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Financing the Pandemic Cycle: Prevention, Preparedness, Response, and Recovery and Reconstruction

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ABSTRACT

The COVID-19 (coronavirus) pandemic exposed critical gaps in the global response to health crises, particularly in the financing of pandemic prevention, preparedness, response, and recovery and reconstruction. This chapter presents a comprehensive framework for pandemic financing that spans the entire pandemic cycle, emphasizing the need for timely, adequate, and effective financial resources. The framework is designed to support policy makers in low- and middle-income countries and in high-income nations, providing a guide to appropriate financing tools for each stage of a pandemic, from prevention and preparedness to response and recovery. To underscore the complexities of pandemic financing, the chapter explores key economic concepts such as global public goods, time preference, and incentives. It also highlights the importance of timely, accessible, and sustainable financial instruments. The chapter lists the pandemic financing instruments used for health during the COVID-19 pandemic, identifying 23 different tools. It uses the Institute for Health Metrics and Evaluation's 2024 Financing Global Health database to estimate that US$91.6 billion was spent for COVID-19 health support, primarily for response financing, over 2020 to 2023. The COVID-19 pandemic wrought significant economic impacts on the order of trillions of dollars, even as investment in pandemic preparedness to mitigate future risks is relatively small, on the order of US$10 billion annually. The chapter concludes with policy recommendations, calling for the establishment of a rapid-response financing mechanism, tailored to the unique challenges of pandemics, and a redesign of global health governance to better address these threats.

INTRODUCTION

The COVID-19 (coronavirus) pandemic revealed significant weaknesses in the international response and action (Sachs et al. 2022). Countries and multilateral entities faced a major challenge in how to adequately pay for the response. To pay for pandemic response alone, however, is to neglect the entire scope and cycle of pandemic prevention and preparedness before the response as well as the recovery and reconstruction after the response. Financial resources can create a critical bottleneck for addressing many of the challenges faced during a pandemic, including human resources such as health workers and physical resources such as medical supplies and countermeasures. Financing for pandemics is paramount—in terms not just of the adequate amount or volume but also of timeliness, relevance, and usefulness to countries in the pandemic cycle, from prevention to recovery (Agarwal and Reed 2022). Moreover, it is important to recognize that investing in pandemic preparedness is intrinsically linked to strengthening the overall health care system. A robust health care system creates the synergies for effective pandemic response measures.

This chapter presents a comprehensive framework for pandemic financing that spans the entire pandemic cycle, designed to serve both governments and international funding bodies, with applicability beyond low- and middle-income countries (LMICs) to include high-income nations as well. This framework is structured to assist policy makers in differentiating among various financial instruments and strategies, each tailored to specific phases within the pandemic timeline. It focuses on identifying appropriate financing tools—ranging from immediate emergency funding to long-term recovery investments—and the actions these tools are intended to support at different stages of a pandemic. Moreover, it delineates key considerations and characteristics of pandemic financing, such as sustainability, accessibility, and adaptability to changing circumstances.

In framing this discussion, it is crucial to understand the economic principles that underpin pandemic financing. The following key concepts are particularly relevant: global public goods, time preference, incentives, market failures, and political economy. The prevention and containment of pandemics are considered *global public goods* because their benefits extend beyond individual countries, requiring collective international investment and cooperation. *Time preference* refers to the tendency of individuals and countries to prioritize immediate rewards over future benefits, often leading to underinvestment in pandemic preparedness. This issue is particularly acute in countries where immediate needs overshadow the need to prepare for long-term risks. *Incentives* shape government behavior and financial decision-making. For example, financial instruments such as insurance mechanisms have incentives to encourage countries to act now, by offering lower premiums for countries that invest in preventive measures. *Market failures* refers to when the free market fails to distribute goods and services efficiently, which can occur during a pandemic. *Political economy*, which refers to the study of how politics and economics interact, may help explain why governments fail to allocate sufficient

