

Pandemic Preparedness Financing STATUS UPDATE

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September 2019

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Background

The Global Preparedness Monitoring Board intends to provide an authoritative, independent, comprehensive, inclusive overview of the state of global preparedness for health crises by issuing an annual report each year, commissioning special reports, and promoting global action. This first annual report will focus as its starting point updates on the status of implementation of recommendations that emerged after the West Africa Ebola Virus Disease outbreak in 2014–15 in several domains—country preparedness capacity, pandemic preparedness financing, governance and coordination of health emergency preparedness, response, research and development, and putting communities at the center of all preparedness—as well as an examination of lessons learned from 2014–15 and current Ebola outbreaks, and risks associated with rapidly moving, high impact pandemics due to respiratory pathogens. It is envisaged that the status of preparedness will be updated each year with new data and information. The report will draw on materials that other monitoring or oversight bodies regularly produce (e.g., World Health Organization’s Health Emergencies Program Independent Oversight and Advisory Committee reports), reports that the Global Preparedness Monitoring Board commissions to address topics that are not otherwise being reviewed, and other relevant published and unpublished reports.

This paper discusses pandemic preparedness financing and cuts across the dimensions of country capacity strengthening, governance and coordination, and research and development. The report is intended for a wide audience including policy-makers, government officials, financing agencies, and the public.

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Acronyms and Abbreviations

ADB	Asian Development Bank
Cat-DDO	Catastrophe deferred drawdown option
CDC	U.S. Centers for Disease Control and Prevention
CEPI	Coalition for Epidemic Preparedness Innovations
CERC	Contingent Emergency Response Component
CFE	Contingency Fund for Emergencies
CGD	Center for Global Development
CPIA	Country Policy and Institutional Assessment
CRS	Creditor reporting system
CRW	Crisis response window
DAH	Development assistance for health
DRC	Democratic Republic of Congo
DRUM	Domestic resource use and mobilization
EAPHL	East Africa Public Health Laboratory Networking Project
EPI	Epidemic Preparedness Index
GAP	Global Action Plan
GDP	Gross domestic product
GHAH	Global Health Advocacy Incubator
GHS	Global Health Security
HIC	High-income country
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IDA18	18th Replenishment of International Development Association Funding
IHME	Institute for Health Metrics and Evaluation
IHR	International Health Regulation
IMF	International Monetary Fund
JEE	Joint External Evaluation
LIC	Low-income country
LMIC	Lower-middle-income country
NAPHS	National Action Plan for Health Security
NCDC	Nigeria Centre for Disease Control
OECD	Organization for Economic Cooperation and Development
PEF	Pandemic Emergency Financing Facility
R&D	Research and Development
REDISSE	Regional Disease Surveillance Systems Enhancement
SARS	Severe acute respiratory syndrome
SCD	Systematic country diagnostic
SDG	Sustainable Development Goal

UHC	Universal health coverage
UMIC	Upper-middle-income country
WBG	World Bank Group
WHEP	WHO Health Emergency Program
WHO	World Health Organization

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Executive Summary

Few natural hazards threaten more loss of life, economic disruption, and social disorder than large-scale disease outbreaks. In 2003, severe acute respiratory syndrome (SARS) killed 774 people. The 2009 H1N1 influenza outbreak resulted in more than 18,000 deaths. Between December 2013 and April 2016, the Ebola epidemic generated more than 28,616 cases and 11,310 deaths in Guinea, Liberia, and Sierra Leone. Since 2012 and through end-February 2019, Middle East respiratory syndrome has taken 823 lives and infected at least 2,374 people. The recent Zika outbreak in the Americas has infected more than 1 million people. The ongoing Ebola outbreak in the Democratic Republic of Congo has accounted for more than 2,000 deaths (as of mid-September, 2019) since the Ministry of Health declared a new outbreak of Ebola virus disease in North Kivu Province on 1 August 2018, and it shows no sign of abating.

The high death count and social disruption are not the only costs associated with pandemics; the financial and economic damages are also devastating. The 2003 SARS epidemic led to a global economic loss of more than USD52 billion. Ebola wiped out recent development gains in Guinea, Liberia, and Sierra Leone. By contrast, upgrading countries' preparedness is relatively inexpensive and affordable; recent data from costing of the gaps in public health capacities identified using Joint External Evaluations (JEEs) suggest that most countries would need to spend on average USD1.69 per person per year to reach an acceptable level of epidemic preparedness. Besides its cost effectiveness, investing in pandemic preparedness contributes to poverty alleviation, especially because infectious diseases tend to affect poor people disproportionately more than others.

To succeed will require a multipronged effort to persuade policy makers and communities to take measures of the political economy, cultural environment, and embrace a "One Health" approach which recognizes human health as connected to that of animal health and the environment requiring multisectoral engagement when mobilizing and allocating resources. It will mean convincing decision-makers that they should not ignore what is important in lieu of what is urgent and make preparedness a priority, persuade the private sector to invest in it, and do so in a sustainable manner. Using 36 recommendations that emanated from various high-level reports after the 2014–15 West Africa Ebola epidemic, this report examines progress made in the last five years on financing preparedness in six broad thematic areas: mobilizing domestic resources to build international health regulation (IHR) core capacities for preparedness; mobilizing development assistance to build IHR core capacities for preparedness; incentivizing countries to prioritize allocations of funds for preparedness; leveraging the insurance model, existing loan & grant, and new funding for response and early recovery; mobilizing funding for research and development for new products and to strengthen clinical research capacities; and sustainable financing to strengthen the capacity of the World Health Organization for health emergency preparedness and response. Many of the recommendations have not been achieved: 50 percent have seen little to no progress; 47 percent have seen some progress; only 3 percent have been largely achieved. Notable progress has been made in response financing in the last five years, but there has been underinvestment in preparedness and prevention. This is despite evidence that suggests more attention to preparedness would be cost effective. Based on this progress review, the following four priority action areas have emerged as a way forward: mobilizing demand for investment in preparedness; beating the DRUM (domestic resource utilization and mobilization) for preparedness; optimizing the use of development assistance for preparedness; and developing standardized measurement and monitoring approach for preparedness financing.

Mobilizing Demand for Investment in Preparedness

Continued and sustained effort is required to mobilize demand for investment in preparedness with heads of state, ministers of finance, and senior policy-makers. Investing in preparedness is a critical dimension of investing in human capital and attainment of universal health coverage and the broader Sustainable Development Goals. Suggested incentives to draw attention to financing preparedness include the following:

- Developing catalytic mechanisms for increasing DRUM, including direct international development assistance for catalytic activities in-country and linking development assistance for capital or one-time expenses with

recurrent costs accounted for in the domestic budget, augmenting domestic budget allocations for preparedness with matching grants from external sources designated for preparedness, and creating synergies for domestic resource mobilization for preparedness by leveraging regional partnerships and strategic networks.

- Exploring options for increasing and earmarking resources for preparedness, including donor contributions earmarked for preparedness that are in addition to the donors' existing and ongoing country contributions and options such as buy-downs, which convert credits to grants upon reaching agreed-upon performance benchmarks, to increase resource availability and use for preparedness.
- Renewing efforts to integrate preparedness into the economic and policy assessment tools of the International Monetary Fund, the World Bank, and other development banks, and of bilateral aid agencies.

Beating the DRUM for Preparedness

Financing preparedness would benefit by being recognized as a critical component of the broader agenda of DRUM. To facilitate greater DRUM for preparedness, national governments, in addition to the comprehensive national action plans for health security, must:

- Articulate and cost an essential package of best buys or priority interventions to increase preparedness capacity that will be financed in the current budget cycle and map these interventions to expected results in the near term. A list of needs for emergency financing, covering health, agriculture, and disaster preparedness, can be identified for priority countries with low JEE scores, with a view to advocating for immediate attention.
- Identify potential areas of efficiency gains to make existing resources go further, including rational planning for specific diagnostic capabilities (including regional and sub-regional collaboration), payroll management, procurement, and managing shared costs with other human and animal health services.

Optimizing the Use of Development Assistance for Preparedness

Given that preparedness is a global public good, development assistance needs to prioritize investments in it. Development assistance has two major roles to play in supporting the preparedness financing agenda: direct support to countries and investing in regional and global public goods.

- DAH must be linked directly with the national DRUM agenda. Working with the SDG Global Action Plan (GAP) sustainable financing accelerator, major global preparedness funders can better align practices to make sure their monies are catalyzing and contributing to more and better preparedness financing.
- In the context of the unmet expectations of countries for development assistance after their completion of JEEs and having developed costed national preparedness plans, it is essential for global development partners to identify with greater specificity where development assistance for preparedness financing can be found. The upcoming 19th replenishment of International Development Association (IDA) Funding provides an excellent opportunity for identifying additional resources for preparedness, including IDA's Crisis Response Window (CRW) to include notional allocation for preparedness, and adapting the CRW to facilitate early response using contingent financing.
- As low-income and fragile countries continue to rely heavily on DAH for financing the health sector, donors may need to co-share responsibility to ensure efficiency in investments and preparedness operations. This will require medium-term predictability and financing modalities that integrate affordable and sustainable domestic financing and stronger health systems.
- Increasing the efficiency of development assistance through decreased fragmentation of DAH and enhanced coordination of domestic and external development partners that integrate multiple national plans (disease and relevant health/non health sector plans). Additional consideration to pre-positioned flexibilities for rapid reprogramming of existing funds in crisis situations would significantly increase available funds in a number of countries, taking due consideration to good governance requirements.

On investing in regional and global public goods:

Two types of financing agendas are critical to secure: with respect to regional preparedness, institutional capacities that offer high value for money through scale and scope efficiencies (relative to what can be afforded and sustained) and with respect to global institutional capacities related to research and development and technical assistance. Several ongoing efforts at regional (Regional Disease Surveillance Systems Enhancement, Africa Centers for Disease Control and Prevention, Indo-Pacific Center for Health Security) and global (Coalition for Epidemic Preparedness Innovations; World Health Organization R&D Blueprint; Gavi, the Vaccine Alliance (support for vaccination during outbreaks) will provide important lessons to build upon.

Developing Standardized Measurement and Monitoring Approach for Preparedness Financing

“What gets measured gets managed.” There are many different terms for, methodologies for, and approaches to defining preparedness financing that confound the discussion regarding tracking, estimating resource needs, and developing an investment case for preparedness. As a result, tracking estimates of development assistance for preparedness produces highly variable results. Similarly, very little is known about the size, source, and use of preparedness financing at the country level. This presents a challenge for decision-makers to formulate and implement informed policy actions. Tracking preparedness and health security expenditures is possible, and there are excellent examples from Vietnam and in Indonesia that can serve as to show how to develop standardized methodologies like the National Health Accounts, disease program subaccounts, as well as recent lessons from estimating financing for a nutrition program that shares similar multisectoral challenges to pandemic preparedness. What needs to be done is to:

- Assemble an expert team from technical and financing agencies tasked with producing a standardized definition of preparedness financing and an expenditure tracking approach.
- Review Vietnam’s and Indonesia’s health security financing assessment, other disease program subaccounts, and the recent experience in assessing financing for nutrition program.
- Develop a check list of investments for preparedness-specific and preparedness-sensitive health system investment activities.
- Develop a standardized approach to and methodology for tracking expenditures for preparedness, including for research and development.
- Introduce dedicated lines into existing global datasets to allow systematic and complete monitoring of development assistance and domestic resources spent on preparedness. Two such examples are the IMF mandatory government financing statistics and the OECD CRS.

Introduction

Few natural hazards threaten more loss of life, economic disruption, and social disorder than large-scale disease outbreaks. An influenza pandemic could infect billions, kill millions, and reduce global economic output by trillions of dollars. It is estimated that the 1918 Spanish Flu killed more than 50 million people. In 2003, severe acute respiratory syndrome (SARS) killed 774 of the 8,098 persons infected (WHO 2003). Between December 2013 and April 2016, the largest epidemic of Ebola virus disease to date generated more than 28,616 cases and 11,310 deaths in Guinea, Liberia, and Sierra Leone (WHO 2016). The 2009 H1N1 influenza pandemic resulted in more than 18,000 deaths (WHO 2010). Since 2012 and through end-February 2019, Middle East respiratory syndrome has taken 823 lives and infected at least 2,374 people. The recent Zika outbreak in the Americas infected more than 1 million people (Lee 2016) and was found to be associated with 2,720 confirmed cases of microcephaly, a congenital syndrome in which children of infected mothers are born with small heads and brain damage (PAHO 2016). The ongoing Ebola outbreak in the Democratic Republic of Congo has accounted for more than 2,000 (as of mid-September, 2019) deaths since the Ministry of Health of the Democratic Republic of the Congo declared a new outbreak of Ebola virus disease in North Kivu Province on 1 August 2018, and it shows no sign of abating.

The high death count and social disruption are not the only costs associated with pandemics; the financial and economic damages are also devastating. The 1918 Spanish Flu is a contributing factor to the immediate post-World War I economic recessions (Elizabeth and Mark 2003). The 2003 SARS epidemic led to a global economic loss of more than USD52 billion (NASEM 2004), and Ebola wiped out many of the recent development gains in Guinea, Liberia, and Sierra Leone, which had been among the fastest growing economies in the world before the crisis. The outbreak led to decreased investment and caused a substantial loss in private-sector growth; unleashed threats to food security through declining agricultural production; and burdened cross-border trade with restrictions on movement, goods, and services. National health security system preparedness is a fundamental global public good and is essential for building global resilience to risk.

During and after the West Africa Ebola outbreak, several commissions, task forces, and expert groups offered suggestions on what the global community and country governments must do to be better prepared for the next huge disease outbreak (e.g., EU Parliament 2015; WHO 2015a; WHO 2015b; WHO 2015c; Moon et al. 2015; NAM 2016; UN High-level Panel on the Global Response to Health Crises 2016; UN Global Health Crisis Task Force 2017; IWG 2017; IVTF 2018). A major theme in these recommendations is the importance of financing preparedness at the country level.

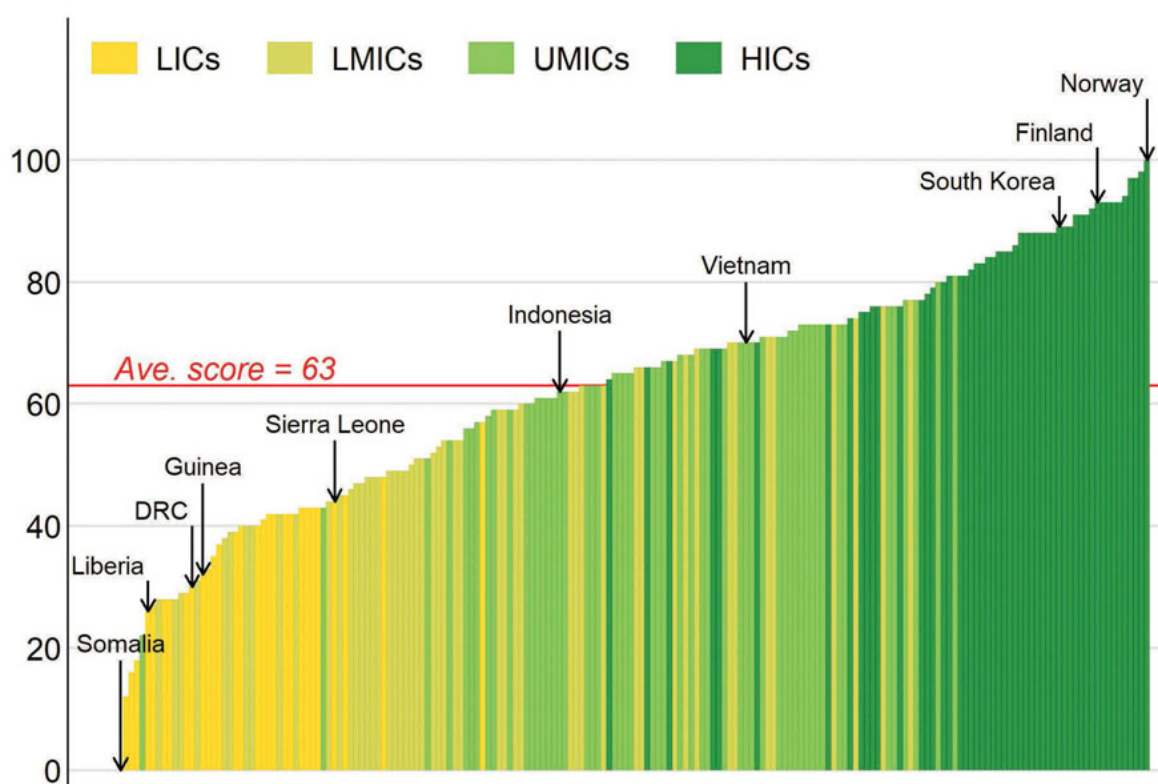
Investing in preparedness yields significant returns. The World Bank Group (WBG) estimates that system improvements in public health and animal health to meet the minimum standards of the WHO and the World Organization for Animal Health, for example, would cost up to USD3.4 billion a year (World Bank 2018), but zoonotic outbreaks occurring between 1997 and 2009—that did not become pandemics—cost USD80 billion, or USD6.7 billion per year (Smith et al. 2019). The expected value of economic benefits of better preparedness would be at least USD6.7 billion per year, well above the estimated investment of USD3.4 billion needed per year. Investing in disaster resilience and pandemic preparedness helps alleviate poverty, especially because infectious diseases tend to affect poor people disproportionately more than others. Preparedness also contributes to shared economic prosperity, particularly by avoiding losses when disasters occur and by stimulating innovation and economic development because investment risks are reduced.

