooled by hospitals and other organizations, services are contracted through joint planning, systems problems are diagnosed and addressed by sharing experiences among health workers and managers, and quality improvement activities are managed in a coordinated fashion (Tangcharoensathien et al., 2018).

Box 2 presents a case example of organization- and cross-organization-level learning in Burkina Faso. Here, the Ministries of Health and Finance agreed to mainstream an innovative health financing solution into policy, following extensive debate and aided by the shared experiences of co-piloting the innovation. The full case study can be found at the end of this document.

Box 2. Organization- and cross-organization level learning in Burkina Faso: inter-ministerial collaboration to integrate practice into policy

In 2016, the Government of Burkina Faso decided to provide free health care for children under five and women in public sector health facilities (the "*Gratuité* policy"). The decision followed previous experience of similar initiatives by the government and international NGOs that worked with local district health management teams (DHMTs) and was driven by a desire to avoid past mistakes.

Previous initiatives had, for example, been plagued with delays in payments to health facilities (after forfeiting income from user fees) which sometimes lasted a year and hampered their work. Free services had also reduced the personal income of health workers (who had been guaranteed dividends derived 20% of the revenue from user fees). This, in turn, hampered the quality of care. Government subsidies to replace user fees were not considered to be revenue and were excluded from the calculation of these dividends.

Problems were anticipated and avoided through deliberation, with many workshops and meetings involving the technical and finance units of the Ministry of Health during the preparation of the Gratuité policy. NGOs participated in the meetings and kept national and local health authorities informed of their ongoing pilot experience on a regular basis. During these deliberations, former DHMT members in pilot districts who were now policy-makers at the Ministry of Health drew on their *own* past experiences**, *discussing* why things went wrong and potential solutions.

A promising idea emerged: the government would **make up** the shortfalls **in payments** to facilities. And to avoid late

payment, health facilities would receive payments ahead of expenditure, **with** the amount to be pre-paid and calculated on the basis of historical consumptions of each facility and adjusted every quarter.

The Ministry of Finance**,** however had reservations about this mechanism, since the proposed model of making payments in advance of expenses and transferring funds that are not defined as subsidies directly to health facilities did not align with existing public financial management procedures. Yet after several working sessions, debates and discussions involving executives from the Ministry of Finance and Ministry of Health (helped by the finance unit of the Ministry of Health, which was originally from the Ministry of Finance), an agreement was reached. This was based on shared experiences of the pilot projects and a recognition of how the proposed model would help to tackle problems. This learning experience helped to institutionalize the policy adaptations and innovations that were needed to avoid previous mistakes, improving the scheme and benefiting the egalitarian agenda of user-fee removal.

Table 2 is a guide to the cases studies at the end of this document that provide further examples of organization- and cross-organization-level learning in different health system contexts.

Table 2. Case studies that demonstrate organization- and cross-organization level learning

Barbados	A learning collaboration between the Ministry of Health and research organizations was instrumental in developing a climate-sensitive warning system for future dengue outbreaks.
Burkina Faso	Ministries of Health and Finance agreed to mainstream an innovative health financing solution into policy, after co-piloting the innovation and extensive debate.
Georgia	An informed and coordinated response to COVID-19 was made possible by establishing a Multisectoral Coordination Council chaired by the Prime Minister early in the outbreak.
Ghana	The efforts of a regional hospital and health directorate to build nursing capacity came to fruition as a result of learning to manage stakeholder interests over several years.

LEARNING LOOPS

As different elements within health systems learn, the aims and consequences of such learning vary. According to theorists of organizational learning such as Argyris and Schön (1996), Senge (1997) and Tosey et al. (2012), these distinct aims and consequences can be viewed through a representative framework of nested learning loops (Fig 4): single-, double- and triple-loop learning.

Fig. 4. Nested learning loops
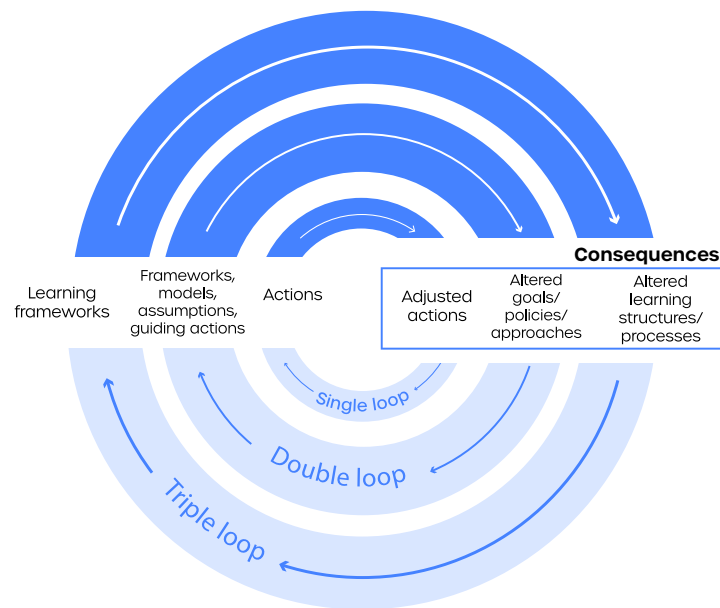
SINGLE-LOOP LEARNING

Single-loop learning contributes to adjustments and corrections in regular actions – adapting routines and practices within the system, but without checking assumptions or underlying root causes. Single-loop learning is important in enabling the organization or system to continue with its present policies or achieve its stated objectives (Argyris, 1977), but it does not question them.

Adapting strategies within an existing programme or framework to achieve goals is commonplace in the health sector. Operational research initiatives, for example, are reported to play a role in improving case findings, diagnosis and treatment to meet central programme targets, as part of several national tuberculosis (TB) programmes in the Asia Pacific region (Kumar et al., 2014; Harries et al., 2019). They are used increasingly to aid programme managers based in LMICs around the world to improve the delivery of programmes to prevent noncommunicable diseases (NCDs) (Kathirvel et al., 2018; Gibbs et al., 2020).

Monitoring and evaluation (M&E) frameworks and strategies tend to use single-loop learning to achieve project targets and goals. In Bangladesh, for example, an M&E strategy was utilized to assist the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) in assessing partnerships and funding sources to better align organizational management priorities to agreed indicators of institutional health and growth (Mahmood et al., 2011). In some cases, M&E frameworks are shared and standardized across settings or countries. The Global Vaccine Action Plan (GVAP), for example, applies a shared framework for all of its member signatories to track and troubleshoot progress towards its objectives and to guide programme course corrections (MacDonald et al., 2020).

Table 3 is a guide to the cases studies at the end of this document that provide further examples of single-loop learning in different health system contexts.

Table 3. Case studies that demonstrate single-loop learning

Benin and Guinea	Improved data visualization and peer-to-peer discussions through a web-based platform improved the responsiveness and efficiency of district health systems.
India (Kerala)	Health authorities progressively built personnel capacity for epidemic preparedness after learning from the experiences of Nipah virus outbreaks in 2018 and 2019.
Indonesia	The introduction of multifunctional dashboards improved the ability of authorities to monitor and assess health system performance and progress towards UHC.

DOUBLE-LOOP LEARNING

Double-loop learning goes a step further to question and influence fundamental frameworks, mental models and assumptions around problems and their solutions, which can result in changes at the level of policies or objectives. According to Argyris (1977), when an organization or system questions the "underlying policies and goals as well as its own program" it engages in double-loop learning.

In Mexico, evidence on how catastrophic and impoverishing health spending was impacting citizens led leaders to question their assumptions about how health financing should be managed and what kinds of financial protection were needed. The resulting policy changes led to the creation of the *Seguro Popular* (Popular Health Insurance), which has since protected many households from impoverishing health expenditures (Knaul et al., 2006). In Nigeria, the fallout of an economic recession moved the government and health management organizations (HMOs) to review and reconsider existing financing models for health services and social protection. The Federal Government's championing of a strategy to promote UHC advanced a policy reform process that led to the establishment of the National Health Insurance Scheme (Onoka et al., 2015).

Box 3 presents an example of double-loop learning in Guatemala. Traditionally, Indigenous communities had a passive or sometimes adversarial relationship with public sector systems, and limited participation in health governance. This strained relationship was transformed over time by their participation in a collaborative learning programme on health systems governance. The full case study can be found at the end of this document.

Box 3. Double-loop learning in Guatemala: changed mindsets and practices in community health governance

Indigenous communities in Guatemala have legally defined rights to participate in the governance of their local health systems, yet their role in health system governance has traditionally been passive. In 2014 a civil society organization initiated a five-year programme of learning on health systems governance with elected community representatives in 30 municipalities.

First, training workshops were delivered by Indigenous "mentors", on topics including health and human rights law, the responsibilities of different levels of government, and how to conduct interviews and monitoring exercises. Next the community representatives received a and their entitlements. They then used their newly acquired knowledge to conduct exit interviews of service users, monitor supplies, interview service providers and authorities, organize and analyse data, and write reports to present in face-to-face meetings with authorities. Finally, they were engaged in continuous in-person and remote (e.g., via podcasts and videos) learning (e.g., about a new law or developing public budget tracking skills).

At first, health workers and local authorities were sceptical about allowing users of services to have a voice in governance. However, as the community representatives gained a deeper understanding of the challenges faced by the local health system, they advocated to municipal, provincial and national governments for policy reforms

that would provide additional resources in rural facilities. Over time, this ongoing participatory learning resulted in community representatives and local health authorities establishing channels of engagement (regular face-to-face meetings and a phone directory for immediate communication) to review their findings from community monitoring, discuss possible solutions and agree on actions to solve problems.

By the end of the programme, active channels of engagement had been established in each of the 30 municipalities between community representatives and municipal government and local health authorities. These engagements now enable local authorities to present the challenges they face.

As part of the continuous training and advice provided by mentors, the representatives have learned about the different levels of governance and decision-making in the Ministry of Health and other public institutions. In contrast to the previously passive and often adversarial relationships that once existed between communities and public systems, the increased understanding and experience of how public policies and resource allocations are made among community representatives have changed their perceptions of, and the nature of their engagement with, the governance of health systems.

Table 4 is a guide to the cases studies at the end of this document that provide further examples of double-loop learning in different health system contexts.

Table 4. Case studies that demonstrate double-loop learning

Barbados	The development of a climate-informed early warning system for dengue reflected a shift from earlier approaches to outbreak preparedness that relied on case monitoring.
China	Health authorities implementing neonatal care interventions learned to tailor strategies and adapt goals to local contexts and constraints, in consultation with local stakeholders.
Guatemala	The traditional limited role of Indigenous communities in health systems governance was transformed through a long-term collaborative learning programme.

TRIPLE-LOOP LEARNING

Triple-loop learning, often referred to as "learning how to learn", involves questioning the very basis (frameworks and assumptions) through which single- and double-loop learning occurs and influencing them to change. Triple-loop learning contributes to improvements in how the system learns through deliberate changes in learning structures and processes (Argyris and Schön, 1996; Tosey et al., 2012).

Akhnif et al. (2018) describe an initiative in six African countries, in which in-country researchers and ministries of health involved in UHC policy development established a learning community of practice. This community of practice identified weaknesses in prevailing learning approaches and identified new approaches to address capacity gaps and increase public awareness to advance UHC.

Another example of triple-loop learning is the gradual change in approaches to evaluate community health worker (CHW) programmes over time. Recognizing the flaws of conventional target-driven evaluation approaches for CHW programmes that fail to capture their complex social empowerment roles, health programmes in several countries have adopted more participatory approaches to integrate their perspectives in defining the objectives and shaping the design and conduct of evaluations (Kane et al., 2016).

Box 4 presents a case example of triple-loop learning in which new learning processes (i.e., outbreak surveillance software and after-action reviews) were established in Nigeria, enhancing the ability of the Nigerian health system to learn while tackling epidemics, with that learning helping to shape the preparation for epidemics in the future. The full case study can be found at the end of this document.

Box 4. Triple-loop learning in Nigeria: learning how to learn about outbreaks

Between 2014 and 2019, Nigeria responded to the threat of Ebola virus, as well as three large outbreaks of Lassa fever, during which health authorities aimed for a fundamental change in the health system response to outbreaks, from "reactive" to "prepared". Several new learning structures and processes were established during this period to improve future responses to epidemics.

One prime example was the deployment of SORMAS (the Surveillance Outbreak Response Management and Analysis System) – real-time web-based software for outbreak and epidemic surveillance. SORMAS was developed and first used in Nigeria in 2014 to support the response to Ebola virus and it has since strengthened the country's capacity to collect and analyse data and use it for critical decision-making. For example, states were provided with medicines and supplies required for the case management of Lassa fever, based on the prevalence of disease as recorded through SORMAS. This helped to ensure targeted provision of resources and avoid the wastage seen in previous years (WHO, 2000).

The Nigeria Centre for Disease Control (NCDC) also developed a process of after-action reviews for the continuous review of its field experiences and assessment of its response efforts. The after-action reviews bring stakeholders together in consultation to examine the previous years' response across technical areas. They begin with an examination of pre-outbreak status (such as plans and policies, human and financial resources, coordination mechanisms and preparedness) followed by learning from the field to capture response innovations and to build on and retain institutional memory. Participants in the after-action review advice on best practices and make recommendations to improve subsequent response efforts.

SORMAS and after-action reviews are now in regular use, transforming the way in which the health system has prepared for and responded to Lassa fever and other outbreaks of disease, including COVID-19.

Table 5 is a guide to the cases studies at the end of this document that provide further examples of triple-loop learning in different health system contexts.

Table 5. Case studies that demonstrate triple-loop learning

Benin and Guinea	A new data visualization and peer-to-peer sharing platform altered the way in which district health managers access, share and use information for day-to-day decisions.
Lebanon	Investment in new learning approaches using the knowledge generated by daily operations drove a more informed approach and policies on private sector stewardship.
Nigeria	Learning structures and processes established during previous epidemics transformed the ability of the health system to learn during new epidemics.

MEANS OF LEARNING

Theorists of learning organizations and development scholars have observed that learning in complex systems occurs through distinct but interconnected means. These are identified broadly as learning through information, through deliberation, and through action or practice (Crossan et al., 1999; Stiglitz, 2001; Jenkin, 2013).

LEARNING THROUGH INFORMATION

Information is gathered, processed and deployed to meet the diverse learning aims of health systems, including measuring success and failure, anticipating trends and discovering new approaches to address problems (Nevis et al., 1995; Schilling et al., 2011). Such information is found in explicit or codified form and may be spoken or written, saved, transmitted and downloaded remotely (Stiglitz,

Fig. 5. Means of learning in health systems
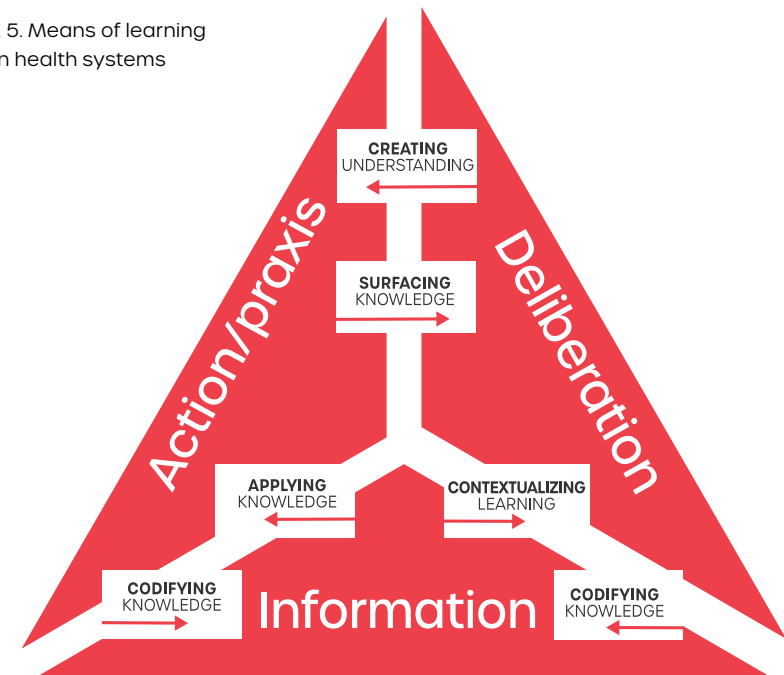
2001; Jenkin, 2013). Learning through information includes collecting and processing information as well as taking steps for its deployment and dissemination.

Common sources of information in a health system include (but are not limited to) routine **health information systems data, primary and secondary research, organizational documentation (e.g., reports and evaluations) and community feedback** (Lemma et al., 2020; Skrip et al., 2020). Information from these sources may be synthesized or analysed to make it easier to use or disseminate. The information is then deployed to inform a range of routine or strategic decisions within the health system, for training and capacity-building, or for dissemination (Marsick & Watkins, 2003).

IIn a refinement of Crossan's 4Is model, Jenkin (2013) describes the application of "tools" or assistive technologies to enable organizational and system learning. Tools have utility across the learning spectrum for health systems, especially given the ubiquity of digital technology and Internet connectivity. However, they have the widest application in the realm of accessing and processing information.[1] Digital platforms play a growing role in the more efficient and timely availability of information (Millimouno et al., 2019). (Automated or "machine" learning and its potential and limitations are discussed in more detail in Box 8).

Box 5 presents a case example of multifunctional "dashboards" to monitor and assess health system performance in Indonesia, and their role in facilitating pro-equity policies. The full case study can be found at the end of this document.

[1]   Jenkin (2013) includes tools such as: collaborative technologies, directories and databases, social media sites, enterprise content-management tools, document summarization tools, data mining and data analysis tools, competitive intelligence systems and pattern-based task management.

Box 5. Learning through information in Indonesia: using a digital dashboard to monitor progress towards universal health coverage (UHC)

Indonesia faces a growing deficit in the financing of its national social insurance scheme. Introduced in 2014, the scheme is a single pool of funds financed through a combination of a government subsidy for the poor, a compulsory contribution from the formal sector and voluntary contributions from workers in the informal sector. However, an equity perspective demonstrates that the deficit problem obscures a problem that is much larger: inequalities in the availability and use of health services across different groups and geographic regions. A research group in Indonesia set out to find a way to raise the profile and policy relevance of equity analysis by improving access to comparative regional analyses of equity data in relation to the scheme.

Since 2019, the introduction of a dashboard for health policy-making at national and provincial level for UHC has enhanced regional comparative analyses of the scheme with a focus on equity. Various data are compiled in the dashboard and can be used by all learners. The dashboard stores the result of national and subnational research, policy analysis and policy briefs. The data are presented as graphics and animation to improve the learning process and make it more attractive for users.

In addition, the dashboard provides access to learning materials on key topics, such as: understanding of health system policy M&E; utilization of the UHC budget by socioeconomic health insurance members and geographic groups; expenditure on UHC by socioeconomic health insurance scheme and geographic groups; UHC policy analysis; and UHC policy briefs. The main materials relate to equity and access for health service usage under the UHC scheme. Early experiences with the dashboard have shown an increasing appreciation of the importance of equity data among policy-makers as UHC data on equity become more available and easily accessed.

Table 6 is a guide to the cases studies at the end of this document that provide further examples of learning through information in different health system contexts.

Table 6. Case studies that demonstrate learning through information

Georgia	Expert groups gathered external information (from evidence synthesis) and combined it with internal data sources to address the emergent problem of COVID-19 preparedness.
Indonesia	A user-friendly dashboard that stores and displays research findings, policy analyses and policy briefs has facilitated monitoring by policy-makers of progress towards UHC.
Nigeria	Information about outbreak epidemiology (from surveillance software) and the outbreak response (from after-action reviews) helped improve health system responsiveness.

LEARNING THROUGH DELIBERATION

Learning results not only from the transmission of information, but is also produced through acts of human *deliberation* (Hayek, 1945; Polanyi, 1966; Stiglitz, 2001). Processes of dialogue and reflection are essential to make the link between past actions, the effectiveness of those actions, and future actions. They are also necessary to contextualize problems and develop a collective understanding and consensus on how to anticipate, prevent and solve them (Crossan et al., 1999; Stiglitz, 2001). Within health systems, these processes encompass a range of **non-peer and peer engagements – including stakeholder consultations, team meetings, research collaborations, conferences and community and public engagement fora** – and may occur in-person or through technology-enabled platforms (McCoy et al., 2011; George et al., 2015; Abimbola, 2020).

Deliberation is important in contextualizing knowledge by capturing insights from different actors, and to identify and advance changes that are actionable (Salais, 2008). The collective understanding that is generated through such processes is more than an aggregate of individual knowledge because it can be enriched by new knowledge and by insights produced through debate and dialogue (Salais, 2008; Sen, 2009; Bonvin & Laruffa, 2018). Engagement with stakeholders is necessary to build common understanding and consensus that can shape policy or enable collective actions, and especially when the knowledge of those stakeholders is crucial for the successful implementation of policies or programmes (Custer et al., 2016).

One example that has often been cited is the National Health Assembly (NHA) in Thailand, which brings together government leaders, academics, and representatives from other sectors, civil society, professional associations and community groups to foster dialogue on UHC planning and implementation. The NHA has enhanced mutual understanding among stakeholders, even though the prioritization of the outcomes of these deliberations in policy-making remains a challenge (Rajan et al., 2019). In India, the Union Government's flagship immunization programme, Intensified Mission Indradhanush (IMI), held regular meetings with programme implementation partners (including 12 other ministries, as well as frontline health workers and NGO and community representatives) to discuss experiences and evaluation findings, particularly in relation to the challenge of vaccine hesitancy, which helped to identify areas for further improvement and learning (Gurnani et al., 2018).

In Tunisia, dialogues between civil society and the national government were first instituted in 2014 and involved extensive debate on the country's plans for UHC and the roles of civil society organizations (UHC Partnership, 2019). These dialogues resumed in 2017 after a period of political instability and will feed into recommendations for the forthcoming National Health Policy.

Box 6 presents a case example from China, where detailed deliberations were instrumental in bringing together national and subnational managers to tailor implementation protocols for neonatal care strategies to subnational sites. The full case study can be found at the end of this document.

Box 6. Learning through deliberation in China: valuing local knowledge and building consensus on neonatal care strategies

The Chinese National Health Development Research Center (CNHDRC), the think tank for China's Ministry of Health, undertook deliberations to contextualize strategies to improve early essential neonatal care for rural areas. This built on a review of international evidence on suitable interventions by the United Nations Children's Fund (UNICEF), which drew on global experience. Local contextualization began with discussions involving the national government, UNICEF and other technical experts to think through what approach would be piloted in rural counties. The package of promising interventions identified from global experience would be trialled over five years in 20 counties spread across four provinces in China to test its suitability and effectiveness and adapt it to local contexts. Before this experimental phase, local contextualization through further deliberation would set the stage for the pilot.

The aim of the deliberation was to help counties learn what could work locally, and to help provinces and the national government learn lessons that should inform national policy and be disseminated widely. During initial deliberations in Beijing (convened by CNHDRC and attended by 35 decision-makers from the four provinces and prospective implementers from the 20 counties), it emerged that it would be difficult to implement the project as a result of county-level resource constraints, and that counties would need support from provincial officials to address these challenges.

It became clear that central-level stakeholders needed to learn how to help counties support the pilots. In the next stage, CNHDRC staff, national-level experts and academics visited pilot provinces and counties for discussions (including with patients) on local policies, initiatives and challenges to build a common understanding of the project and identify local support needs (including through the examination of health records and the observation of health facilities). County-specific reports were developed as a result, including priority interventions and implementation plans, and these were refined through county-level meetings to help central stakeholders better understand varying county capacities and needs.

Provinces modified their strategies based on what they learned from this process. Ningxia Province, for example, engaged a local religious leader for advocacy purposes, to convince people to use the new interventions, while Sichuan Province changed the selection of counties after finding that their local health infrastructure was too weak to support implementation. Pilots were designed to ensure that the lessons from implementation in each county are learned by that county, but also by provincial officials in the provinces where each county is located. These officials will then take such lessons into account for implementation in the other counties within their province.

Table 7 is a guide to the cases studies at the end of this document that provide further examples of learning through deliberation in different health system contexts.

Table 7. Case studies that demonstrate learning through deliberation

Burkina Faso	The ministries of Health and Finance agreed to mainstream an innovative health financing solution into policy following extensive debate, aided by the experience of its co-piloting.
China	Detailed consultations helped bring together national and subnational managers to tailor implementation protocols for neonatal care strategies to subnational sites.
Guatemala	Community representatives and local health authorities collaborated to review findings from community monitoring, facilitating joint discussion and agreement on solutions.

LEARNING THROUGH ACTION

A third means of learning in complex social systems is through *action* and praxis (Stiglitz, 2001). People, whether individually or as part of a team, group or organization, learn through the practice and iteration of tasks and projects (Lazonick & Brush, 1985; Genberg, 1992; Levitt et al., 2013; Hendel & Spiegel, 2014). Complex social systems are repositories of such tacit and experiential learning, which is held by diverse actors within or across different parts of the system (Hayek, 1945). Experiential learning gives rise to **innovations** and **"good practices"**, which can then be learned by other actors in different parts of the system or in other systems. According to Stiglitz (2001), this occurs through horizontal learning processes (e.g., **on-the-job mentoring, team learning, study tours, secondments**), which entail "seeing how it is done", "being shown how to do it" or a combination of both. Consultations among actors can yield experiential learning, which can be captured and codified into information for future application (Fig. 6).

In Kenya, for example, nursing personnel who serve nomadic Somali communities engaged in participatory learning exercises, working with these communities over time to understand their health problems and practices, and their perceptions of health care services and information networks. The relationships that were built as a result enabled the nurses to provide more effective services attuned to the communities' lifestyles (Maalim, 2006).