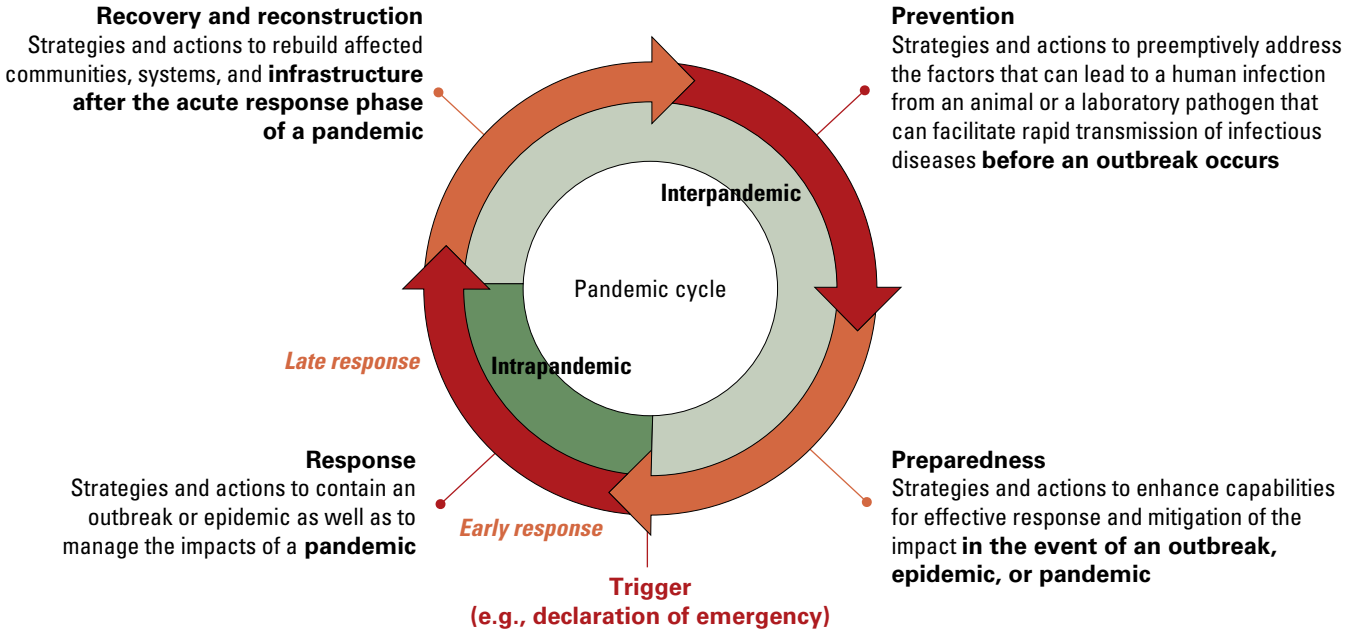
resources toward preparedness. These concepts provide a basic framework for understanding the complexities and challenges of pandemic financing, as detailed throughout this chapter.

The structure of the chapter is as follows: First, it introduces the pandemic cycle, delineating its different phases along with categorizing actions. Next, it delves into the interplay between basic epidemiologic and economic concepts, such as public goods and time preference. Following that discussion, it provides a formal definition of pandemic financing and the range of financing instruments available to countries and international funding agencies. Afterward, it presents a case study that examines the financial flows during the COVID-19 pandemic. Building upon those sections, the next section proposes funding schemes tailored to each phase of a pandemic. Finally, it summarizes the chapter's primary recommendations, emphasizing the imperative for establishing a rapid-response mechanism.

Definition of the Pandemic Cycle

For the purpose of this chapter on financing the pandemic cycle, this section first introduces and defines the pandemic cycle, encompassing four distinct phases of pandemic prevention, preparedness, response, and recovery and reconstruction (figure 13.1). The overall pandemic cycle emphasizes the recurrent nature of pandemics and the corresponding strategies and actions required. Each phase reflects both aspects of timing and types of actions relative to the occurrence of a pandemic, with the prevention, preparedness, and recovery phases considered as

Figure 13.1 Framework for the Phases of the Pandemic Cycle



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"interpandemic" or between pandemics, and the response phase as "intrapandemic" or during the pandemic. Further, prevention and preparedness often occur simultaneously—that is, before a pandemic—but the two phases entail different types of actions. Similarly, recovery commonly overlaps with response.