Despite these efforts, progress in creating and financing preparedness capacities during noncrisis times has been slow. This is reflected in low Joint External Evaluation (JEE) and Metabiota Epidemic Preparedness Index (EPI) scores (table 1 and figure 1). The voluntary JEE tool, launched in 2016 by the World Health Organization (WHO), combines peer review and self-assessment to deliver a systematic evaluation of country's preparedness capabilities across 19 technical areas. The EPI measures a country's capacity to detect and respond to infectious disease events,

TABLE 1: Joint External Evaluation (JEE) Scores—76 Countries

Group	Overall average	Selected technical areas—JEE scores			
	JEE scores	Preparedness	Laboratory	Surveillance	Workforce
Global	2.8	2.3	3.2	3.4	3.0
IDA Countries	2.2	1.5	2.6	3.0	2.6
Non-IDA Countries	3.5	3.3	4.0	3.8	3.5

Source: Computed from 76 JEEs using WHO JEE mission reports.

FIGURE 1: Metabiota Epidemic Preparedness Index (EPI) by Income Group—188 Countries

Source: EPI, Metabiota (2018).

Notes: LIC, lower-income country; LMIC, lower-middle-income country; UMIC, upper-middle-income country; HIC, high-income country.

with lower scores indicating less capacity (Oppenheim et al. 2019). Average JEE scores in IDA countries (average 2.2) indicate limited capacity. A low EPI score—average 34.8 for LICs and 53.9 for LMICs—similarly shows limited capacity.

Many reports, analyses, and interviews informed the preparation of this report. A starting point for this work was to define the targets against which progress on preparedness could be gauged. Drawing on major task forces and commissions, a set of recommendations emanating from multiple high-level reports was used. These recommendations aim to spur the global community to action in preventing another crisis like the one witnessed in 2014–15. In assessing progress, the team used, among other things, peer-reviewed and gray reports during and since the 2014–15 Ebola outbreak; published reports from technical and academic agencies; case studies from WHO, World Bank, and others; National Action Plan for Health Security (NAPHS) costing data from WHO; development assistance tracking data from Georgetown University, the Institute of Health Metrics and Evaluation (IHME), and the Universal Health Coverage (UHC) Study; and EPI and JEE scores. To validate preliminary results, the team consulted with an ad hoc reference

group comprising subject-matter experts and representatives from international technical agencies including the U.S. Centers for Disease Control and Prevention (CDC), Georgetown University, Resolve to Save Lives, WHO, and the World Bank. Finally, to cast a wide net in assessing progress, interviews of key informants were conducted and are ongoing. Institutions participating in these interviews include Africa CDC, Asian Development Bank, Georgetown University, Global Health Advocacy Incubator, International Monetary Fund (IMF), Metabiota, national governments, Resolve to Save Lives, U.S. CDC, WHO, and the World Bank. The draft report was presented to the Global Preparedness Monitoring Board and benefited from feedback and suggestions.

This report assesses progress on financing preparedness after the 2014–15 West Africa Ebola outbreak at the global and country levels and is organized as follows. Section 2 provides a status update on the implementation of high-level recommendations pertaining to financing by presenting synopses of recommendations and progress to date, discussing reasons for progress or lack thereof, and highlighting noteworthy regional efforts. Section 3 discusses pandemic preparedness financing and focuses on placing preparedness efforts in a macroeconomic context, illustrating examples of estimated country financing needs for preparedness through the NAPHS process, discussing initiatives in tracking development assistance for preparedness, and showcasing examples of resource allocation mapping for preparedness. Section 4 presents four priority areas for Global Preparedness Monitoring Board engagement and advocacy. Annex 1 contains recommendations from previous commissions and task forces related to financing and a progress assessment. Annex 2 provides a summary of high-level initiatives established since the 2014–15 Ebola crisis. Annex 3 presents a summary of the NAPHS cost estimates for 22 countries, including selected macro and sectoral indicators. Annex 4 describes a methodological note and robustness check on figure 4.

Status Update



















Synopsis of Recommendations and Progress

Thirty-six recommendations related to financing have been consolidated into six thematic groups (table 2): mobilizing domestic resources to build International Health Regulations (IHR (2005) core capacities for preparedness; mobilizing development assistance to build IHR core capacities for preparedness; incentivizing countries to prioritize allocation of funds for preparedness; leveraging the insurance model, accessing existing loans, grants, and new funding for response; mobilizing funding for research and development (R&D) for new product development and to strengthen clinical research capacities; and sustaining financing to strengthen WHO's capacity for health emergency preparedness and response. Each of the recommendations is rated satisfied (green), partially satisfied (yellow), or unsatisfied (red) (Annex 1). The status assessments are based on currently available information, although these recommendations may be revised as more information becomes available and new developments arise.

Mobilizing domestic resources to build IHR core capacities for preparedness

LICs and LMICs should produce a domestic resourcing or financing plan that integrates preparedness into their national budget. As of the end of February 2019, 92 countries and territories had completed a JEE (of which 51 are IDA countries), 48 had completed a NAPHS (of which 31 are IDA countries), and 25 had costed their NAPHS (of which 21 are IDA countries). This speaks to the increasing momentum in many countries in preparing a plan. These plans also identify many of the priority investment areas that are common to broader public health systems (strong front-line surveillance capacity, good laboratories, effective infection prevention control), but little progress has been made in paying for these plans and integrating them into national budgets. Countries must consider financing for preparedness as part of a broader domestic resource use and mobilization (DRUM) effort. For instance, in the health sector, countries are making progress in identifying fiscal space for UHC and establishing excise taxes for tobacco control.

TABLE 2: Summary Status of Financing Recommendations by Theme

Recommended action	Status	Traffic light		
A. Mobilizing domestic resources to build IHR core capacities for preparedness—6 recommendations	Few national governments have developed detailed financing proposals to support implementation of plans to strengthen preparedness.			
B. Mobilizing development assistance to build IHR core capacities for preparedness—5 recommendations	External partner commitment to explicitly support preparedness is insufficient.			
C. Incentivizing countries to prioritize allocation of funds for preparedness—7 recommendations	Major international financing institutions, including the IMF and World Bank, have not included infectious disease risk assessments and response under their mandates.			
D. Leveraging the insurance model, accessing existing loans and grants and new funding for response—5 recommendations	World Bank and WHO have created insurance (Pandemic Emergency Financing Facility) and contingency (Contingency Fund for Emergencies) mechanisms to rapidly respond to pandemics.			
E. Mobilizing funding for R&D for new product development and to strengthen clinical research capacities—11 recommendations	Global, regional, and national preparedness R&D is insufficient; innovative financing approaches are needed.			
F. Sustainable financing to strengthen WHO's capacity for health emergency preparedness and response—2 recommendations	Assessed and voluntary contributions to WHO to support emergency preparedness and response must be increased.			

Note: IHR, International Health Regulation; WHO, World Health Organization; R&D, research and development.

Box 1: Role of Nigeria Center for Disease Control (CDC) in Fighting Lassa Fever

After the large Lassa fever outbreak in 2018, the NCDC, together with partners, instituted five measures to improve preparedness in 2019.

1. With the Irrua Specialist Teaching Hospital, trained more than 1,000 health care workers in the six zones in the country on Lassa fever management, diagnosis, and surveillance
2. Pre-positioned treatment and diagnostic supplies in the 21 states that recorded cases in 2018
3. Published messages about Lassa fever in three major newspapers and on weekly radio shows on Radio Nigeria and encouraged intensive community engagement
4. Made high-level advocacy visits to state governments, encouraging them to do more to prevent and respond to cases of Lassa fever
5. Developed new case management guidelines, initiated a Lassa fever research consortium, and hosted an international conference on Lassa fever to share knowledge

Immediately after declaration of the 2019 outbreak, rapid response teams comprised of officers from the NCDC, Federal Ministry of Agriculture and Rural Development, and Federal Ministry of Environment supported the response in the high-burden states of Edo, Ondo, Ebonyi, Plateau, Bauchi, and Taraba, where NCDC has also supported full availability of drugs, personal protective equipment, laboratory reagents, and other supplies required for case management and diagnosis of Lassa fever. This year, there has been no stock-out reported in any state.

Source: NCDC 2019.

Signs of investment at the national and regional levels to establish and strengthen institutions with public health preparedness mandates, in part paid from the public purse, are encouraging. Nigeria has established a CDC (box 1), and many countries, including Liberia and Zambia, have or are creating national public health institutes. In December 2016, Liberia approved an institute that aims to strengthen infection prevention and control efforts, laboratories, surveillance, infectious disease control, public health capacity building, and response to outbreaks and monitoring of diseases with epidemic potential. In 2015, Zambia launched its first agency dedicated to coordination of public health aspects of emergency preparedness and response activities (ZNPHI 2019). Senegal created a budget line to support the operating costs of its Health Emergency Operating Center¹—one of the primary agencies responsible for preparedness. An example of regional-level effort is the creation of an Africa CDC, which the Assembly of Heads of State and Government of the African Union endorsed in January 2015. (See Section 2.3 for more information.) More countries are participating in regional World Bank projects, for which they could use International Development Association (IDA) Regional Program funds, and projects containing activities to strengthen pandemic preparedness, for which they could use their own IDA country allocations.

National governments need to leverage private companies with the resources and expertise to help strengthen health security. The private sector remains a largely untapped resource—with notable exceptions including the efforts of the Global Health Security (GHS) Agenda Private Sector Roundtable. Engaging the private sector more effectively requires:

- Building greater awareness of the risks of infectious disease outbreaks to ensure less resistance from companies to tax reforms and regulations and to encourage cooperation with national governments.
- Involving the private sector in development of national plans for preparedness with a view to leveraging private sector assets and capabilities.
- Offsetting negative externalities from business activities by requiring appropriate investment from the private sector in risk mitigation and preparedness (IWG 2017).

¹ This was part of ongoing efforts of the Global Health Advocacy Incubator (GHAi) and other partners to increase DRUM for preparedness at the national level, but in 2017, the small budget committed to preparedness was reallocated to other areas, leaving the U.S. government and Bill and Melinda Gates Foundation as the only sources of the operating budget for the Health Emergency Operating Center. This advocacy engagement by GHAi with policy-makers and public officials to raise awareness will continue in Senegal and has begun in Nigeria, with more countries planned (Source: communication with GHAi, March 21, 2019).

The Private Sector Roundtable (PSRT) for global health security, has established a strategic partnership with the Government of Uganda to improve its ability to prevent, detect and respond to health threats. During the 2017 World Health Assembly, Hon. Jane Aceng, Minister of Health, Uganda, invited the PSRT to support the country in addressing some of the gaps identified in their JEE and subsequent costed NAPHS. These areas of need include: (1) workforce development, (2) increased awareness among government leaders about the importance of investing in global health security, (3) antimicrobial resistance capacity building, and (4) monitoring and evaluation for GHSA. In response, PSRT member companies, put together a series of offerings to address some of these needs. Specifically, through training programs, secondments, and monitoring and evaluation support. As of 2019, the PSRT is a permanent member of the GHSA Steering Group.

A strong investment case needs to be made to the private sector. Of the potential motivations identified for increasing stakeholders' investments in preparedness (IWG 2017), ensuring economic stability and increasing security and social stability are important to the private sector. As discussed under the recommendations on incentives, indices that assess economic vulnerability to pandemics can drive countries to strengthen preparedness to increase private sector investment and their allocation of resources under IDA. These indices can be used as a way to open dialogue with private sector actors on investing in national preparedness.

Mobilizing development assistance to build IHR core capacities for preparedness

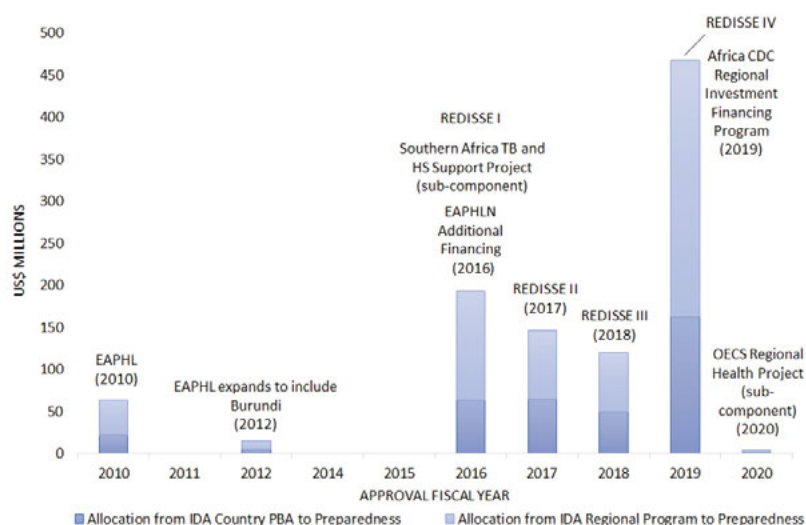
A strategy involving governments and partners is needed to mobilize adequate resources to finance preparedness and have development partners fulfill and build on existing collective and bilateral commitments.

Countries, subregions, and the international community are increasingly recognizing preparedness capacity as a critical part of wider public health system strengthening and the UHC agenda. Broadly speaking, external financial and technical support is needed for in-country capital investments and one-time spending, multicountry regional initiatives, and failed and fragile states where domestic resourcing is not a realistic option. Major initiatives have placed preparedness in the frame of their call for resource mobilization, including:

- Global health financing, reflected in “Beating the DRUM” a conference held for the Global Financing Facility with the purpose of building consensus around a global agenda on how to improve DRUM in lower-income countries through faster implementation of known solutions and accelerated identification and adoption of new approaches.
- A global action plan to accelerate progress toward Sustainable Development Goal (SDG) 3,² signed by 12 global health institutions, calls for greater collaboration and alignment behind seven accelerators, including sustainable financing and support in fragile settings and for disease outbreak responses.
- WHO’s five-year strategic plan that has preparedness as one of its “triple billion” targets—one billion more people benefitting from UHC, one billion more people better protected from health emergencies, one billion more people enjoying better health and well-being. Resource mobilization strategies go beyond WHO’s base resource needs and include resources for WHO’s proposed expansion as well as resources for countries and other global health agencies to mobilize and implement.
- World Bank commitments as part of its 18th Replenishment of IDA Funding to support at least 25 IDA countries in developing pandemic preparedness plans, frameworks for governance, and institutional arrangements for multisectoral health emergency preparedness, response, and recovery.
- World Bank East Africa Public Health Laboratories Project (USD129 million) to establish a network of efficient, high-quality, accessible public health laboratories for diagnosis and surveillance of tuberculosis and other communicable diseases.
- West Africa Regional Disease Surveillance Systems Enhancement (REDISSE) Program (USD390.8 million), currently involving 11 countries and the West Africa Health Organization, an interdependent series of projects to increase national, regional, and cross-sectoral capacity for integrated disease surveillance and response in West Africa.
- Southern Africa Tuberculosis and Health Systems Strengthening Project (USD122 million), which includes activities to strengthen disease surveillance.

² SDG 3: Ensure healthy lives and promote well-being for all at all ages.

FIGURE 2: International Development Association (IDA) Commitments to Preparedness in Regional Health, Nutrition and Population Global Practice Projects, 2010–2020



Source: World Bank staff analysis using project financial data.