Health officers worked with researchers across locations in South Africa and Kenya for seven years to establish district-level learning sites to support real-time learning about their everyday decision-making practices (Barasa et al., 2020). Activities included collaborative research, longitudinal observations of experiences, and meetings to reflect on the insights that emerged. These sites, in turn, facilitated learning through action for the local health officers and researchers, but also served as pilot or demonstration sites of collaborative learning for decision-makers elsewhere in the health system.

Box 7 presents a case example from Mozambique, where district health system managers went through repeated cycles of peer-led skill-building and review to improve their performance in managing child health services. The full case study can be found at the end of this document.

Box 7. Learning through action in Mozambique: building practical health management skills with skill-building cycles

A project was designed to accelerate the reduction of newborn deaths in Mozambique by helping district health system managers learn through cycles of skill-building, supported by mentoring, iterative performance reviews and the active sharing of experience among peers. Mozambique has made significant progress in the reduction of under-five mortality, but there had been stagnation in newborn health indices in some provinces. This was the result, in part, of health system bottlenecks, including the limited use of data in decision-making, fragmentation across levels of service delivery, and a shortage of qualified health workers, with those available overworked and lacking adequate in-service training and mentorship. Led by district health managers and integrated into routine services, the project took place in 12 districts and 154 health facilities across two of the provinces where progress had stalled.

The programme included activities conducted in sequence, but repeatedly. First, there was a semi-annual standardized assessment by health workers of health facility readiness to deliver services during or around the period of birth. Second, each assessment was followed by performance audit and feedback meetings with district managers and health workers to identify facility performance gaps and develop local solutions and budgets for their implementation.

Through repetition, participants gradually build their capacity to assess data quality, conduct trends analysis, prepare reports that synthesize data and deliver presentations. These activities were followed by district-to-facility supportive supervision, which prioritized one-to-one mentorship to build practical skills that were improved progressively through in-service training and the repetition of practice throughout each round of the project.

Global evidence was then locally contextualized. District and facility managers demanded space to adapt the approach, resulting in new arrangements in, for example, the way in which performance reviews were conducted and supervision teams were composed. The modified format encourages open, frank discussions to facilitate peer-to-peer experience-sharing, self-evaluation, and vertical (district manager to facility teams) and horizontal (peer-to-peer) positive pressure that activates, reinforces and sustains learning.

Local ownership helped make learning part of the organizational culture, with a learning network emerging across health facilities in each of the 12 districts. Over time, this has promoted positive competition and imitation among peers, and incentives for participants to fulfil their responsibilities and be appreciated for doing so.

Table 8 is a guide to the cases studies at the end of this document that provide further examples of learning through action and practice in different health system contexts.

Table 8. Case studies that demonstrate learning through action and praxis

Lebanon	Teams in the Ministry of Health learned through iteration how to better use information to improve the efficiency of government spending on health care.
Mozambique	District health system managers underwent repeated cycles of peer-led on-the-job skills-building to improve their performance in managing child health services.
Republic of Korea	Experiences and tacit knowledge from the management of previous epidemics were applied to the introduction of laws to improve public trust and transparency during the COVID-19 response.
Ghana	A regional leadership team neutralized opposition to its efforts to build nursing capacity over years of experiential learning (including learning from previous mistakes in the management of stakeholders).

Box 8. Machine learning and health systems: promises and pitfalls

Machine learning – an application of artificial intelligence (AI) – can provide health systems with the ability to learn from and improve their own experience automatically. Machine learning begins with data (i.e., unprocessed information) of varying levels of complexity, with a computer programme looking for patterns within the data.

Drawing on those patterns, the programme helps decision-makers to make better choices in the future. Based on its own experience, the machine learning application (i.e., computer algorithms) improves its own ability to identify patterns progressively and helps the system that uses it to make better decisions. Machine learning allows computers to learn automatically without human intervention or assistance and adjust actions accordingly (Wyber et al., 2015; Panch et al., 2018; Wahl et al., 2018; Paul & Schaefer, 2020).

Machine learning can improve health system effectiveness and efficiency by augmenting day-to-day decision-making across the health system. It can be used to predict, model and reduce the spread of epidemics, for example, by using data from electronic health records, Internet searches, social media and environmental conditions, to predict the emergence of disease outbreaks (Fleming et al., 2007;

Dahiwade et al., 2019; Peters et al., 2020; Samaras et al., 2020). It can also make it easier for decision-makers to aggregate data from different levels of the health system.

Machine learning is not, however, risk-free. Aggregated data errors could, for example, result in misdirected interventions and resource allocation (Nell et al., 2020). AI has also been known to mirror the unwanted exclusionary biases that are prevalent in society (Mayson, 2018; Zou & Schiebinger, 2018). In addition, machine learning does not adequately register knowledge that is subjective and qualitative, far less knowledge that is tacit and experiential – hidden in human memory and experience.

Care must be taken, therefore, to ensure that machine learning does not oversimplify problems and displace the need for contextualization and consensus-building through human deliberation. While machine learning has potential benefits for health systems, an over-reliance on it could discount and displace more subjective but important types of knowledge and learning.

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CHAPTER 3
The need for learning health systems

A NEGLECTED CONCERN

Health systems the world over endure the adverse effects of policies and practices that have not been based on relevant knowledge and experience. Many health systems, particularly in LMICs, still lack the capacity to generate and use the knowledge that they need to be effective. Policies and practices are often poorly informed by evidence and data (Akhnif et al., 2018), and reservoirs of tacit and experiential knowledge remain poorly utilized and exploited (Kothari et al., 2012; Becerril-Montekio et al., 2016). Investments in learning activities tend to account for a remarkably small proportion of overall investments in health programmes and systems, and activities focused on learning have not, historically, found their place or favour in budgets in comparison to other health system priorities (Abimbola et al., 2017; Grépin et al., 2017; Thakkar & Sullivan, 2017).

Why is learning neglected by health experts, planners and advisors? One explanation is that operational exigencies in health systems crowd out the softer work of learning, which may be regarded as having less immediate or predictable benefits. One contributing factor to the relative neglect of learning could be that the conceptualization and framing of learning in health systems, its potential benefits, and the means for its operationalization have not been well articulated or advocated.

LEARNING FOR CHANGE

Chapter 2 outlined the different dimensions of learning in health systems – learning at different levels, by different means, and through the different loops or learning routines. This chapter explores the positive changes engendered through learning and the potential benefits for health systems (Fig. 6).

IMPROVING SYSTEM FUNCTIONS

Learning is vital to improve the performance of health systems functions at all levels. In its simplest "single loop" form, learning enables individuals, teams and organizations to adapt and improve their regular practices to perform their stated functions more effectively (Argyris, 1977). In doing so, they may utilize different types of formal and informal information as well as the tacit knowledge gained through prior experiences and actions (Hayek, 1945; Polanyi, 1966; Garvin, 1993; Argyris & Schön, 1996; Crossan et al., 1999; Stiglitz, 2001; Tosey et al., 2012; Jenkin, 2013).

A 2013 systematic review and meta-analysis, for example, found that women's groups that utilize participatory learning and action processes have contributed to decreasing maternal, neonatal and child (MNC) morbidity and mortality in low-resource settings in Bangladesh, India, Malawi and Nepal. These women's groups aimed to increase knowledge and change behaviour among pregnant women, and the review found that their strong participation was associated with a decline in both maternal and infant mortality rates (Prost et al., 2013).

In another example, the Global Action Plan for the Prevention and Control of NCDs utilizes operational research to guide programme implementation strategies. In India, programme managers were engaged in a multi-site operational research

(OR) project to determine guidelines for screening TB and diabetes mellitus to combat the NCD burden. Capturing the experience of these managers and engaging stakeholders in the guidelines resulted in a more relevant product and increased motivation among managers to make use of the findings (Kathirvel et al., 2018).

Box 9 presents a case example from Kerala, India, where systemic changes that were introduced on the basis of experiences during an earlier outbreak of Nipah proved useful in strengthening the state's preparedness for future outbreaks. The full case study can be found at the end of this document.

Fig. 6. Potential benefits of learning in health systems
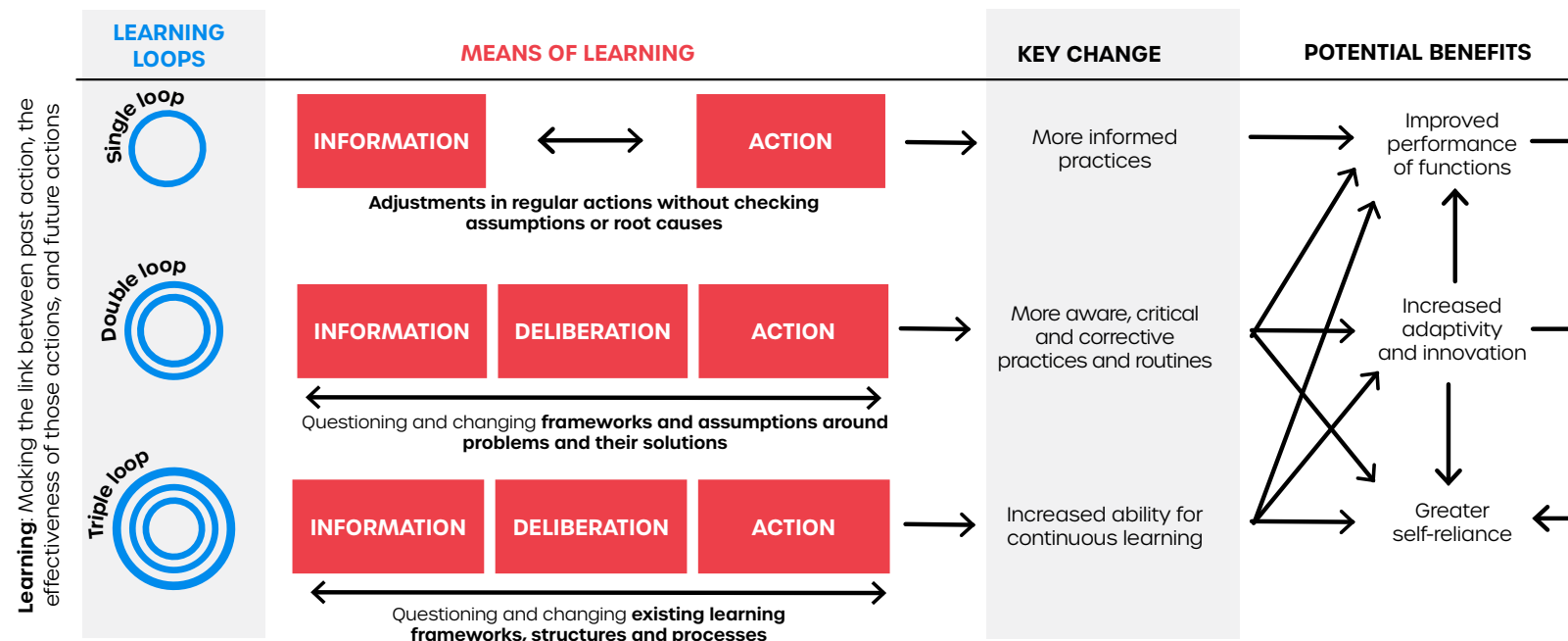
Box 9. Improving outbreak preparedness in Kerala (India): redeploying nurse trainers and expert committees

Nipah is a deadly virus with a case fatality rate of 40% to 75%, and the potential to create public panic in Kerala. Like COVID-19, it requires the basic public health measures of early identification, contact tracing, quarantine and isolation. Following the Nipah virus outbreaks of 2018 and 2019, Kerala state moved progressively to put in place different aspects of epidemic preparedness and response.

Massive training on infection control was rolled out during and after the first Nipah virus outbreak in 2018. Eight nurse-trainers were selected and trained to head the team on infection control. Their training covered the use of personal protective equipment (PPE), segregation of patients in ambulatory care and procedures for ensuring isolation. This core group of nurses then trained more than 200 nursing master trainers, who were then placed in public hospitals. These master trainers were ready to swing into action to rapidly train or retrain facility staff, including many newly appointed doctors, whenever an outbreak occurred. When a single Nipah virus case was detected a year later, in 2019, it was met with a comprehensive response and further transmission was halted.

In 2020 these master trainers were activated once again in response to the COVID-19 outbreak. Trained volunteers and field staff drew up so-called route maps to specify the movements of index cases during their respective infective periods. These anonymized maps were disseminated through local media channels and social media, urging those who were at those locations at those times to come forward for screening and possible quarantine. Kerala State Government developed helplines, which were staffed around the clock and linked to hundreds of medical and administrative personnel who made themselves available to respond to calls for information and assistance, helping people to come forward voluntarily for testing and quarantine. The message was that entire districts need not be alarmed. A database of these personnel was put in place to undertake such tasks following the Nipah virus outbreak – creating a system that could be activated for the COVID-19 response.

In addition, 18 cross-sector working committees had been set up to respond to the Nipah virus outbreaks. Each had clear terms of reference, with government-ratified operating procedures and reporting lines. These committees were reconvened and re-oriented to combat COVID-19. The close relationships across authorities and staff of different sectors that had been built during the Nipah virus outbreaks helped to reduce the start-up time for the actions that were needed by different authorities – e.g., those in charge of the ports of entry and quarantine mechanisms. Some members of the working committees that operated during the COVID-19 outbreak were the same as during the Nipah outbreaks. Their tacit knowledge helped to ensure the seamless use of learning from their previous experiences. The working committees relied on adaptation and enforcement of protocols, and were able to draw on a pool of institutional memory from past experience.

System functions can also be improved through deeper double- and triple-loop types of learning. As noted, health systems that apply double-loop learning use insights from past experiences, deliberations and diverse sources of information to question and alter approaches to problems and solutions. Engagement with stakeholders is needed to build common understanding and consensus to shape policy or enable collective actions, particularly when their knowledge is crucial for successful policy or programme implementation (Custer et al., 2016). Furthermore, improving the structures and processes that will enable learning in the future can also have a salutary impact on the current performance of health system functions.

In South Africa, a collaborative network of NGOs convened by the National Department of Health conducted a critical review of the prevention of mother-to-child transmission (PMTCT) protocols and strategies to determine why both supply and demand were low, which meant that the programme was not achieving its targets. Based on the deliberations of the NGO collaborative, key changes were made to the programme design that took into account the experience of providers and community concerns, and that developed strategies that included updated targets and improved data, simplified programme strategies and built networks to enable

coordination. These changes supported information sharing and collaboration between facilities by establishing regular site visits and opportunities to debrief and share experiences across sites, enabling the more streamlined and effective scale up of the PMTCT programme (Mate et al., 2013).

To address a perpetual shortage of physicians in remote and rural areas, task shifting from physicians to nurses and other locally available workers such as CHWs has become a common mitigation strategy and an example of double-loop learning. Experiences of task shifting across different contexts have led many health systems leaders to rethink physician-centred approaches to primary care provision, and to the formal expansion of the scope of practice for nurses and mid-level providers, resulting in more efficient service provision and greater access for populations (Fulton et al., 2011; Maier & Aiken, 2016).

Box 10 presents a case example from the Republic of Korea, where insights from the experience of managing previous epidemics was applied to introduce new laws to improve public trust and transparency, with a positive impact on COVID-19 control efforts. The full case study can be found at the end of this document.

▌ Box 10. Improving pandemic control in the Republic of Korea: transforming assumptions about public trust and participation

The COVID-19 response in the Republic of Korea has been strengthened by experience from the previous outbreak of Middle East Respiratory Syndrome (MERS) in 2015. Lack of transparency and trusting communication with the public during that outbreak was recognized to have marred the government response. From that experience, the public and government learned the importance of effective surveillance, early diagnosis, clear stakeholder responsibilities and transparent communication. When the COVID-19 outbreak began, the public was quick to comply with recommendations to maintain a social distance, wear face masks, cancel meetings and work from home, even without major enforcement. Unlike many countries, the Republic of Korea did not need to impose a ban on public gatherings or religious meetings, public transportation never stopped, and restaurants and shops remained open.

Following the country's experience with MERS, the government also introduced new laws for pandemic preparedness. The laws mandate a citizen's right to information about government strategies and approaches to tackle the pandemic. It has also allowed the Ministry of Health and Welfare to collect information and request telecommunication companies to share information on the (potential) locations of patients, with the provision that collected information will be destroyed when the outbreak is over. This has made it possible to use extensive contact tracing. The revised laws also mandate employers or government to compensate people in treatment or quarantine as a result of outbreaks, as well as hospitals that incur losses through their treatment of patients or suspected patients of infectious diseases.

These legal provisions are an example of double-loop learning, and have resulted in the greater awareness and participation of citizens in the COVID-19 response. The new laws have increased and sustained high levels of public trust in the Korea Center for Disease Control. During the COVID-19 outbreak, the government also adopted other measures to increase public responsiveness and trust, such as drive-through testing, residential treatment for milder patients and telemedicine. Without this effective response, shaped by learning on the part of both the government and the public, the Republic of Korea might have had a greater number of confirmed cases, greater health-care expenditures and more deaths.

Table 9 is a guide to the cases studies at the end of this document that provide further examples of learning contributing to improvements in the performance of health system functions.

Table 9. Case studies that demonstrate learning to improve health system functions

Georgia	Long-term investments in public health surveillance systems and embedded rapid health systems review platforms improved epidemic preparedness and response.
India (Kerala)	Systemic changes based on the experience of an earlier outbreak (master-trainers, expert committees) helped to strengthen the state's preparedness for future outbreaks.
Mozambique	A skills-building initiative for district health system managers on the use of routine data helped to improve the quality of trend analysis and data synthesis.
Republic of Korea	Interventions designed to improve public trust and transparency based on past experiences helped to improve the uptake of public health recommendations for COVID-19.

ADAPTIVITY AND INNOVATION

In an ever-changing world, the ability of health systems to anticipate and respond to changes in internal and external contexts is an important asset. Such changes can range from evolving societal expectations, population characteristics and diseases patterns, to external shifts such as the shocks caused by political and economic upheavals, natural disasters or global ecological trends. Health systems that are informed by experience, stakeholder deliberations and reliable information and evidence, and that are ready to recognize and correct past mistakes (double-loop learning), are in a better position to adapt and tailor their actions to meet contextual changes.

One notable example of this adaptivity is Thailand's experience of preparing for UHC reforms in the 1970s, through investments in district health systems and research capacity.

The country anticipated and planned ahead for the potential challenges arising from the implementation of a UHC scheme, such as the anticipated growth in demand for services at the district level. Thailand has since achieved a high level of financial protection and improved equity in both access to, and use of, health services. While the Thai UHC reforms were led by politicians, they were shaped by technocrat reformists and researchers, who had a continuous influence on how the UHC reforms were carried out over three to five decades, as they anticipated, prevented and solved problems through repeated action-learning cycles (Tangcharoensathien et al., 2007, 2018; Pitayarangsarit & Tangcharoensathien, 2009).

Another example of adaptive learning comes from Chhattisgarh State in India. Shortly after its creation as a new state in 2000, Chhattisgarh established an ambitious CHW programme. The leaders of the agency responsible for its management had learned from the experience of early

setbacks that the strong association of the programme with any one political regime could be detrimental to its survival during the next regime. They learned over time to avoid overtly partisan patronage of the programme, and this was identified as a key factor in the programme's ultimate success through multiple political transitions over 15 years (Nambiar & Sheikh, 2016).

Box 11 presents a case from Barbados, in which a learning collaboration between the Ministry of Health and Wellness (MHW) and researchers was instrumental in the development of a climate- and epidemiology-sensitive warning system for future dengue outbreaks. The full case study can be found at the end of this document.

▍ Box 11. Adapting to ecological transitions in Barbados: developing a climate-informed early warning system for dengue

The previous approach for dengue risk management in Barbados relied on early recognition of outbreaks by monitoring the occurrence of cases and anticipating their seasonality without any formal link to climate and epidemiological data. The MHW led the process of development of a climate-informed early warning system (EWS), which provided a quantitative predictive model of dengue outbreak risk and the conditions that favour the transmission of such mosquito-borne diseases.

Barbados has great potential to harness a decade of disease case data, untapped as a result of limited capacity (in terms of personnel, skills and issues related to protected time) for the in-house analysis that is needed to generate probabilistic forecasts several months in advance of outbreaks. The project team that was set up to develop the EWS comprised staff from the MHW, the Caribbean Institute for Meteorology and Hydrology (based in Barbados), and interdisciplinary researchers with diverse expertise in climate risk management, social science, epidemiology and modelling.

Building an EWS that is fit for purpose would require rounds of learning through consultation across sectors (the health and climate sectors) and among stakeholders (including researchers and practitioners), which began in 2017. There had, until this point, been only limited interaction and mutual understanding among the relevant stakeholders.

Working together across sectors, stakeholders co-developed the EWS. The health sector now uses climate data to inform bespoke responses to outbreak forecasts. As a result of financial constraints, the EWS is still a pilot, and health-sector learning has, to date, involved a few leaders and key individuals. But their receptiveness to new information sources marks a subtle yet significant advance. For example, their prior experience of engaging with modellers prompted early outreach to the local research body for modelling and analysis to inform the country's ongoing COVID-19 response. For the MHW, the lasting impact of the EWS experience has been sustained policy support for research-informed decision-making and research collaborations.

As important as the ability of health systems to manage and adapt to change is the ability to drive change when needed – to innovate. Health systems that innovate successfully are usually those that accommodate (or actively encourage) reasonable experimentation and risk-taking in their policies and practices, and that have the ability to assess and codify innovations for future use and scaling up (Fig. 6) (Stiglitz, 2001).

In Kenya and South Africa, managers and health workers strive to solve problems each day, from patient complaints and staffing shortages to changes in policies and protocols. Managing these problems requires resilience, which has been fostered through relatively stable governance structures and financing, but these systems have found that everyday resilience is not enough to sustain initiatives and drive innovation. As a result, there has been investment in leaders at every level of the health system in these countries to reframe challenges, engage staff in problem solving,

and develop strong social networks within and between organizations to foster and support learning and innovation (Gilson et al., 2017). The managers have reported the emergence of diverse innovations through these processes, including the collective setting of budget priorities to build trust and shared commitment, the development of principles for improved collaboration between vertical disease control programmes and district health management, and experimentation with ways to augment hospital revenues, such as by farming oilseeds.

Box 12 outlines a case from Ghana, where an innovative experiment to build nursing capacity came to survive and thrive because its leadership team learned to analyse and manage the stakeholder environment effectively over several years and despite setbacks. The full case study can be found at the end of this document.

Box 12. Nurturing an innovation to strengthen the health workforce in Ghana: learning about stakeholder management to enable complex reforms

In 2008, the Ridge Regional Hospital and the Greater Accra Regional Health Directorate in Ghana were confronted with the fact that a long-standing shortage of skilled anaesthesia staff had now become a major crisis. The effects on the ability to deliver on the country's vision of improved health and reduced inequities in health outcomes was acute in critical areas, such as the delivery of timely, high-quality and effective emergency obstetric care: essential for the reduction of maternal and neonatal mortality.

A rapid appraisal to further understand the situation and devise solutions that were contextually relevant, feasible and legitimate involved an approach based on the co-production of knowledge – tapping into the tacit and experiential knowledge, experience and observations of senior managers, clinicians and frontline staff in the Greater Accra region; as well as analysis of routine data from the health management information system (HMIS). All the evidence confirmed that surgery was suffering because

of the lack of skilled anaesthesia staff; and that the high rate of neonatal and maternal morbidity and mortality were caused, in part, by this staff shortage and the inadequate anaesthesia support for emergency obstetric care, affecting both the smaller district hospitals in the region and other hospitals across the nation as a whole.

The conclusion from the different sources of evidence was that more schools needed to be established for the training of nurse anaesthetists in the short to medium term. The two doctor anaesthesiologists in the Ridge Regional Hospital met the Greater Accra Regional Director of Health Services and argued that the Ridge hospital should take a bold step and start a nurse anaesthesia training school. It was a solution that would take a few years to produce results, but the evidence suggested that it would be the most effective and sustainable solution to the challenge of staff shortages.

This reform encountered problems related to inadequate stakeholder engagement and management that could have killed it before it even started. The process of establishing a professional nurse anaesthesia training school by a regional hospital was, in some sense, a daring innovation. There was some opposition when important stakeholders protested at such a reform taking place without their knowledge and engagement. This experience led to major learning at the organizational level about stakeholder analysis and management. It became clear that the mapping and analysis of stakeholders was a critical part of any major reform in the complex system, as well as listening to them, responding rapidly to them, and moving to mobilize and strengthen support and neutralize stakeholders opposed to reform by convincing them to become supporters.

Over time, a potentially risky innovation was transformed to become an established and respected institution, as batch after batch of new nurse anaesthetists graduated successfully and began to provide excellent service, not only in the Ridge Regional Hospital but in district hospital anaesthesia services across the country. In its first decade, the Ridge Nurse Anaesthesia Training School produced more than 300 nurse anaesthetists to work throughout the country and it is now Ghana's popular "first choice" training school for these vital personnel.

Table 10 is a guide to the cases studies at the end of this document that provide further examples of how learning improves adaptivity and innovations in health systems.

Table 10. Case studies that demonstrate learning to increase adaptivity and innovation in health systems

Barbados	A climate-sensitive warning system for dengue outbreaks developed through a learning collaboration led by the Ministry of Health and Wellness could help the health system adapt to ecological transition.
Burkina Faso	An innovative health financing solution was mainstreamed into policy, helped by the Ministries' of Health and Finance shared learning experiences of its co-piloting.
China	The adaptation of neonatal care strategies to local contexts and constraints was enabled by deliberations *between* local and federal health authorities.
Ghana	An innovation to build nursing capacity came to thrive as a result of its leadership team learning to analyse and manage the stakeholder environment effectively.

SELF-RELIANCE

Health systems that build or improve their structures and processes for continued learning – through information, deliberation and action – have an advantage because they possess the inbuilt ability to learn. Health systems with such learning capabilities are in a better position to set their own priorities, define their own frameworks for action, and optimize their use of existing resources. As such, they are less dependent on external actors for knowledge and intelligence. Such health systems are created through triple-loop learning – when an organization or system questions existing learning frameworks and methods and works to transform them.