This chapter aims to inclusively address pandemic financing in a manner that is applicable across various health systems and countries, with a special emphasis on the unique challenges and opportunities present in LMICs. However, the principles and frameworks discussed herein hold relevance for all nations, underscoring the universal challenges pandemics pose and the collective efforts required for effective prevention, preparedness, response, and recovery.

First, the *prevention phase* refers to the strategies and actions that preemptively address the factors that can lead to a human infection from an animal or a laboratory pathogen, or that can facilitate rapid transmission of infectious diseases before an outbreak occurs. The foundation of prevention lies in the initial event that leads to the spread to humans, such as the initial crossover event from animals to human (for example, as governed by a ministry of agriculture or land) or the spread from a laboratory to humans, as well as measures to lower the natural R_0 (the basic reproduction number, or the average number of secondary cases generated by one infected individual in a fully susceptible population), such as the use of universal precautions in health care settings and improved ventilation in public transportation (for example, defined by a ministry of transportation).

Second, the *preparedness phase* also refers to the strategies and actions taken before an outbreak occurs but that focus on enhancing capabilities for effective response and mitigation of the impact in the event of a potential outbreak, epidemic, or pandemic.

The *trigger* is the critical juncture that separates the prevention and preparedness phases from the response phase (refer to chapter 14 in this volume). The trigger is an action taken by a public health authority for a given geographic jurisdiction, which officially labels and declares an incident using an alert system, such as an outbreak, epidemic, or pandemic, with a pandemic typically involving a formal emergency declaration and in accordance with relevant jurisdictional law, and which can benefit from having a tiered scale of alerts for improving communication (Fan, Cash, et al. 2023).

Following the trigger, the *response phase* refers to the strategies and actions to respond to and contain or mitigate the impacts of the labeled incident in a given jurisdiction. The *early response* is characterized by efforts to prevent an outbreak from becoming an epidemic or an epidemic from becoming a pandemic. The goal is to stop all transmission of the pathogen—that is, "to put the genie back into the bottle." The *late response* occurs if the early response does not stop all transmission, and it aims at reducing death and disease through public health measures as well as the development and application of treatments and vaccines. The response phase

includes the period of surge or exponential growth of a given disease as well as its decline following an epidemic curve. The response phase is demarcated by the trigger, indicating the start of the pandemic, and a declaration by the same public health authority that the response phase of the labeled incident has ended. Further, the end of the intrapandemic period or response phase is conceptually simpler for diseases that can be controlled or eliminated, but the ending is less obvious for conditions that persist as naturally occurring in a seasonal fashion or that continue to spread even after an acute response phase, such as with HIV/AIDS or COVID-19.

Next, the *recovery and reconstruction phase* refers to the strategies and actions to rebuild affected communities, systems, and infrastructure following the shocks and traumas of the pandemic period. Arguably, this phase overlaps with the prevention and preparedness phases (for future pandemics), but it is labeled as a distinct postpandemic phase for which the strategies and actions address the societal changes and impacts that resulted from the pandemic.

Categorization of Pandemic Actions

The considerations outlined in the previous subsection guide the systematic identification and categorization of pandemic actions into the four crucial phases of the pandemic cycle (table 13.1), drawing from multiple lists such as the Pandemic Influenza Preparedness framework and Joint External Evaluation tool of the World Health Organization (WHO), Group of Twenty High Level Independent Panel Report, Oxford COVID-19 Government Response Tracker, International Monetary Fund's COVID-19 Policy Tracker,[1] and others (G20 HLIP 2021; Hale et al. 2021; WHO 2022, 2024). This categorization serves as a road map or playbook of possible pandemic actions for which strategic financial planning is necessary to allocate funds at pandemic phase. This approach ensures a methodical, comprehensive, and coordinated strategy for responding to global health crises, addressing the challenges at the global, regional, national, and local levels. Identifying and classifying actions can help improve coordination, collaboration, and assignment of responsibilities, particularly across ministries and sectors as well as between different authorities and agencies, and thus can better address the control of a pandemic.