Notes: Regional Disease Surveillance Systems Enhancement Program (REDISSE) Phase IV, Africa Centers for Disease Control Regional Investment Project, and Organization of Eastern Caribbean States (OECs) Regional Health Project are in the pipeline. EAPHL, East Africa Public Laboratory Networking Project.

The increase in preparedness projects demonstrates a welcome surge in commitment. Challenges remain, including managing often slow disbursement rates because of limited absorption capacity and countries showing little interest or willingness to expend time and energy when they perceive that there is not an emergency. Three projects under development (planned for approval in 2019) are the next phase of REDISSE (Phase IV) and the Africa CDC Regional Investment Financing Program project, with planned commitments of USD280 million and USD250 million, respectively, and the Organization of Eastern Caribbean States Regional Health Project, with planned commitments of USD27 million. Figure 2 illustrates the total net commitment of each project according to year of project approval; projects disburse the total IDA commitment over an average of five years (depending on project lifetime).

The Asian Development Bank (ADB) is increasingly emphasizing regional cooperation. Regionally, since 2016, the ADB, through the Greater Mekong Subregion Health Security Project (USD125.0 million), has been working with the governments of Cambodia, Lao People's Democratic Republic, Myanmar, and Vietnam to enhance responses to emerging infectious diseases and management of other major public health threats. The project is addressing weaknesses in these countries' health systems and promoting cross-country cooperation to improve national and international health security by supporting regional cooperation and communicable disease control in border areas, strengthening national disease surveillance and outbreak response systems, and improving laboratory services and hospital infection prevention and control. In 2016, Asian Development Fund donors gave ADB the mandate to strengthen its support of regional health security through grant financing via a set-aside within the Asian Development Fund contribution framework, in which USD53 million in grants was leveraged into four projects covering seven countries (in the Pacific Islands, Bhutan, Sri Lanka, and Vietnam) worth USD195.6 million. Rationale for and description of the projects are as follows.

- Pacific Regional System Strengthening for Effective Coverage of New Vaccines (Samoa, Tonga, Tuvalu, Vanuatu), USD25.0 million.** In the Pacific Islands, incomplete immunization programs in Samoa, Tonga, Tuvalu, and Vanuatu, among others, make nations vulnerable to outbreaks, and weak supply chains further limit preparedness in the region. None of the four countries has human papilloma virus, pneumococcal conjugate, or rotavirus vaccines scheduled. Coverage of other vaccines is low (meningococcal coverage 53 percent in Vanuatu, 67 percent in Tonga). Such low coverage could lead to disease outbreaks in the entire region, contributing to vulnerability. A regional project allows these smaller countries to pool purchasing power to

receive reliable supplies. An ADB project addresses this by introducing the remaining WHO-recommended vaccines into vaccine schedules (human papilloma virus, pneumococcal conjugate, rotavirus), strengthening regional vaccine procurement, and raising community awareness of vaccination scheduling.

- ***Bhutan Health Sector Development Program, USD20.0 million.*** Weak real-time surveillance and disease reporting in Bhutan and other countries contributes to lack of preparedness and ability to respond to national and regional health outbreaks. Bhutan is often ignored in regional programs, despite its position as a critical location to detect and respond quickly to outbreaks occurring in the most populous nations in the world. An ADB project aims to improve national health information management for disease surveillance (JEE recommendation) and increase preparedness and response capacity, including expanding financing of vaccines and increasing treatment capacities of primary health care facilities
- ***Sri Lanka Health System Enhancement Project, USD50.0 million.*** In Sri Lanka, the JEE found that a national multihazard public health emergency preparedness and response plan was weakly developed and implemented, highlighting the country's limited capacity to monitor these diseases at points of entry. Because Sri Lanka is a major sender and receiver of migrant workers and is at high risk of dengue fever (more than 80,000 cases in 2017 outbreak), points of entry must be strengthened to prevent disease importation and exportation. The ADB designed a project in collaboration with the Sri Lankan government to address this regional health security gap by strengthening communicable disease surveillance and management in rural areas (JEE recommendation) and building capacity at points of entry by developing quarantine capabilities and conducting routine health assessment of migrants.
- ***Vietnam Local Healthcare Sector Development Program, USD100.6 million.*** Health care systems in Vietnam have been unable to diagnose infectious diseases quickly and accurately, leading to lack of preparedness and limited response capacity to manage local and country- and region-wide outbreaks. Vietnam is a strategic country in the region, with a large number of avian flu outbreaks of strains that affect humans and animals, large rates of migration (equivalent of 10 percent of population enters and leaves the country every year), and geographic proximity to other countries (2,800 miles of shared borders). An ADB project aims to increase capacity of 12 pilot districts along borders and socioeconomic corridors to identify and manage health security threats, including human communicable diseases and antimicrobial resistance, and implement local health care reforms to improve quality and timeliness of local disease surveillance, particularly in border areas (JEE recommendation).

Incentivizing countries to prioritize allocations of funds for preparedness

Greater investment in preparedness will require macroeconomic justifications convincing to finance and planning experts. According to the International Working Group on Financing Preparedness, “if a country’s economic vulnerability to infectious disease outbreaks were incorporated into mainstream macroeconomic analyses, bond ratings and investment criteria, investment in pandemic preparedness would no longer be solely the concern of the Health Minister” (IWG 2017). The IMF regularly conducts a country surveillance process under its Article IV responsibilities relating to assessment and identification of economic and financial risks. If these consultations included infectious disease and health security risks, it would underscore the importance of the economic effect of pandemics. The World Bank has two internal processes that could facilitate and be used to encourage preparedness investments: the Country Policy and Institutional Assessment (CPIA) and Systematic Country Diagnostic (SCD). The CPIA determines country allocations of IDA resources, taking into account multiple factors. The SCD is a country-specific exercise to identify a set of priorities that then informs lending investments. Although there are signs that attention is being paid, there have been no breakthroughs. The IMF has begun to look at pandemic and health security as an Article IV risk factor but has not taken steps to integrate such risk into its country discussions. The World Bank CPIA and SCD mechanisms consider health sector aspects but not infectious disease preparedness. WHO has made some progress in recognizing countries that provide outbreak information quickly but has not “shamed” those who do not. It has not developed an effective way to confront governments with unscientific bans.

Leveraging the insurance model, accessing existing loans and grants, and new funding for response

Noticeable progress since the 2014–15 Ebola outbreak in creating new financing mechanisms, approaches, and funding commitments for response. The World Bank Pandemic Emergency Financing Facility (PEF) insurance model has been in operation since July 2017 (box 2). It covers 78 IDA-eligible countries against the risk of pandemic outbreaks through a combination of insurance financed by bonds and derivatives and a donor-funded cash window. The cash window has been operational since mid-2018 and (as of August 2019) has allocated USD61.4 million in response to the DRC Ebola outbreaks. The PEF design and its triggers are being reviewed before the next installment of the facility—PEF 2.0. It could include more incentives for countries to invest in preparedness, country or regional coverage, an expanded list of covered pathogens, or more countries covered.

Box 2: Pandemic Emergency Financing Facility (PEF)

The World Bank Group developed the PEF, in consultation with the World Health Organization, other development partners, and the private sector, to help fill a critical gap in the international aid architecture as one part of the global solution to improving pandemic risk management. The PEF helps fill the financing gap that occurs after an initial outbreak and before large-scale humanitarian relief assistance can be mobilized.

All International Development Association–eligible countries are eligible to access PEF funds. The PEF provides surge funding through two windows: insurance and cash. The insurance window leverages funding from capital markets using catastrophe bonds and swaps. The cash window is funded through traditional donor contributions. The insurance window covers severe events of a specific pathogen, coupled with predetermined activation criteria. These criteria are based on outbreak size, growth, and spread. Payout from the capital markets into the PEF vary according to disease and outbreak size and spread. Allocations to affected countries are prorated according to each country's population and outbreak size. The cash window provides greater flexibility in funding severe infectious disease outbreaks from known and unknown pathogens. Criteria for activating the cash window are based on pathogen type, epidemiological thresholds, independent expert advice, and the decision of the PEF Steering Body.

The WHO established a Contingency Fund for Emergencies (CFE), with 19 countries contributing a total of USD114 million since its launch in 2015. Emergency allocations have been made on 78 occasions totaling approximately USD76 million and ranging from USD20,000 to USD10 million (WHO 2019a), and decisions have been made swiftly, including providing substantial resources to respond to the DRC Ebola outbreak. In 2017, donors in affected countries reimbursed approximately one-third of allocations.³ Under PEF, up to 25 percent of the insurance window payment could be used to replenish CFE for eligible expenditures in the same country, but this has not been tested.

The World Bank continues to include Contingent Emergency Response Components (CERCs) in its health lending operations and has expanded the scope of the Catastrophe Deferred Drawdown Option financial instrument (box 3) for health emergencies and epidemics. CERCs (box 4) have been activated for Nigeria's response to Lassa fever (USD2.5 million), the Yemen cholera response (two CERCs totaling USD40 million) and supporting the DRC Ebola strategic response plans. To combat the Ebola outbreaks in DRC, at the end of July 2019, USD80 million had been disbursed from the World Bank's IDA contingency mechanisms and USD31.4million had been disbursed from the PEF's Cash Window (for both the 9th and 10th Ebola outbreaks). On July 24, 2019, the World Bank announced that it is mobilizing up to USD300 million to scale up support for the global response to the 10th Ebola epidemic in the DRC (World Bank 2019b), largely financed through IDA and its Crisis Response Window; at least 70 percent of this amount is to be in the form of grants and the remainder in credits (World Bank 2019c). On August 19, 2019, the PEF Steering Body approved an additional USD30 million from the Cash Window (World Bank 2019d), bringing the total amount committed from the PEF for the Ebola outbreaks in DRC to ~USD61.4 million. In 2015, the World Bank Crisis Response Window (CRW) was expanded to include public health emergencies and epidemics. The primary objective of the CRW is to provide IDA countries with resources that will help them respond to severe economic crises

³ As of February 26, 2019, the biggest contributors to the CFE from 2015 to 2019 have been Japan, Germany, the United Kingdom, Sweden, Denmark, Australia, Korea, and the Netherlands, accounting for ~90 percent of the USD113.8 million in donations. Recipients of the largest CFE allocations in 2018 were DRC (USD22.8 million), Bangladesh (USD3.5 million), Nigeria (USD3.5 million), regional Africa (USD1.6 million), Zimbabwe (USD1.1 million), and Venezuela (USD1.1 million).

Box 3: Catastrophe Deferred Drawdown Option (Cat-DDO)

The Cat-DDO instrument, a special type of development policy financing instrument typically used to provide rapid liquidity to countries to address natural disasters, is available to International Development Association (IDA) and International Bank for Reconstruction and Development (IBRD) countries. In 2016, the World Bank Board formally extended the use of Cat-DDOs for public health–related events. In these events, Cat-DDOs provide a contingent line of financing for disbursement after the drawdown trigger—typically the member country’s declaration of a state of emergency—is met. Cat-DDOs can provide liquidity at an early stage of an infectious disease outbreak to prevent escalation, allowing governments to mount a substantial and comprehensive response for effective containment and control of the outbreak.

To gain access to the Cat-DDO, the recipient country must have an adequate macroeconomic policy framework and be preparing or already have a satisfactory disaster risk management program, which the World Bank will monitor on a periodic basis. For IDA countries, country limits on the size of Cat-DDOs and an overall IDA-wide portfolio limit of USD3 billion apply. The country limit for IDA countries is USD250 million or 0.5 percent of gross domestic product (GDP), whichever is lower; for IBRD countries, the limit is the lower of 0.25 percent of GDP or USD500 million. As of August, 2019, 21 countries have active or pipeline Cat-DDO projects, eight of which identify health-related emergencies as a trigger for disbursement.

Box 4: Contingent Emergency Response Component (CERC)

A CERC is a financing mechanism that helps recipient countries quickly access project funds for emergency response and early recovery after an eligible crisis has occurred or is about to occur. Typically, a CERC is embedded in an investment project during preparation and can be designed as a contingent window (a zero-dollar component) or with an amount of pre-allocated funding. If the CERC is activated, the funds can be used quickly without prior need for formal project restructuring—minimizing time and effort when it matters most. A CERC of the immediate response mechanism provides access to a country’s undisbursed International Development Association (IDA) allocation to respond to an emergency.

CERCs also serve as contingent windows for provision of additional financing to escalate the emergency response, which can come from the International Bank for Reconstruction and Development, IDA, or trust funds. During the ninth Ebola outbreak in Democratic Republic of the Congo (DRC), the World Bank Group activated the CERC of its DRC health system project investment, which gave the government access to an additional USD80 million in IDA credits to respond to the outbreak if needed (World Bank 2019f).

A review of World Bank Health, Nutrition, and Population lending projects across the 75 IDA countries reveals that 37 countries (25 in Africa, three in East Asia, six in Latin America and the Caribbean, two in the Middle East and North Africa, one in Europe and Central Asia) have health, nutrition, and population projects containing an active CERC. As of August 31, 2019, an additional five IDA countries have health, nutrition, and population CERCs in the pipeline.

and major natural disasters. It can be triggered when a country has declared a national public health emergency, and WHO has declared that the outbreak is of potential international importance (World Bank 2019e). In 2014, USD420 million in CRW funds were allocated to the West Africa Ebola crisis.

The Ministry of Health of the DRC declared a new outbreak of Ebola virus disease in North Kivu Province on August 1, 2018. Over a year later the outbreak is still ongoing, and during the most recent 8 weeks (for the period ending September 10, 2019) between 40 and 90 new cases have been recorded every week. Lack of community trust is hampering response efforts, Dr. Joanne Liu, Médecins Sans Frontières International President, said, “On the one hand, we have a rapid and large outbreak response with new medical tools such as vaccines and treatments that show promising outcomes when people come early. On the other hand, people with Ebola are dying in their communities, and do not trust the Ebola response enough to come forward” (MSF 2019). The outbreak response has been sufficiently funded using resources through the CERC, PEF, project restructuring, and the CFE, among others, but after more than a year, the outbreak is no longer in the early stages, and a prolonged response is needed; the major surge financing mechanisms have been triggered or deployed.

With satisfactory funding in the first months of the outbreak, one can only lament the dire mix of inadequate preparedness in a fragile-state setting, existing security challenges, and lack of community trust. As the IDA19 replenishment approaches, questions and proposals are arising as to what can and must be done to ensure financing is made

available to at-risk countries in noncrisis times. The Center for Strategic and International Studies (2019) released a policy brief arguing that there are three potential pathways to achieve at least USD1 billion per year in new investments in preparedness by LICs and LMICs:

- Expand the remit of IDA's existing CRW: Currently focused on response to various crises including economic, health, and natural disasters, its mandate and allocation could be expanded to create an IDA crisis preparedness and response window equipped with an additional USD1 billion per year for LICs and LMICs for preparedness, on top of the CRW's current allocation.
- Link additional domestic financing for preparedness to results: The WBG has experience using a variety of IDA tools that could be used to catalyze investments in preparedness. For example, the WBG can promote "buy downs" that convert IDA loans to grants if countries achieve agreed-upon performance benchmarks.
- Establish a new global financing mechanism dedicated to health security preparedness, for which there is little appetite: Modeled on the Global Financing Facility for Every Woman and Every Child, donors could establish a new global financing platform with the primary aim of aligning and mobilizing additional resources in support of country preparedness plans, including domestic budget resources, IDA, and other international public- and private-sector financing.

Mechanisms for response lack donor diversity. Three donors (Japan, Germany, United Kingdom; ~75 percent of all donations from 2015 to 2019) support the CFE (WHO 2019a); the PEF has three donors (Japan, Germany, Australia). There are obvious sustainability problems, and the loss of even one of these donors to changing priorities could undermine these mechanisms. Furthermore, donors wish to invest catalytically, with the hope that resource-constrained countries will eventually commit their own domestic resources and take responsibility for developing preparedness capacity during nonoutbreak periods. A crisis preparedness and response window is one solution to creating a sufficient amount of funds for countries that emphasize preparedness while also maintaining a pool of funds for a health emergency.