India's process of system reform to achieve UHC is an example of how a country has utilized an evaluation framework, its own embedded research and policy analysis capacity, and

an ongoing deliberative and iterative process to solve myriad problems that are also faced by many other countries that are pursuing a UHC agenda. National leaders and counterparts at WHO recognized that there could be no one-size-fits-all solution to challenges such as workforce capacity, financing, the management of decentralization or the overall management of services delivery, and that they needed to generate and utilize evidence to guide their evolving programme implementation (Duran et al., 2014).

Learning and action have also been stimulated in Nigeria by efforts to tackle mother-to-child transmission of HIV. Despite having a PMTCT programme in place, the number of HIV-infected infants has remained high. The country has implemented new strategies to expand sites, integrate PMTCT into other service delivery packages and has task-shifted

while working to improve its HMIS to improve data quality and availability. While challenges related to health-worker capacity and unified data systems remain, a health systems approach has helped the government and key implementing partners improve service delivery and develop systems to support continued learning and innovation for the future (Olakunde et al., 2019).

Box 13 presents a case from post-war Lebanon, where, despite persistent adverse geopolitical circumstances, the Ministry of Public Health was able to tackle several critical stewardship challenges within the private health sector by capitalizing on experiential knowledge and building local expertise. The full case study can be found at the end of this document.

Box 13. Building local expertise in post-war Lebanon: learning to tackle the challenges of private health sector stewardship

Lebanon's Ministry of Public Health (MoPH) had been left with little authority in the country's post-civil war chaos of the 1990s. During the 2000s, and despite persistent adverse geopolitical circumstances, the MoPH overcame many challenges to transform a fragmented health system into a resilient and high-performing positive outlier in the region. This transformation was driven in large part by investments to improve learning processes and to capitalize on the wealth of information and knowledge generated by the daily operation of the health system.

One challenge among many was the public purchase of inpatient care for uninsured citizens in private hospitals. Costs skyrocketed as a result of very limited checks and balances on private providers' billing practices, and regularly exceeded budgetary allowances. A crucial step taken by the MoPH was to set up a Performance Contracting Team divided into three committees working respectively on utilization review, admission criteria and performance indicators. This team launched research and analytical work to assess utilization patterns and understand the

price structure of bills for laboratory examinations, imaging and operating-room costs. Through this exercise, MoPH staff gained a level of knowledge and skills that changed their relations with the hospitals. The effects were almost immediate: the negotiation of a 13% rebate and better justifications for spend (e.g., the use of universal disease classifications, and evidence that patients were not charged more than the 15% co-payment).

Next, computerization of pre-admission authorizations, and later of discharge data, gave the MoPH team further opportunities to enhance their expertise in their understanding of costs and billing practices, and helped the MoPH to gain the credibility to negotiate prices. It also led to a radical simplification of the authorization process for patients, with gains in time, money and comfort, while eliminating the previous common practice of double billing and curtailing gross overbilling.

In the 2010s, the MoPH teams were ready to broaden their scope from looking at admissions and bills to analysing

discharges and outcomes. Computerization streamlined management processes and provided precious databases. The analysis of these databases by the MoPH teams generated a wealth of information and enhanced the reputation of the Ministry as an organization capable of data-driven regulation.

Alongside this step–by-step process of performance contracting, accreditation too became increasingly outcome-oriented, with accreditation proving to be an important learning tool to improve the technical quality of care and mitigate perverse incentives. The accreditation process was, initially, supported by external technical expertise, but a Lebanese team under MoPH oversight was soon trained and able to take over. Initial funding came from the government before a shift to funding from the private hospitals themselves, which were now convinced of the value added to themselves, as well as their clients.

Table 11 is a guide to the cases studies at the end of this document that provide further examples of greater self-reliance through learning in health systems.

Table 11. Case studies that demonstrate greater self-reliance for learning

Ghana	Regional health authorities learned to leverage country stakeholders' support effectively in an initiative that strengthened the region's health workforce capacity.
Lebanon	The Ministry of Public Health capitalized on local experiential knowledge and built domestic technical expertise in improving the stewardship of the private health sector.
Nigeria	The establishment of vital new learning processes for outbreak control helped the health system strengthen its capacity to generate the knowledge needed to tackle future epidemics.

CHAPTER 4
Building learning health systems

This chapter discusses what it takes to build learning health systems. What are the structures, processes and capacities that need to be developed to enable, support and sustain learning within health systems?

INSTITUTIONALIZING LEARNING

As organizational theorists Marsick and Watkins (2003) (also Jenkin, 2013; Watkins & Kim, 2018) have described, learning practices are routinized and coordinated through processes of institutionalization – the establishment of rules and procedures conducive to learning at organization and cross-organization levels (Fig. 7). Institutionalization allows learning to occur widely and systematically to bring about improvements throughout the system in a sustained manner.

Fig. 8 lists examples of mechanisms for the institutionalization of learning in health systems, mapped broadly to the means of learning and the learning loops that they support.

Fig. 7. Institutionalization of learning at organization and-cross-organization levels
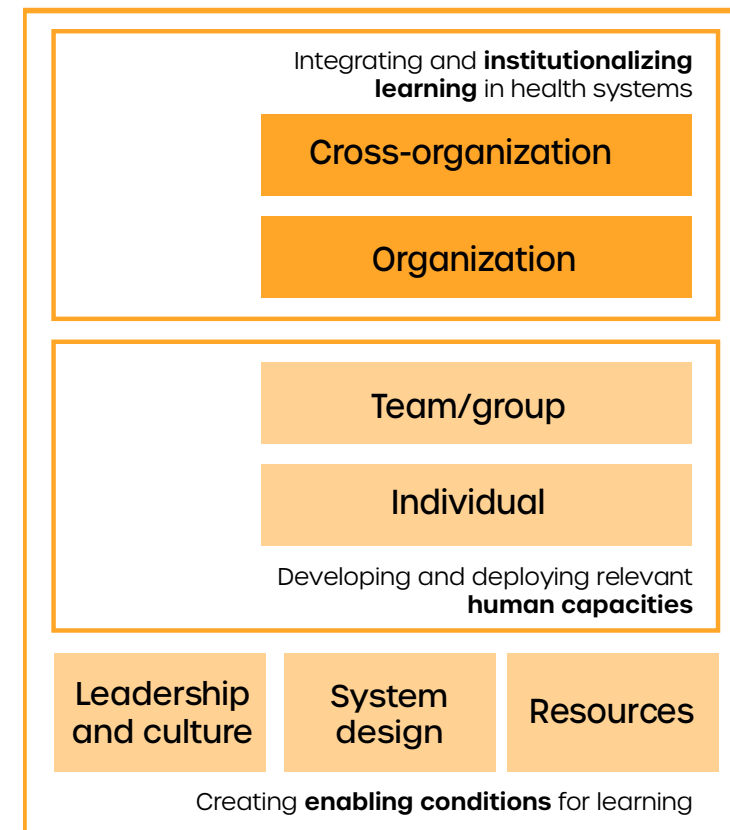
Integrating and **institutionalizing learning** in health systems

Cross-organization

Organization

Team/group

Individual

Developing and deploying relevant **human capacities**

Leadership and culture

System design

Resources

Creating **enabling conditions** for learning

Fig. 8. Examples of mechanisms to institutionalize learning in health systems
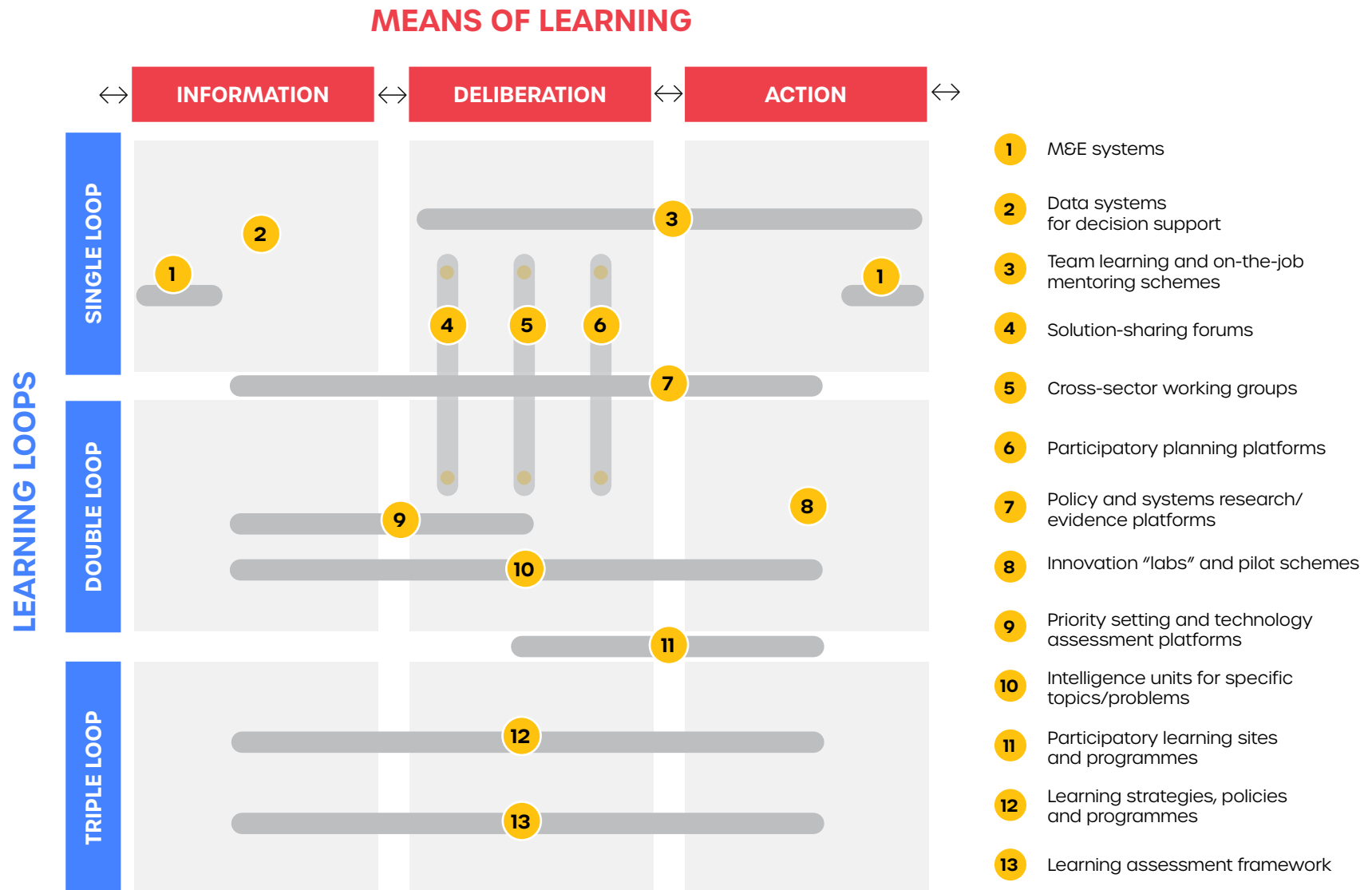
MEANS OF LEARNING

| | INFORMATION | DELIBERATION | ACTION |

LEARNING LOOPS

SINGLE LOOP

DOUBLE LOOP

TRIPLE LOOP

1 M&E systems

2 Data systems for decision support

3 Team learning and on-the-job mentoring schemes

4 Solution-sharing forums

5 Cross-sector working groups

6 Participatory planning platforms

7 Policy and systems research/ evidence platforms

8 Innovation "labs" and pilot schemes

9 Priority setting and technology assessment platforms

10 Intelligence units for specific topics/problems

11 Participatory learning sites and programmes

12 Learning strategies, policies and programmes

13 Learning assessment framework

Institutionalizing the use of routine data requires the strengthening of systems for data aggregation and deployment within policy and service delivery units/entities in the health system. The application of technology has, in addition, a key role in improving and mainstreaming the routine use of data. The increasing ubiquity and reduced costs of information technology hold real potential in terms of its ability to mainstream the use of data in health systems (Howitt et al., 2012; Krumholz et al., 2016; Friedman et al., 2017).

In many settings, M&E approaches within health systems have evolved to increase their focus on learning. The Monitoring & Evaluation/Accountability (M&E/A) framework of the GVAP is one example of how learning evolved within an initiative.

The GVAP included an initial collaborative effort to develop an M&E framework (MacDonald et al., 2020). The M&E approach then evolved to utilize iterative rounds of inputs from leaders of vaccination programmes at global, regional and country levels to develop and refine their M&E/A framework over the course of two years; this framework now guides how progress data are organized and reported to the World Health Assembly (Cherian et al., 2020).

The institutionalization of knowledge use also occurs by building links between researchers and decision-makers, which may take the form of embedded or bridging arrangements with researchers (see Fig. 9), and can be influential in shaping national and subnational health reforms (Frenk, 2006; Cairney & Oliver, 2017; Morain et al., 2017;

Rodríguez et al., 2017; Meng et al., 2019). Such collaborative arrangements require investments in research support to address problems in the health system through the provision of relevant evidence to influence policy and decision-making processes (Witter et al., 2019b).

Notable examples of embedded policy and systems research include the role of policy institutes in Thailand, which played a key role in efforts to achieve UHC (Tangcharoensathien et al., 2007, 2018; Pitayarangsarit & Tangcharoensathien, 2009; Thaiprayoon & Smith, 2015). A more recent example is the establishment of the National Knowledge Platform in India to support research and evidence synthesis on domestic health systems (Sheikh et al., 2016; Sriram et al., 2018).

Applied research and policy analysis institutes can provide important learning opportunities to health systems, particularly when they foster long-term relationships across researchers and decision-makers (Nevis et al., 1995; Cairney & Oliver, 2017). While many policy institutes have broad mandates, specialized intelligence units may be established to analyse priority problems or advance strategic thinking in specific areas, such as disaster management or behaviour change (Patel et al., 2018; Verrecchia et al., 2019). For example, the Nigeria Centre for Disease Control (NCDC) was established in 2007 and was well-poised not only to coordinate and lead the response for the Ebola virus outbreak in 2014 for Nigeria, but also to support the responses in Liberia and Sierra Leone (Njidda et al., 2018).

Depending on the subject of enquiry, relevant knowledge and information may need to be either concentrated selectively within the health system or distributed widely. An example from Georgia involved gathering external information (from evidence synthesis) and combining it with internal data sources to address COVID-19 preparedness. In this instance (see Box 14) the centralization of intelligence through the presence of a "nerve centre" in the Ministry of Health was important in enabling a rapid and coordinated response. The full case study can be found at the end of this document.

▌ Box 14. Establishing a "nerve centre" to coordinate the epidemic response in Georgia

In the six weeks between the COVID-19 outbreak in China and the first reported case in Georgia, the Government of Georgia took steps informed by experiences of Asian countries that controlled the spread effectively and protected the economy. There were, at first, different views in the national cabinet on the merits of a lockdown, given that 20% of Georgia's gross domestic product (GDP) comes from tourism. Meetings with the Ministry of Health, the Prime Minister and the National Security Council raised three key questions: how significant was the threat relative to the capacity of the national health system?; how had other countries dealt with the threat?; what was the best way to manage the response in the specific context of Georgia?

A government-associated research team delivered evidence on these questions through a rapid review on how the Republic of Korea, Singapore and the China, Hong Kong Special Administrative Region had controlled their epidemics in February and March 2020; and through modelling of the potential impact of physical distancing on the epidemic. The modelling and review informed recommendations in mid-March 2020, which triggered the policy response to the early phases of the epidemic, key aspects of which were:

- establishing border quarantine points and enhancing case identification and contact tracing;

- mounting public communications campaigns, using traditional and digital media;

- establishing triage systems with the help of emergency hotlines and primary health care providers to reduce unnecessary referrals to hospital.

A coordinated cross-sectoral epidemic response was made possible through a single nerve centre – the Multisectoral Coordination Council, which was established during the early days of the outbreak and chaired by the Prime Minister.

Policy institutes can also play a valuable role in priority setting. In Thailand, for example, long-term partnerships based on trust between the Ministry of Public Health (MoPH) and entities like the National Statistics Office have enabled the MoPH to assess its priorities in response to emerging developments in health systems (Pitayarangsarit & Tangcharoensathien, 2009). Health technology assessment units – an established mechanism in HICs to evaluate and assess technologies to inform decision-making – are now being established in many LMICs (Downey et al., 2017; MacQuilkan et al., 2018; Leelahavarong et al., 2019), although further efforts and investments are needed to support their establishment in many low-resource settings (Kriza et al., 2014).

The institutionalization of deliberative and experiential learning is just as important as the mainstreaming of information flow. In Bangladesh, the use of data from the country's national health information system (DHIS2) to monitor health system performance has faced challenges related to slow Internet, weaknesses in data quality and a lack of integration between the public and private sectors. However, DHIS2 users have found it valuable for the integration of data reviews and for quality checks at local and national levels, while the use of dashboards has made it possible to synthesize findings and discuss them among peers (Begum et al., 2020). In South Africa, a WhatsApp-based peer community of practice that supports shared learning among graduate nurses has helped to expand professional learning networks through alumni connections and integration with the professional cadre of workers (Abiodun et al., 2020).

Working groups and inter-ministerial committees are common examples of mechanisms to enhance understanding and promote consensual action across the health sector and other sectors. During UHC policy processes in Morocco, an inter-sectoral committee and a joint knowledge management platform enabled shared learning on the mutual benefits of UHC (Akhnif et al., 2019). In South Africa and Zambia, cross-sector partnerships aimed initially at poverty reduction supported collaborative research to help understand and address complex problems related to health and development (Rein & Stott, 2008).

Deliberative platforms for community engagement and participatory planning are rich sources of learning (Rao & Sanyal, 2010; Mitozo & Marques, 2019). For example, local health councils in Brazil have been established and provide a forum for rich discussions and disputes, where citizens and representatives from diverse backgrounds and groups can voice their demands and complaints. These councils also monitor and inform budgets submitted for federal funding. Health conferences then bring together health council representatives to deliberate on health policy issues at local, municipal, state and national levels, in an example of interlinked learning across different levels of the health system (Cornwall & Shankland, 2008).

Programme pilot schemes and learning sites are examples of experimental or action learning from which other sites can also learn through observation and research (Garvin, 1993; Basten & Haamann, 2018; Nancarrow et al., 2013). Practice and innovation labs are another way to identify promising

local practices and learn from them, with the potential to scale up or diffuse innovations to other settings and across systems (Ayers et al. 2013; Bennett et al., 2017). In South Africa, a well-documented example of collaborative learning sites involving health managers and researchers has helped managers reflect on their practices and identify problems and innovations (Gilson et al., 2014, 2017; Lehmann & Gilson, 2015; Scott et al., 2014; Cleary et al., 2018; The Western Cape HPSR Journal Club Team, 2020). Another recent and relevant example is an innovation platform in Australia that has supported quality improvement for Indigenous primary health care in rural areas (Bailie et al., 2020).

Finally, the institutionalization of triple-loop learning implies setting up structures and processes to examine current approaches to learning and improving them for the future. This can take the form of the development of a learning strategy for the health system, or policies to enhance learning at all levels of the health system. Ghana has developed such an approach, building on several decades of embedded research and experience with learning processes as it piloted, scaled up and institutionalized the Community-based Health Planning and Services (CHPS) programme. The CHPS+ programme is now the national initiative to institutionalize learning into the programme itself, with a focus on district-level teams that learn continuously from the implementation and from feeding that learning back into the policy process (Phillips et al., 2020). In the United States, there are examples of health systems that have learning strategies. These cover such aspects as building infrastructure, establishing a coordination team, ensuring availability of data, developing relationships and engagement processes with other stakeholders, and actively reviewing implementation experience to inform further policy development and reform (Myers et al., 2018).

Table 12 is a guide to the cases studies at the end of this document that that provide further examples of institutionalization of learning in health systems

Table 12. Case studies that demonstrate institutionalization of learning

Georgia	The centralization of intelligence through the presence of a "nerve centre" in the Ministry of Health was important in enabling a rapid and coordinated response to COVID-19.
Indonesia	The integration of a UHC dashboard for health policy-making at national and provincial level has facilitated regular regional comparative analysis of progress.
Nigeria	New learning processes (surveillance software, after-action reviews) were integrated into health system routines, increasing their ability to learn while tackling future epidemics.

OPTIMIZING PEOPLE'S LEARNING CAPACITIES

Building a learning health system also requires creating human skills and capacities to learn and their effective use (Fig. 9). As described in Chapter 2, learning at the individual (and team or group) level entails different forms of information-gathering, intuition (or tacit learning) and interpretation (Crossan et al., 1999; Marsick & Watkins, 2003; Jenkin, 2013). Specific learning skills and capacities vary according to people's roles within the health system and can be gained or developed either through formative (pre-service) education or through different means of continuing development. For people's learning skills and capacities to be engaged effectively, they need to be deployed to appropriate roles within the health system, and supported through career advancement opportunities, incentives for growth and environments that are conducive to learning.

Fig. 10 sets out areas for the development and deployment of the human capacities that are needed to enhance learning in health systems, mapped broadly to the means of learning and to the learning loops that they support.

To contribute effectively as members of a learning health system, **health care providers, health managers and policy-makers** need to have developed a range of relevant capacities. These vary, depending on their roles within the health system and can include interpreting routine data, synthesizing evidence, using the findings of M&E, team and participatory learning, identifying and scaling up innovations, and communication and knowledge management.

Fig. 9. Learning capacities at individual and group level
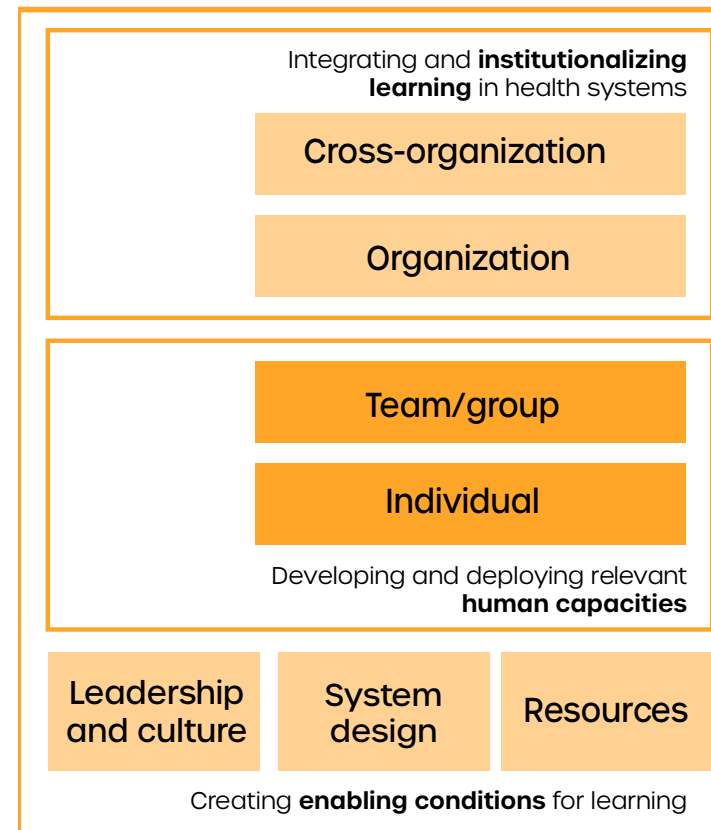
Integrating and **institutionalizing learning** in health systems

Cross-organization

Organization

Team/group

Individual

Developing and deploying relevant **human capacities**

Leadership and culture

System design

Resources

Creating **enabling conditions** for learning

Fig. 10. Examples of human capacities needed in learning health systems
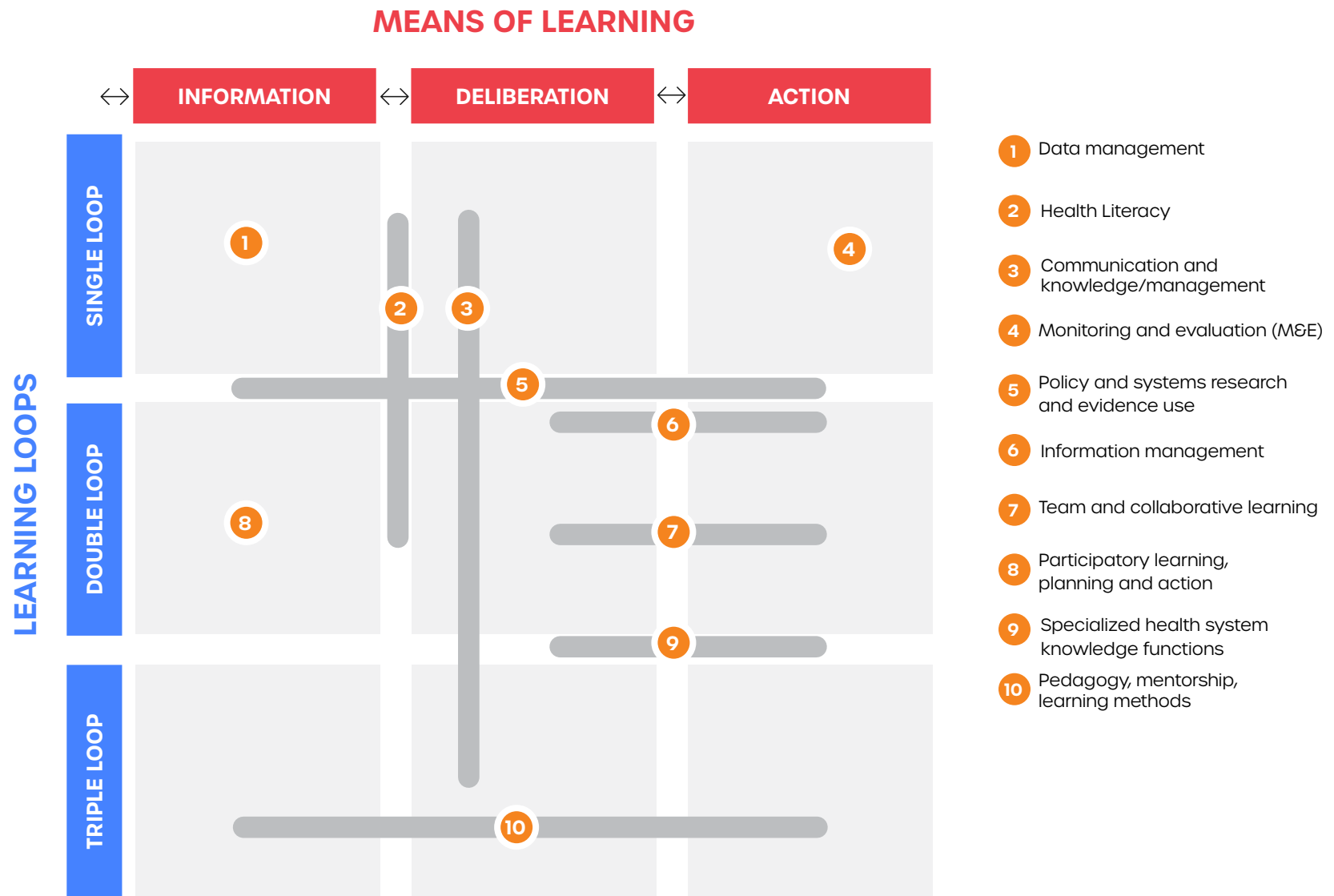
MEANS OF LEARNING

Capacity	Description
1	Data management
2	Health Literacy
3	Communication and knowledge/management
4	Monitoring and evaluation (M&E)
5	Policy and systems research and evidence use
6	Information management
7	Team and collaborative learning
8	Participatory learning, planning and action
9	Specialized health system knowledge functions
10	Pedagogy, mentorship, learning methods

Some countries have recognized and addressed this need to impart learning skills among health personnel. In Chile, an expert panel convened by the Ministry of Health has informed the creation of the National Guidelines for Clinical Practice, which physicians are mandated to use by law as minimum standards for practice. Medical students in Chile are, therefore, taught skills for evidence searching and critical appraisal. A research database, Epistemonikos, has also been developed to make evidence more accessible to health policy-makers and practitioners (Caneo & Calderón, 2018).