This categorization aligns with WHO's new framework on Health Emergency Prevention, Preparedness, Response, and Resilience, which emphasizes comprehensive strategies for managing health emergencies (WHO 2023). It differs, however, by incorporating a stronger focus on international governance and regional capacity development, ensuring that both global coordination and local self-sufficiency are emphasized to enhance overall resilience. Although this chapter's list of pandemic actions—or interventions—does not include all the interventions identified in the WHO 2023 report, having a common vocabulary and a consolidated list or playbook of pandemic actions can help policy makers better understand the decision space and the range of available options.

Table 13.1 Pandemic Actions Categorization through the Pandemic Cycle

Category	Strategies and actions
Policies, guidelines, and legal instruments	*Development and dissemination.* Creation of distribution of global and regional policies, guidelines, and recommendations for pandemic prevention, preparedness, response, and reconstruction, including the establishment of a National IHR Focal Point and sharing of national policies
	Regulatory frameworks. Development of regulatory frameworks to expedite the review and approval of products (such as PPE) during emergencies
	Guidelines for points of entry. Establishment of guidelines for international travel, transportation, and points of entry to prevent the spread of disease
	Implementation of national policies. Enforcing national policies, guidelines, and laws regarding case management, testing strategies, health care facility management, and the continuity of essential health services
	Travel and border control. Implementation of travel restrictions, quarantine measures, and health screening at borders to limit the importation of cases
International collaboration, coordination, and initiatives	*Global funding and aid.* Mobilization of international aid and funding to support pandemic prevention, preparedness, response, and reconstruction efforts
	Investment incentives. Encouraging investments from countries and partners to strengthen pandemic response capacities
	Coordination mechanisms. Establishment of clear coordination mechanisms across sectors and levels of government for effective emergency response
	Strengthening global health governance. Enhancing the role of international organizations in coordinating pandemic response, ensuring compliance with international health regulations, and fostering global collaboration
	Accountability mechanisms. Implementing mechanisms for monitoring and evaluating the performance of countries and international bodies in pandemic prevention, preparedness, and response
	Regional capacity development. Supporting the development of regional capacities, including the establishment of regional health centers, strengthening local health systems, and enhancing regional manufacturing capabilities for medical supplies and vaccines
	Global initiatives. Establishment of global initiatives, such as those to address socioeconomic impacts and inequalities exacerbated by the pandemic
Surveillance systems (early detection, monitoring, and reporting)	*Biosafety and biosecurity systems.* Establishment and strengthening of national biosafety and biosecurity systems
	Global surveillance networks. Development of global networks for early detection and monitoring of outbreaks, including genome sequencing and real-time data-sharing platforms
	One-Health surveillance. Routine surveillance to identify new or rare infections in humans (for example, surveillance of fevers of unknown origin) and any zoonotic links of such infections
	National laboratory systems. Strengthening national laboratories by enhancing testing capacities, integrating digital surveillance tools, and improving real-time data reporting and analysis
	Contact tracing and monitoring. Tracking cases, conducting contact tracing, and monitoring disease trends to inform response strategies
Health system capacity and resources	*Pandemic simulation exercises.* Design and implementation of simulation exercises to test and improve pandemic preparedness
	Health care infrastructure. Strengthening of health care infrastructure, including the expansion of hospital beds, critical care units, medical equipment, laboratory capacity, and health care workforce capacities
	Essential health services. Ensuring the continuity of essential health services during a pandemic
	Capacity building for regional manufacturing. Developing regional capacities for the production of medical supplies, including training local workforce, technology transfer, and establishing supply chains

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Table 13.1 Pandemic Actions Categorization through the Pandemic Cycle (continued)