Mobilizing funding for R&D for new product development and to strengthen clinical research capacity

New R&D resources have become available. There have been new funding and in-kind responses for preparedness-related research. Chief among them is the Coalition for Epidemic Preparedness Innovations (CEPI), an innovative partnership between public, private, philanthropic, and civil organizations. Since its 2017 launch, it has raised more than USD740 million of its USD1 billion funding target, investing in candidate vaccines for Lassa virus, Middle East respiratory syndrome–related coronavirus, and Nipah virus (CEPI 2019). CEPI has announced call for proposals for the development of platforms that can be used for rapid vaccine development against unknown pathogens, with an additional call for proposal planned for vaccines against Rift Valley fever and Chikungunya. The International Vaccine Institute, an independent international organization operating under a treaty signed by 35 countries, WHO, and recently CEPI, is engaging in preparedness-related research and research on vaccines against diarrheal infections, bacterial meningitis, pneumonia, Japanese encephalitis, and dengue fever. Research on vaccines that CEPI or the International Vaccine Institute produces requires translation into operations and practical programs. Gavi, the Vaccine Alliance, partners with the research community to draw on the latest information and thinking from the scientific, medical, and product delivery communities. Its multiyear investment from donors allows it to conduct operational research that is shared with the science community.

The WHO R&D Blueprint provides a structure for coordinated research. The Blueprint is a global strategy and preparedness plan that allows rapid activation of R&D activities during epidemics. Although it is a necessary framework, it does not address the insufficiency of R&D funding for preparedness, and it cannot make a long-term commitment to implementation without increased, sustained financing. Inadequate engagement from the private sector weakens the prospect of securing more resources. WHO is tracking investments under the Blueprint.⁴

The International Vaccines Task Force recommended that current and planned investments in increasing clinical research capacity and in mechanisms for tracking respective investments at the country level be

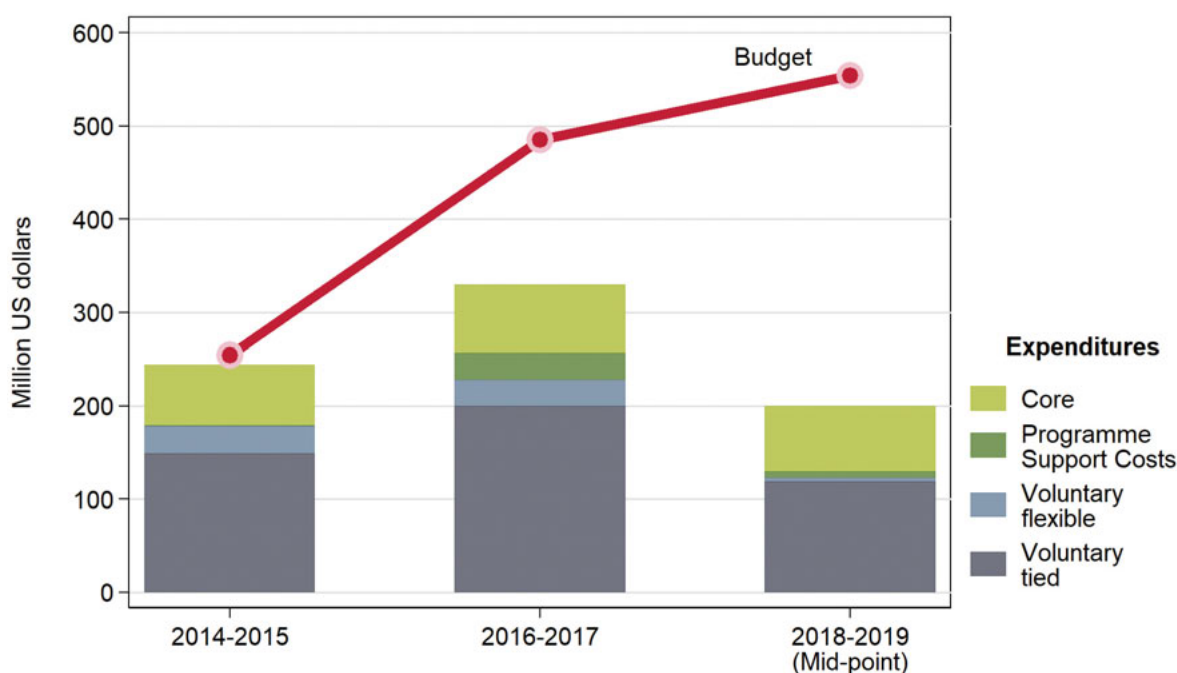
⁴ Actual figures to be updated for the final version.

reviewed. Expert consultations have taken place on the former, but realistic options for the latter have not been considered. Several initiatives, such as World Report by the National Institutes of Health, are collecting data on funding clinical research that could serve as platforms for further development.

Sustaining financing to increase WHO's capacity for health emergency preparedness and response

Predictable, sustained funding is needed for the WHO Center for Emergency Preparedness and Response, CFE, and the Pandemic Influenza Preparedness Framework. There have been significant increases in WHO Health Emergency Program (WHEP) budgets and expenditures over the last five years. For 2018 and 2019, the approved budget is 114 percent (figure 3) of the budget for 2016 and 2017, which in turn had a significant increase from 2014 and 2015. This signals that WHO and member states have made a considerable commitment to increasing funding for WHEP. Financing for WHEP from the assessed contributions budget has increased significantly, from 7 percent in 2014 and 2015 to 11 percent in 2018 and 2019, a further indication of prioritization by WHO management. Nevertheless, WHO “approved” budgets that should reflect needs combine assessed and voluntary contributions and are not fully funded at the beginning of a two-year period, and actual expenditures at the ends of those periods often fall short of the approved budget. Dependence on voluntary contributions as a proportion of the total WHEP budget has increased, limiting predictability and sustainability. Approximately 75 percent of the WHEP budget and expenditures are at the regional and country level, although the WHEP has new authority as a centralized program allowing WHEP to decide on resource allocations, including transferring additional resources at the regional and country level to fill gaps around expenditures financed from tied contributions.

FIGURE 3: World Health Organization (WHO) Health Emergency Program Budget and Expenditures, Not Including Contingency Fund for Emergencies and Pandemic Influenza Preparedness



Source: World Bank staff analysis using WHO data.

The Pandemic Influenza Preparedness Framework is an innovative public health instrument that brings together WHO, Members States, public health laboratories, vaccine manufacturers and others with the goal to better prepare the world to respond to pandemic influenza. The PIP Framework includes a financing mechanism called “Partnership Contribution” that supports pandemic influenza preparedness activities and a legally-binding mechanism to secure access to vaccines and other products in advance of a pandemic. The Partnership Contribution, paid by vaccine

manufacturers that use the Global Influenza Surveillance and Response System, amounts to USD28 million annually and is the primary source of funding for the framework.

Up to 70 percent of the Pandemic Influenza Preparedness Framework budget supports preparedness activities designed to build capacities in laboratories and surveillance, burden-of-disease studies, regulatory agency, risk communications, and deployment planning. The remaining 30 percent of the budget is dedicated to rapid response activities, including the ability to access and procure approximately 10 percent of the global pandemic influenza vaccine supply at the time of an influenza pandemic. Since 2012, 170 million USD have been contributed by industry through the PIP Framework (i.e. USD28 million annually, or USD56 million for each two-year period). Expenditures for 2016 and 2017 totaled nearly USD39 million, and more than USD25 million was spent in 2018.

Reasons for Progress and Lack Thereof

There has been progress at the global level in part because of heightened awareness of the human and economic costs of inaction. There is also acknowledgement that infectious disease outbreaks require a multipronged response and cross-sectoral commitment. Academic and research institutes have been critical in spurring change by compiling evidence of losses, estimating pandemic risks, and dissecting the West Africa Ebola response. Fora such as the UN General Assembly and Security Council, the World Economic Forum, Group of 7 and Group of 20 meetings, and the 2019 IMF seminar on pandemics and antimicrobial resistance have contributed to high-level awareness-building. This has driven the creation of major new efforts such as the GHS Agenda and CEPI. Furthermore, multilateral agencies have been encouraged to incorporate pandemic preparedness as part of their mandate, as the World Bank's 18th Replenishment of IDA Funding commitment to support to at least 25 countries in developing strategic pandemic preparedness plans indicates (De Geyndt 2018).

Three factors can explain lack of progress at the country level: There is no clear understanding or definition of preparedness financing, countries and their finance ministries are not fully on board, and those who can take action do not widely recognize that health security and preparedness is a distinct concept that must be adopted. Greater awareness by those who control the purse has not uniformly led to concrete financial support. Limited resources, other immediate priorities, and even other program claimants for long-term investment such as for climate change and food safety make it difficult to invest in pandemic preparedness even though it is clear that it will cost less than responding to an outbreak when one occurs. For international institutions that need to show tangible, quick results or finance ministers who face constituencies with real short-term needs and political pressure, it is a difficult case to make. Pandemic preparedness is a compelling need, but to paraphrase George Orwell's *Animal Farm*, it has to be more equal than others.

Financing for global public goods requires effort from countries at national, regional and global levels. This is not easy to achieve because of diversity in preferences for investing in global public goods. Developing capacities that contribute to global public goods for preparedness requires a two-pronged approach: adequate assistance and a focus on producing national public goods, such as developing national capacity aligned with national health strategies that can respond to health-related emergencies while also creating additional funding for initiatives and activities with scale and scope efficiencies that can build needed preparedness capacity at regional and global levels.

Noteworthy Regional Efforts

In the years since the West Africa Ebola outbreak, there have been significant regional efforts to strengthen preparedness. Annex 2 is a summary of high-level initiatives established since the Ebola crisis. Two initiatives discussed here are the Africa CDC and the Indo-Pacific Center for Health Security.

The Africa CDC is a specialized institution of the African Union to serve member states by improving surveillance, emergency response, and prevention of infectious diseases. Launched officially in 2017, it has developed a five-year strategic plan that is providing the basis for several external funders, including the World Bank and the People's Republic of China, to consider significant direct or parallel financial support. This plan describes five strategic pillars: surveillance and disease intelligence, information systems, laboratory systems and networks, emergency preparedness and response, and public health research. Each of these pillars has several strategic objectives, defined

sets of activities, and performance measures. An Africa CDC investment financing project from the World Bank is currently under preparation and leverages the expertise of the Korea CDC, U.S. CDC, China CDC, European CDC, and other local institutions, such as the African Society for Laboratory Medicine, for the provision of technical assistance.

The Indo-Pacific Health Security Initiative, which the Indo-Pacific Centre for Health Security implements, was launched in 2017. Australia provided AUD300 million in funding for five years, exhibiting its proactive role in responding to global and regional challenges relating to infectious disease. The Indo-Pacific has been a source region for several emerging infectious diseases this century, including SARS and H5N1 avian and human influenza, and has contributed to antimicrobial drug resistance to high-burden diseases, including tuberculosis and malaria. The Indo-Pacific Centre for Health Security invests in product development partnerships to accelerate research on new drugs and diagnostics, applied health systems research, and capacity building in field epidemiology and targets investments at the country level to strengthen health systems.

Understanding Financing for Preparedness

Although understanding and ability to assess the core capacities needed to implement IHR and develop plans to increase these capacities at the country level has increased remarkably, the same is not true for financing these activities. Information on how much is invested and by whom is scarce. The absence of information coupled with many resource-constrained countries receiving low scores on preparedness assessments such as the JEE are warning signs of inadequate resources being directed to this area. With few available case studies of countries taking the necessary steps to finance preparedness, proposed incentives for stimulating investment are merely theoretical. Countries that want to invest are faced with the daunting task of identifying sources of funds for preparedness. All these challenges reflect the need for a coordinated, meaningful efforts to break the cycle of panic and neglect and ensure satisfactory, sustained investment in noncrisis times. This is an opportune time for scaling-up efforts in financing preparedness because the UHC agenda has momentum, and preparedness is increasingly recognized as foundational to its achievement.

Several features frame the preparedness financing agenda. Preparedness happens across a continuum of prevention, detection, response, and recovery. The JEE structure describes the 19 technical areas of preparedness that need financing and institutional arrangements. There are preparedness-specific investments such as specialized laboratories that need to be recognized as distinct from generic UHC actions. Equally important are preparedness-sensitive activities as the first point of contact for care of individuals; this requires readiness for the provision of front-line services. An effective UHC preparedness effort must also consider sectors outside health. For example, livestock and wildlife veterinary services are critical for effective surveillance of infectious diseases originating in animals.

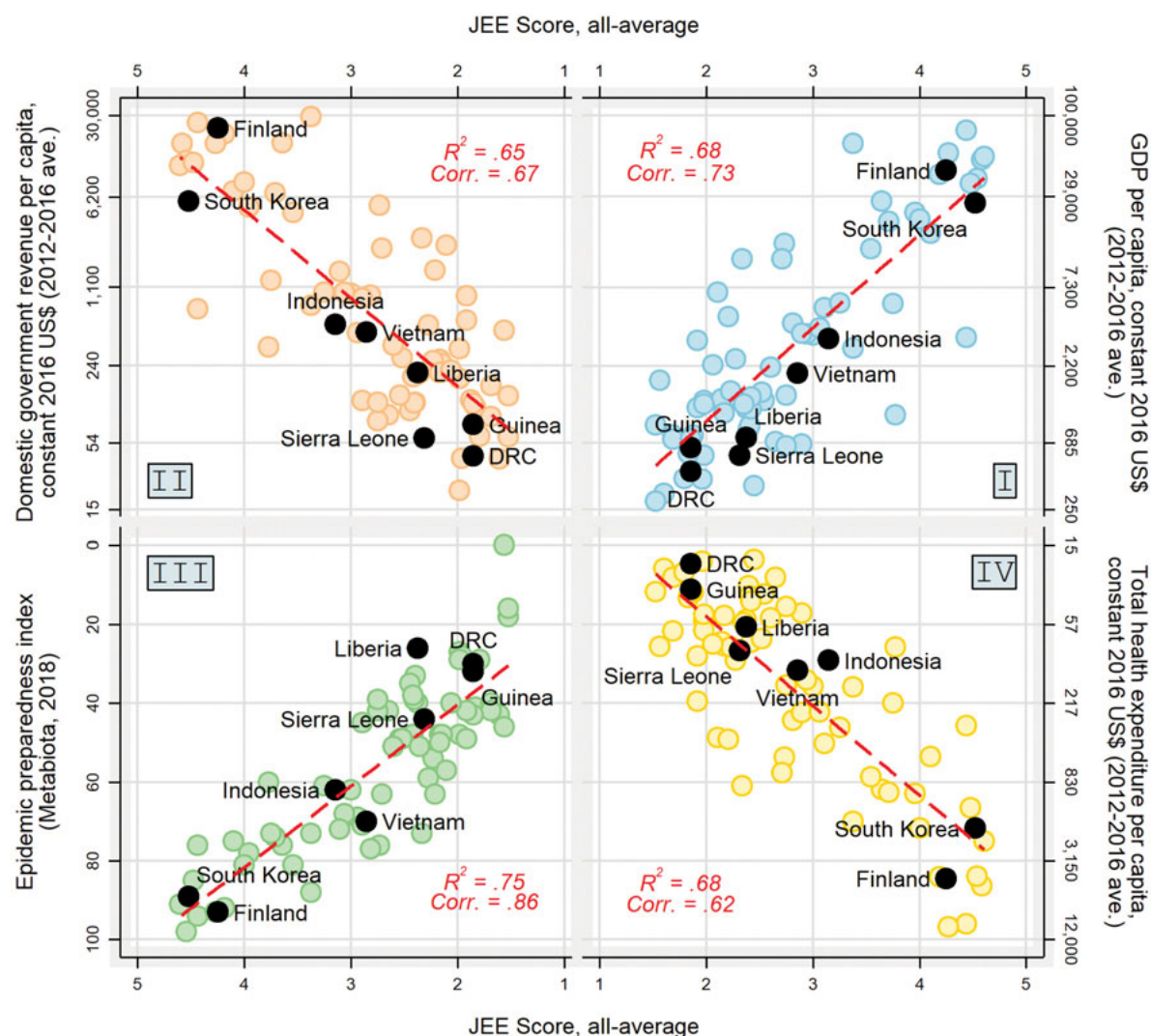
Meaningful efforts have been undertaken to understand the state of investments in preparedness at the country level since the West Africa Ebola outbreak. Vietnam was the first country to pilot the health security financing assessment, with the objective of understanding the current state of financing for health security. This assessment approach was exhaustive, spanning multiple ministries, agencies, and departments at the central level and in all 63 provinces. A similar assessment is now taking place in Indonesia using a simpler, more-streamlined approach. In addition, many countries have gone through the NAPHS process and have estimated resource needs for increasing preparedness; costs have been estimated for more than two dozen NAPHSs and are typically presented for five years. Sierra Leone and Tanzania are leading the way in conducting resource mapping to inform the annual planning and budgeting process. Multiple initiatives and studies have sought to track development assistance for preparedness, including from the “Development Assistance for Health to achieve Universal Health Coverage” study, Georgetown University, IHME, and WHO. This section presents an overview of available information pertaining to pandemic preparedness financing, discusses salient features for financing preparedness, and identifies priority areas.