Skills in data and research utilization are commonly identified as being valuable for capacity-building to support health systems research and learning (Hawkes et al., 2016). Examples include efforts to build capacity for data management at facility, district and provincial level by conducting training on quality-of-care improvement and processes and the management of implementation challenges in Mozambique, Rwanda and Zambia. This initiative is reported to have resulted in the improved development and execution of action plans, a joint sense of ownership and value in the use of data, and consistent adherence to clinical protocols (Wagenaar et al., 2017). In another example from Chile, in-service skill development for policy-makers on using evidence in decision-making has supported government efforts to reduce user fees and expand family care centres to rural areas (Caneo & Calderón, 2018). In Uganda, training government leaders and NGO managers through workshops, consultations and joint planning processes has also been found to be useful for the harmonization and more effective use of M&E tools (Hauge, 2001).

Team-based learning is another important area where in-service and pre-service training can be effective. In-service training on team-based learning in Viet Nam has used both classroom learning and fieldwork for teams to improve HIV programme implementation and planning to drive improvements in the future (Do et al., 2018). In Argentina, a capacity-building strategy for frontline providers to adapt guidelines to the local context found that participatory approaches that integrated technical and social/team skills facilitated effective engagement, as well as the utilization of knowledge to inform practice and policy (Esandi et al., 2013). In further examples, district teams in Ghana have engaged in a leadership development programme (LDP) that has improved teamwork and prioritization (Kwamie et al., 2014), while a pre-service training programme in Kenya for health professionals focused on leadership and management skills to manage teams and govern health systems programmes at various levels (Kiarie et al., 2016).

The capacities required to integrate and scale up innovations in health systems include the abilities to develop a persuasive case for support, to plan for adaptation across contexts, to develop a shared understanding with teams and personnel and generate their support, and to manage and coordinate implementation efforts (Wutzke et al., 2016). In Bosnia and Herzegovina, for example, the introduction of a family medicine-centred primary health care approach was aided by the ability of the reform team to engage stakeholders, helping them understand the benefits of the innovation and setting expectations of what could be achieved (Atun et al., 2007).

Developing the capacities of **communities, citizens and users of health services** is essential to enable their contributions to learning. The concept of health literacy is relevant here, theorized by Nutbeam (2000) as spanning three levels:

- functional health literacy – basic skills to function effectively in a health context;
- interactive health literacy – advanced cognitive and social skills to be able to extract and apply information and derive meaning from communication;
- critical health literacy – more advanced skills to critically analyse information and exert greater control over events and situations.

Capacity-strengthening of communities, citizens and users, therefore, includes imparting public information on health services, rights and protections. However, it also includes the development of social skills to engage meaningfully with stakeholders in health systems, and the empowerment of people with critical and transformative abilities through, for example, education for effective community representation in health planning and governance.

Engaging the individual users of services, particularly those from disadvantaged groups, to share their experiences and perspectives as a basis for advocating for behaviour change and activism has been found to be effective in the context of health promotion programmes (Parker et al., 2012). In India, leadership training for subdistrict committee members has increased their participation and commitment by helping members understand their roles, their relationships to other NGOs and government programmes, and by monitoring their

activities and impact (Prashanth et al., 2014). Disaster resilience has also been increased when communities are supported to prepare for, respond to, and recover from disasters by supporting community members to promote wellness and lead efforts while also recognizing and working to address power and resource inequities (Gil-Rivas & Kilmer, 2016).

Another important area for a learning health system is the development of the relevant capacities of **researchers and analysts** and ensuring that these capacities are deployed effectively to drive improvements in the system. Countries, provinces or districts seeking to build a learning health system need a critical mass of researchers and analysts who can contribute expertise and generate evidence on priority subjects.

The cadres of researchers and analysts required to serve the needs of a learning health system include those focused on the analysis of health systems and policy (health policy and systems researchers), as well as experts in areas of special importance (e.g., disaster management or behaviour change) or of strategic significance for planning (e.g., economic evaluation or technology assessment). In Mexico, for example, organizations such as the National Institute of Public Health and the Mexican Health Foundation have trained researchers who occupy key positions in the health system and who conduct independent and credible evaluations, feeding into policy design as well as new technologies and changed community behaviour (Frenk, 2006).

Thailand has developed short- and long-term plans to expand training opportunities on economic evaluation to increase capacity for health technology assessment (HTA) as well as

for ongoing monitoring and research by the government-linked organizations responsible for HTA and health system evaluation (Chaikledkaew et al., 2009). Similarly, Hungary recognized a capacity gap for the implementation of HTA and undertook a proactive training initiative among local universities before establishing the Hungarian Health Economic Association (META), which is now a driving force for HTA initiatives (Kalo et al., 2013). In a study of learning across six LMICs, the capacity to use evidence was cited as one of the most influential factors in the uptake of policy (Witter et al., 2019b).

Several targeted courses have been developed for health policy and systems research (HPSR), including in Africa and India. The Consortium for Health Policy and Systems Analysis in Africa (CHEPSAA) has developed HPSR training courses and materials to ensure that HPSR skills are taught as a cross-cutting theme in post-graduate training programmes that could support multidisciplinary learning and action (Erasmus et al., 2016). In India, the Keystone HPSR fellowship and short course was developed for researchers and policy-makers by a collaboration of 13 organizations to bridge the gap between available research capacity and health systems challenges (Garimella et al., 2016).

Many researchers with relevant technical expertise lack the capacity to collaborate effectively with health system actors, which constrains their ability to contribute to learning. It is important to address this gap through training for health researchers in co-production and in collaboration with non-academic partners. Doctoral and post-doctoral candidates are a key group in whom to instil knowledge and attitudes so that they continue to engage as embedded researchers as they embark on their careers. Several programmes in the

US and Canada have developed processes for this through fellowships that enhance skills and experience related to leadership and change management, and that provide opportunities for participants to be embedded within a host organization and be mentored by health systems leaders, as well as academics. The programmes also provide guidance on undertaking research, frameworks and tools, and on the need for protected time to explore policy-relevant research questions. They have also created national networks of participants and alumni (Kanani et al., 2017; McMahon et al., 2019).

In addition, training workshops for researchers and academics who are already working provide opportunities for them to gain experience. In Nigeria, for example, they can gain this experience as embedded researchers through secondments to the Ministry of Health (MoH) that increase their knowledge of policy processes and forge relationships between these academics and the MoH leadership (Uneke et al., 2018). In the United Kingdom of Great Britain and Northern Ireland, organizations and teams have hosted secondees to ensure their meaningful experiences and their acquisition of skills (Gerrish & Piercy, 2014).

Building these skills and cadres, however, is insufficient if their contributions are not incentivized and aligned to health system priorities though relevant employment opportunities and funding. In Thailand, the International Health Policy Program (IHPP) has implemented apprenticeships and long-term fellowships since 1997 (Tangcharoensathien et al., 2007), which have laid the foundation for increased capacity for the use of evidence in policy (Towse et al., 2004). Since its inception, 47 PhD students and nine Masters students have been trained in HPSR and have been retained in Thailand.

The development of this embedded capacity is reported to have taken 30–50 years (Tangcharoensathien et al., 2007; Pitayarangsarit & Tangcharoensathien, 2009).

Finally, it is important to establish a critical mass of **teachers, trainers, mentors and methodologists** to help develop and strengthen capacities in these different learning arenas, and continue to strengthen effective learning approaches in response to evolving learning needs. The World Bank's flagship health systems training programme, for example, uses a training-of-trainers model, with a core team of faculty taught the initial offerings of the course, which then expands to core teams of regional trainers who can facilitate country-specific course offerings and partnerships (Reich et al., 2016). Mentorship has been identified consistently as a valuable experience for both mentors and mentees: an experience that also contributes to an intergenerational sharing of experience, paving the way for one generation of junior professionals to mentor the next generation (Cole et al., 2014).

Table 13 is a guide to annexed case studies that provide further examples of optimization of people's learning capacities in health systems.

Table 13 a guide to the cases studies at the end of this document that that demonstrate optimization of people's learning capacities

Guatemala	Training community representatives in health rights, laws and governance helped improve the quality of their experience and contributions to local health governance bodies.
India	Training of existing health care personnel (nursing master-trainers) for specialized outbreak control roles enabled them to mobilize rapidly during the COVID-19 epidemic.
Mozambique	Repetitive cycles of peer-led skill-building helped improve district health system managers' abilities to use routine health data in managing child health services.

ENABLING CONDITIONS

LEADERSHIP AND CULTURE

The role of leaders (of teams, organizations and systems) is essential for initiating, championing and creating an environment that favours learning (Akhnif et al., 2018, 2019; Meessen et al., 2019). Leadership has a key role in developing a vision for learning, establishing learning structures and processes, and spurring collective action across organizations or systems to identify and solve problems. Learning-friendly leadership can validate important new ways to learn and to generate knowledge (Schilling et al., 2011), steward the platforms and processes involved in learning, and create space for discussion and debate within and across teams and organizations.

Leadership can influence system culture, and culture, in turn, influences how leaders function (Senge et al., 1994; Marsick & Watkins, 2003; AHPSR, 2016). The key elements of culture that are conducive to learning are teamwork and cooperation, readiness for change and new ideas, and an appreciation of differences and inclusivity (see also Garvin, 1993; Vassalou, 2001; Birleson & Brann, 2006; Schilling et al., 2011; Akhnif et al., 2019).

The culture of a system, organization or team determines how learning is valued and used. Excessively hierarchical cultures can inhibit the openness and sharing that are essential for learning, particularly the double-loop learning that challenges the status quo (Akhnif et al., 2018). Where the culture is more persuasive and less hierarchical, leaders are more likely to value experiential and deliberative forms of learning, and recognize and promote experimentation and innovation (Scott & Gilson, 2017; Gilson & Agyepong, 2018).

SYSTEM DESIGN

The design of processes within a team, organization or system can enable or constrain learning. For example, processes of governance and accountability, quality improvement, the deployment and mobility of personnel, priority setting and planning, communication and supervision all matter for the quality of learning (Goh, 1998; Crossan et al., 1999; Vassalou, 2001; Birleson & Brann, 2006; Plazas, 2013; Pronovost et al., 2017). To maximize their learning potential, systems need an active learning agenda and vision, as well as the ability to accommodate learning from deliberation, experience and information, and to develop effective mechanisms for feedback that is generated internally (rather than relying on standards or targets that are imposed by external sources) (Akhnif et al., 2017).

Organizational structures can also create barriers for learning when teams are instructed to work in siloes or when managers are unable to provide time or the skills to facilitate thinking through root causes and generate innovative approaches. This situation was found in South Africa, where initiatives such as the District Innovation and Action Learning for Health System Development (DIAHLS) programme aimed to address it (Cleary et al., 2018). Supportive supervision is another core process for the enhancement of learning, yet this remains a chronic challenge in many LMIC settings where supervision continues to be authoritarian and fault-finding (if not rent-seeking in some contexts). While there are good examples of improved practice (Nkomazana et al., 2016), the extension and maintenance of good supervision requires continuous efforts.

Decentralization can have a salutary effect on learning in some cases, given that individuals and teams are, in general, better able to share knowledge in smaller units, such as those at district or subnational level (Nevis et al., 1995; Crossan et al., 1999; Dias & Escoval, 2015; Morain et al., 2017). It is also crucial that the incentive structures within health systems are aligned to its learning requirements. In a study of learning across six LMIC health systems, incentives were reported as one of the most influential factors in the uptake of policies (Witter et al., 2019b).

Learning is incentivized for researchers when institutions recognize and support learning as part of job expectations and promotions, when funding opportunities are available to enable collaborations with policy-makers and policy processes, and when there are opportunities for publication (Allcock et al., 2015; Akhnif et al., 2018). Motivation by policy-makers – often driven by funding availability and the overall political economy for evidence use and learning in a health system – can be strong incentive for the engagement of individuals and organizations in learning and collaborative initiatives (Witter et al., 2019b). Finally, managers can provide an enabling environment for teamwork and for the encouragement of staff to make learning meaningful and worthwhile (Birleson & Brann, 2006).

Fig. 11. Enabling conditions to build learning health systems
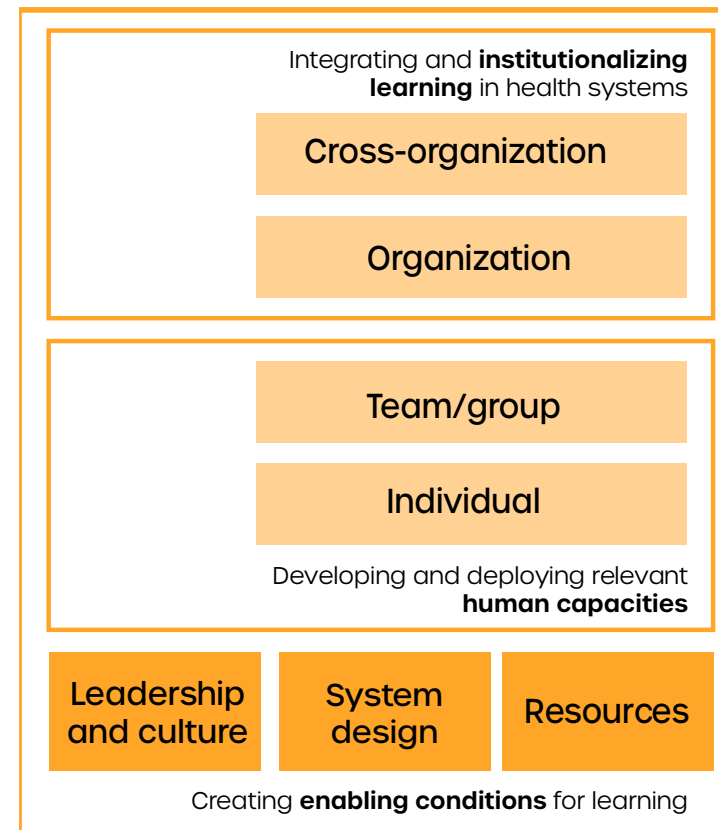
Integrating and **institutionalizing learning** in health systems

Cross-organization

Organization

Team/group

Individual

Developing and deploying relevant **human capacities**

Leadership and culture

System design

Resources

Creating **enabling conditions** for learning

RESOURCES

Establishing a learning health system requires financial resources. This includes, first and foremost, the costs of establishing and sustaining the mechanisms of institutionalized learning. These include (but are not limited to) M&E and data systems, policy and systems research funds and platforms, solution-sharing and deliberative platforms, innovation incubators or labs, and specialized intelligence units and action-research sites, as well as the costs of developing and executing a learning strategy (Fig. 11).

Developing the infrastructure for applied research requires long-term and stable support (Akhnif et al., 2018) as does the development of data systems and technologies (Cresswell et al., 2016). In Morocco, the need for resources has been key, particularly at the lower levels of the health system where frontline workers and managers are connected directly to system problems and are well-placed to innovate and contribute to learning (Akhnif et al., 2019).

In addition, there are costs associated with the development of the varied human capacities for learning within the system and their effective deployment. Funding is needed to support trainees from diverse backgrounds, and then to create and sustain interdisciplinary teams of researchers. Funding is also required to protect the time that is needed to pursue innovations and produce tools and methods to address the learning questions of both trainees and the teams they will join afterwards (Krumholz, 2014). Capacity-building requires the allocation of protected time for pre-service and in-service training to explore policy-relevant research questions, and to build the relationships with other stakeholders that are needed for effective and embedded research processes (Bautista, 2019).

Educational fees for trainees vary widely around the world, but can be prohibitively high in many countries. This makes it essential to ensure that the costs of education do not prevent key stakeholder groups from becoming effective contributors to learning teams and organizations (Frenk et al., 2010). Apart from initial commitments towards learning goals, fiscal flexibility and stability are key to developing and sustaining infrastructure for learning (Friedman et al., 2017; Morain et al., 2017; Akhnif et al., 2018).

Many applications of information technology offer economical and feasible learning solutions at scale (Kahn et al., 2010; Derenzi et al., 2011). Technology is useful not only to facilitate the flow of information, but also to accelerate deliberative and experiential forms of learning through simple and low-cost applications such as online learning platforms – which are used increasingly in low-resource settings (Scott & Gilson, 2017). However, some technologies can also require significant fixed and running costs in the long term, and these costs should be weighed judiciously against the benefits (Vuong et al., 2019).

External funding can have an important catalytic role in setting learning investments in motion and sparking learning cultures. The KEMRI-Wellcome Trust Laboratories[1] are an example of initial external funding with strong partnership and motivation

by in-country partners in Kenya, aiming to build capacity for high-quality laboratory research and practice. After more than 30 years of operation, the laboratories have made a contribution that far exceeds the initial scope to support science in many areas and to advance the achievement of standards of excellence, including for standard operating procedures, accreditation and collaborations (Gumba et al., 2019). However, external support also carries the risks of fragmentation of funding and of activities, standards and conditions that are externally imposed, and that can, in the long term, constrain learning (Bennett et al., 2015; Dias & Escoval, 2015; Morain et al., 2017; Bertone et al., 2019). The infusion of domestic resources into learning activities can, however, engender several long-term benefits and efficiencies for a health system: improved system functions, improved adaptivity and reduced dependence on external support (see Chapter 3) (Birleson & Brann, 2006; Tsai, 2014).

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[1] KEMRI is the Kenya Medical Research Institute.

CHAPTER 5
A continuous quest

AVENUES FOR ACTION

As described in Chapter 4, building a learning health system requires deliberate, sustained effort to develop learning structures and processes across the levels, loops and means of learning. Learning and the need for learning are continuous, and becoming a learning health system is not a journey with one clear or universally acknowledged beginning and end point (Garvin, 1993). The learning needs of health systems are deeply contextual, and there can be no single blueprint or framework for the operationalization of learning health systems. However, this does not reduce the need for action to advance such systems, nor the urgency of the agenda.

What actions can different actors and stakeholders take to advance learning health systems? For a country, province or a district seeking to build such a system, it is important that **health policy-makers and planners (ministries, directorates and departments of health)** play a leading role in enabling this transformation (Table 14). Acts of cross-organizational leadership that can be undertaken by policy-makers and planners include developing and implementing a learning strategy for the health system, supporting it by devising a framework to assess and benchmark progress, and ensuring the adequate and well-targeted investment of funds for learning activities.

Health sector leaders are also best placed to take other actions: strengthening the integration and institutionalization of learning at all levels of the health system (from strengthening M&E and data-delivery systems to establishing policy/systems research and priority-setting platforms, innovation incubators and participatory planning forums). Health sector leaders and employers also have a role in ensuring that health systems can absorb, deploy and retain people and teams with relevant learning capacities, and in the continuous strengthening of the learning capacities of their in-service personnel (see, for example, the case study from Kerala, India).

Specific actions to advance learning health systems may be undertaken more effectively at organization or team level (such as by specific **health programmes, facilities and other employers, as well as by teams of health workers).** These actions include strengthening team-based learning and on-the-job mentoring, establishing learning sites and participatory learning initiatives, and developing communities of practice and solution-sharing platforms (see case studies from Benin, Guinea and Mozambique).

Building learning health systems, however, is not solely the domain of the health sector. It also requires important contributions from other stakeholders. Actions that can be

taken by **community representatives and civil society organizations** include the strengthening of deliberative platforms for participatory planning and governance (such as facility committees, health councils and health assemblies), the amplification of the voices of citizens and service users, and participation in and the spurring of shared learning. Community and civil society groups can also advance learning by providing communities and service users with education in their health rights, entitlements and protections, and in advanced aspects of health governance and laws (see case study from Guatemala).

The role of research leaders (including **research councils, universities and other research organizations**) is also a crucial one. Research organizations have a key role in collaborating with policy-makers to establish platforms for policy and systems research, evidence synthesis and evidence use to meet the general and specialized knowledge needs of the health system (see case studies from Barbados and Indonesia). Research councils and universities can act by increasing their focus on interdisciplinary and applied policy/systems research and help build research capacity in these areas to meet the learning needs of health systems.

Finally, **educational councils and professional training institutes** can also do more to build the capacities of future health professionals and health sector personnel in key learning areas. These include, but are not limited to, M&E, data management, communication and knowledge management, research methods and evidence use, innovation management, participatory learning and team-based learning.

As discussed in Chapter 4, leadership is critical to create the enabling conditions for learning. Ultimately, all of the stakeholders mentioned have potential leadership roles in fostering cultures and creating incentives for participatory and inclusive learning that accommodates deliberative and experiential learning, as well as information; and in mobilizing processes of single-, double- and triple-loop learning to enable health systems (at all levels) to become more self-aware, self-critical and open to change.

Progress in advancing learning health systems may be understood in terms of the extent to which a health system has set in motion the different mechanisms to institutionalize learning, has developed and deployed the human capacities needed to enable learning, and has generated learning processes across its different dimensions – the levels, learning loops and means of learning. Table 14 provides a broad and non-exhaustive guide to the different markers of progress that can be used as a basis to create a strategy or assessment framework for a learning health system. The specific parameters and benchmarks of progress are best defined on the basis of the prevailing situation in the health system in question, as well as on goals and standards that are determined for and by that health system. No matter what progress a health system has made in terms of its learning goals, it will always continue to need to learn, and will require commensurate investments in such learning to help it achieve its goals more effectively and equitably.

Table 14. Examples of actions to advance learning in health systems

	Health policy-makers and planners (cross organization level)	Health programmes, facilities, employers, health worker teams (organization and team levels)	Community and civil society groups and organizations	Research councils, universities and other research organizations	Educational councils and professional training institutions
INTEGRATING AND INSTITUTIONALIZING LEARNING IN HEALTH SYSTEMS					
Strengthen M&E approaches	Core	Core			
Strengthen data delivery systems for routine decision support	Core	Core			
Establish / strengthen policy and systems research and evidence synthesis platforms	Core			Core	
Establish / strengthen dedicated intelligence units for priority areas	Core			Supplemental	
Establish / strengthen priority setting and technology assessment platforms	Core		Supplemental	Supplemental	
Strengthen team-based management and on-the-job mentoring	Supplemental	Core			
Establish / strengthen learning sites and participatory action / research programmes	Supplemental	Core	Core	Core	
Establish / strengthen forums for participatory planning and governance	Core		Core		
Establish / strengthen innovation incubators and pilot evaluation schemes	Core	Core		Supplemental	
Establish / strengthen peer solution-sharing platforms and communities of practice	Supplemental	Core		Supplemental	
Develop and implement a learning strategy	Core	Supplemental	Supplemental	Supplemental	Supplemental
Establish an approach / framework to assess and benchmark progress	Core				
DEVELOPING AND DEPLOYING RELEVANT HUMAN CAPACITIES					
Strengthen education for health personnel in key learning areas*					Core
Strengthen education for future researchers / analysts in key learning areas**				Core	Supplemental
Strengthen education for educators and experts, in learning pedagogy and methods				Supplemental	Core
Strengthen education for communities and service users in health rights and protections, health systems governance and participatory planning	Supplemental		Core		Supplemental
Create work and careers for people with capacities in key learning areas*	Core	Core			
Create in-service capacity building opportunities for personnel in key learning areas*	Core	Core		Supplemental	Supplemental
CREATING ENABLING CONDITIONS FOR LEARNING					
Ensure that learning processes are participatory and inclusive, and its benefits accessible widely to people at all levels of the health system	Core	Core	Core	Core	
Promote a culture throughout the health system that recognizes the different means of learning and learning "loops", and sets those learning processes in motion	Core	Core	Core	Core	
Support the aforementioned actions through adequate financial investments and political leadership	Core	Supplemental	Supplemental	Supplemental	Supplemental

* including but not limited to M&E, data management, communication and knowledge management, research methods and evidence use, innovation management, participatory learning, team learning (fig 11).