Category	Strategies and actions
Health system capacity and resources	*Supply allocation and distribution.* Planning and managing the allocation and distribution of essential medical supplies (such as PPE and ventilators), vaccines, and other critical resources, including cold chain management, stockpiling, and developing vaccine distribution plans
	Resource mobilization. Deployment of resources, including medical supplies and health care personnel, to regions heavily affected by an epidemic or pandemic
Research and development (vaccines, therapeutics, diagnostics, and PPE)	*Market shaping.* Using mechanisms such as advance market commitments and pooled purchasing to incentivize the development of vaccines and therapeutics
	Fast-track R&D. Accelerating research and development processes for new countermeasures, including diagnostics, drugs, monoclonal antibodies, and vaccines
	Regulatory approval. Streamlining regulatory approval processes to ensure timely access to critical medical interventions, especially in the context of an epidemic
	Technology transfer and IP. Facilitating technology transfer, managing IP rights, and ensuring equitable access to pandemic countermeasures
	Manufacturing and production. Scaling up manufacturing and production capacities to meet global demand
	Supply chain management. Ensuring robust supply chain and logistics management for the delivery and administration of pandemic countermeasures
	Knowledge sharing. Promoting global collaboration and sharing of research findings, best practices, and lessons learned
Risk communication and community engagement	*Public awareness campaigns.* Global campaigns to raise public awareness and trust as well as to counter mistrust and promote preventive behaviors
	Situation updates and misinformation. Regular provision of updates on the pandemic situation, preventive measures, and treatment options while addressing misinformation
	Community-driven assessments. Development of community-driven risk assessments and capacity mapping to tailor responses to local needs
Epidemic control and mitigation measures	*Infection prevention and control.* Implementation of control measures to reduce transmission in research laboratories, health care settings, public spaces, and communities
	Testing and diagnosis. Ensuring access to testing supplies, laboratory services, and information about the most effective and cost-effective diagnostic protocols and tools
	Tier-specific strategies. Development and execution of tier-specific diagnostic testing strategies, treatment plans, and care protocols based on the severity and spread of the pandemic
Reconstruction efforts (throughout the entire cycle)	*Economic recovery.* Implementation of economic recovery measures, including stimulus packages and support for affected industries and businesses
	Social support. Provision of financial assistance, unemployment benefits, food security measures, and support for vulnerable populations
	Mental health services. Establishment of mental health support and counseling services for populations affected by the pandemic

Source: Original table created for this publication.

Note: Green refers to prevention, yellow to preparedness, red to response, and purple to multiple pandemic phases. IHR = International Health Regulations; IP = intellectual property; PPE = personal protective equipment; R&D = research and development.

KEY EPIDEMIOLOGIC AND ECONOMIC CONCEPTS

Understanding the financing of pandemics requires a grasp of epidemiologic and economic principles that can shape how resources are allocated and used. This section delves into the critical concepts of pandemic epidemiology, including the unique characteristics of infectious diseases that differentiate them from other types of disasters. It also explores essential economic concepts such as public goods, time preference, incentives, market failures, and political economy, which underpin the strategies for effective pandemic preparedness and response.

Infectious Disease Epidemiology

Epidemics and pandemics, the latter classified as disasters, possess distinct characteristics that set them apart from other types of disasters such as floods, hurricanes, volcanic eruptions, earthquakes, and tsunamis. They also differ among themselves, including in terms of their time frames, growth patterns, detectability, and transboundary natures.

The time frames differ greatly between natural disasters and epidemics. Whereas natural disasters such as hurricanes can occur over the period of a day, the unfolding impact of an epidemic can be longer, even as cases spread to many people (that is, with a high R_0), but epidemic detection may take weeks depending on the specific biology of the pathogens, the symptoms, or the lack thereof.

Unlike disasters, which generally have an acute phase followed by diminishing impact, infectious diseases unfold in a manner characterized by exponential growth, which can result in surging and widespread transmission. In the case of respiratory pathogens, such epidemics have the potential to eventually reach the entire population unless contained. Infectious diseases invariably follow an epidemic curve in which cases (as well as hospitalizations and deaths) surge, peak, and then decline; however, compared to physical disasters such as earthquakes or hurricanes with peak intensity in a short period of time, such as a day, epidemics are slow. They are also less visible and in some cases invisible, especially if an extended period of asymptomatic infection occurs or if some infections are completely asymptomatic. The most important difference is that, as they grow exponentially, they become exponentially more difficult to contain. Finally, if containment is not possible, then the death and disability they cause does not abruptly end, unlike with a hurricane, tsunami, or flood. Thus, addressing epidemics both early and effectively while considering the potential for sustained efforts over time for mitigation makes infectious diseases quite different from natural disasters.