Preparedness Capacities in the Macroeconomic Context

In the absence of comprehensive data on countries’ investments in preparedness, JEE scores are used as a proxy for current capacity and levels of investment. A simple assumption is that higher JEE scores indicate greater preparedness capacity and greater investment in preparedness, which strong correlations between JEE scores and GDP per capita, domestic revenue per capita, total health expenditures per capita, and EPI confirm (figure 4).⁵

Countries with higher GDP and a broader tax base are better prepared, as expected, but the analysis also identified countries performing below and above their potential. Figure 4 was constructed using data from

⁵ See Annex 4 for further discussion of sources, estimation methodology, and robustness checks.

FIGURE 4: Macroeconomic Indicators and Preparedness Scatterplots

Source: World Bank staff analysis, data sources: World Health Organization (Joint External Evaluation (JEE) scores and total health expenditures per capita); International Monetary Fund (IMF) World Economic Outlook (gross domestic product (GDP) per capita and general government revenue); IMF Government Finance Statistics (share of government revenue not sourced from grants); Organization for Economic Cooperation and Development Creditor Reporting System (alternative source for nondomestic source of government revenue); Metabiota (epidemic preparedness index).

76 countries⁶ that fall into different income groups—24 low, 26 lower-middle, 8 upper-middle, and 18 high income. The correlations and regressions presented are I—JEE scores vs GDP per capita, II—JEE scores vs domestic government revenue per capita, III—JEE scores vs EPI, and IV—JEE scores vs total health expenditure per capita. The resulting graphs indicate that countries with a broader tax base and more-efficient tax administration, with corresponding higher domestic government revenue, have a higher GDP, which in turn provides resources to invest in resilient (human and veterinary) health systems, resulting in greater preparedness capacity (as measured according to JEE and Metabiota EPI scores). JEE scores are measured on a scale of 1 to 5 (1=no capacity, 2=limited capacity, 3=developed capacity, 4=demonstrated capacity, 5=sustainable capacity). The EPI measures a country's capacity to detect and respond to infectious disease events, with lower scores indicating less capacity.

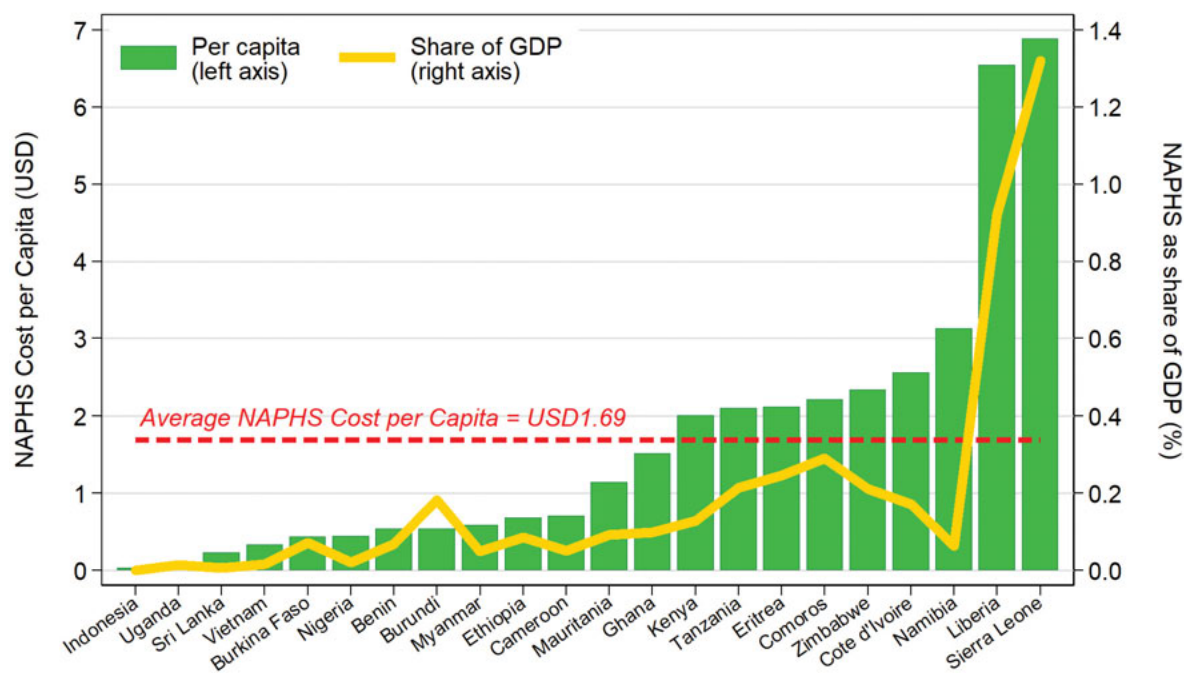
⁶ These are all the JEEs conducted using JEE Version 1.0. An additional 14 countries conducted JEE using Version 2.0. Reports of the 14 JEEs have not been published, so the results were not included in this analysis.

Fiscal space for public expenditures on health has been increasing, although not fast enough to meet SDG needs, and LICs continue to depend highly on external financing. Public spending on health has grown between 3 percent and 6 percent per year over the last 16 years (Xu et al. 2018; Tandon et al. 2018). Government expenditures on health grew faster in LMICs, with most of the increase attributed to economic growth, and slower in HICs, where an important source of growth was prioritization of government expenditures. These reviews also concluded that, although external funding on health represented less than 1 percent of global health expenditures, in LICs, development assistance for health (DAH) constitutes a significant share of government fiscal space for health. The IMF estimates that additional fiscal space is needed for government investments in health, education, roads, electricity, and water and sanitation to reach the SDG target amount of 15 percent of GDP in LICs and 4 percent in emerging middle-income economies by 2030 (Gaspar et al. 2019). Whereas the goal is achievable for the MICs, the achievable target for LICs would be 5 percent, leaving a significant gap. The World Bank report estimates that, to achieve health targets under SDG 3, LICs will need to spend USD112 per capita and LMICs USD146 per capita on health by 2030. This falls worryingly short of actual spending of USD12 and USD27, respectively, in 2015 (Tandon et al. 2018).

Current Efforts in Estimating Country Financing Needs for Preparedness

Multiple costing tools have been created to help national governments, policy-makers, and development partners estimate the scale of resources required to build and sustain national IHR capacities, including an activity-based tool that WHO developed and two benchmark-based costing tools—the Georgetown University IHR Costing Tool⁷ and the CDC Priority Actions Costing Tool. Figure 5 shows estimated costs emerging from national costing exercises. Twenty-five countries have costed their NAPHS, of which 22 have been used in this analysis.^{8,9} Figure 5 presents average annual costs per capita that the various countries estimated and presents these costs as a proportion of GDP.

FIGURE 5: Average National Action Plan for Health Security Cost Per Capita



Notes: NAPHS, national action plan for health security; GDP, gross domestic product

⁷ Available at <https://ghscosting.org/>.

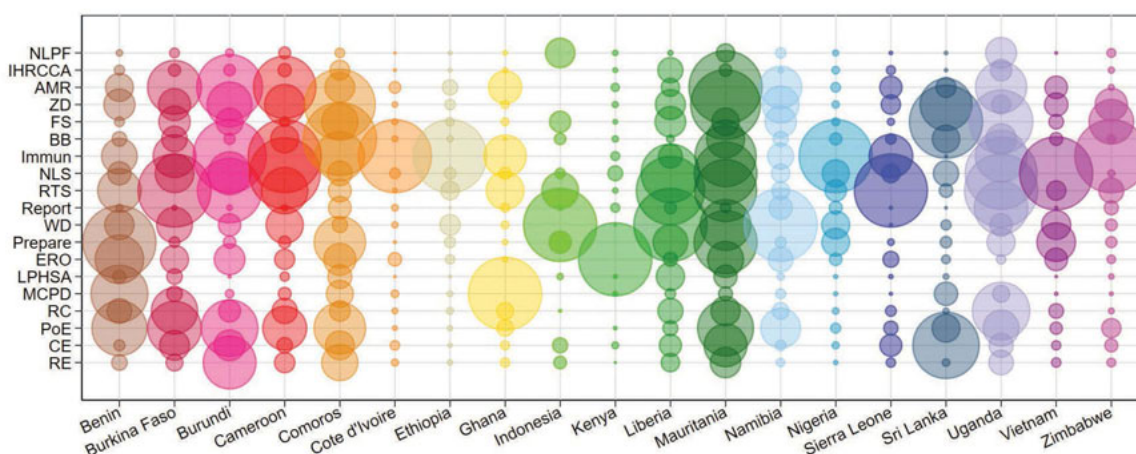
⁸ The cost estimates from Cambodia, Maldives, and Mongolia are omitted from this analysis because of data interpretation and compatibility problems. All other costed NAPHSs, those published on the Strategic Partnership Portal (<https://extranet.who.int/sph/publications>) and those that NAPHS Focal Point, Country Health Emergency Preparedness and IHR (CPI) at WHO provided, were included.

⁹ See Annex 2 for detailed figures on the 22 NAPHS cost estimates and selected macro and sectoral indicators.

Although country-level estimates vary greatly, the cost of strengthening preparedness at the country level is not exorbitant. Likewise, the average annual per capita cost to implement NAPHS and improve IHR core capabilities is estimated at USD1.69 (figure 5), although there is significant variation between countries, with average annual costs ranging from USD0.03 per person in Indonesia to USD6.89 per capita in Sierra Leone. Similarly, a wide variation in total NAPHS costs as a share of GDP was noted—from less than 0.001 percent of GDP to 1.3 percent. It is difficult to draw conclusions about the validity of these numbers without understanding the current level of investment in IHR activities in each country and the expected level of improvement or change to be achieved with additional spending. As discussed later in this section, Vietnam is one of the few countries that has conducted a systematic assessment of current financing across the JEE technical areas and, therefore, one of the few countries that can place the estimated incremental cost into context. Without this information, and given the variation in IHR cost estimates, more must be done to streamline this exercise and ensure a transparent methodological process.

The variation in cost estimates across countries reveals the innate challenges associated with this exercise. First, an incremental approach to costing activities, such as those related to IHR functions, may assume that the current production function is optimal. This can perpetuate existing inefficiencies. Alternatively, a tool may assume that there is no capacity, and therefore cost estimates might be higher than actual costs. Second, expanding activities could result in zero additional cost if, for example, staff are reallocated from a lower-priority area to IHR activities. Third, costing is, for the most part, inherently nonlinear, and applying a linear function could ignore potential efficiencies such as economies of scale. Fourth, joint or shared costs, such as a new computer system for surveillance capacity that could also handle communications or receive veterinary reports, are challenging to capture in a tool. These challenges notwithstanding, cost estimates are necessary for discussions with ministries of finance and other partners about allocation of resources needed to implement activities designed to increase health security competency (Katz et al. 2018).

FIGURE 6: Share of National Action Plan for Health Security Costs Across Joint External Evaluation 19 Technical Areas¹⁰



There are wide differences in the distribution of estimated costs between and within countries' JEEs, reflecting lack of clarity as to what needs to be costed (figure 6). Some countries, such as Mauritania, Uganda, and Comoros, show NAPHS costs distributed relatively evenly across the 19 technical areas. Others show IHR costs concentrated in one or two technical areas, such as Kenya, with NAPHS costs concentrated in emergency response operations (90 percent of costs); Cote d'Ivoire, in immunization (87 percent); and Sri Lanka, in food safety and chemical events (both areas combined for 61 percent of total costs). This heterogeneity between countries of the largest cost drivers raises the question of what should be costed. A lack of clarity on which immunization activities should be

¹⁰ Abbreviations: NLPF-National Legislation, Policy and Financing; IHRCCA-IHR Coordination, Communication and Advocacy; AMR-Antimicrobial Resistance; ZD-Zoonotic Disease; FS-Food Safety; BB-Biosafety and Biosecurity; Immun-Immunization; NLS-National Laboratory System; RTS-Real Time Surveillance; Report-Reporting; WD-Workforce Development; Prepare-Preparedness; ERO-Emergency Response Operations; LPHSA-Linking Public Health and Security Authorities; MCPD-Medical Countermeasures and Personnel Deployment; RC-Risk Communication; PoE-Points of Entry; CE-Chemical Events; RE-Radiation Emergencies.

covered in the costing or whether the cost of developing a medical counter-measures stockpile should be included contributes to this confusion. WHO (2019c) released a Benchmark Tool¹¹ in February 2019 that includes a list of benchmarks and corresponding actions that can be applied to improve country performance in emergency preparedness by developing and implementing a NAPHS. Its goal is to provide guidance on activities to inform the NAPHS; it will be interesting to see the effect of this guidance on the NAPHS development process in terms of time spent on the exercise and resulting estimated costs.

Despite the shortcomings and wide variations of the NAPHS cost estimates between countries, the average annual cost per capita of USD1.69 is a good figure to work with. This figure is comparable with findings from the systematic, comprehensive health security financing assessment from Vietnam that estimated total per capita spending of USD1.94 for 2016. The annual additional per capita cost to implement the Vietnam IHR Master Plan (2019–25) is estimated at USD0.33. This example reinforces that the resources needed to increase preparedness are not out of reach. It is not the cost, but rather prioritization, that needs to be addressed to ensure that commitments to preparedness do not get pushed aside or reallocated to more “urgent” or visible needs.

The State of Tracking Development Assistance for Preparedness

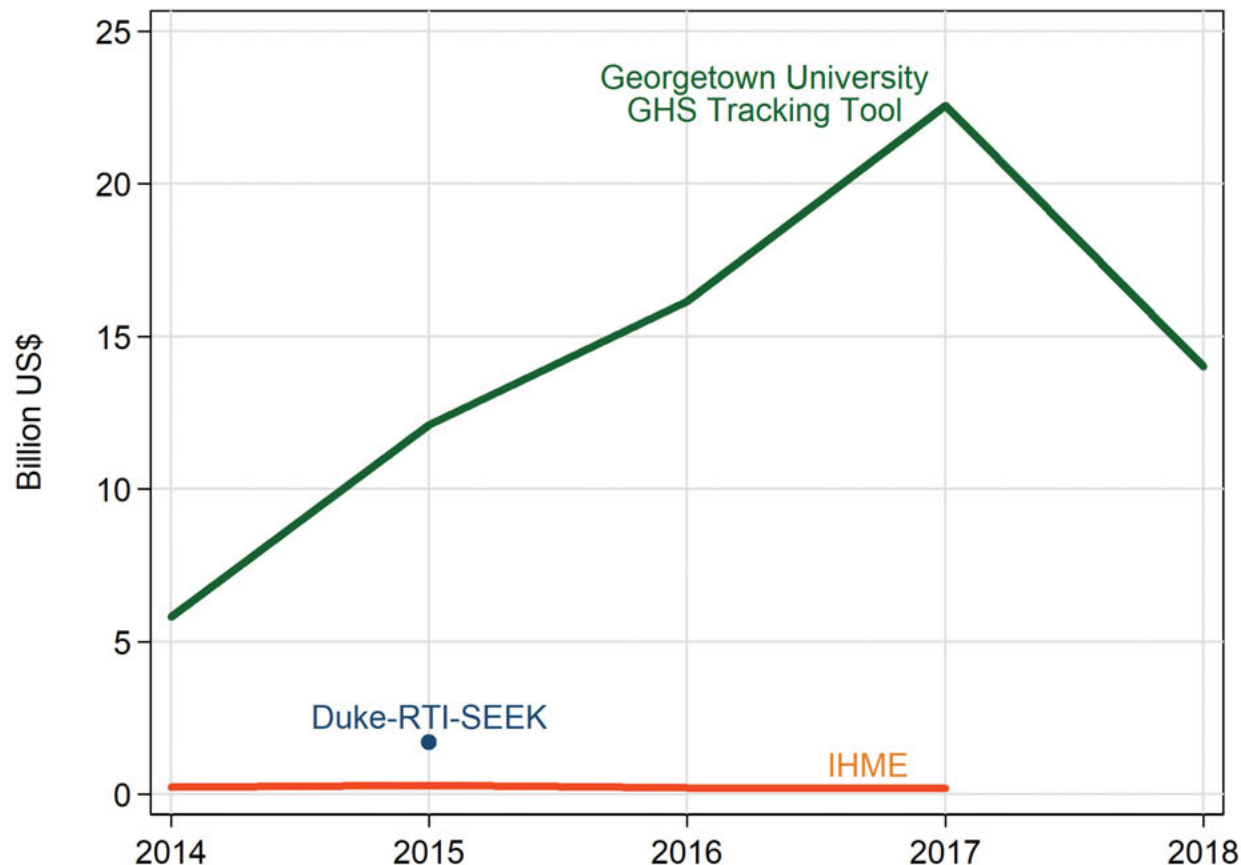
Estimates of funding required at the global level to build and reinforce public health capabilities to prepare for future global health crises have been varied. In 2016, the U.S. National Academy of Medicine estimated that additional financial resources to counter infectious disease crises would amount to approximately USD4.5 billion annually. In 2017, the International Working Group on Financing Preparedness concurred with the National Academy of Medicine that a range of USD1.9 billion to USD3.4 billion for preparedness annually was roughly what would be needed (IWG 2017). These estimates were made before refined means of tracking preparedness methods were developed. What we now know is that the upper estimate of USD3.4 billion for preparedness alone falls far short of, conceivably half of, what is needed.¹²

Several tracking tools and studies have been developed to analyze flows of global health funding, producing highly variable results. One of the most widely used databases is the Organization for Economic Cooperation and Development (OECD) Creditor Reporting System (CRS), a compilation of data tracked and monitored to measure donor flows to developing countries. Another is the G-Finder public search tool, which analyzes global investment in R&D of new products to prevent, diagnose, control, or cure neglected diseases in developing countries. To support resource and priority mapping, WHO offers partner matching through the Strategic Partnership Portal for International Health Regulations (2005) and Health Security that identifies donors and partners supporting IHR in WHO member states (WHO 2019b). Other initiatives and studies have been mandated or have expanded their mandate to track investments in global health security and pandemic preparedness. The GHS Funding Tracking Dashboard, which Georgetown University and Talus Analytics developed, was designed to help the global community better understand who is funding what and where in the context of global health security; IHME expanded the scope of their Financing for Global Health Study in 2017 to identify DAH flowing to pandemic preparedness; and the Development Assistance for Health to achieve Universal Health Coverage study (2017), which the International Health Partnership for UHC 2030 and WHO commissioned, produced a report tracking 2015 donor investments in the two foundations of UHC: health systems strengthening and health security. Figure 7 compares data from these three sources.