** including but not limited to interdisciplinary policy and systems research, evidence synthesis, research communications and stakeholder management, specialized health system knowledge functions (such as economic evaluation or behaviour change management) (fig 11).

Legend: ▇ Core or lead role ▇ Potential or supplemental role ▢ Limited role

HEALTH SYSTEMS STRENGTHENING THROUGH A LEARNING LENS

There have been incremental advances in thinking about health systems strengthening over the past 30 years – on what makes a strong health system, and on appropriate paradigms to inform efforts to strengthen systems worldwide. The WHO "health system building blocks" framework was developed to communicate the kinds of inputs that are required to strengthen health systems to a wide audience (WHO 2010). In more recent years there has been a growing recognition that health systems are complex and adaptive social systems that adjust and transform in response to their environment (Paina & Peters, 2012). These concepts have also helped to position health systems as being *people-centred,* and have breathed dynamic life into the building blocks (De Savigny and Adam, 2009; Abimbola et al., 2014, 2017; Sheikh et al., 2014a, 2014b; Whyle & Olivier, 2020). More recently, *resilience* has emerged as a concept to describe an essential characteristic of a strong health system (Kruk et al., 2015; Abimbola & Topp, 2018; Topp, 2020). Resilience recognizes the importance of governance and the intelligent use of information in how health systems respond and react to stress and shocks.

Learning health systems are those that make the link between past actions, the effectiveness of those actions, and future actions. Learning is a forward-looking and actionable lens through which to view the strengthening of health systems, building on existing frameworks, and linked to the agendas of improved equity, efficiency, resilience, people-centredness, self-reliance and improved quality. The importance of learning is increasingly pronounced in the current context, with the growing focus on the abilities of health systems to respond to pandemics, to transition from foreign aid to domestic funds, and to capitalize on the information revolution to achieve their goals (Akhlaq et al., 2016; Braithwaite et al., 2017). Ultimately, learning is a route to progress and empowerment for health systems – particularly those in LMICs – by developing the inbuilt ability to generate and use the knowledge and skills they need for their constant improvement and performance.

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Case studies illustrating different aspects of the learning health systems concept

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	Individual and team	Organization and cross organization	Single loop	Double loop	Triple loop	Information	Deliberation	Action and praxis	Improved system functions	Adaptivity and innovation	Self reliance	Institutionalizing learning	Optimizing learning capacities
Barbados — Co-developing a climate-informed dengue early warning system		X		X		X				X		X	
Benin and Guinea — Using digital tools to advance learning among health district management teams	X		X		X								X
Burkina Faso — Learning from experience for the abolition of user fees for women's and children's health care		X					X			X			
China — A learning approach to strengthen neonatal care in poor counties				X			X			X			
Georgia — Deployment of evidence in the national response to COVID-19		X				X			X			X	
Ghana — Health systems learning at sub-national level to establish nurse anaesthesia training		X						X		X	X		
Guatamala — Learning for participatory governance in the national health system	X			X			X						X
India — Learning from the Nipah virus outbreak to inform the COVID-19 response in Kerala	X		X						X				X
Indonesia — Learning for health equity: the DaSK dashboard for universal health coverage			X			X							
Lebanon — Learning to get a fair deal for hospital care								X			X		
Mozambique — Addressing neonatal mortality through a peer-to-peer learning intervention at district level	X							X	X				X
Nigeria — How experience with Lassa fever helped the country prepare for COVID-19					X	X					X	X	
Republic of Korea — Learning from the MERS experience for a rapid response to COVID-19				X				X	X				

Barbados – Co-developing a climate-informed dengue early warning system

Rachel Lowe,[1,2] Leslie Rollock,[3] Anna M. Stewart-Ibarra[4]

The World Health Organization and the World Meteorological Organization have advocated the use of climate information as part of comprehensive early warning and response systems to manage climate-sensitive diseases. Climate information can be used to predict the optimum conditions that favour the transmission of mosquito-borne diseases such as dengue, chikungunya and Zika. Climate-informed epidemic early warning systems (EWS), which integrate information from seasonal climate forecasts, can facilitate timely preventative public health interventions to minimize the impact of an epidemic. Example interventions include intensive and focused vector control measures and educational campaigns to inform local communities of risk prevention measures.

The Barbados Ministry of Health and Wellness (MHW) used a process of co-development to design a prototype dengue EWS and to support disease risk management within climate services. The goal of the project was to build a predictive model to quantify the risk of dengue outbreaks by generating probabilistic forecasts several months in advance. The EWS is based on a statistical model that disentangles the impacts of climatic drivers from other unknown risk factors,

such as variations in vector control, new viral introductions and immunological risk factors (Lowe et al., 2018). This effort was part of the Building Regional Climate Capacity in the Caribbean (BRCCC) programme, managed by the Caribbean Institute for Meteorology & Hydrology (CIMH) and funded by the United States Agency for International Development.

An opportunity to improve practice

The existing approach for dengue risk management in Barbados relies on early recognition of outbreaks by monitoring the occurrence of cases and syndromic data. The MHW tends to anticipate seasonality in dengue outbreaks in line with the typical warm and rainy season, although climate information and epidemiological data are not formally linked or integrated. The MHW recognized the potential in harnessing collaborative data analysis, given the existence of a largely untapped historical record of disease case data (since 1999) and low capacity for in-house analysis in terms of personnel, skills and issues related to protected time.

At a regional level, climate (the CIMH) and health (the Caribbean Public Health Agency and the Pan American Public

Health Organization) stakeholders have, since 2017, issued a quarterly *Caribbean health-climatic bulletin* to ministries of health across the region. However, the bulletins have not included quantitative analyses of disease risk (Trotman et al., 2019). Health practitioners recognized the need to generate local evidence of climate and health linkages:

> We want more evidence-based decision-making. We want data ... That's priority #1 ... to get the evidence. (Health stakeholder, regional) (Stewart-Ibarra et al., 2019, p.16)

The project team comprised staff from Barbados MHW, the CIMH (also based in Barbados), and interdisciplinary researchers with diverse expertise in climate risk management and governance, social science research, epidemiology and modelling. Face-to-face meetings were a critical part of developing the partnership and the co-learning process, as indicated by stakeholders:

> Just sitting with people in the sectors makes such a big difference ... Understand them, what drives them, what are their needs? Because we might think they need something they don't ... Sometimes it's about forgetting yourself and putting yourself in the other person's shoes to really figure out what the need is about. That's true engagement. (Climate stakeholder, regional) (ibid., p.13)

> Once we build the trust, then we build the network, then we can see what the willingness to collect, to centralize, to digitize, and to share the data really is. (Climate stakeholder, regional) (ibid., p.14)

In 2017, researchers travelled to the Caribbean to meet with climate and health practitioners. Initially this was to meet with local team members from the climate and health sector, and later to conduct qualitative research and a data audit, as well as to present findings and solicit feedback. The team also disseminated the project results in regional fora such as the meeting on Early Warning Information Systems Across Climate Timescales (EWISACTS) during the Caribbean Climate Outlook Forum (CariCOF).

Learning through collaboration

The collaborative research process brought together a team of researchers, meteorologists and health sector practitioners. The process of co-designing the system included:

- engagement of practitioners to assess needs and priorities;
- an audit of available health and climate data;
- cleaning/collation of relevant health and climate data from the country;
- co-development of the pilot model;
- feedback from practitioners via national and regional consultations; and
- webinar training for climate and health practitioners.

Specifically, the Barbados MHW provided disease case data for analysis and information on the definition of endemic channels. MHW staff were also involved in dialogue at the start of the project regarding desired research outputs. They indicated the ideal timeframe for an epidemic warning:

> A year can feel like a long time away. With three months, there will be a sense of urgency and you can do meaningful activities, although there might not be new resources. (Health stakeholder, Barbados) (ibid., p.17)

EXECUTIVE
SUMMARY

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Health practitioners guided the researchers regarding best practices to engage with decision-makers:

> Decision makers at the policy level are not health care providers. They are administrators, they are politicians, and we need to help them. We need to feed [decision-makers] with the kind of information they can understand, and [so] they can feel comfortable making decisions. (Climate and health workshop participant, Barbados) (ibid., p.18)

Learning took place at a cross-system level – that is, between the health and climate sectors in collaboration with researchers. Through a series of stakeholder interviews and questionnaires (ibid.), researchers learned about the perceptions, needs and priorities of both the climate and health sectors. They also considered existing resources/ capacities and gaps that need to be addressed to develop an operational EWS.

Health-system capacity gaps were identified in data science and geographical information systems (GIS) in particular. The preferred training activities included a technical workshop on how to use climate information and GIS (digital maps) to identify areas at risk of vector-borne diseases, and how to communicate to local communities the effects of climate on health. The most popular means of receiving information from an EWS to predict arbovirus epidemics was via climate and health bulletins (sent as a PDF by email), followed by an online interactive GIS platform.

Health sector partners communicated their preferred characteristics of an EWS, which included receiving the probability of optimum conditions for a dengue outbreak

around three months ahead of time, issued on a quarterly basis and updated in the months prior to the peak dengue season. Through in-person visits and workshops, teleconferences and online webinars, the health system planners learned:

- how climate information can be used to inform health decision-making (using examples from Brazil (Lowe et al., 2014) and Ecuador (Lowe et al., 2017));
- the limitations of seasonal climate forecast information (for example, most reliable during El Niño events and less so during other years) (Ballester et al., 2016);
- the limitations of spatial epidemiological information on small islands; and
- the importance of access to a live stream of data to enable real-time health early warnings.

Improving climate preparedness

The team learned together about integrating disparate data sources, current practices and decision thresholds (for example, definitions of the endemic channel), and the tools needed to develop and implement an epidemic forecast model. They also explored the limitations of the data informing the model, including lack of dengue virus serotype-specific epidemiological data.

A key outcome of the learning process was the discovery of nonlinear and delayed impacts of hydrometeorological extremes on dengue outbreaks (Lowe et al., 2018). This provided evidence on the importance of proper management of water storage containers during drought events (for

example, covering and cleaning containers, and treatment with larvicide) to avoid creating habitats within which disease vector mosquitoes thrive and thereby increasing the risk of dengue outbreaks. This outcome also highlighted the importance of messaging in the Caribbean Health Climatic Bulletin on water storage container maintenance during drought periods (Trotman et al., 2018). The research was cited in the December 2020 edition of the Bulletin, advising public health stakeholders to be aware of increased dengue risk due to a widespread drought in the first half of 2020 followed by an intense heat season and excessive rainfall, particularly in the eastern Caribbean (CARPHA/PAHO/CIMH, 2020).

As a result of this collaborative learning process, senior public health practitioners in the Barbados MHW are more aware of the value of pre-emptive climate information. Moreover, they now consider climate information in their disease control and prevention planning activities. The environmental health team of the MHW review the Health Climatic Bulletin each quarter and take action in response to standardized precipitation index and temperature forecasts. For example, a drought forecast well ahead of the dengue season may activate focused, intensive vector control in specific communities that are known to have issues with mosquito breeding in water storage containers. A forecast of an exceptionally wet and warm season just prior to or during the dengue season could trigger island-wide fogging and awareness campaigns, including releasing messages using public service announcements via news outlets. This receptivity to new sources of information signifies a subtle yet significant learning process, shifting the health system to become more resilient to extreme climate events.

Limitations and successes

The major limiting factor of the project was lack of financial support to transition from a pilot to an operational dengue EWS implemented by local health practitioners. Additionally, the health sector learning was relevant to a few key individuals, who are leaders in the health system, rather than to all stakeholders in the system as a whole.

The implementation of a sustainable decision-support system would involve strengthening local capacities to operate a routine, real-time EWS including long-lead seasonal forecasting of disease transmission with spatial risk mapping (Lippi et al., 2020). Nonetheless, lasting impacts for the Barbados MHW include sustained policy support for collaborative research more generally and with the CIMH specifically, as well as an overall appreciation of the benefit of research-informed decision-making. Indeed, the prior experience of engaging with modellers prompted early outreach to the local research body for modelling and analysis to inform the response to the COVID-19 outbreak.

Conclusion

This case study demonstrates the learning process of co-creating a novel pilot dengue EWS. The needs and capacities of the Barbados MHW were at the centre of the development process. The team learned together by carefully assessing health system needs and perceptions and by jointly analysing complex climate and health data.

The MHW increased their comprehension of the potential role of an EWS in mitigating climate impacts on health. The collaborative research provided new evidence on the links between dengue risk and hydrometeorological hazards,

including extreme drought and heavy rainfall, and provided usable timelines for the health system to implement time-sensitive actions to control mosquito populations. The environmental health team now considers information on climate forecasts provided in the quarterly Health Climatic Bulletin to inform a bespoke response to hydrometeorological extremes and to eliminate potential mosquito breeding sites accordingly.

Given the lack of additional funds and resources, it was not possible at the time to establish an operational dengue EWS capable of providing monthly risk forecasts. However, thanks to subsequent collaborations with the Red Cross Red Crescent Climate Centre and the Pilot Program for Climate Resilience, the team is working to evaluate the developed model within an operational framework and to provide online digital platforms to inform vector control and educational campaigns in several Caribbean islands. Overall, this partnership has supported the greater agenda on climate services for the health sector in the Caribbean region and has provided a framework for an operational Caribbean arbovirus EWS.

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Benin and Guinea – Using digital tools to advance learning among health district management teams

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A health system that responds quickly to emerging issues requires a health information system (HIS) that facilitates evidence-informed decision-making at the operational level. It also requires timely information sharing and for good practices to be maximized. "District.Team" – a facilitated web-based platform that combines local data visualization and peer-to-peer discussions – was developed to address this need and to enhance knowledge exchange among Health District Management Teams (HDMTs) in Benin and Guinea. It was designed by a multidisciplinary team with analytical capacities in epidemiology and health systems, complemented by skills in data visualization, online community facilitation and web design.

District.Team was piloted in Benin and Guinea in 2016–2017 by a cross-institutional team from *Centre de Recherche en Reproduction Humaine et en Démographie* (CERRHUD) and *Centre National de Formation et de Recherche en Santé Rurale* (CNFRSR), with support from the Institute of Tropical Medicine of Antwerp in Belgium and funding from the United Nations Children's Fund (UNICEF). The learning model consisted of five steps (Millimouno et al., 2019; Keugoung et al., 2020):

1. identification of a health issue or challenge to investigate

2. development of the tailored online tool of enquiry (survey questionnaire)

3. completion of the questionnaire by HDMTs

4. analysis, visualization and publication of the results on a custom-made web platform

5. online discussion of results (on the same web platform) and synthesis of lessons learned.

HDMTs received invitations via email, SMS and phone to participate in the various steps, as well as reminders during the process.

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3   Health Service Delivery Community of Practice, Yaoundé, Cameroon
4   Centre d'Excellence Africain pour la Prévention et le Contrôle des Maladies Transmissibles, Université Gamal Abdel Nasser, Conakry, Guinea

Participation in difficult contexts

District.Team was launched in 2016 in an epidemic context in both countries – namely, Ebola virus disease (EVD) in Guinea and Lassa fever in Benin. Learning took place in settings where mobile phone and Internet connections were still problematic. However, participation rates were generally well sustained throughout the five questionnaire cycles that were conducted in each country. In Cycle 1, 85% (Benin) and 100% (Guinea) of HDMTs completed the online questionnaire and there was active participation in online discussions (21% and 40%, respectively). In the final cycle, Cycle 5, 61% of HDMTs in Guinea completed the questionnaire and 74% participated in online discussions. While the questionnaire was not rolled out to HDMTs in Benin in Cycle 5, 44% of HDMTs contributed to online discussions supported by secondary data from the 2016 national review of maternal death surveillance and response (Millimouno et al., 2019; Keugoung et al., 2020).

Shared knowledge for positive impact

HDMTs expressed diverse views on the impact of the District.Team data analysis and visualizations on their own practices (Keugoung et al., 2020). A District Medical Officer (DMO) from Benin felt positive about the overall experience: "Thanks to data visualization, we identified the gaps in our district's preparedness [to the cholera outbreak]. This allowed us to readjust the stock of drugs." DMOs felt that engagement with their peers from other settings during the online discussions was critical to improving their own knowledge on particular health issues and challenges. A DMO from Guinea noted that, "the theme on the management of human resources was very

interesting, essential and relevant as only four out of 30 positions are filled by the government. We were keen to know what was the situation in other districts." Many participants also valued the availability of the facilitation team to guide them, as well as periodic face-to-face meetings to enhance trust among HDMTs and between them and the facilitation team.

DMOs stressed that District.Team was an innovative and user-friendly platform that allowed all data and member contributions to be shared. Teams also discovered their own strengths and capabilities through the process of engaging with data and online sharing. A DMO from Benin noted that, "with District.Team, we became aware that each DMO has developed specific skills and competencies and we could learn from each other". The virtual and asynchronous nature of District.Team was noted by most DMOs as its main strength, as each member could access it online at any time and place. One DMO in Benin asserted, "there are fewer face-to-face meetings, and you do not need to travel to participate".

The District.Team initiative lasted for only 14 months. However, in that period, it attracted the interest of some officials at regional and central levels. A regional director of health in Guinea, concerned about the insufficient dissemination of guidelines and standards, opined that districts should build on the gains of District.Team to mainstream the use of computer equipment and digital documentation (Millimouno et al., 2019). In Benin, the Ministry of Health used District.Team to encourage bottom-up participation of HDMTs in elaborating the National maternal death surveillance and response plan 2017–2022 (Bello et al., 2017; Ministère de la Santé du Bénin, 2017).

Barriers to success

Alongside these successes, there was a gradual decline in participation by HDMTs due to the lack of integration of District. Team into existing health programmes and HIS platforms. HDMTs struggled to find time and win support from supervisors, while DMOs described further barriers. These related to lack of time, and interference by regional and central staff, vertical programmes, and financial and technical partners. DMOs often resorted to using their free time to participate, and many acknowledged that the lack of mainstream support of District. Team in the health system did not give them confidence to share their views in a public forum. One DMO in Benin commented, "what was lacking was the participation of the central level; if my hierarchy is not interested in this project, why should I be?" (Keugoung et al., 2020).

Conclusion

District.Team showed that facilitated digital solutions can activate collective intelligence and problem-solving within public health administration, even in resource-limited health systems. Such learning aligns well with health system priorities. Learning among HDMT occurred on priority health issues identified at local level and hence was more likely to lead to action. However, investment in facilitation as well as ownership by national health systems authorities are key for a sustainable and effective digital learning platform.

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Burkina Faso – Learning from experience for the abolition of user fees for women's and children's health care

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On 2 March 2016 the Government of Burkina Faso announced that it would provide free health care in public facilities for children under five and for women for pregnancy-related health demands, childbirth and the treatment of genital cancers. This became known as the *"Gratuité* policy*"* (Gouvernement du Burkina Faso, 2016).

The decision was sudden and unexpected, and initially caused some apprehension and scepticism among health professionals and experts (leFaso.net, 2016). However, policies to remove or reduce user fees have been implemented previously in Burkina Faso so lessons could be learned. Health system actors faced a race against the clock to leverage and learn from earlier policies to abolish or reduce user fees in an effort to avoid past mistakes and propose alternatives. When interviewed, one policy-maker recalled:

It is true that the decision was abrupt and seems to have been taken in a hasty manner, but in reality it was the culmination of several years of field experience and advocacy. So, we did not move forward without some benchmarks.

Experience from "SONU" and related projects

The Emergency obstetric and neonatal care (or SONU – *Soins Obstétricaux et Néonatals d'Urgence*) policy – a nationwide policy to subsidize 80% of obstetric and neonatal emergency care – was launched in Burkina Faso in 2007 (Ridde et al., 2014; Ganaba et al., 2016). Building on this, pilot projects were implemented from 2008 to 2015 in six out of 70 health districts (Tougan, Séguénéga, Sebba, Dori, Kaya, Diapaga) that combined 100% subsidies under the SONU policy with full removal of user fees for children under five years (Ridde & Yaméogo, 2018). The main criteria for choosing these districts were low use of health services and high levels of poverty and malnutrition.

The pilot projects were led by international nongovernmental organizations (NGOs) such as *Action Contre la Faim*, Help*, Médecins du Monde,* Save the Children and *Terre des Hommes,* in collaboration with local district health management teams (DHMT) (ibid.). However, the funds for both the SONU and *Gratuité* policies came or come almost entirely from the state budget.

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A major flaw of the SONU policy was a delay in payments to health facilities, primarily caused by the late release of subsidies by the state. These delays sometimes spanned a year and hampered the proper functioning of facilities (Assemblée Nationale du Burkina Faso, 2012; Kiendrébéogo et al., 2014). Historically, health workers have been incentivized with dividends constituting 20% of their health facility's revenue (excluding sales of drugs). Yet, as SONU subsidies paid by the state were not considered revenue – and were therefore excluded from the calculation of dividends – the policy effectively reduced the guaranteed personal income of health workers. This, in turn, had a negative impact on the quality of care provided.

Lessons learned to inform Gratuité

The delays in payments, lower dividends and increased workload caused by the SONU policy were a key consideration for policy-makers when designing and implementing the *Gratuité* policy. Numerous workshops and meetings were held between the technical and financial services of the Ministry of Health (MoH), which in large part focused on the failings of the SONU policy. To some extent, lessons were also drawn from the pilot projects implemented by the international NGOs. Some DHMT members who previously worked in the pilot districts were now policy-makers at the central level of the MoH and could reflect on their past experiences to inform the design and implementation of the *Gratuité* policy. The NGOs also organized meetings and kept national and local health authorities regularly informed of their activities and achievements (Ridde & Yaméogo, 2018).

A THIRD-PARTY FUNDING MODEL

Some of the district pilot projects served as incubators to test new approaches for *Gratuité*. In one such experiment, the NGOs funded a proportion of a project equivalent to the user fee that the erstwhile SONU policy did not support, hence effectively acting as a third-party funder (Ridde et al., 2013).

When the *Gratuité* policy was being designed, the idea of a third-party payment system emerged throughout the many discussions between the MoH's technical and financial services as holding promise. It was felt that a system that was endorsed by the state and that could enable pre-payment of funds for health facilities could address the issues of late payments and potential reductions in health workers' income. A former member of a DHMT we interviewed commented:

> It was clear during our discussions that if the Gratuité policy funding was going to be in the form of a subsidy, health workers' dividends would practically disappear, especially since the curative care for children under five, which constitute a large part of health facilities revenue, was now concerned [and not just emergency obstetric and newborn care as was the case with the SONU policy]. There would be insurgencies in health facilities.

With this third-party payment innovation, the state could directly compensate for any shortfalls that resulted from the withdrawal of user fees at facility level. And, since these funds were recorded as revenue not subsidies, the sums could be included in the calculation of dividends to incentivize health staff. Pre-payment by the state to health facilities also helped to avoid late payments, while the amount to be pre-paid was calculated based on historical consumption at each facility, adjusted every quarter before funds were paid again.

SECURING BUY-IN

The Ministry of Finance (MoF) was reluctant to adopt the proposed third-party model because it did not fit into traditional public financial management procedures. Indeed, the established approach until then was that state funds should go to health facilities as a subsidy only. This was the first experience for the MoF of a third-party model in health system financing through public funds, and the MoF also had reservations about paying in advance for expenses that had not yet been accrued.

Yet an agreement was reached after several working sessions between executives of the MoH (helped by their own financial services team who themselves came from the MoF) and executives of the MoF. One policy-maker we interviewed recalled:

> The debates were heated and sometimes tense; but with support of our financial services we took time to discuss and explain to the officials of the Ministry of Finance the pitfalls that the SONU policy experienced and the reasons for this. We also explained experiences we have had with the pilot projects and how the model we propose would help tackle the problems. They understood and agreed to make a derogation from the public finance management rules.

Official approval of this mechanism came through the signing of an inter-ministerial decree some two years later, in 2018 (MS & MINEFID, 2018).

TRANSPARENCY AND ACCOUNTABILITY

Another innovation was to contract national and international NGOs to perform independent checks in health facilities and in households. This initiative focused on minimizing fraud and

drew on the experience of the performance-based financing scheme being implemented at the same time. Here, too, architects of the *Gratuité* policy had to overcome resistance – not only within the MoH but also the MoF – particularly to explain why the national budget of a low-income country like Burkina Faso should be drawn on to contract international organizations.

ONGOING LEARNING AND EVALUATION

The *Gratuité* policy is continually fine-tuned. Semi-annual meetings bring together key stakeholders to assess its implementation and the payment method is also regularly adjusted as specific issues arise. For example, having found that some health facilities had cash management problems and were unable to source medicines correctly, it was decided that each health facility would be paid 20% to 30% of the total amount due, with the rest paid directly to the pharmacy that supplies drugs to that health district. The health facility can then stock up on drugs up to the amount that is deposited at the district pharmacy.

Conclusion

The *Gratuité* policy has been designed and implemented based on many lessons from previous policies on the abolition or reduction of health user fees. Past experiences have informed extensive and sometimes intense deliberations and negotiations between stakeholders in government. Efforts were made to understand what happened previously, experiences were shared, and experiments were carried out purposively through pilot projects to explore how the proposed innovations could be applied.

These learning processes did not always go smoothly and often took time to materialize, however. Informed arguments were particularly important to convince the MoF to accept the proposed changes and innovations to the funding model, for example. Here, the role of peer mediators was particularly helpful to facilitate learning processes – specifically the involvement of representatives from the MoH's financial services who helped the MoF better understand the proposed model so that a consensus could be reached.