The transmissible nature of infectious diseases implies that a disease can originate locally but has the potential to escalate into global crises if not contained. Unlike some natural disasters, which are constrained in their cross-border effects, pandemics, particularly of respiratory pathogens, have global reach. A failure to detect and contain an outbreak in one region can eventually trigger devastating consequences worldwide.

Infectious Disease Economics

Four economic concepts are especially important to pandemic financing: public goods, time preference, incentives, market failures, and political economy.

Public Goods

A *public good* is one that benefits everyone, from which nobody can be excluded, and whose consumption does not reduce availability for subsequent consumption. For example, if the use of personal protective equipment by bat guano harvesters in one cave in Liberia makes a pandemic less likely to occur, it will benefit people in the Arab Republic of Egypt, Japan, and Uruguay—and the benefit for someone in Japan is no less because it also benefits Egyptians. Conversely, failure to contain an outbreak does not affect just the community or country that failed to contain it but can have repercussions for every country, as demonstrated by the COVID-19 pandemic (Schäferhoff et al. 2019).

The prevention and control of infectious diseases as public goods are challenging because, once infected, an individual will underinvest in the control and spread to others. At the same time, those who are not yet infected may also underinvest in protection because they can free ride on others protecting themselves individually—for example, through immunization and adequate herd immunity.

Public goods have a characteristic of geographic scale or scope: local (for example, fire protection), national (for example, national defense), regional (for example, regional epidemics), and global (for example, pandemics and mitigation of climate change). The control and prevention of pathogens may vary in their local, national, regional, or global spread and thus their geographic scope as a public good. For example, the control of respiratory pathogens arguably has greater scope to be a global public good, whereas the control of bloodborne diseases may be mostly limited to a regional public good (Fan, Cash, et al. 2023).

Public goods become more challenging as scale increases, because the involved entities increase in their number, diversity, and type beyond individuals. In the case of global public goods, entities are no longer individuals alone but countries, with countries able to free ride on the levels of preparedness of other countries. Consequently, according to this logic, individual countries would underinvest in preparedness if most of the benefits accrue to those in other nations. Standard economic theory would justify government or at least collective intervention to address public goods. Adequate funding of global public goods would require that countries everywhere contribute proportionately so that each country can benefit.

Pandemic preparedness has often been framed as a public good, but it may also be characterized as a merit good with positive externalities. Unlike pure public goods, which are both nonexcludable and nonrivalrous, many core capacities for prevention and preparedness—such as surveillance systems, laboratory networks, and health workforce training—confer substantial direct benefits to the countries that invest

in them, in addition to providing spillover benefits to others. Countries with strong prevention, preparedness, and response (PPR) systems are better equipped to detect and contain outbreaks early, reducing domestic health and economic disruptions while simultaneously lowering the risk of cross-border spread.

Time Preference

The economic concept of *time preference* or time discounting refers to the differential valuation that individuals or countries place on receiving a good now compared to later, or at an earlier date compared to a later date, with a tendency to discount rewards in the future compared to the present. Time preference or discounting may explain the much lower investment in preparing for pandemics for which benefits would be observed at an unknown future date, compared to more investment in responding to a pandemic when the benefits are immediately observed (even if, as noted earlier, the immediacy of epidemics is less immediate than other natural disasters). Countries with greater resource constraints, such as LMICs, may have more significant time preference, especially countries addressing immediate or basic needs such as food security. Political cycles also affect time preference, because leaders tend to focus on short-term gains that can be seen during their time in office.

Adopting a long-term perspective can counter the tendency for large time discounting compounded by short-term preferences of political cycles. A long-term view would imply not only a smaller discount rate but also the role of contracts and agreements, such as through international cooperation, that can create long-term commitments for countries to persist in their investments in pandemic preparedness over time, irrespective of changes in leadership and political priorities, or as a deterrent if they fail to do so. Such a long-term perspective may also be interpreted as sustainability, previously defined by the United Nations Brundtland Commission as meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations Brundtland Commission 1987, section I, para. 27).