As with NAPHS costing exercises, tracking of development assistance for preparedness produces highly variable results. The GHS tracking dashboard estimates that USD11.8 billion was spent on global health security in 2015 (GHS 2019), as opposed to USD1.7 billion for health security reported in the Development Assistance for Health to Achieve Universal Health Coverage study and USD236 million for pandemic preparedness that IHME estimated (IHME 2019). Comparing estimates for U.S. funding in 2017, the GHS tracking dashboard estimates that the United States disbursed USD1.2 billion for global health security, whereas IHME estimates that USD63.9 million flowed to

¹¹ WHO developed the tool with technical inputs from Africa CDC, U.S. CDC, Public Health England, Resolve to Save Lives, and the South Asia Field Epidemiology and Technology Network.

¹² The preparatory work for the WHO investment case resulted in a figure close to USD8 billion, although that figure did not make it through to the final investment case report, indicating challenges with making reliable estimates.

FIGURE 7: Development Assistance for Health for Pandemic Preparedness, 2014 to 2018

pandemic preparedness. The Development Assistance for Health to Achieve Universal Health Coverage study reports data only for 2015.

These results confirm the many challenges in quantifying country and donor investments in preparedness.

First, there are multiple approaches to defining what constitutes an investment in preparedness: IHME targets investments in “pandemic preparedness,” whereas the GHS tracking dashboard includes all investments in “global health security.” Approaches to identifying investments that fall under preparedness vary widely, from narrow definitions that cover only extreme pandemic events to broad definitions that cover whole-of-society approaches—with various sector-specific definitions in between. Second, there is no widely accepted methodology of measuring preparedness financing. The research team undertaking the UHC study used the OECD CRS database,¹³ a data source that the GHS tracking dashboard and the IHME study also used, but the research team compared their more-intensive line-by-line assessment methodology with IHME’s automated keyword searches of descriptive information in the CRS and described IHME’s approach as disadvantageous because, “in particular, information reported in the CRS is often too sparse to be classified based on key terms and against a multi-faceted topic like UHC” (Development Assistance for Health to Achieve Universal Health Coverage 2017). Lastly, it is difficult to separate investments in preparedness from those in health system strengthening. The multisectoral, cross-departmental, multilevel (global, regional, national, subnational) nature of preparedness makes it difficult to track investments at the national level. Leveraging shared infrastructure, such as laboratory capacity, enables greater efficiency, but also makes it difficult to measure what is invested in preparedness as opposed to other categories (e.g., response). Learning lessons from other similarly complex areas would be helpful. Box 5 discusses the experience in estimating financing for malnutrition.

¹³ Although pandemic preparedness spending is captured in the database, the CRS database does not identify flows for pandemic preparedness or global health security as a distinct category.

These data are not exceedingly useful in understanding the scale of development assistance for preparedness. The GHS tracking dashboard, although using the JEE as a reference for the methodological approach, estimates an amount that far surpasses existing needs estimates and is therefore unrealistic. The UHC study, although adopting a robust methodological approach, is pre-JEE and does not extend past 2015, making it out of date. The IHME data paint an incomplete picture of flows for preparedness.

The challenges faced in estimating financing for pandemic preparedness are not unique. Many other areas of focus face similar challenges. One example is malnutrition. As with pandemic preparedness, estimating financing specifically for malnutrition is difficult given the multisectoral nature of interventions aimed at addressing it. Box 5 presents a summary of lessons learned from estimating financing for malnutrition.

Box 5: What Is Not Measured Is Not Managed: Lessons from Estimating Financing for Malnutrition

Addressing malnutrition is critical for economic and human development. Malnutrition refers to imbalances in proteins; calories; and crucial micronutrients such as iron, vitamin A, zinc, and iodine. Malnutrition can affect individuals at all ages and is typically classified as undernutrition, caused by insufficiency of nutrient intake, or overnutrition, caused by overconsumption of nutrients such as proteins and fats. Typically, as countries grow and develop, they undergo a nutrition transition: a decline in undernutrition with a concomitant increase in overnutrition. It is possible for individuals and populations to experience overnutrition and undernutrition at the same time or to experience both at different times. Undernutrition in infants and children can have life-long consequences, not just for health outcomes, but also for accumulation of human capital, economic development, and poverty reduction. Undernutrition is responsible for almost half of all child deaths, and being stunted in early childhood adversely affects cognitive development, limits attainment of education, decreases adult wages, and can increase the risk of adult onset of noncommunicable diseases, all of which make children more vulnerable to poverty as adults. Likewise, overnutrition and obesity are risk factors for several chronic conditions in adults, including diabetes and cardiovascular diseases. Certain life stages—fetuses, infants, preschool-aged children, women of reproductive age, pregnant and lactating women, elderly adults—are more vulnerable to the effects of malnutrition than others. Assessing the level, distribution, composition, and effectiveness of financing that targets malnutrition is critical to helping inform design and implementation of corrective policies.

Interventions for addressing malnutrition go well beyond the health sector, with important contributions from education, agriculture, water, sanitation, and other relevant sectors. For example, addressing malnutrition requires improvements in hygiene associated with improvements in access to water and sanitation. Similarly, promoting dietary diversity may require encouraging production, import, and consumption of certain types of healthy foods. In addition, malnutrition is generally not addressed using stand-alone interventions; implementation is often bundled together with other health and non-health programs. Even within the health sector, malnutrition is often addressed in conjunction with interventions aimed at improving maternal and child health more broadly (e.g., nutrition messaging and supplementation generally provided during antenatal care visits.)

Newly developed methods of estimating financing to address malnutrition are increasingly being applied in many countries. For estimation of public financing for malnutrition, these methods entail a detailed review of nutrition-related budget line-items—programmatic or activity based—in various ministries. These line items are further classified as being nutrition specific—with the primary goal of improving nutrition status—including activities that support early, exclusive breastfeeding for six months together with appropriate complementary feeding thereafter, micronutrient supplementation, and treatment of severe malnutrition. Others might be for nutrition-sensitive interventions—activities with other primary objectives but reflecting a conscious effort to improve nutrition—such as supporting small farms for women and families and clean water and sanitation that can reduce infection and disease. In addition, in some cases, informants are asked to provide ‘weights’ representing the proportion of financing under an activity that—at least in their subjective opinion—is directed at improving nutrition. These methods, initially developed and applied to assess public financing for malnutrition in Tanzania, are being piloted in several developing countries, including India, Bhutan, Bangladesh, Indonesia, Nepal, and Sri Lanka.

Because different countries classify nutrition interventions differently, cross-country comparability of financing for malnutrition is difficult. School meal programs, for example, typically fall under nutrition-sensitive interventions, but in a country such as Bhutan that is grappling with challenges related to childhood anemia, these programs are classified as nutrition specific. Some progress has been made recently in defining a common core set of interventions based on evidence of their effectiveness and in highlighting country-specific line items spanning multiple ministries that can be tracked over time to assess the extent to which lack of financing is a bottleneck to addressing malnutrition, similar to the process underway for financing of pandemic preparedness.

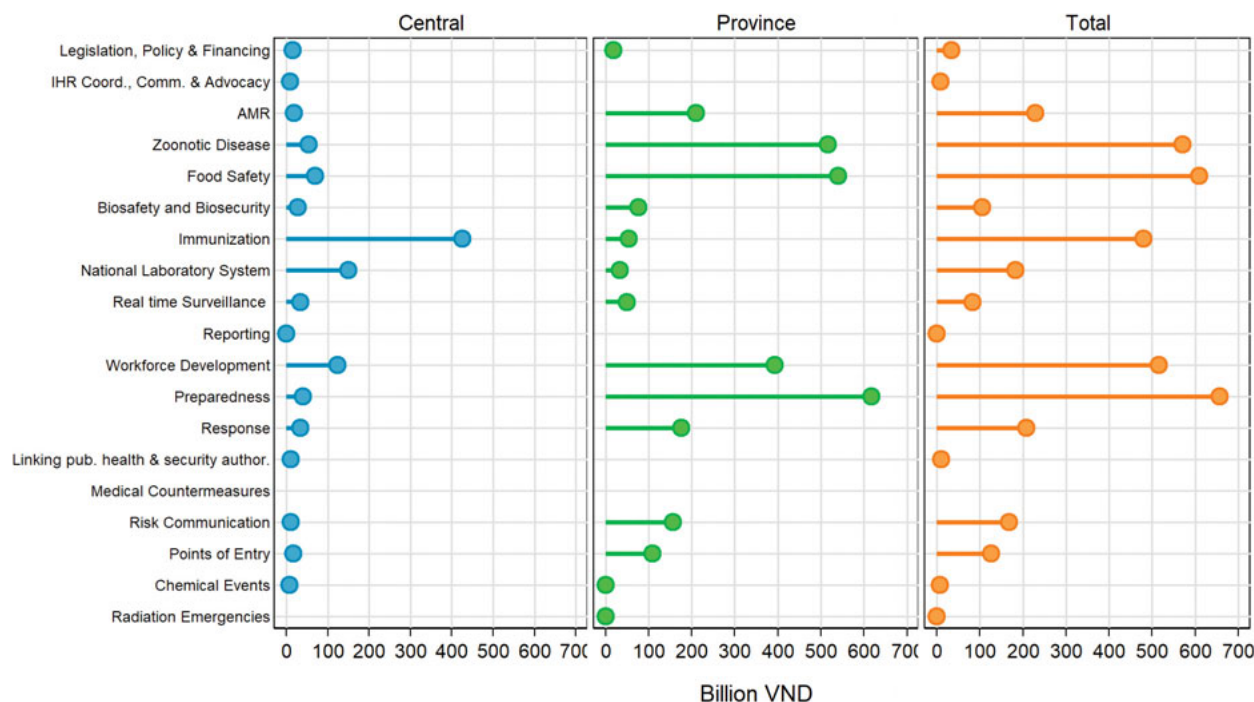
Differences in estimated global needs of USD1.9 billion to USD3.4 billion per year for preparedness are much smaller than the total DAH of USD37.4 billion reported in 2017. DAH amounted to more than USD10 per capita in LICs and more than USD2 per capita in LMICs in 2015 (IHME 2019); due to the large scale of resources directed to health, there is reason to believe that more can be allocated to fill the financing for preparedness gap if donors and development partners align around financing this global public good.

Examples of Approaches to Estimating Financing for Preparedness

Without standardized tools for monitoring national investments in preparedness, efforts to assess national spending will require deliberate effort from national stakeholders.¹⁴ Vietnam is an exceptional case, having conducted a health security financing assessment using a tool that the World Bank developed in collaboration with technical public health agencies (WHO, World Organization for Animal Health, Food and Agriculture Organization, CDC) and countries in East Asia and the Pacific with funding from the Australia Department of Foreign Affairs and Trade. A joint team of national and international experts under a multiagency task force that the Vietnamese Prime Minister authorized conducted a comprehensive analysis of funding sources, agents, and users at the central and provincial levels. The assessment was national and comprehensive, involving a 15-person team from the Health Strategy and Policy Institute working with the World Bank, and involved consultations, in-depth interviews with 18 informants, 24 small-group discussions at the provincial level, and participation of 204 people in three regional workshops.

The health security financing assessment revealed that, in 2016, Vietnam spent USD181.2 million on health security activities (of which nearly 75 percent was spent at the provincial level), which amounts to USD1.94 per capita, 0.09 percent of GDP, and 0.29 percent of total government expenditure on health. The Vietnamese government financed 77 percent of health security expenditures, with external aid contributing 12 percent, and miscellaneous fees and charges accounting for the remaining 11 percent. The IHR technical area of preparedness accounted for the largest

FIGURE 8: Vietnam Health Security Expenditures by 19 Technical Areas, 2016



Source: World Bank staff analysis using health security financing assessment data, Vietnam (2018).

¹⁴ Such tools include national health accounts that provide a systematic framework for mapping expenditures in health and the Public Expenditure Tracking System, which triangulates budget and financial records from different sources (IVTF 2018).

proportion of expenditure, followed by food safety, zoonotic diseases, workforce development, and immunization. Reports from different provinces convey varied results, but figure 8 represents a reasonable picture of high and low JEE technical area expenditures of central and provincial governments. A similar exercise is underway in Indonesia, with plans to expand the activity in Cambodia, Myanmar, and Lao People's Democratic Republic.

The lessons learned from these pilot assessments should inform development of a standardized, simplified tracking methodology and approach to assess domestic spending on IHR implementation capacity. Relevant technical and financing agencies such as the World Bank, WHO, OECD, and World Organization for Animal Health are best positioned to collaborate in the development of an intuitive means of monitoring and recording domestic allocations to preparedness.

Lessons being learned from complementary resource mapping exercises indicate a possible comprehensive approach for assisting preparedness financing. WHO has led a resource mapping exercise in several countries, including Sierra Leone and Tanzania. It uses an spread sheet-based tool to facilitate discussion between national governments and development partners for a coordinated multisectoral approach and attracts new partnership, funding and technical support. It allows policy-makers, donors, and partners to realize where gaps exist and where more investment of financial and technical resources is needed for implementation of NAPHS. More-standardized methodologies for understanding preparedness financing, costing NAHPS, and identifying available resources could result in a complete set of tools in support of a preparedness financing agenda.

Way Forward

A critical window of opportunity is open—one that is the culmination of efforts to make sure that history does not repeat itself and the world be better prepared for future outbreaks. Major shifts have taken place in awareness of these threats, but without prioritized and sustained financing, people and economies will remain vulnerable. To ensure meaningful progress a deeper understanding of the shared value and collective effect of investments in preparedness should be leveraged. This means strengthening the evidence and knowledge base; building a strong investment case; and communicating that case to decision-makers and winning their support to prioritize and integrate preparedness in the annual national planning, budget appropriations, and sectoral resource allocation processes. This section puts forward four priority areas for Global Preparedness Monitoring Board to use in its advocacy, and monitoring mandate over the next year. The four priority areas are: mobilizing demand for investment in preparedness; beating the DRUM (domestic resource utilization and mobilization) for preparedness; optimizing the use of development assistance for preparedness; and developing standardized measurement and monitoring approach for preparedness financing.