Finally, a "learning-by-doing" approach was used during implementation of the *Gratuité* policy, which has allowed the policy to remain agile and for quick adjustments to be made as required. These cumulative learning experiences have enabled several policy adaptations and for innovations to become institutionalized, ultimately improving the *Gratuité* scheme and benefiting the agenda of user fee removal more broadly.

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China – A learning approach to strengthen neonatal care in poor counties

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Many of China's reforms have proceeded by "feeling the stones while crossing the river" – a quote from Deng Xiaoping that describes the action of a person tentatively crossing a river by feeling for the next foothold. Deng was speaking in the 1970s, when China was taking initial steps towards major economic reform. As development has progressed, the government has had to deal with ever more complex tasks. The leadership now explicitly recognizes that, in many policy areas, China is now crossing a zone of "deep water" (Li & Zhu, 2013; Zhou, 2013), where it has become difficult to feel the stones as a guide forward.

In China's health sector today, this approach has led the government to experiment with many models for service provision. Thus, the "learning-by-doing" approach has helped in the development of policies and practical approaches for health service provision that work in the Chinese context (Husain, 2013, 2017; Xiao et al., 2013, 2018). In recognition of the need to adopt systematic and sophisticated learning approaches, however, the government has encouraged the establishment of think tanks – including the China National Health Development Research Center (CNHDRC), which is the think tank of the National Health Commission (NHC, China's health ministry).

Collaborating to learn

In 2017, the NHC realized there was a need to improve early essential neonatal care (EENC) in the country's rural areas (WHO, 2015). Not knowing what approaches would best fit the complex rural health system, the NHC invited the CNHDRC to take the lead. The think tank began by convening a learning process in which a number of counties (among the lowest levels of government in rural China) in four provinces would test a package of interventions and adapt them to their local circumstances. The aim was to help the counties learn what worked locally, as well as to allow the provinces and the NHC to learn lessons that could be disseminated more widely and inform national policy. The China office of the United Nations Children's Fund (UNICEF) helped summarize international experience that the counties could draw on, while the process of learning was managed by the CNHDRC.

Planning and design of the interventions took place from 2016 to late 2017, with the anticipation that a package of EENC interventions would be trialled in 20 counties over five years to test their suitability and effectiveness. Intervention planning was carried out over several months in 2016, with initial discussions involving key central stakeholders, namely the NHC, UNICEF and a range of Chinese technical experts.

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These discussions helped all parties to clarify the aims of the programme and to think through what would be piloted in the counties.

The roles of key agencies were also defined at this initial stage.

- UNICEF carried out a review of international evidence on suitable interventions, drawing principally on global experience.
- The maternal and child health (MCH) department of the NHC oversaw the national pilot programme and prepared national policy based on the lessons learned from the pilots.
- The CNHDRC worked with the participating provinces and counties to undertake an assessment of health and the health system, as the basis upon which interventions would later be designed. It also established mechanisms to monitor and evaluate progress and outcomes.

Learning from the bottom up

UNDERSTANDING THE CONTEXT

The NHC and the CNHDRC decided to test the interventions in poor counties before developing a national neonatal policy. In March 2017, the CNHDRC convened an inception workshop in Beijing that was attended by 35 people from four provinces and 20 pilot counties. Participants included decision-makers from the Provincial Health Commissions plus prospective implementers from county health bureaus and county MCH hospitals. The agenda was designed to inform participants about the overall objectives and the planned situation analyses, as well as to gather information on the counties' expectations of the pilot – the problems the project would help the counties to solve – and the support they would need to achieve success.

The workshop showed that the cost-effectiveness of the interventions was only one consideration for the counties. Stakeholders also revealed they would need support from provincial officials to help them work through local challenges or to gain access to resources. Overall, 33 of 35 attendees recognized that the pilot was in line with national and provincial policy priorities, although 25 of 35 thought it would be difficult to implement due to resource and skill constraints. The CNHDRC described this meeting as an "aha!" moment, in which it became clear that central-level stakeholders needed to learn how to help counties support the pilots and make implementation a success.

SECURING BUY-IN

The next important stage consisted of visits to the pilot provinces and counties between June and August 2017. Visits began with meetings with the Provincial Health Commission and other key agencies in the provincial capital to discuss the project's aims, to secure the province's support and to gather information on relevant local policies and initiatives. The team brought together a wide range of experts including CNHDRC staff, representatives of the Chinese Centre for Disease Control and Prevention (CDC), national-level clinical experts and local university partners. The local project management agency was the provincial MCH Hospital in each pilot, with each having an overview of the MCH situation in their respective provinces.

Following provincial meetings, the team – including central and provincial representatives and local university staff – visited the counties. This broad representation communicated the importance of the pilot and helped to build a common understanding of its aims, the challenges faced by the

counties and their support needs. Information was collected through questionnaires, stakeholder interviews, examination of records and facility data, and observation in facilities. In this way, the team gained a good understanding of the situation in the counties, including capacity and readiness for the pilot.

ASSESSING BARRIERS TO SUCCESS

The clinical experts reported on the lack of proper skills and essential drugs and technologies for delivering the interventions, however. The CNHDRC and local university researchers discussed their worries about the anticipated workload with representatives from the county-level government and documented their concerns. Project officers at various levels communicated the management plan and tried to match this with the local conditions. All counties reported a lack of health staff, inadequate skills and competence, and poor access to essential medicines and medical technologies. Cultural and language issues were also reported as an important barrier to accessing essential neonatal care as many ethnic minorities reside in China's remote counties.

CONSOLIDATING LEARNING AND MAPPING NEEDS

County-specific reports, which analysed neonatal deaths, challenges to implementation, costing and financing, and priority EENC interventions were produced as an outcome of the visits. The reports also calculated potential deaths averted from the pilots and were an important input to counties' own planning efforts.

Further meetings helped the counties to obtain feedback on and refine their implementation plans. The analyses and reports allowed the team to spot potential barriers to implementation, such as insufficient staffing and low capacity, and also enabled counties to articulate clearer and more targeted requests for support. In turn, this helped central stakeholders to better understand the capacities of the counties and the areas in which they would need assistance. Provinces then modified their strategies on the basis of what they had learned from this process. Ningxia Province, for example, engaged a local religious leader to advocate on behalf of the pilot and convince people within the province to use the new interventions; Sichuan Province changed the five pilot counties that were originally identified as being poorest, after finding that the local health infrastructure was too weak to support implementation of the project.

As a result of the meetings, visits and collaborations described above, counties kicked off implementation in late 2017, using much more detailed implementation plans than would otherwise have been possible. Most counties have launched their programmes as expected and have chosen high-impact interventions that cover 90–95% of the eligible population. Ningxia and Sichuan are already rolling out this package of interventions province-wide. The implementation strategy has drawn on the lessons learned by the pilot counties to include training and capacity-building for medical staff and project managers, and to build an information reporting system to monitor progress.

Conclusion

Within highly decentralized health systems such as in China, pilot studies at the local level can help to identify barriers and facilitators relevant for successful implementation of initiatives at scale. The case described demonstrates that collaborative bottom-up learning can foster success in policy implementation: collaborative learning between key actors at various levels helped to reduce information asymmetries and enhanced coherence between national project design, provincial implementation plans and the needs of poor counties. The bottom-up learning approach also helped provinces to contextualize interventions, through active engagement of policy actors in the analysis of county-specific factors for better informed and feasible implementation plans.

For an intervention to yield better results it should be well understood by local implementers. The staff of the CNHDRC played an important role in designing and facilitating health system learning and, furthermore, there was a substantial resource commitment as well as methodological support. A major challenge that remains is how to institutionalize this bottom-up learning process to enhance the capacity of China's health system to meet the needs of a vast population.

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Georgia – Deployment of evidence in the national response to COVID-19

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Following the initial outbreak of COVID-19 in China, the Government of Georgia took steps to protect citizens almost one and a half months before diagnosing its first case. The government strategy has been informed by the experiences of Asian countries that have managed to flatten the curve of infections and protect their economy.

Georgia's small economy, with 3.7 million citizens (Geostat, n.d.) and a fragile health system, required timely action against COVID-19. The political choices have been those of epidemic control using "complete lockdown" or allowing economic activity, especially for those with low-wage jobs.

The experiences in Asia have proved instrumental in implementing adequate and proportional epidemic control measures that have saved lives and preserved livelihoods (Wilson, 2020). Past investments from the World Health Organization (WHO), the World Bank (World Bank, 2006), the United States Centers for Disease Control and Prevention (CDC) (CDC, 2019) and the US Defense Threat Reduction Agency (DTRA) (U.S. Embassy in Georgia, n.d.) were critical preconditions that have enhanced Georgia's national response capacity and pandemic preparedness.

Together, this knowledge from Asia and prior investments in the country helped Georgia's National Center for Disease Control and Public Health (NCDC) alert the Ministry of Health (MoH)[1] in a timely manner about a possible outbreak, to equip its pandemic response centre and to prepare a national pandemic preparedness and response plan (NCDC, 2020). Consequently, Georgia's public health and surveillance systems were well prepared to identify the first case of COVID-19 on 26 February 2020.

Setting learning priorities

The discovery of the first case of COVID-19 in Georgia triggered discussions within central government. Health-sector authorities (the MoH and NCDC) suggested immediate border closures and strict lockdowns. However, the economic division of the government advocated keeping the country open. Tourism constitutes 20% of gross domestic product (GDP) in Georgia – with a sizable portion generated during the winter months from ski resorts – therefore the economic division did not support plans to halt tourist arrivals during the holiday season.

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[1]   The official name of the ministry is the Ministry of Internally Displaced Persons from Occupied Territories, Labor, Health and Social Affairs of Georgia. However, for simplicity, it is referred to here as MoH.

1.   Curatio International Foundation, Tbilisi, Georgia

Divergent voices in the cabinet led Prime Minister Giorgi Gakharia to seek external and independent advice, including from experts at the Curatio International Foundation (CIF). Meetings with the MoH, the Prime Minister and the National Security Council established key concerns, namely: (a) how significant a threat COVID-19 was, relative to the capacity of the national health system; (b) how other countries have dealt with the pandemic; and (c) how best to organize and manage key elements of the pandemic response within the specific context of Georgia.

Learning from the evidence

The CIF team focused on the rapid delivery of necessary evidence around these particular concerns, which included epidemic modelling and rapid review of the experiences of other countries.

Epidemic modelling was carried out using the Penn Medicine COVID-19 Hospital Impact Model for Epidemics (CHIME) (Penn Medicine, 2020) that emerged during the week of 15 March 2020. This tool allowed CIF to model the impact of physical distancing on the spread of infections in Georgia and to analyse the extent to which this measure could "flatten the curve". The modelling also helped the government to visualize the magnitude of the expected threat, which triggered the set of policy responses described below. CIF's rapid review focused on the experiences of the Republic of Korea, Singapore and China, Hong Kong Special Administrative Region, as these countries had managed to flatten the curve during the early part of February–March 2020. The review explored what was done, and how, in these particular countries.

Both the modelling exercise and the rapid review informed recommendations that were compiled into a report for the government during mid-March 2020, and that were also made publicly available (Curatio International Foundation, 2020). The broad set of recommendations included:

- the need to prevent health system overload using modelling estimates along with physical distancing measures;
- enhancing national planning and coordination;
- establishing quarantine points at the borders and enhancing the identification of cases, contact tracing and isolation efforts;
- mounting public communications campaigns, using traditional and digital media;
- differentiating the roles of hospitals in managing COVID-19 cases; and
- establishing a triage system with the help of emergency hotlines and primary health care providers to reduce unnecessary referrals to hospital.

During March–April 2020, knowledge delivery was achieved through several meetings with MoH senior officials, the Prime Minister's office and staff within the National Security Council. Asian country experiences were discussed in these meetings, as well as necessary adjustments to interventions in light of Georgia's context. Implementation plans were also formulated.

Acting on lessons learned

Having discussed the recommendations set out by CIF and considered necessary context-specific adjustments, the government took the following actions.

- Quarantine spaces were established for traced contacts and citizens returning from abroad. This included mobilizing 6 500 hotel rooms, the training of hotel staff by epidemiologists in quarantine management and the continuous monitoring of suspected cases. In total, 20 500 individuals passed through quarantine by 10 May 2020 (Stopcov.ge, n.d.).
- The NCDC significantly enhanced its measures to identify cases, trace contacts and isolate individuals. Police and state emergency departments were mobilized to help with the quarantining of traced contacts. These efforts helped to break the virus transmission chain at the community level.
- Georgia's borders were closed and returning citizens were quarantined for 14 days. The flow of travellers was managed jointly by the tourism department in close cooperation with the border control services and the emergency department, both of which sit under the Ministry of Interior.

Sizable outbreaks (five in total) in a specific geographical location were quarantined for several weeks with the support of the military. Epidemiological services carried out the necessary tests, screened people, isolated suspected cases and quarantined contacts.

At a broad level, the health system built three lines of defence. The first was established by linking the national emergency call centre (under the Ministry of Interior) with family medicine centres throughout the country. This enabled remote follow-up of all individuals making emergency calls that potentially related to COVID-19, while the National Family Medicine

Training Center developed case management guidelines (Government of Georgia, 2020a) and trained clinical and call centre staff in case management. As of 10 May 2020, the call centre handled 14 192 calls, with only 3% of individuals hospitalized.[2] The system offloaded the ambulance network so that routine ambulance calls could be serviced.

The second line of defence included remote management of patients at home and in case of need referring them to the 37 fever clinics that were set up around the country to care for suspected COVID-19 cases (Government of Georgia, 2020b). Primary health care providers involved in remote case management were able to refer all suspected cases to these clinics. As a third line of defence, upon diagnosis of COVID-19 patients were transferred to designated COVID-19 hospitals for inpatient treatment. These interventions were reinforced through active public communication with the help of the media, alongside the mandatory lockdown measures, lasting for four weeks only.

An effective response through coordinated action

The cross-sectoral cooperation described above was made possible through a single nerve centre – the Multisectoral Coordination Council – which was established in Georgia during the early days of the outbreak and chaired by the Prime Minister. The Council included selected ministers and members of parliament as well as representatives from the health sector and from the President's Office. It focused on four priority areas and appointed responsible individuals

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[2] Private communication with MoH and the emergency call centre.

to each: (1) protecting the health and lives of citizens; (2) safeguarding the economy and assuring its timely recovery; (3) ensuring public security; and (4) managing strategic supplies. The Council met several times a week and coordinated the national response (Stopcov.ge, 2020). At the time of writing, this had enabled Georgia to halt the spread of infections and reduce the daily number of detected cases since 28 April 2020. As of 19 June 2020, Georgia had reported a total of 895 confirmed cases and 741 patients who had recovered from COVID-19 (Stopcov.ge, n.d.). Compared to other countries in the region at this stage, Georgia was coping well with only 225 cases per 1 million population (Worldometer, n.d.). Furthermore, stresses on Georgia's hospital and ambulance sectors were largely avoided.

Conclusion

The lines of defence implemented in Georgia, and described here, helped deliver the favourable results. The gains won through timely, coordinated and evidence-based action have helped the country's health system and other sectors to be prepared for future waves of the pandemic.

Along with notable public health outcomes, the Government of Georgia has also managed to introduce physical distancing measures with only short-term lockdowns. These interventions have allowed for some economic activities to continue, which – while insufficient to match the financial losses in the tourist sector – could help the recovery of domestic economic activities and thus save livelihoods. All interventions described here have required a coordinated, cross-sectoral response, which has been made possible through the centralized Multisectoral Coordination Council, led by the Prime Minister.

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Ghana – Health systems learning at sub-national level to establish nurse anaesthesia training

Emma Christiana Antwi,[1] Irene A Agyepong[2]

Anaesthesia care capacity is a longstanding and continuing problem in low- and middle-income countries including Ghana (Dubowitz et al., 2010; Hadler et al. 2016; Ulisubisya, 2016; Brouillette et al., 2017). In 2008, the Ridge Regional Hospital in Accra and the Greater Accra Regional Health Directorate recognized that a long-standing shortage of skilled anaesthesia staff had become a major crisis. This impacted the ability to deliver on a vision of "improved health and reduced inequities in health outcomes", and was especially marked in areas such as emergency obstetric care that are critical for reducing maternal and neonatal mortality. Progressive gains in the reduction of maternal mortality in the Ridge hospital and across the Greater Accra region more generally were at threat (Greater Accra Regional Health Directorate & Ghana Health Service, 2011).

The initial response from the hospital management was one of redistribution. This included the hiring of locum anaesthesia staff and requests for more staff from the human resources directorate of the Ghana Health Service (GHS) Greater Accra Regional Health Directorate and at the national level. But these strategies did not work: the shortage of skilled staff was absolute and nationwide (Choo et al., 2010). In such conditions, redistribution solutions simply shift shortages from one service delivery point to another, and problems around equitable access to high-quality services remain unresolved.

Understanding the problem through data-driven analysis and co-production of knowledge

A rapid appraisal was conducted by the Regional Health Directorate to further understand the shortages in anaesthesia staff and to devise contextually relevant, feasible and legitimate solutions. This involved a co-production of knowledge approach – tapping into the tacit and experiential knowledge of senior managers, clinicians and frontline staff in the Greater Accra region, as well as analysis of routine health management information system data from the hospital's biostatistics unit and regional and national data. Routine data from hospital records on the numbers of existing anaesthesiology staff and the number of surgeries that were performed daily, weekly, monthly and quarterly were analysed. Reports and presentations from health institutions in the region were also reviewed.[3]

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3   Including Greater Accra Regional Health Directorate & Ghana Health Service (2009; 2010) and unpublished administrative records of a meeting between the Greater Accra Regional Director of Health Services and nurse anaesthetists at Ridge hospital, July 2008.

1   Ghana Health Service, Greater Accra Regional Health Directorate/Ridge Hospital Nurse Anaesthesia Training School, Accra, Ghana
2   Ghana College of Physicians and Surgeons, Public Health Faculty, Accra, Ghana

The evidence confirmed that surgery was suffering; and, moreover, that the absolute shortages and inadequate anaesthesia support for obstetric care were contributing to high rates of neonatal and maternal morbidity and mortality. It also became apparent that this problem was not limited to Ridge Regional Hospital, but affected the smaller district hospitals in the region and other hospitals nationwide.

The data showed that there were few physician anaesthesiologists, whose training took considerable time. Furthermore, the incentives were low for doctors to specialize in anaesthesiology and very few were entering the pipeline. It would take considerable time for adequate numbers of physician anaesthesiologists to qualify.

While potentially more diploma and graduate nurses were available and interested in entering the nurse anaesthesia training pipeline, there were only two such training schools in the country – the School of Anaesthesia at the 37 Military Hospital;[4] and the Kumasi School of Anaesthesia at the Komfo Anokye Teaching hospital.[5] With so few facilities, there was a limit to how many nurses could train at a given time.

Devising evidence-informed solutions

The conclusion from the rapid appraisal of the evidence was that more nurse anaesthesia training schools were needed to address the skills shortage in the short-to-medium term. In the medium-to-long term, wider issues needed to be addressed around the incentives for both doctors and nurses to enter and stay in the specialist area of anaesthesia.

The two physician anaesthesiologists at the Ridge Regional Hospital met the Greater Accra Regional Director of Health Services. They argued that the hospital should take a bold step and start a nurse anaesthesia training school. In their view, the time and efforts of the hospital's few physician anaesthetists and senior skilled nurse anaesthetists were better directed at addressing the staff shortage than burning out as they tackled impossible workloads.

The problem of absolute shortages of skilled staff would remain for the short term, but the strategy would provide an effective and sustainable solution for the medium-to-long term – more nurse anaesthetists would start entering the hospital system within 24 months, and they would keep entering annually. Furthermore, Ridge Regional Hospital already had the infrastructure in terms of theatres, conference rooms and skilled senior human resource staff to run such a training school.

Hospital management and staff backed the proposed solution with enthusiasm and the Regional Health Directorate also offered its support. The Kybele Group USA team – already working with the Obstetrics and Anaesthesia Departments at the Ridge Regional Hospital to improve quality of service and care – also supported the programme and were welcomed as a collaborating partner to increase training capacity.

Securing funding and stakeholder buy-in

The goal of the new facility was to train well qualified and motivated nurse anaesthetists who would acquire lifelong

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4   See http://www.37soa.edu.gh (accessed 17 April 2021).
5   See https://soakumasi.edu.gh/index.php/about-us/ (accessed 17 April 2021).

skills to make them reliable, competent and trustworthy, and able to work in any environment. Having analysed the resource constraints of the two existing nurse anaesthesia institutions, the reform team explored sources of financing. They identified four sources of funding: the Ministry of Health (MoH), Ridge Regional Hospital support, internally generated funds from training fees once the school admitted students, and in-cash and in-kind donor support through collaborations such as with Kybele USA. The team began lobbying for support from these sources.

The reform team also recognized the importance of stakeholder consultations, and many consultative meetings were held with policy-makers in the MoH, the GHS Human Resource Division, the Regional Health Directorate, Kybele USA, Ridge Regional Hospital and the two existing nurse anaesthesia training schools. However, the programme still encountered problems related to inadequate stakeholder engagement and management.

The process of establishing a professional nurse anaesthesia training school was in some sense a daring innovation for a regional hospital. It attracted support as well as some opposition when key stakeholders – including the Ghana Society of Anaesthesiologists (GAS) – protested at such an effort taking place without their knowledge and engagement. This omission was purely accidental. The reform team had enthusiasm and a "yes we can" attitude, but perhaps lacked a full understanding of stakeholder analysis and management.

The team quickly applied their experiential learning about the importance of identifying, mapping, engaging with and assuring the support of key stakeholders in the health and education sectors – who in diverse ways were critical to the success of the programme. Meetings were held with GAS, which then became a supporter and enabler of the programme.

Through this experience, the team learned at the organizational level about stakeholder analysis and management. That the school took off, survived and has now become institutionalized has relied on the team rapidly learning the importance of stakeholder analysis and management in successful change leadership. Mapping, listening to and analysing stakeholders, and then responding rapidly to mobilize and strengthen support and to neutralize opposition, are critical for any major reform in a complex system (Brugha & Varvasovszky, 2000; Gilson et al., 2012; Balane et al., 2020). Additionally, through the stakeholder consultative meetings, ideas were shared, curricula were developed, and negotiation and lobbying skills were improved. Observations from how the two existing training schools were managed also provided contextual "how-to" learning.

Institutionalization of reforms

As part of the learning from earlier stakeholder engagements, the leadership team at the Greater Accra Regional Health Directorate realized that some powerful players were still neutral or mildly sceptical about the reform. More so, that these individuals could potentially halt the reform efforts within the Ridge Regional Hospital if these players moved into strong opposition. It was important, therefore, to generate short-term wins to convince all stakeholders of the viability of the proposals, while at the same time taking care not to push stakeholders into opposition before the school had the chance to prove itself.

To protect the innovative reform efforts, a strategic decision was taken with the team in the Ridge hospital to keep the opening of the school quiet and low key, despite the desire of some leaders and implementers to celebrate through a public launch. Rather, it was agreed that all energies and resources would be focused on generating short-term wins through successful graduation of the first cohorts. The short-term win when the first cohort graduated was widely advertised to encourage the institutionalization of the reform (Kybele, 2011). This, in turn, would convince people that the school could make a viable contribution to solving the problem of insufficient numbers of skilled anaesthesia staff to support emergency obstetric care and other surgical needs in Ghana.

As nurses successfully graduated from the training school and went on to provide excellent services – not only at the Ridge Regional Hospital but also in district hospital anaesthesia services across the country – the reform effort moved from a potentially risky innovation to an established and respected institution.

Conclusion

The success of the Ridge Nurse Anaesthesia Training School is evident in the numbers and in the school's established reputation. The first four classes graduated 93 trainees (Potisek et al., 2017); after its first decade more than 300 nurse anaesthetists had graduated from the school (Ghanaweb, 2019). These graduates provide anaesthesia services spread across Ghana and the facility has become a popular first choice for nurses seeking anaesthesia training in the country. In 2020, the Anaesthesia Department of the Ridge Regional

hospital had 25 staff, compared to the 10 staff when the reform efforts began. The number of surgeries, including for emergency obstetric care, has also gone up. The hospital is respected for the quality of its emergency obstetric care, to which anaesthesia makes no small contribution.

The training school is not without challenges, many of which relate to the resource constraints faced by many low- and middle-income countries. However, the sense of innovation and constant efforts to learn and adapt to the context remain – for example, the training school currently uses part-time staff from across the health system and external educational institutions to enhance its faculty while making best use of available budgets. This learning approach made it possible for the school to be established initially and has since enabled the school to progress from a risky endeavour to a professional training facility.

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Guatemala – Learning for participatory governance in the national health system

Walter Flores,[1] Benilda Batzin[1]

Poverty and ill-health are linked to ethnicity in Guatemala, where 40% of the total population comprises indigenous people. Overall, such individuals are more likely to suffer poorer health and to ultimately die younger – their life expectancy is 13 years less than that of non-indigenous Guatemalans (United Nations, 2009).

Over 70% of indigenous people live in rural areas where they communicate in their native languages and maintain specific cultural practices. Communities within these rural territories face barriers to accessing local health care services and a lack of trust between users and service providers is common. Most rural facilities are also characterized by insufficient allocation of resources.

Such limitations are commonly presented as problems of health service delivery. However, they are also the visible effects of governance failures in the health system. In 2014, a civil society research organization – the *Centro de Estudios para la Equidad y Gobernanza en los Sistemas de Salud* (CEGSS) – sought to tackle these limitations by facilitating the involvement of Guatemala's indigenous communities in specific functions related to health systems governance.

A participatory process hinged on community representatives

During a five-year collective learning process in 2014–2018, communities (who were health service users) worked with CEGSS to:

- learn about public policy and implement health service monitoring;
- engage with local and provincial authorities to solve identified problems within the health system;
- contribute to strengthening participatory governance.

The entire process followed a participatory action research design that was jointly implemented by CEGSS and grassroots indigenous organizations in rural municipalities of Guatemala.

More than 250 communities within 30 rural municipalities participated in the process, which relied on the involvement of community representatives. Each community elected at least two individuals to be trained as volunteer "Community Defenders of Health Rights", who together with CEGSS agreed a system of non-financial incentives for their roles (Flores, 2019).[6]

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6   Namely, a sleeveless jacket, cap, rain jacket and a backpack, all of which had logos identifying them as Community Defenders.

1.   Centro de Estudios para la Equidad y Gobernanza en los Sistemas de Salud-CEGSS, Guatemala City, Guatemala

One female Community Defender described her role as being different than many other community leaders that collaborate with external agencies or nongovernmental organizations: "[Authorities] realized we were really organizing with the communities, they said: 'This is not just some organization, it's the community, its citizens'" (Batzin et al., 2020, p.15).

A flexible learning approach, sensitive to context

During the initial round of training workshops, some participants expressed the opinion that the project was attempting the same as other nongovernmental organizations (NGOs) and government agencies: "They bring lawyers and doctors from the city, who do not speak our language. For us, it is hard to believe what they say if they do not know what it is like to live in rural areas where we have many needs".[7] The CEGSS team reflected on this view and developed a new training strategy that was flexible and sensitive to local communities.

First, university graduates were recruited who were indigenous and were able to maintain contacts with grassroots organizations. This enabled the training to be based on traditional indigenous community practices of dialogue, learning by doing, leading by example and trust. For this, new indigenous staff from CEGSS were to act as mentors. Second, instead of detailed training sessions and contents, methodological guidelines were developed that described the knowledge and skills to be acquired by participants. Each mentor then had the flexibility to organize the sessions as they thought would best fit the context. And third, all sessions were to be held in the local indigenous language.

Under this training model, the creativity and motivation of both mentors and community participants became evident. A strong bond was also forged between mentors and Community Defenders, which continues to this day (Hernández & Sebastian, 2017; Batzin et al., 2020). To support cross-learning among the 30 municipalities, Community Defenders were also organized as a network, of which there are currently 150 active members – 42% are female and around 20% are under 30 years of age.

Forging collaborations to benefit all actors

In the first year of implementation (2014), CEGSS produced policy briefs and held face-to-face seminars to inform health care workers and local authorities about the new decentralization law that recognizes the right of citizens to participate in planning, monitoring and evaluation of services. CEGSS argued that community engagement in the governance of local health systems may potentially improve communication, collaboration and trust between service users, health workers and the authorities.

The majority of seminar participants were sceptical about allowing service users to have a voice and representation in governance functions. However, a minority of these stakeholders recognized the potential benefits of community participation and supported implementation of the project. These supporters were frontline workers assigned to distant health posts, with minimal or no supervision, and few resources to carry out their work.

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7   Pers. comm. between CEGSS staff and Community Leaders from the rural highlands, 2009.

In explaining to a journalist why he collaborates with Community Defenders, a nurse from a rural post said: "It's not the same managing a rural health care outpost with no involvement from the community. Previously I was assigned to a healthcare outpost in Escuintla and when problems arose, we were on our own. There was no one we could call" (Hernández & Sebastian, 2017, p.12). Likewise, a medical doctor in charge of municipal health services explained to a journalist that collaborating with Community Defenders and the community more broadly was also important when trying to secure additional resources in the face of budget cuts:

> This year, 2017, we've been told by central-level authorities to stick to the number of inhabitants recorded in 2002 which means the allocated budget will only cover less inhabitants than we have. I am asking the Community Defenders to intervene in some way by mobilizing their contacts or seeking help from other members of the network or from other provinces. (ibid.).

This collaboration between frontline workers and Community Defenders brought positive results. In some places, the municipal government allocated resources to fix or upgrade the local infrastructure. In others, the advocacy of Community Defenders at provincial and national level resulted in the provision of an ambulance for the local health clinic. Local services also reported a higher attendance for both vaccinations and growth monitoring when Community Defenders helped to promote these services (Flores & Hernández, 2018; Hernández et al., 2019).

This supportive group of frontline workers also played an important role in gradually convincing their colleagues on the benefits of participatory governance. Indeed, after three years of implementation, most frontline health care workers and municipal authorities accepted the benefits of community participation and understood service users' demands to contribute to the governance of their local health systems (Hernández et al., 2019).

Community learning to navigate public institutions

Channels of engagement have been established in each of the 30 municipalities between Community Defenders and the municipal government and local health authorities. As part of the continuous training and advice provided by CEGSS mentors, Community Defenders have learned about the different levels of governance and decision-making in the Ministry of Health and other public institutions and are able to communicate with local authorities about the challenges they face.

Field visits were arranged to the capital, Guatemala City, for Community Defenders to learn about the National Congress and meet with members of congress who represent their territories. They also learned about the National Ombudsman Office. Now that Community Defenders understand where decisions on public policies and resource allocations are made, they advocate at different governance levels. For instance, in December 2016, Community Defenders requested an official meeting with the Minister of Health to present a report on the failings of provincial warehouses to provide prompt distribution of medicines and essential supplies to rural health posts. The minister granted a meeting and working groups were created to seek potential solutions. In explaining the relevance of the Community Defenders' work, the Minister

of Health said to a journalist: "The ministry has to guarantee the right to health care. But if citizens also demand this right, the system as a whole is strengthened. Each community needs to find the way to organize and demand high quality services" (Hernández & Sebastian, 2017, p.9).

In another instance, in 2018, the Network of Community Defenders compiled more than 100 complaints from patients who were referred to a secondary hospital but could not travel due to either ambulance fuel shortages or illegal demands for payment from health care workers to provide transport. Reports were presented to municipal and provincial authorities, but the problems continued. Because Community Defenders had learned about the important role of the National Ombudsman Office, however, they presented their reports there too and requested independent verification of the complaints. A team of investigators from the Ombudsman Office verified and confirmed the problems reported regarding emergency transport. Consequently, provincial authorities implemented measures that have improved the organization of and resources for ambulance services.

Conclusion

By using a participatory action research design, CEGSS and the Network of Community Defenders have been able to address many challenges in engaging with actors and public organizations within the governance system. Learning has been an incremental journey for the Network that has allowed Community Defenders to navigate upstream within complex government and state institutions. In addition, health workers have seen the benefits felt by the initially small number of colleagues who supported participation of service users, and

therefore have come to trust the process of engagement with Community Defenders. Together, this has meant that the CEGSS project was able to start small and gradually build upon initial successes.

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India – Learning from the Nipah virus outbreak to inform the COVID-19 response in Kerala

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India's first case of COVID-19 was reported from the state of Kerala on 30 January 2020. As Kerala's migrants and students returned home, the state continued to report the highest number of cases in the country until early April that year. By the end of June 2020, however, Kerala had one of the lowest incidences of the disease and the lowest mortality among all states.

The state government had learned lessons from the Nipah virus outbreak in 2018 and 2019 and had institutionalized different aspects of epidemic preparedness and response (World Health Organization, 2020): this proved critical in Kerala's handling of COVID-19. While Kerala witnessed a steady incidence of new cases from July 2020, it continued to have one of the lowest death rates in the country and was cited in national daily reports as becoming "the toast of the international media for the effective way in which it tackled the COVID-19 pandemic early on" (Ninan, 2020).

Epidemic preparedness built on experience

There were many things unique about the Nipah virus outbreak. First, it was completely unexpected – there was no past record of any case in Kerala. Second, Nipah is a deadly virus, with a case fatality rate of 40–75% that was compounded by the lack of a definitive cure (World Health Organization, 2018). Hence, the only approaches to controlling it were the basic public health measures of early identification, contact tracing, quarantine and isolation. Third, because Nipah was a new disease, and so deadly, it created considerable panic in the state. Internal reviews revealed that, while the source of the first case could not be determined, most of the subsequent infections were acquired from health facilities. The death of a nurse from Nipah virus served as a further red alert to the health system.

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PREPARING AN EPIDEMIC RESPONSE CADRE

Having recognized the importance of preventing hospital-acquired infection and anticipating that a person with Nipah virus could be admitted in any of the medical college hospitals in Kerala, a massive training on infection control was rolled out during and after the outbreak. This training made use of a team formed just before the Nipah virus outbreak, as part of a process related to anti-microbial resistance control.

Eight nurse-trainers were selected and trained to head the team on infection control. This training covered the use of personal protective equipment (PPE), segregation of patients in ambulatory care and ensuring isolation. This core group then trained over 200 nursing master trainers, who were subsequently placed in public hospitals. This cadre was ready to rapidly train or retrain facility staff, including many newly appointed doctors, whenever an outbreak occurred. Hence, when a single Nipah virus case was detected a year later, it was met with a comprehensive response and further transmission was averted.

In 2020, this cadre were activated again in response to the COVID-19 outbreak. An advisor pointed out, "[during the Nipah virus outbreak] we had the central agencies coming and helping us with protocols of donning and doffing [PPE]. But this time [during the COVID-19 outbreak] we never asked for anything. We are self-sufficient in infection prevention control. All the medical colleges have enough and more trained nurses and doctors, so we can train other people."[8] Their success was measurable in the low rate of infection among health professionals in Kerala. A senior professional who advises the government commented: "In six months of the pandemic, no doctor treating COVID-19 patients in the medical college was infected, and only one nurse was infected".[9]

BUILDING PUBLIC TRUST THROUGH COMMUNICATION

Another skill learnt from the Nipah virus crisis – this time by public health personnel – was that of sustaining contact tracing and quarantine. For example, on 4 April 2020, Kerala had identified and quarantined at home 171 355 contacts, having reported a total of 306 cases of COVID-19 (Government of Kerala, 2020; Sadanandan, 2020). This is compared to Maharashtra, for example, which had more than double the cases on the same day, but less than a third of the total under quarantine (Shukla et al., 2020).

This strong contact-tracing response for COVID-19 was largely due to the internalization of lessons learned from the Nipah virus outbreak. In 2020, trained volunteers and field staff drew up "route maps" that specified the movements of index cases during their respective infective periods. These anonymized route maps were then disseminated via local media, social media and news channels, urging those who were at those locations at the time to come forward for screening and possible quarantine. The message, as reported by a senior implementation officer, was that "the whole district population need not be alarmed, only the few thousands who were at these sites need be concerned".[10]

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8   Interview with senior doctor involved in control of the Nipah outbreak, 8 July 2020.
9   Interview with senior doctor involved in control of the Nipah outbreak, 9 July 2020.
10   Interview with senior official of Kerala Health Department, 12 July 2020.

The importance of communicating the contract-tracing approach was learned well during the Nipah virus outbreak, where those who had contact history or were symptomatic were asked to come forward voluntarily to be tested and quarantined. This required high levels of trust from the public, plus efforts to prevent stigmatization and fear around the outbreak. In addition, Kerala developed helplines that were staffed 24 hours a day by a team of hundreds of medical and administrative personnel who responded to calls for information and for assistance. Following the Nipah virus outbreak, a database of counsellors and channels of communication were put in place in each district to undertake these tasks. These systems were then activated for the COVID-19 response, allowing rapid deployment of helplines and control rooms that could adapt quickly to the specificities of the new outbreak.

AN ALL-OF-GOVERNMENT RESPONSE
Another lesson learned from the Nipah virus outbreak was that an all-of-government response was needed. In 2018 and 2019, the intensive contact tracing and communication strategy to control panic among the population meant that a number of departments outside of the health sector had to be involved. As many as 18 cross-sector working committees had been set up in response, each with specific terms of reference, standard operating procedures and clear reporting lines ratified through government orders.

These committees were established in the first Nipah virus outbreak, mobilized again for the second outbreak and then reconvened and re-oriented in 2020 to combat the COVID-19 pandemic. Commenting on the rapid response in 2020, a government advisor commented:

> All the systems were in place even for Nipah. So, when this corona came, all the red channels, the media outreach, the helplines, how to take the swab, how to send the swab, the biomedical waste disposal waste management, all those things were there … We had protocols and everything in place, so we never had to spend much time on these – the only thing we had to do, was to activate the system.[11]

Relationships were established across authorities and between staff of different sectors during the Nipah virus outbreak. These same relationships could be utilized in the COVID-19 response to mobilize different authorities: the ports of entry, infection control teams, contact-tracing teams, volunteer mobilization teams, trainers, helplines and counselling services, ambulance services, infection-control training and quarantine mechanisms. In several instances the same committee members were involved in both the Nipah virus outbreaks and the COVID-19 response, and their tacit knowledge was critical. While the working committees consciously adapted and enforced protocols, they also drew on a pool of institutional memory from the Nipah virus.

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[11]   Interview with senior doctor involved in control of the Nipah outbreak, 9 July 2020.

Conclusion

Kerala's achievements in containing cases of COVID-19 owes much to its response to the earlier outbreaks of Nipah virus. The state had developed a robust epidemic response, had built community trust through communication and had engaged across different arms of government. These measures were buttressed by the state's long-term investments in building effective public health services.[12] Importantly, Kerala utilizes a learning approach that has contributed significantly to the resilience of its health system – learning processes are embedded not only within health systems, but extend also to all government sectors and community institutions.

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[12]   Interview with senior doctor involved in control of the Nipah outbreak, 8 July 2020.

Indonesia – Learning for health equity: the DaSK dashboard for universal health coverage

Laksono Trisnantoro,[1] Krishna Hort[1]

In 2014, Indonesia introduced an ambitious plan to provide universal health coverage (UHC) to all by 2019 through the *Jaminan Kesehatan Nasional* (JKN) social insurance scheme. The scheme combines a government subsidy for the poor (*penerima bantuan iuran* or PBI), a voluntary contribution by informal sector workers (*peserta bukan penerima upah* or PBPU) and a compulsory contribution from employees and employers in the formal sector (*pekerja penerima upah* or PPU). The scheme is managed by the Social Health Insurance Agency (*Badan Penyelenggara Jaminan Sosial-Kesehatan,* BPJS) using a single pool mechanism.

While the scheme faces a number of challenges and has yet to achieve coverage of the whole population, the issue that is attracting most attention is the deficit – the gap between the contributions collected and provided by central and provincial/district government, and the expenditure on services provided. Each year the Government of Indonesia has to provide additional finance to cover this deficit, which amounts to around 32 trillion Rupiah (Rp) or approximately US$ 2.2 billion. The Ministry of Finance claims there is a mismatch between the contributions and expenditure and has threatened to withdraw funds to cover the deficit unless contributions are increased (CNN Indonesia, 2020).

Divergent views on the challenges and solutions

There have been numerous research studies and recommendations on how to solve the issue of the JKN deficit.

An analysis by the national team for acceleration of poverty reduction (*Tim Nasional Percepatan Penanggulangan Kemiskinan,* TNP2K), with support from the Health Policy Plus project, recommended that ongoing voluntary contributions should be encouraged, while at the same time efforts should be made to reduce expenditure. They proposed that hospital expenditure should be better managed, and that the public should be encouraged to make more use of primary care through provider payment reforms (Prabhakaran et al., 2019).

Another more recent report from the nongovernmental organization Prakarsa (Djamhari et al., 2020) focused on the failure of primary health care to provide promotive and

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preventive care, inefficient use of hospital-level services and the high incidence of catastrophic expenditure for acute crises. At the same time, Prakarsa noted that contribution rates remained below the level required to cover such costs. Other commentators focused on the management of the JKN by the BPJS, claiming that the problems around the deficit stem from fraudulent claims from hospitals, formal sector employers manipulating records to reduce their contribution, double counting and payments to non-enrolled beneficiaries due to poor data management by the BPJS.

Fundamental issues that have been neglected somewhat in these analyses are the BPJS member segments and regional perspectives. This includes the degree of equity in contributions and the utilization of services between BPJS members and different geographic areas of Indonesia (Trisnantoro et al., 2019). An equity perspective demonstrates that the deficit actually obscures a much larger problem, namely inequalities in the availability and use of health services by different member groups of the BPJS and across regions. Indeed, if all population groups and regions had the same access and use of health services as those in more advantaged regions, the deficit would be much higher. Consequently, additional funding is needed not only to address the deficit, but also to improve the supply of health facilities and the workforce in disadvantaged areas.

This perspective has not gained much traction in the national policy arena, however, which has tended to focus instead on the JKN as a single pool. To address this, the Center for Health Policy and Management (CHPM) sought to raise the profile and policy relevance of equity analysis by facilitating learning.

A new platform for equity analysis

While data are available in regional and national profiles and surveys, access to the data is limited and comparative analyses are scarce. To address this gap, and to support a learning process, the CHPM introduced a web-based knowledge management platform.[13] The platform was piloted in 2014, officially launched in 2015 and provides three inter-related and reinforcing components:

1. a data repository;
2. learning for decision- and policy-making in UHC and health policy through blended online and face-to-face short courses on health system and health policy analysis;
3. dialogue on key policy questions.

A recent improvement has been the use of a dashboard (DaSK) to support learning on policy analysis and recommendations around UHC, which emphasizes issues around equity. Financing for the platform has been provided through grants from the Universitas Gadjah Mada (UGM), supported by various research funding plus international agencies including the World Health Organization (WHO) and Australia's Department of Foreign Affairs and Trade (DFAT) through its Knowledge Sector Initiative.

Multi-level learning

Since 2015 the UHC and health system material has been organized online to facilitate various levels of learning.

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[13]   www.kebijakankesehatanindonesia.net

Originally, the objective was for individual learning – between 2015 and 2019, the monitoring of UHC policy was organized in a yearly cycle with policy-makers, researchers and academics joining policy monitoring events. However, in 2019, there was a change in approach to encourage organizational learning. Partnerships were established with various universities and policy dialogue events were held with many organizations.

The learning process is organized mainly in the form of research reports and policy dialogue meetings, with some materials on the platform targeting cross-organization and cross-system learning. A key lesson has been to increase the use of the "learning organization" principle to understand UHC and the health system. Many academics and trainers with expertise in the field of health insurance – including researchers from 13 universities – have partnered with the CHPM to create knowledge materials for learning. And by using DaSK, the learning materials can be updated, presented and analysed by health care organizations.

The initial focus of the policy learning process has been national-level policy-makers such as the presidential office, the ministries of finance and health, the BPJS, and also members of parliament. The CHPM has also commenced engagement with local government (at provincial, district and city levels), where there is growing interest in their potential contribution. However, the learning process has not yet been organized systematically at this local level.

A dynamic platform for comparative analyses

Since 2019, DaSK has further facilitated comparative analyses for health policy-making at national and provincial level to achieve UHC. Various data are compiled within the dashboard for knowledge dissemination and use by individual and organizational learners across countries (CHPM, 2020). The data include the results of national and sub-national research, policy analyses and policy briefs, and are presented as graphics and animations to improve the learning process. Additionally, DaSK provides access to learning materials on areas such as: understanding health system policy monitoring and evaluation; utilization and expenditure of UHC budgets according to the socioeconomic profile of health insurance members and geographic groups; and UHC policy analysis. Key materials relate to equity and access to health services under the UHC scheme, with the main message being that the principle of equity is not yet incorporated in current UHC and health system policy.

A number of formal online courses have been organized through the web platform and a "community of practice" (CoP) approach is used to increase the effectiveness of peer-to-peer learning. In 2020, the platform specifically encouraged many organizations to use the principles of knowledge management and learning organization in their working culture.

Conclusion

There have been some gradual changes in the policy debate since the CHPM's web-based knowledge platform was introduced in Indonesia. More national policy-makers and organizations are involved in the learning process, and at the same time their understanding of equity has increased from the DaSK data and policy debates on UHC and the health system.

More recently, the issue of equity has become important for Indonesia's political agenda. Although powerful lobbyists in the national parliament still promote the interests of the middle class who are the primary beneficiaries of the current JKN policy, a culture of learning around equity is increasing among policy-makers. Digital technologies such as DaSK support mass learning across Indonesia and increase the availability and access to UHC data. In turn, this will help health systems better manage change by adapting, predicting or innovating in the policy process.

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Lebanon – Learning to get a fair deal for hospital care

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The Lebanese Ministry of Public Health (MoPH) held little authority in the post-civil war chaos of the 1990s. However, during the 2000s, and despite persistent adverse geopolitical circumstances, the MoPH sought to overcome various challenges to transform the country's fragmented health system into a resilient (Ammar et al., 2016) and high-performing outlier in the region (Economist Intelligence Unit, 2014).

This transformation was driven in large part by investments made to improve learning processes, which enabled the MoPH to capitalize on the wealth of information and knowledge generated within the health system on a daily basis (Van Lerberghe et al., 2018).

A bad deal for the public purse, a bad deal for patients

One challenge, among many, within Lebanon's health system was the public funding of uninsured patients in private hospitals. The National Health Accounts for the 1990s had shown that this absorbed 24% of total expenditure and 62% of public expenditure from central government (Ammar et al., 2000).

Although an administratively cumbersome process, uninsured patients could get the MoPH to pay for their hospital admission. The process began with citizens obtaining a "certificate of non-adherence" from the social security funds and the civil servants' cooperative. With this, individuals could head to Beirut to queue for a rubberstamped pre-admission authorization form from the MoPH. Many would use a broker for the entire process, which fuelled the clientelism that was pervasive in the health sector. After hospitalization, private health facilities would send itemized bills to the MoPH that were eventually paid with few checks and balances. Predictably, MoPH costs skyrocketed and regularly exceeded budgetary allowances.

At the same time, concerns were raised about quality of care due to the small size of many hospitals, managerial inefficiencies (with occupancy ratios of 60–65%) and underutilization of sophisticated technology (fewer than three interventions were conducted per week in most open-heart surgery centres). There were numerous instances of overbilling of both the public purse and of individual citizens. Diagnostic tests, imaging, and drugs and medical supplies accounted for 44% of these costs, which suggested that hospitals boosted revenues by inflating investigations and supplies. Over-hospitalization was clearly an issue too – part spurious

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and supply induced, and partly due to ambulatory care being relatively poorly financed (Ammar, 2003).

More rational purchasing thus became a matter of patient protection, as well as of budgetary prudence. The MoPH needed to work towards cost-containment and transparency, parsimony in hospitalization and better quality of care. At the time, however, the MoPH lacked the capacity and credibility to negotiate a fairer deal.

Gaining credibility by gaining knowledge

A crucial step taken by the MoPH was to set up a performance contracting team. This was divided into three committees that worked, respectively, on utilization review, admission criteria and performance indicators.[14] The team launched research and analytical work as part of the World Bank-funded Emergency Social Protection Implementation Support Project (ESPISP) (World Bank, 2016) to assess utilization patterns and to understand the price structure of bills for laboratory examinations, imaging and operating room costs. Through this exercise, MoPH staff gained a level of knowledge and skills that changed their relations with the hospitals. The effects were near immediate: the negotiation of a 13% rebate and better justification for spend (including the use of International Classification of Diseases (ICD-10) and evidence that patients were not being charged more than the 15% co-payment set out in policy).

Digitization of the pre-admission authorizations, and later of discharge data, gave the MoPH team further opportunities

to understand the costs and billing practices, and helped the Ministry to gain the credibility to negotiate prices. The computerized system also radically simplified the authorization process for patients, eliminated the previous practice of double billing and curtailed gross overbilling.

From improved capacity to realigned incentives

Prior to the reforms, perverse incentives persisted in the hospital system. Even facilities that provided poor or dangerous care could submit bills, and overinvestment in sophisticated equipment permitted hospitals to capture higher tariffs. While the MoPH's agenda of cost-containment conflicted with the immediate interests of political and private sector lobbies, there were shared concerns around improving quality of care and efficiency.

The reputation of the MoPH team for professionalism and their granular understanding of the technical issues transformed the pricing negotiations into opportunities to push for more rational, evidence-based clinical practices. Under the new approach, pricing negotiations were based on the reality of costs, but rewarded quality and good performance.

Mindful of the private sector practice of seeking cheap solutions to maximize profit – and out of concern that its cost-containment policies might jeopardize the quality of health care – the MoPH decided to upgrade and tighten its accreditation standards. Although introduced as a voluntary engagement at first, accreditation soon became

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[14] Decision 1501: Decision to form a committee for setting admissions criteria, Decision 1510: Decision to form a committee for evaluation based on performance indicators, and Decision 1511: Creation of the utilization review committee, all taken on 17 September 2009 (see www.moph.gov.lb).

a prerequisite for contractual arrangements between the government and hospitals. This put to an end to the indiscriminate acceptance of hospitals as suppliers and was a key step in linking purchasing to performance.

The MoPH now possessed the skills, tools and teams to link tariffs for purchasing care to accreditation results, and had the confidence to negotiate this in a transparent way. By the 2010s, the MoPH team was ready to broaden its scope from looking at admissions and bills to analysing hospital discharges and health outcomes. Digitization streamlined management processes and provided precious databases for this purpose. The MoPH's analyses generated a wealth of information and enhanced the reputation of the Ministry as an organization capable of data-driven regulation.

Under the new regime, the tariffs for contracting hospital services now relied on a mix of validated criteria: accreditation score, the results of patient satisfaction surveys, a case-mix index, admissions to intensive care units, the ratio of surgical to medical admissions and a deduction rate (Ammar et al., 2013). This pricing system reflected both the complexity and the quality of services provided. It was perceived as fair and objective, incentivized good practice, and discouraged overuse and abuse of the system.

> The 2014 policy resulted in increased health care effectiveness, by increasing the case-mix index of hospitals contracted by the Ministry. This increase was mainly attributed to decreased unnecessary hospitalizations and was accompanied by improved medical discharge coding practices (Khalife et al., 2020, p.2).

Alongside the stepwise process of performance contracting, the accreditation system became more and more outcome oriented. This proved to be an important learning tool to improve the technical quality of care and to mitigate perverse incentives. Whereas the accreditation process was supported by external technical expertise initially, a Lebanese team was soon trained under the oversight of the MoPH and was able to take over. This was funded first by the government, and then by private hospitals that by now were convinced of the value added to themselves, as well as their patients.