Mobilizing Demand for Investment in Preparedness

Investing in preparedness is a critical dimension of investing in human capital, and the costs of inaction related to underinvestment are well known and documented. As this report shows, the costs of action are modest at the margins of what every country can afford to invest—an average USD1.69 per capita per year—and the returns on investment are massive. It is a prioritization and management challenge that needs to be taken on. The health security and preparedness agenda must be an essential part of the mobilization of heads of state and ministers of finance around human capital as it relates to health. This demand mobilization will not only help to increase domestic resource availability, it will also facilitate the necessary multisectoral participation.

Within the health sector, it is important to build “convergence” messages between investing in UHC and investing in health security and preparedness. As this report highlights, the investment areas—strong front-line surveillance capacity, good laboratories, effective infection prevention and control—are priorities for UHC and preparedness. This convergence could be enhanced through at least three specific opportunities for global advocacy: the GHS Agenda—Financing Package; the SDG Global Action Plan, with its accelerators on Fragility, Conflict and Violence, preparedness, and sustainable financing; and through the UN General Assembly High-Level Segment on UHC for September 2019.

Incentives—well designed and focused—can encourage financing preparedness. These include:

- Developing catalytic mechanisms for increasing domestic resource use and mobilization, including direct international development assistance to catalytic activities and linking development assistance for capital or one-time expenses with recurrent costs accounted for in domestic budget (IWG 2017), augmenting domestic budget allocations for preparedness with additional matching grants from external sources earmarked for preparedness (IVTF 2018), and creating synergies for domestic resource mobilization for preparedness by leveraging regional partnerships and strategic networks.
- Exploring options for increasing resources for preparedness, including donor contributions that are earmarked for preparedness in addition to donors’ existing and ongoing country contributions (Ahluwalia, Summers and Velasco 2016) and options such as buy-downs, which convert credits to grants upon reaching agreed-upon performance benchmarks, to increase resource availability and use for preparedness (IVTF 2017).
- Renewing efforts to integrate preparedness into the economic and policy assessment tools of the IMF, World Bank, and other development banks (IWG 2017; NAM 2016).

Beating the DRUM for Preparedness

Financing preparedness would benefit by being recognized as a crucial component of the broader agenda of DRUM. The production of costed national plans for preparedness, although helpful in some cases, has led to inflated and unrealistic expectations of what can be done in the current budget or policy cycle.

- An essential package of best buys or priority interventions for increasing preparedness capacity needs to be articulated, costed, and financed in the current budget cycle and map these interventions to expected results in the near term. A list of needs for emergency financing, covering health, agriculture, and disaster preparedness, can be identified for priority countries with low JEE scores, with a view to advocating for immediate attention.
- Efficiency gains are an important way to extend existing resources. They also apply to the preparedness agenda, including rational planning for specific diagnostic capacities (including regional and sub-regional collaboration), payroll management, procurement, and managing shared costs with other human and animal health services.

Optimizing the Use of Development Assistance for Preparedness

Given that preparedness is a global public good, development assistance needs to prioritize investments in it. It is affordable and should be possible to achieve, given that the estimated preparedness-financing needs are relatively small (between USD1.9 billion to USD4.5 billion annually) and the overall volume of DAH (USD37.4 billion in 2017). Development assistance has two major roles to play in supporting the preparedness financing agenda: direct support to countries and investing in regional and global public goods. To increase preparedness financing would require only more-explicit prioritization and management of DAH allocations.

On direct support to countries:

- Development assistance must link directly with the national DRUM agenda, but the global health security community has operated in isolation of the DRUM agenda for far too long, with an implicit theory of change that development assistance on its own will sustain national capacities. This has led to a disastrous track record of dependence on development assistance and substitution of domestic resources. Working with the SDG GAP sustainable financing accelerator, major global preparedness funders can better align funding strategies to make sure their monies are catalyzing and contributing to more and better preparedness financing.
- In the context of the unmet expectations of countries for development assistance after their completion of JEEs and having developed costed national preparedness plans, it is essential for global development partners to identify with greater specificity where development assistance for preparedness financing can be found. The upcoming replenishment of IDA19 provides an excellent opportunity to identify additional resources for preparedness, including the IDA CRW to incorporate preparedness as part of its financing scope, and to make the Regional Program available for single-country investments.
- As LICs and fragile countries continue to rely heavily on DAH to finance their health sectors, DAH donors may need to share responsibility to ensure efficiency in investments and preparedness operations. This would require medium-term predictability and financing modalities that integrate affordable, sustainable domestic financing and stronger health systems.
- Increasing the efficiency of development assistance through decreased fragmentation of DAH and enhanced coordination of domestic and external development partners that integrate multiple national plans (disease and relevant health/non health sector plans). Additional consideration to pre-positioned flexibilities for rapid reprogramming of existing funds in crisis situations would significantly increase available funds in a number of countries, taking due consideration to good governance requirements.

On investing in regional and global public goods, two types of financing agendas are critical to secure: with respect to regional preparedness, institutional capacities that offer high value for money through scale and scope efficiencies (relative to what can be afforded and sustained), and with respect to global institutional

capacities related to R&D and technical assistance. With respect to regional preparedness financing, there has been considerable progress as described in this report (see references to the REDISSE program), but despite progress, there are concerns that require immediate attention and action.


































- Although development assistance has fueled an impressive set of regional institutional opportunities (e.g., REDISSE, Africa CDC, the Indo-Pacific Health Security Initiative), and it is too early to make any informed assessment, member countries must examine closely how they will finance recurrent costs in the medium term.
- The usage rate of available resources is low, pointing to absorptive capacity constraints that needs to be considered a priority area of attention.
- With respect to financing of global institutional capacities, progress with the CEPI and WHO R&D blueprints, together with Gavi support for vaccination during outbreaks, has been encouraging. Similarly, the surge in support in financing WHEP is helping to strengthen WHO's preparedness capacity (which is in good shape and does not require any recommendations at this time).

Developing Standardized Measurement and Monitoring Approaches for Preparedness Financing













There are many different terms for, methodologies for, and approaches to defining preparedness financing that confound the discussion regarding tracking, estimating resource needs, and developing an investment case for preparedness. As a result, tracking estimates of development assistance for preparedness produces highly variable results. Similarly, very little is known about the size, source, and use of preparedness financing at the country level. This presents a challenge for decision-makers to formulate and implement informed policy actions. Tracking preparedness and health security expenditures is possible, and there are excellent examples from Vietnam and in Indonesia that can serve as to show how to develop standardized methodologies like the National Health Accounts, disease program subaccounts, as well as recent lessons from estimating financing for nutrition program that shares similar multisectoral challenges as pandemic preparedness. What needs to be done is to:

- Assemble an expert team from technical and financing agencies tasked with producing a standardized definition of preparedness financing and an expenditure tracking approach.
- Review Vietnam's and Indonesia's health security financing assessments, other disease program subaccounts, and the recent experience in estimating financing for a nutrition program.
- Develop a check list of investments for preparedness-specific and preparedness-sensitive health system investment activities.
- Develop a standardized approach and methodology for tracking expenditures for preparedness, including for R&D.
- Introduce dedicated lines into existing global datasets to allow complete, systematic monitoring of development assistance and domestic resources spent on preparedness. Two such examples are the IMF mandatory government financing statistics and the OECD CRS.

Annex 1: Summary Status Updates of Financing Recommendations Grouped into Six Themes

Recommended action	Status	Traffic light		
1. Mobilizing domestic resources to build IHR core capacities for preparedness				
1.1 Within 3 months of developing costing plans following JEE/PVS assessments, governments should prepare financing proposals to support implementation of the plan [NAM; IWG]	Many governments have prepared costing NAPHS, but little evidence exists of detailed financing proposals			
1.2 National governments should develop an investment case, articulating political and economic arguments for integrating costing plans into national budget cycles [IWG]	With the exception of Vietnam, no evidence that countries have developed investment cases			
1.3 National governments should examine ways of generating domestic resources to finance preparedness, by (i) improving tax collection; or (ii) introducing earmarked taxes [IWG]	No evidence of revenue-enhancing tax reforms for preparedness in low-income countries			
1.4 National governments should incorporate the private sector into their strategy for reinforcing preparedness [IWG]	Some involvement of the private sector in a few countries, but no evidence of systematic effort and improvement			
1.5 National governments should increase investment in the training of health professionals and establish Community Health Workers (CHWs) systems [UN High-level Panel]	Good progress in recent years; WHO has established guidelines			
2. Mobilizing development assistance to build IHR core capacities for preparedness				
2.1 A clear strategy needs to be developed to ensure that governments invest domestically, and adequate external support is mobilized for low-income countries; This must be supported by transparent monitoring and national assessments of capacities [Harvard–LSHTM]	The JEE/PVS assessments have contributed to national progress on assessments; The GPMB addresses the monitoring component; Improvements are needed in relation to transparency and central data collection			
2.2 WBG should convene other multilateral donors and development partners to support financing for preparedness, focusing on in-country capital investments, multi-country regional initiatives and failed and fragile states where domestic resourcing is not a realistic option; Development partners should encourage national governments to match investments and commit domestic resources [NAM; IWG]	Under IDA18, WBG has supported over 25 countries in developing pandemic plans and is supporting regional disease surveillance projects in West Africa and East Africa; Overall uptake of IDA financing for strengthening preparedness is slow			
2.3 Partners sustain their ODA to health and direct a greater percentage to strengthening health systems under an agreed-upon government-led plan [UN High-level Panel]	ODA levels directed at health system strengthening are varied; Both increases and decreases are observed from different partners			
2.4 The WHO DG leads urgent efforts, with other partners, to mobilize financial and technical support to build IHR Core Capacities [UN High-level Panel]	WHO has intensified its efforts to improve capabilities to deal with IHR capacities and has established a Health Emergency Program			
3. Incentivizing countries to prioritize allocations of funds for preparedness				
3.1 IMF and WBG should incorporate economic risks of infectious disease outbreaks into macroeconomic and market assessments of individual countries, including in Article IV consultations [NAM; IWG]	No evidence of this having been completed; IMF has not included outbreak risk in Article IV consultations			
3.2 IMF should ensure ability to provide budgetary support to governments raising alerts of outbreaks, e.g., through the Rapid Credit Facility; [NAM]	No evidence of an explicit commitment to ensuring budgetary support when outbreak alerts raised			

Recommended action	Status	Traffic light		
3.3 WHO should promote early reporting of outbreaks (and confront governments that implement trade and travel restrictions without justification) and funders should create economic incentives for early reporting [Harvard–LSHTM]	WHO runs the Health Emergency Program and has established the CFE; It has not developed industry wide frameworks nor promulgated the negative impacts from trade and travel restrictions			
3.4 WBG should include assessment of preparedness capacity in the CPIA tool and the IDA allocation formula; Other MDBs should consider introducing equivalent mechanisms to incentivize preparedness investments [IWG]	Country Policy and Institutional Assessment (CPIA) does not currently address pandemic preparedness			
3.5 WBG should incorporate analysis of pandemic preparedness in the SCD that identify a set of priorities for achieving a country's development goals [IWG]	Systematic Country Diagnostic does not adequately address pandemic preparedness			
3.6 WBG and other donors should condition funding related to health system strengthening on country's participation in external assessments [NAM]	No evidence that conditionality has been used to encourage JEE assessments			
4. Leveraging the insurance model, existing loan & grants, and new funding for response and recovery				
4.1 WBG should establish the Pandemic Emergency Financing Facility as a rapidly deployable source of funds to support pandemic response [NAM; UN High-level Panel]	The PEF is established and operationalized; Sustainability challenges need to be addressed			
4.2 The Insurance Development Forum, WBG, and other partners should work together (i) to develop the next iteration of the PEF (PEF 2.0) that ties recipient countries' investments in preparedness to relief of their PEF 2.0 premiums; (ii) stimulate participation from the insurance markets to provide capacity for PEF 2.0; and (iii) investigate how business interruption insurance can be provided to private sector companies [IWG]	The PEF is currently under revision and multiple design options for PEF 2.0 are being explored			
4.3 WHO should create and fund a sustainable contingency fund of \$100–\$300 million to support rapid emergency response through one off contributions or commitments proportional to assessed contributions from member states [UN High-level Panel; NAM]	WHO has created the CFE; Funding levels are below target			
5. Mobilizing funding for R&D for new product development and to strengthen clinical research capacities				
5.1 IDA-eligible countries should commit short- and medium-term resources to address their clinical research capacity goals, potentially from their IDA portfolios [IVTF]	No evidence of completion			
5.2 Research funders should establish a global R&D financing facility for outbreak-relevant drugs, vaccines, etc. when commercial incentives are not appropriate [Harvard–LSHTM]	CEPI has been established, with over \$740 million in funding received			
5.3 WBG should include, as a part of its IDA Mid-Term Review, an investment framework for national and regional clinical research capacities [IVTF]	No evidence of completion			
5.4 WBG should develop mechanisms to buy down IDA loans and convert them into grants for countries that have demonstrated development of research capacity based on agreed milestones [IVTF]	No evidence of completion			
5.5 WBG should collaborate with development partners to incentivize DRM in developing countries for clinical research capacity, including by matching grants and other incentivizing mechanisms [IVTF]	No evidence of completion			
5.6 CEPI should commit resources to strengthening clinical research capacities in LMICs where clinical trials for vaccines against CEPI priority pathogens are likely to be conducted [IVTF]	Some progress documented			
5.7 Private health sector businesses operating in LMICs should commit to maximize their contribution to clinical research capacity in LMICs including by transfer of skills/expertise and/or allocating a percentage of their spending to support the development of clinical research capacity [IVTF]	No evidence of completion			
5.8 WBG, through the PEF and CEPI Trust Funds, should establish a rapid financing vehicle to support the priority outbreak-related research agenda and to strengthen in-country capacity [IVTF]	No evidence of completion			

Recommended action	Status	Traffic light		
5.9 WHO should work with R&D stakeholders to catalyze the \$1 billion p.a. commitment to maintain a portfolio of projects in drugs, vaccines, etc. [NAM; UN High-level Panel]	No evidence of completion			
5.10 WHO and the WBG should develop a resource tracking tool to track funding that supports clinical research capacity-building within the country [IVTF]	No evidence of completion			
6. Sustainable financing to strengthen WHO's capacity for health emergency preparedness and response				
6.1 In May 2016, the World Health Assembly should agree to an appropriate increase in WHO member states' core contributions to provide sustainable financing for the Center for Health Emergency Preparedness and Response [NAM]	Assessed and voluntary contributions to WHO to support emergency preparedness and response must be further increased			
6.2 10% of all voluntary contributions to WHO—beyond program support costs—are mandatorily directed to support the Centre for Emergency Preparedness and Response [UN High-level Panel]	Assessed and voluntary contributions to WHO to support emergency preparedness and response must be further increased			

Sources: Moon 2015; NAM 2016; UN High-level Panel on the Global Response to Health Crises 2016; IWG 2017; IVTF 2018.

Notes: Each of the recommendations is rated satisfied (green), partially satisfied (yellow), or unsatisfied (red). The ratings are based on the best available information, recognizing that there may be additional information and new developments that result in changes.

CEPI, Coalition for Epidemic Preparedness Innovations; CFE, Contingency Fund for Emergencies; IDA, International Development Association; IDA18, 18th Replenishment of IDA Funding; IHR, international health regulations; IMF, International Monetary Fund; JEE, Joint External Evaluation; LMIC, lower-middle-income country; LIC, low-income country; NAPHS, National Action Plan for Health Security; PEF, Pandemic Emergency Financing Facility; R&D, research and development; WBG, World Bank Group; WHO, World Health Organization.