Institutionalizing the learning approach

The years of investment in analytical capacity and data-driven negotiation gave the MoPH the authority to actively steer the purchasing of hospital care. Yet the learning experience was not limited to public authorities: the network of hospitals also went through a cycle of learning while adhering to evidence-based practice. And new institutional capacities – on accreditation and on third-party administration of hospital admissions – emerged as a spin-off in the health landscape. Novel regulatory practices were thus made possible by a specific learning platform, where operational data on hospital admissions and billing were combined with technological innovation and cutting-edge analytical strategies.

Similar learning processes occurred in other areas too, such as pharmaceutical policy and disaster preparedness, and have become part of the organizational culture of the MoPH. Importantly, this change was brought about in a consensual manner: the higher standards have been adopted by a broad

set of stakeholders, who see the advantage of a level playing field and have accepted the regulatory role of the MoPH. The adversarial relations of the 1990s – where hospitals took advantage of the weaknesses of a defensive MoPH – have given way to cooperation around the shared benefits of fairer contractual arrangements and improved quality of care.

Conclusion

As a consequence of the MoPH's learning approach, a sector that was previously characterized by unregulated competition has morphed into one with institutional quality assurance, realigned incentives and more rational public spending. Transparency has improved and overbilling has been curtailed, and there are indications that spurious and excessive hospitalization is reducing, along with costs. Khalife et al. summarize this transformation and the role of the MoPH in the learning process:

> The MoPH role as facilitator and steward of the partnership was enhanced by the introduction of a fairer and more appropriate contracting model based on local evidence that also helped counter prevailing political and confessional/religious favouritism. The new hospital contracting system is one example of a merit system that the MoPH succeeded in introducing and gaining the acceptability by a major player in the health sector: the private hospitals (Khalife et al., 2017, p.40).

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Mozambique – Addressing neonatal mortality through a peer-to-peer learning intervention at district level

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Despite the significant strides made in Mozambique over the past two decades to reduce child mortality, an estimated 78 deaths occur among children under 5 years (U5) for every 1 000 live births (You et al., 2015). And progress on neonatal mortality (NNM) has been slower. Although the NNM rate has fallen from 44 to 27 deaths per 1 000 live births over the same period (Hug et al., 2019), the data indicate subnational disparities in achievements: around half of Mozambique's 11 provinces show reductions below the average annual NNM decrease of 5.5% between 2000 and 2010 (Fernandes et al., 2014).

Health system bottlenecks – such as a shortage of qualified health workers, weak in-service training and mentorship programmes, fragmentation of service delivery across different levels of the health system, and limited use of data in decision-making – all contribute to the problem of ongoing neonatal deaths (Ministério da Saúde, 2013). Evidence shows that the availability of trained human resources, particularly maternal and child health (MCH) nurses, is associated with better health outcomes. Yet the ratio of MCH nurses to women of reproductive age and U5 children remains very low in Mozambique at 0.53 nurses per 1 000 women and children (Ministério da Saúde, 2016). Furthermore, of the existing MCH nurses, some have not received high-quality training, many are overworked, and all are part of a health system that is still consolidating a robust mechanism to train health workers (Dgedge et al., 2014; Ministério da Saúde, 2016).

This scenario highlights the need for effective interventions to enhance district-level leadership and accountability and to optimize peer-to-peer learning to accelerate reductions in NNM. In an effort to address the health system gaps, the Mozambique Ministry of Health (MoH) implemented the Integrated District Evidence to Action (IDEAs) programme in 2016 to improve maternal, newborn and child health in 12 districts and across 154 health facilities in Manica and Sofala provinces. These efforts were supported by the Doris Duke Charitable Foundation and the University of Washington, Department of Global Health.

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A peer-to-peer learning approach

IDEAs is a multi-component programme that is led by district managers and integrated into routine services. The programme was founded on the premise that iterative peer-to-peer performance reviews, active experience-sharing and operational planning could help increase coverage of evidence-based interventions to address the problems associated with NNM. The implementation strategy focuses on three central interventions:

1. a semi-annual assessment using standardized tools to assess the readiness of health facilities to deliver clinical services during or around the period of birth;

2. performance audit and feedback (A&F) meetings to identify facility-level performance gaps and develop action plans to address these gaps; and

3. a supportive supervision system.

The IDEAs approach is flexible and adaptable to local settings. It was designed based on evidence of what works in A&F, using systematic reviews and applying individual and organizational behaviour theory (Foy et al., 2005; Gardner, 2010).

The A&F discussions, preparation of action plans and supportive supervision are all designed and implemented to maximize active peer-to-peer learning – the central purpose of IDEAs (Proctor et al., 2013; Powell et al., 2015). A&F meetings rely on routine health information system data and readiness assessments to track progress in health facility performance. Health facility teams conduct a data quality assessment before each A&F meeting to ensure that any decisions made are based on quality information. The trends in performance indicators are then presented by each team, followed by group discussions to enable results to be interpreted and for performance bottlenecks to be identified. The final day of A&F meetings is reserved for each health facility team to identify micro-interventions that can address performance gaps, and to develop an action plan with timelines, realistic budget allocations and the necessary commitments required for implementation.

Supportive supervision to reinforce learning

Supportive supervision is undertaken within the IDEAs approach, focusing on selected health facilities. Facilities are chosen based on performance (two low-performing and one high-performing facility) and a supervisory team is formed to meet the in-service training needs of those health facilities. The district team (comprising of at least the MCH supervisor, the public health programme manager and the health information system manager) is also tasked with addressing any questions on the MoH guidelines and expectations agreed upon at the A&F meetings. This format encourages open, frank and fruitful discussions, and creates an environment conducive to active peer-to-peer experience-sharing and self-evaluation, as well as the promotion of team and individual accountability.

A cyclical approach for sustainable learning

A repeated and sequential approach allows facility teams – particularly MCH nurses – to gradually build and strengthen their skills in data quality assessment, secular trends analysis, communication and negotiation. In turn, these skills

are required in data quality evaluations (availability and concordance), the preparation of reports and the delivery of presentations to a broad audience. Furthermore, the IDEAs approach helps individuals to develop the skills to identify performance gaps and to design budgets to implement local solutions. During district-to-facility supervisory visits, priority is given to one-to-one mentorship, with an emphasis on practical skills. Vertical (district manager to facility teams) and horizontal (peer-to-peer) positive pressure is generated throughout the cyclical IDEAs approach that activates, reinforces and sustains learning.

Districts have implemented the IDEAs programme without interruption since it was launched in 2016. As initially planned, participants have conducted seven performance review meeting rounds (two per year) and 265 supportive supervisory visits at priority health facilities. This equates to an average of 2.1 supervisions per facility per year. Overall, 49% of follow-up supervisions have been led by the same district supervisor. This has proved critical in ensuring continuity in mentoring, and has helped to build trust, to facilitate peer-to-peer communication and to enable progression within in-service training.

Lessons learned

Implementation of IDEAs over the four-year period has yielded several key lessons.

- Integration of IDEAs into the routine health system and among district managers has been critical to the success and longevity of the approach. District ownership has helped to consolidate learning and make it routine as part

of organizational culture and practice.

- IDEAs engenders a learning network across health facilities in each of the 12 districts. Within this, frontline health workers lead the process of creating and strengthening communication and collaboration with the leadership in other district health facilities.

- The transparent and discursive culture of A&F meetings has promoted positive competition among peers and has motivated frontline health workers and/or district managers to fulfil their responsibilities. In turn, health workers feel appreciated in terms of their contributions.

The adaptability of IDEAs to local context has been crucial to its uptake, routinization and scalability. During the initial implementation period, district and facility managers requested an opportunity to contribute when IDEAs was adapted to the local context. This resulted in new arrangements, including for the format of performance reviews and the composition of supervisory teams. MCH nurses from other districts are now included within the teams to allow for experience-sharing, as are other relevant district managers to meet the needs of specific health facilities. Together, these adaptations have contributed to improvements in A&F meetings and in-service training.

Limitations to the IDEAs approach

Supervision under the IDEAs approach requires strong planning skills and effective coordination mechanisms, which are still lacking in most districts. Despite the positive findings, IDEAs faces critical challenges, with the most relevant relating to preparation for and implementation of supportive supervision. Indeed, this creates a notable bottleneck, leading

to missed opportunities for peer-to-peer learning. Furthermore, the context of a shortage of human resources, particularly as a result of a high turnover of MCH nurses, affects the gains made by the programme. Training and integration of new health workers demands substantial time and financial resources too.

Conclusion

The IDEAs programme showcases how a supportive learning environment for frontline health workers can lead to sustained improvements in leadership practices and can strengthen collaboration among health facilities. The value of supporting peer-to-peer learning and experience-sharing is also clear in order to optimize gains in skills. Early signs of proactive communication and collaboration across health facilities suggest that the IDEAs approach is gradually creating an environment to translate knowledge into action at the health facility level and to minimize fragmentation within health service delivery.

An evidence-based intervention such as IDEAs has the potential to be applied at scale and to contribute to improvements in service delivery, as we have seen in Manica and Sofala provinces. However, this effort alone may not be sufficient to influence the NNM curve and achieve a substantial reduction in mortality. Critical attention should also be given to the timely removal of health system bottlenecks and the building of a solid and evolving learning system that is led by frontline health workers and managers.

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Nigeria – How experience with Lassa fever helped the country prepare for COVID-19

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The many unknowns about COVID-19 pose a tremendous threat to countries around the world. In combating COVID-19, Nigeria – Africa's most populous country – is relying on its experience with another disease, Lassa fever.

While the two diseases have notable differences, there are several similarities too. Lassa fever and COVID-19 are both caused by viral infections and bring about mostly non-specific symptoms typical of more common diseases such as malaria in West Africa or influenza in North America and Europe. Both are fatal for a fraction of those who are infected, and a high proportion are hospitalized. While not novel, Lassa fever has been poorly researched since its discovery in 1969; this is mostly due to low biomedical research investments, limited geographic endemicity and biosafety level-four requirements for viral research.

An additional shared factor is the lack of confirmed effective medical countermeasures or therapeutics for either disease. While global efforts are focused on finding these for COVID-19, Lassa fever – after five decades – still has no clinically approved drug for treatment and no vaccine. As in the response to COVID-19, the prevention, management and control of Lassa fever depends on strong leadership and political commitment, stringent public health measures, health system resilience and behaviour change interventions.

Overcoming health system challenges

The Nigeria Centre for Disease Control (NCDC) coordinates the country's response to disease outbreaks. In the last three years, Nigeria has experienced year-round outbreaks of Lassa fever – with the 2019/2020 outbreak being the largest recorded globally. The majority of cases in West Africa occur in Nigeria, with annual multi-state concurrent outbreaks usually reported between December and May in what is often described as the "Lassa fever season" (Coyle, 2016). Between 2016 and 2019, the NCDC responded to three large outbreaks, and in mounting a response had to overcome key health system challenges.

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LIMITED AUTHORITY OF THE NCDC

The first and most fundamental of these challenges was the limited authority of NCDC as the lead agency responding to public health emergencies and disease outbreaks in Nigeria. The NCDC was established in 2011 but it remained a skeletal agency that was not legally recognized as a federal public health authority until 2018. This meant that the NCDC could not hire its own dedicated staff, manage its finances directly or oversee other structures required for a national public health institute to function effectively. In the absence of a statute, the NCDC depended largely on the Federal Ministry of Health (MoH), which was not built for the emergency nature of disease outbreaks.

Thankfully, in November 2018, the NCDC Act was passed into law by the President of the Federal Republic of Nigeria. It gave the NCDC a legal mandate to operate and receive funding and it clearly outlined the functions of the agency (NCDC, 2020a). The Act also allowed the NCDC to recruit additional human resources, increasing the number of staff from fewer than 100 to 215 within three months of the Act being passed (Ihekweazu, 2018). These additional staff have been key to strengthening national and subnational reporting, as well as the delivery of surveillance activities, public health laboratory services, and emergency preparedness and response to Lassa fever and other disease outbreaks including COVID-19.

RESOURCE CONSTRAINTS AFFECTING PREPAREDNESS AND RESPONSE

The second health system challenge related to the need to enhance the human and financial resources of state governments required for outbreak preparedness and response.

Nigeria's Constitution mandates that states have the primary responsibility to prevent, detect and respond to infectious disease outbreaks (Onyemelukwe, 2019). Therefore, to support states in this endeavour, the NCDC launched a state-level advocacy and mobilization plan for Lassa fever. Prior to the Lassa fever season in 2018, the NCDC Director General visited state governors in the three states with the highest burden of Lassa fever – Edo, Ondo and Ebonyi – to mobilize political support and advocate increased funding to respond to the disease. Subsequently, a new treatment centre was established in Ondo State, and increased financial and technical resources were allocated by the state governments of Edo and Ebonyi to better equip their existing treatment centres. To continue to encourage a state-led response for Lassa fever, the NCDC has expanded this approach and now supports states in their advocacy efforts to development and local private sector partners.

TOOLS ESSENTIAL FOR OUTBREAK PREPAREDNESS

The next challenge was to begin to transform the public health response to Lassa fever from "reactive" to "prepared" mode. The development of guidelines and protocols was critical in ensuring that a well-defined preparedness and response strategy for Lassa fever existed, to be coordinated by the NCDC as the national public health institute. One critical step was the deployment of the Surveillance, Outbreak Response Management and Analysis System (SORMAS) – the real-time, web-based software for outbreak and epidemic surveillance. SORMAS was developed and first used in Nigeria in 2014 to support the Ebola virus response and is now used for Lassa fever and other diseases, including COVID-19 (Maxmen, 2018).

The use of SORMAS has strengthened Nigeria's capacity to collect and analyse data, and to use this for critical decision-making. For example, states were provided with medicines and supplies required for Lassa fever case management, based on the prevalence of disease as recorded through SORMAS. This helped to ensure targeted provision of resources and to avoid wastage – as was seen in outbreaks in previous years (Tom-Aba et al., 2020). In addition, at the beginning of both 2019 and 2020, the NCDC deployed Rapid Response Teams to states that recorded a high number of Lassa fever cases in the previous year. This helped these states to prepare and develop a strong coordination structure to respond to Lassa fever as well as other diseases.

THE NEED FOR DISEASE-SPECIFIC TRAINING

As the NCDC evolved, a trained health workforce became central to achieve the public health functions that the agency was established to carry out. In 2018, the NCDC and the Irrua Specialist Teaching Hospital organized nationwide training for health workers in all states (Dan-Nwafor et al., 2019). Through this initiative, 253 participants including doctors, nurses, epidemiologists and other cadres were trained on Lassa fever case management, surveillance, and infection prevention and control. This was an important step towards ensuring that all states have treatment centres with trained health workers, thereby reducing the burden on existing centres. The NCDC also trained laboratory scientists by pairing them with other lab experts as mentors. These trainings corresponded with a decline in Lassa fever case fatality rates from 25.1% in 2018 to

19.2% in 2020. Following this training of laboratory staff, the average turnaround time between the collection of samples and confirmation of results reduced from five days to two days (Kingsley Dike et al., 2019; NCDC, 2020b).

Reflecting on performance to inform future responses

The NCDC also undertook steps to review its field experiences and consistently assess its response efforts. After-action reviews (AARs) were implemented in 2017, 2018 and 2019 to improve the NCDC's response activities for Lassa fever. The NCDC employed an approach that brought together relevant stakeholders within thematic working groups to examine the previous years' response across specific technical areas (NCDC, 2017, 2018, 2019).

The AARs commenced with a review of the pre-outbreak status – specifically existing plans and policies, human and financial resources, coordination mechanisms and preparedness activities. These reviews were followed by learnings from the field to capture response "innovations" to build on and retain institutional knowledge. For example, in 2018, Edo state shared its use of football matches and environmental sanitation days to increase awareness of Lassa fever among citizens. Ultimately, AAR delegates advised on best practices and made recommendations for improvements in the response to particular outbreaks.

Learning health systems need commitment and investment

By responding to annual outbreaks of Lassa fever and other infectious diseases, the NCDC has invested in improving data-gathering and intelligence for decision-making. Nigeria's health system is now better equipped to learn about emerging disease dynamics. In addition, the review mechanisms, such as regular AARs, have provided an opportunity for Nigeria to learn from its experience and improve its response to infectious disease outbreaks. These improvements in the health system have been facilitated by significant political investment and increased resources for health security – but these gains must be sustained through continued investment and political commitment for Nigeria to ensure national preparedness and to contribute to global health security.

Conclusion

COVID-19 rages on at the time of writing. Nigeria is again deploying its health system learning from the Lassa fever response to control another disease with few therapeutic control options. At the beginning of the COVID-19 response, the first few laboratories in Nigeria to be activated for testing were those that had been established for Lassa fever testing. The lessons learned from the national sample transportation mechanism for Lassa fever have helped to ensure a seamless process for COVID-19. This has also been the case for surveillance, and for supply chain and logistics systems.

However, most importantly, Nigeria has learned many lessons from Lassa fever about the value of stronger health systems – specifically on creating advocacy coalitions with state governments and development partners, supporting a workforce skilled in outbreak response, facilitating subnational leadership, and ensuring that intelligence from a combination of field experience and robust epidemiology consistently informs improvements in outbreak response. The challenge for Nigeria will be in securing and sustaining the resources needed to combat the current pandemic and be prepared for the future. Through its handling of Lassa fever, the country already has the institutional knowledge and the innovation to create and refine its own solutions.

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Republic of Korea – Learning from the MERS experience for a rapid response to COVID-19

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The Republic of Korea has been hit hard by the COVID-19 pandemic – the first case was confirmed in the country at the end of January 2020, while a huge outbreak that began at the end of February reached a peak of around 800 new confirmed cases per day by the beginning of March. Yet, since mid-April 2020, the number of new confirmed cases has stabilized at around 10 per day, with the majority being imported cases: the country responded to the outbreak swiftly, managing to flatten the epidemiological curve and avoid overburdening the health system (Kwon, 2020).

Thanks to an effective and quick response to the initial outbreak, the Republic of Korea has not needed to impose severe restrictive measures such as lockdowns. Had the country not controlled infections effectively, it would have faced many more confirmed cases, greater health care expenditure, and higher mortality rates. Avoiding lockdown has also contributed to lower socioeconomic costs associated with the response to COVID-19.

Lessons learned from the Republic of Korea's painful experience of Middle East Respiratory Syndrome (MERS) in 2015 – with 186 cases and 38 deaths (Oh et al., 2018) – have enabled a quick response from both the government and the public to COVID-19. At that time, the government failed to respond early to MERS and also lacked transparency in its disclosure of key information to the public. Encouragingly, however, the government and the public learned from this experience about the importance of effective surveillance and alerts, early diagnosis, clear roles and responsibilities for stakeholders and transparent communication (Lee & Ki, 2015), and as a result substantially enhanced its preparedness to respond to major outbreaks. During COVID-19, the government has also adopted several measures through "learning by doing", such as drive-through testing, residential treatment for milder patients and telemedicine.

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The policy response to COVID-19

Although the Republic of Korea has instituted nationwide postponements of the beginning of the spring semester and changes from face-to-face to online classes within schools and colleges as part of its response to COVID-19, there has been no ban on public gatherings or religious meetings, public transportation has continued to operate, and restaurants and shops have remained open. The public has been quick to comply with the government's recommendation of social distancing and the wearing of face masks, cancelling meetings and working from home without the need for major enforcement of the regulations.

Instead of very restrictive measures, a policy of mass testing and extensive contact tracing has been implemented. As the first cases of COVID-19 were reported at the end of January 2020, the government was already on a fast track to prepare mass production of test kits – a critical step for early detection and isolation of cases, and prevention of further infections. Indeed, about six weeks after the approval of test kits, more than 300,000 people had been tested.

Crucially, when a person tests positive for COVID-19, all paths are traced to check where a patient has visited and when. This includes checking restaurants that they may have visited or specific bus routes or subway lines they have used. According to law, the government is permitted to use all types of information in this endeavour, such as credit card payments, mobile phones and closed circuit television (CCTV) in public places. Text messages are then sent by the local and district government to all residents with information on a patient's movements during the infectious period.

Transparent communication has also been very effective in the Republic of Korea's response to the COVID-19 outbreak by increasing public trust in the government and therefore compliance with government recommendations. Each day, the Director of the Korean Center for Disease Control and Prevention (KCDC) and a government team provide a briefing on key policy measures and statistics such as new cases, mortality, the number of COVID-19 patients treated and the regional distribution of cases. In a recent survey, 75.3% of those surveyed indicated that they trust the regular briefing on COVID-19 given by the government, while 92.2% stated that they trust the KCDC (You, 2020). During the COVID-19 crisis, the KCDC has ranked the highest in terms of public trust for an organization or authority, higher than the Ministry of Health and Welfare (MoHW), local governments and public hospitals.

Finally, the National Health Insurance (NHI) system, which is mandatory for the entire population (Kwon, 2008), rapidly responded to COVID-19 by listing and pricing diagnostic tests, amending the benefit criteria for COVID-19 medicines through a shorter review, and introducing a fee for infection prevention for COVID-19 patients. As such, there is no financial burden for treatment of COVID-19 patients because the majority of costs are covered by the NHI. Furthermore, communicable diseases such as COVID-19 are exempt from co-payments. The cost of testing is reimbursed by the NHI for those who have travelled abroad and either have symptoms or require testing following recommendation from a physician, while NHI contributions are frozen for any citizen who is significantly affected by COVID-19. To support health care providers, the NHI system provides advance payments set at 90–100% of reimbursements from the previous year.

Learning from MERS to inform the COVID-19 response

After the MERS outbreak in 2015, the Government of the Republic of Korea revised the law, empowered the KCDC, and increased personnel and funding for infectious disease control to strengthen pandemic preparedness.

Three rounds of revisions of the Infectious Disease Control and Prevention Act since the MERS outbreak now allow the Minister of Health and Welfare to collect – and also to disclose to the public – information from the National Policy Agency and telecommunication companies on the location of patients and potential patients (with the provision that this information is destroyed when the relevant tasks for the outbreak response have been accomplished) (Park et al., 2020). These amendments have enabled the use of extensive contact tracing to control the spread of COVID-19.

The revised law also introduced a mandate for employers or the government to compensate employees and the self-employed who are receiving treatment for COVID-19 or are in quarantine. Additionally, the government must compensate hospitals that incur losses due to the treatment of patients or suspected patients of infectious diseases. A high-level central office has also been established for the emergency response.

As hospital infection was a serious concern during the MERS outbreak, the government has designated "COVID-19 safe hospitals" to minimize potential transmission this time round. There are 344 hospitals (28 tertiary hospitals, 215 general hospitals, 99 hospitals, plus two Korean medicine hospitals) that provide separate services and pathways to respiratory patients during the treatment process. The government has also designated 67 public sector hospitals with around 7 500 beds exclusively for the treatment of COVID-19 patients.

LEARNING BY DOING DURING THE COVID-19 RESPONSE.

In addition to learning lessons from the MERS outbreak, the Republic of Korea has introduced particular innovations in its response to COVID-19 as a result of "learning by doing" during the pandemic. Examples include the following.

- In the early days of the COVID-19 outbreak, there were some cases where a patient visited a health facility for testing, health personnel were infected, and the facility had to close. Later, outdoor drive-through testing units were introduced nationwide for rapid testing without the potential risk of transmission.

- Telemedicine has traditionally not been allowed due to opposition from the Korean Medical Association (KMA), which is worried about increased market power among big hospitals at the expense of office-based physicians in the community. In the face of COVID-19, however, telemedicine has been allowed temporarily under a limited scope to protect patients with existing health conditions and also to minimize the potential infection of health service providers.

- The Republic of Korea's mass testing programme resulted in many patients testing positive for COVID-19, all of whom were hospitalized initially. However, this overloaded the health system in some regions and resulted in a shortage of beds for patients who were severely ill with the virus. To avoid a repeat of this crisis, large suburban residential buildings that are used by public enterprises or private firms for education, training and short-term residences for

employees have been transformed into accommodation for patients with milder symptoms. These patients are evaluated by a physician who checks their respiratory symptoms and physical conditions twice per day, either in person or via telemedicine. In turn, vulnerable patients such as the elderly or those with pre-existing conditions, along with patients with severe symptoms of COVID-19, are given higher priority and are hospitalized.

Conclusion

The response to COVID-19 in the Republic of Korea has been effective and has so far contained the outbreak without the need for severe restrictive measures. Learning from the past experience of MERS in 2015 and "learning by doing" during the current pandemic are major contributing factors to this success. After MERS, laws were revised and new policies were introduced for contact tracing, information disclosure to the public and strengthening of the KCDC – together, these measures increased the preparedness of the country for another major outbreak of an infectious disease.

As COVID-19 is a novel virus, the government has needed to be flexible in its policy approach, adapting measures and legislation based on new evidence and learning from trial and error. Continuous revisions of patient triage and the introduction of a new type of facility for milder patients has helped the country to avoid overburdening the health system. In turn, policy learning from the COVID-19 crisis and the restructuring of health policy can minimize the social cost of future crises in the Republic of Korea and inform ongoing efforts around disease preparedness and response.

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ABOUT THIS REPORT

Learning – at individual, team, organization and cross-organization levels – is fundamental to health systems strengthening and the achievement of health goals. Yet, many health systems, especially in low- and middle-income countries, still do not have adequate capacity to generate and use the knowledge that they need to be effective. Investments in learning activities tend to be a remarkably small proportion of overall investments in health programmes and systems, and learning-focused activities have historically not found place or favour in budgets when compared with other health system priorities. This report advances a comprehensive understanding of what is meant by – and how to create – learning health systems. It outlines the benefits of learning health systems and the actions needed to build such systems.

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