Annex 2: High-Level Initiatives Established Since the Ebola Crisis (in alphabetical order)

Name of initiative	Sponsoring entities	Launch date	Funding goal	Level funded	Other progress	Intervening phase
Africa Centers for Disease Control and Prevention	African Union	January 2017	Initial USD35 million (for 2017 and 2018)	Unknown	3 of 5 regional collaborating centers opened in central, southern, and western Africa	Prevention, detection, response
Coalition for Epidemic Preparedness Innovations	Norway, Germany, Japan, India, Belgium, Canada, Australia, European Commission, World Economic Forum, Gates Foundation, Wellcome Trust	January 2017	Planned USD250 million for 7 years USD1 billion	To be determined 74%	2 calls for proposals to develop new vaccine platform technologies	Prevention, response
European Medical Corps	European Union	February 2016	Unknown	Unknown	11 of 28 European Union countries have contributed experts or equipment, with 1 deployment	Response
REDISSE (World Bank)	World Bank, Gates Foundation, Foundation Merieux, Resolve, Canada, China	2016–2018	USD377 million + USD13 million from trust funds	100%	New REDISSE program in process to cover 5 more countries	Surveillance, preparedness
WHO Global Health Emergency Workforce	WHO member states	May 2016	Unknown	Unknown	64 emergency medical teams from 25 countries and nongovernmental organizations registered	Response
WHO Health Emergency Program	WHO member states	January 2016	USD500 million for 2017	73%		Prevention, detection, response
WHO Contingency Fund for Emergencies	Germany, Japan, United Kingdom	May 2015	USD100–300 million	30%	21 health emergencies have received Contingency Fund for Emergencies funding	Response
WHO Research and Development Blueprint	UK Department for International Development provides core funding for Blueprint	May 2015	Unknown	Unknown	9 priority diseases identified for research and development	Prevention
World Bank Pandemic Emergency Financing Facility	World Bank, Germany, Japan	May 2017	USD425 million insurance market USD50–100 million grants	~100% backed by bonds and credit ~USD64 million received in contributions	6 priority pathogens covered under insurance window	Response

Note: This table has been updated from Ravi 2019.

Notes: REDISSE, Regional Disease Surveillance Systems Enhancement; WHO, World Health Organization.

Annex 3: National Action Plan for Health Security (NAPHS)

Cost Estimates for Strengthening International Health Regulation (IHR) Capacities

Countries	Average annual IHR cost (USD)	Average per capita annual IHR cost (USD)	Total per capita health expenditures (USD)	IHR cost (percentage of total health expenditures)	Domestic per capita government revenue (USD)	IHR cost as percentage of domestic government revenue	GDP per capita (USD)	IHR cost as percentage of GDP
Benin	6,182,712	0.54	30.40	1.77	111.20	0.48	791.50	0.07
Burkina Faso	8,635,555	0.44	42.04	1.04	106.14	0.41	606.55	0.07
Burundi	6,105,858	0.54	19.27	2.82	21.08	2.58	298.01	0.18
Cameroon	17,429,226	0.71	64.47	1.10	181.34	0.39	1,377.87	0.05
Comoros	1,848,916	2.22	59.00	3.76	124.46	1.78	762.74	0.29
Cote d'Ivoire	63,997,721	2.57	75.67	3.40	276.99	0.93	1,494.70	0.17
Eritrea	10,739,147	2.12	29.89	7.09	117.26	1.81	860.27	0.25
Ethiopia	73,752,955	0.69	27.52	2.49	109.06	0.63	802.12	0.09
<i>Ethiopia (excluding immunization)</i>	<i>16,930,915</i>	<i>0.16</i>	<i>27.52</i>	<i>0.57</i>	<i>109.06</i>	<i>0.14</i>	<i>802.12</i>	<i>0.02</i>
Ghana	44,823,265	1.52	70.74	2.15	258.36	0.59	1,551.77	0.10
Indonesia	8,232,747	0.03	118.26	0.03	515.44	0.01	3,604.28	0.00
Kenya	102,597,060	2.01	70.29	2.86	286.12	0.70	1,559.39	0.13
Liberia	30,989,735	6.55	70.05	9.35	215.42	3.04	710.48	0.92
Mauritania	5,186,679	1.14	46.77	2.44	340.57	0.34	1,235.22	0.09
Myanmar	31,704,987	0.59	70.19	0.84	222.56	0.26	1,210.46	0.05
Namibia	7,936,518	3.13	420.02	0.75	1,470.34	0.21	4,864.08	0.06
Nigeria	87,824,668	0.45	83.47	0.54	122.56	0.37	2,207.86	0.02
<i>Nigeria (excluding immunization)</i>	<i>34,824,668</i>	<i>0.18</i>	<i>83.47</i>	<i>0.21</i>	<i>122.56</i>	<i>0.15</i>	<i>2,207.86</i>	<i>0.01</i>
Sierra Leone	52,088,193	6.89	86.31	7.99	55.59	12.40	522.173	1.32
Sri Lanka	4,848,458	0.23	168.25	0.14	543.27	0.04	3,845.99	0.01
Tanzania	120,631,712	2.10	36.07	5.84	130.42	1.61	978.96	0.22

(continued)

Countries	Average annual IHR cost (USD)	Average per capita annual IHR cost (USD)	Total per capita health expenditures (USD)	IHR cost (percentage of total health expenditures)	Domestic per capita government revenue (USD)	IHR cost as percentage of domestic government revenue	GDP per capita (USD)	IHR cost as percentage of GDP
Tanzania (excluding animal vaccines)	17,317,268	0.30	36.07	0.84	130.42	0.23	978.96	0.03
Uganda	4,270,932	0.10	37.61	0.26	91.00	0.11	670.37	0.01
Vietnam	32,130,357	0.33	128.90	0.26	515.79	0.06	2172.01	0.02
Zimbabwe	40,530,284	2.34	93.94	2.49	241.50	0.97	1,111.44	0.21

Source: National Action Plan for Health Security (NAPHS) published on Strategic Partnership Portal (<https://extranet.who.int/sph/publications>); NAPHS costing reports provided by focal point, Country Health Emergency Preparedness & IHR at World Health Organization.

Notes: GDP, gross domestic product.

Annex 4: Methodological Note on Figure 4

Liechtenstein, Somalia, and South Sudan have incomplete data on macroeconomic indicators and so are excluded from figure 3.

Joint External Evaluation (JEE) score is the average of 48 scores from 19 technical areas and related indicators included in the World Health Organization (WHO) JEE framework. Gross domestic product (GDP) per capita, domestic government revenue per capita, and total health expenditure per capita are an average of 2012 to 2016 values.

The authors have no knowledge of any existing global database on domestic government revenue. In the absence of data, we estimated the indicator using two IMF databases. Domestic government revenue ($DOMGOVREV_i$) is calculated using the formula:

$$DOMGOVREV_i = GOVREV_i \times DOMSHARE_i$$

where $GOVREV_i$ is general government revenue data from International Monetary Fund (IMF) World Economic Outlook, and $DOMSHARE_i$ is the share of domestic government revenue in total government revenue. $DOMSHARE_i$ is estimated using data from IMF government financial statistics:

$$DOMSHARE_i = \frac{(TOTREV_i - GRANTREV_i)}{TOTREV_i}$$

where $TOTREV_i$ is government revenue data, and $GRANTREV_i$ is total grants from foreign governments and international organizations. We used the average of the latest five years of available data for $DOMSHARE_i$.

For some countries from which the share of data was not available in the IMF government financial statistics, we used a different method for calculating $DOMGOVREV_i$. In this case, we used data from the Organization for Economic Cooperation and Development Creditor Reporting System (CRS) and the following formula to calculate $DOMGOVREV_i$:

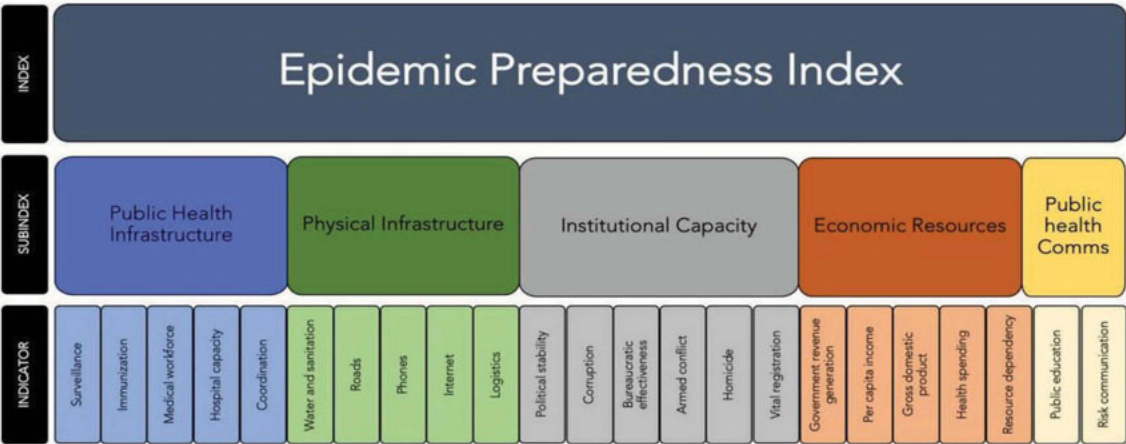
$$DOMGOVREV_i = GOVREV_i - ODAPUB_i$$

where $DOMGOVREV_i$ and $GOVREV_i$ are as defined earlier. The new variable, $ODAPUB_i$, is total official development assistance channeled through the government system, downloaded from CRS.

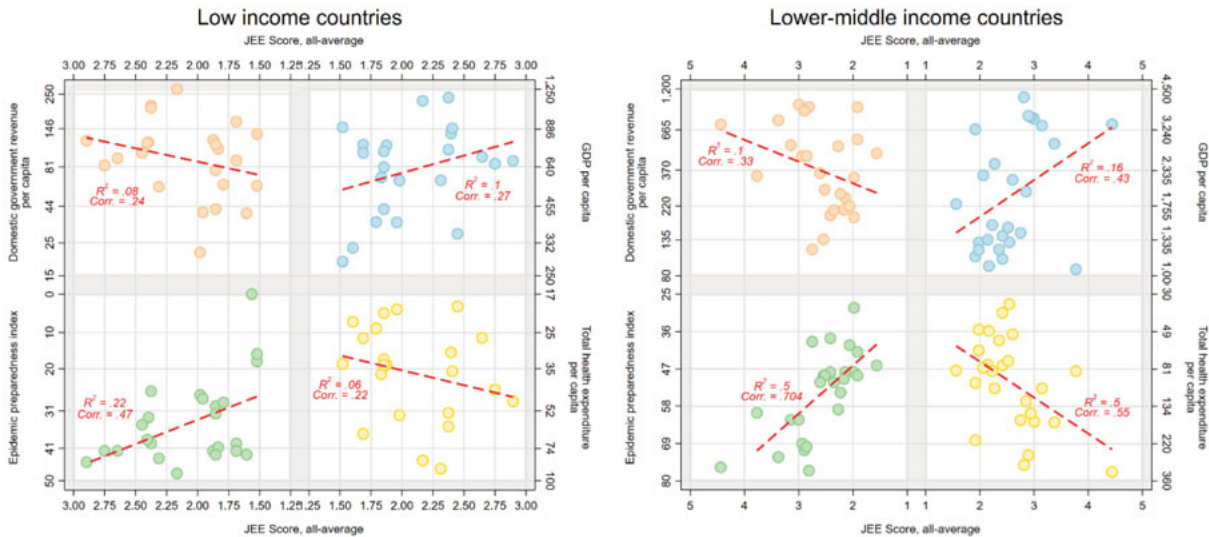
Total health expenditure is the sum of current health expenditure and capital health expenditure. Both indicators are available from the WHO Global Health Expenditure Database.

Metabiota (Oppenheim et al. 2019) developed the Epidemic Preparedness Index to assess a country's preparedness for epidemic and pandemic outbreaks. It is an aggregate of scores of five subindices: public health infrastructure, physical infrastructure, institutional capacity, economic resources, and public health communication (see the following figure).

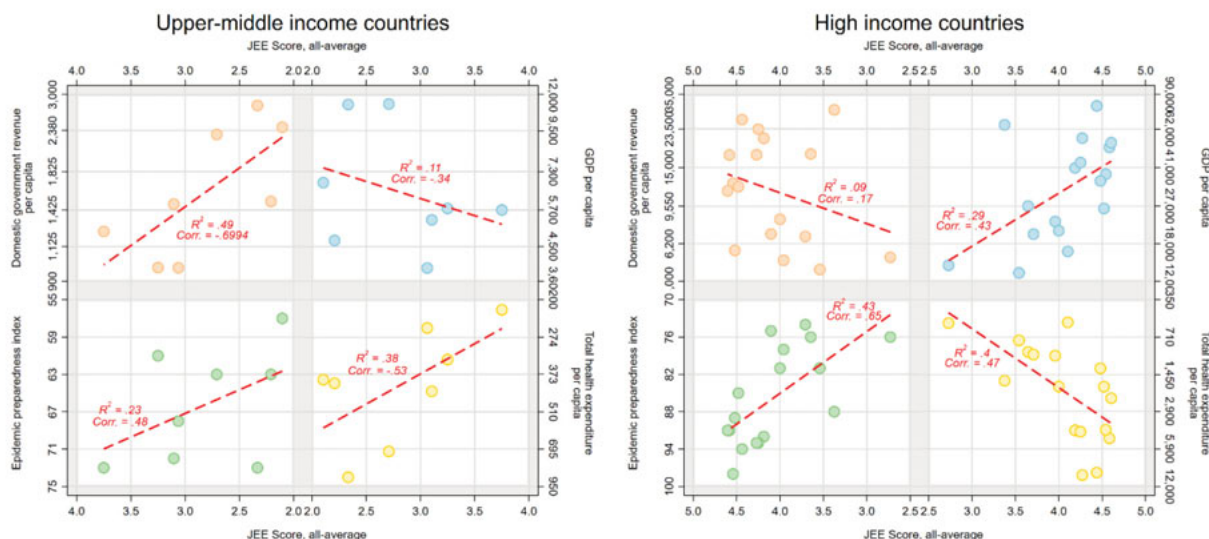
Epidemic Preparedness Index



To assess the influence of GDP per capita and the other three indicators (domestic revenue per capita, epidemic preparedness score, total health spending per capita), a robustness check was conducted by reproducing the quadrant chart according to income group.¹⁵ Except for upper-middle income countries (UMICs), the charts below show that the positive relationships remain. The relationships are expected to be weaker because there are fewer observations. This is especially true for the eight UMICs, which now show inverse relationships except between JEE and epidemic preparedness scores.

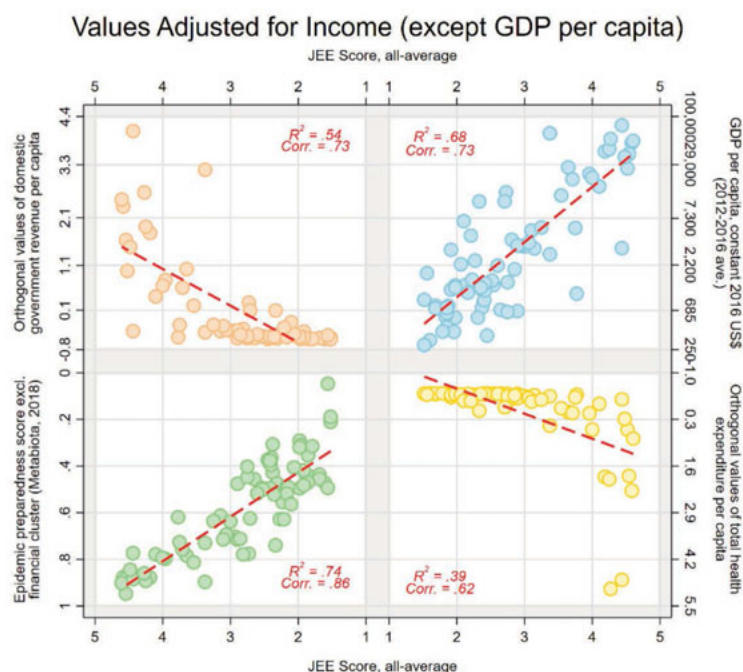


¹⁵ 2016 classification of income groups was used.



As another robustness check, we orthogonalized the values of domestic government revenue per capita and total health expenditure per capita using a modified Gram-Schmidt procedure (Golub and Van Loan 2013). Orthogonalization is a procedure that transforms original variables into a set of orthogonal variables from which the effect of other variables have been removed. We applied the orthogonalization procedure to domestic revenue per capita and total health expenditure per capita separately to adjust for the effects of GDP per capita when analyzing the relationship between these two indicators and JEE scores. We also adjusted the epidemic preparedness score for the effects of income by excluding the economic resource cluster from the aggregate score.

The figure below shows that the positive relationships are still strong, with correlation coefficients greater than 0.6, although coefficients of determination (R^2) are lower for the orthogonal values of domestic government revenue per capita and total health expenditure per capita because of several outliers. For domestic government revenue per capita, the outliers are Qatar and Switzerland. Dropping these two countries would increase the R^2 to 0.731 and the correlation coefficient to 0.855. For total health spending, dropping the outlier countries of Switzerland and the United States would increase the R^2 to 0.483 and the correlation coefficient to 0.695.



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