Incentives

The theory of *incentives* and the principal-agent problem are essential to understanding any payment of financial resources and the risks of moral hazard (Laffont 1993; Laffont and Martimort 2002). Paying a country to be prepared involves different incentives compared to a country investing its own resources to be prepared. Given the potential global impact of local preparedness or lack thereof, neighboring areas and beyond may be concerned that the lack of preparedness in another locale can spread and affect their locale. In contrast, purchase of insurance by a country, on the expectation that the insurer will provide assistance, may result in moral hazard, that is, engaging in risky behavior that may necessitate a payout from the insurer. Thus, any discussion of pandemic financing should recognize the

ways in which funding flows and recognize that associated agreements and contracts have incentives in shaping behavior, particularly of governments.

The relationship between an international funding agency and a country can be formally defined as a contract and interpreted formally as a principal-agent relationship, with its associated challenges of incentives. A financing flow thus has two aspects: (1) its role of mobilizing revenues and resources to a country (from the perspective of the receiving country), and (2) the aspect of purchasing and payment, in which an international agency pays a receiving country for a contractually agreed set of services or goods. From the perspective of external financing as resource mobilization, external financing represents one of multiple sources of revenues as a government policy maker decides how to spend its resources. Past research on the consequences of foreign assistance to countries indicates the potential for aid fungibility; that is, an increase in foreign assistance for health may be associated with a decrease by the country in domestic government health spending, with implications for sustainability (Dieleman, Graves, and Hanlon 2013).

Market Failures

During a pandemic, *market failures*—when the free market fails to distribute goods and services efficiently—become evident in the allocation of scarce inputs such as diagnostic tests, antimicrobial drugs, and vaccines. For instance, countries with resources or production capacity may hoard or ban the export of supplies instead of distributing them to populations in greater need or lacking the ability to pay.

The market failures in this context arise from several factors. First, the global inequality in incomes underpins stark differences in ability to pay for supplies and medical countermeasures during a pandemic, not least of which are vaccines. Compounding this inequality is the lack of timely sharing of financial resources between high-income nations and lower-income nations that lack resources to purchase needed supplies or put down deposits to get in the queue for the purchase of such supplies. The sharing of those resources requires a coordinated international mechanism involving timely, respected, and authoritative resource allocation. Second, intellectual property rights create time-bound monopolies to encourage the private sector to invest in developing new products. International agreements provide for the suspension of such monopolies when needed to confront a public health emergency. However, the mechanisms to do so are so slow, cumbersome, and restrictive that they have not successfully accelerated access to products in the event of an emergency such as the COVID-19 pandemic—not even for products developed with a large proportion of public funding. Third, national governments have exacerbated the problem by restricting export of key products until fully satisfying local demand (even enabling stockpiling) before meeting the needs of people at greater risk in other countries. During the COVID-19 pandemic, short supply and individual hoarding behaviors among those who could pay led to temporary shortages of key products such as face masks.

Political Economy Factors

Although externalities justify some level of international financing and coordination, the significant internalized benefits may suggest that underinvestment in PPR cannot be attributed solely to the public good dilemma. The other microeconomic concepts such as time preference and incentives provide useful insights into decision-making, but their application to pandemic preparedness must be complemented by a broader political economy and institutional design perspective. *Political economy* refers to the study of how politics and economics interact and how they shape each other. A broader set of political economy factors may play a larger role in explaining why many governments fail to allocate sufficient resources for preparedness.

Unlike individuals or firms, national governments operate within political, bureaucratic, and fiscal constraints that shape their willingness and ability to invest in preparedness. Political leaders, for instance, may prioritize short-term electoral gains over long-term resilience, particularly in democratic systems with frequent election cycles. Institutional fragmentation—both within governments and across international actors—can further limit coordinated action, leading to underinvestment in preparedness despite clear long-term benefits.

Moreover, despite their relevance in shaping the production and allocation of medical countermeasures, market failures interact with geopolitical competition, industrial policy, and national security concerns, which influence decisions on research and development, manufacturing, and distribution. Consequently, financing mechanisms for pandemic preparedness cannot be framed solely as correcting market failures but must also account for political incentives, institutional coordination challenges, and the strategic interests of key players. Thus, an approach that may be more pragmatic or feasible relative to a proportional allocation system may be to align preparedness financing with equity-driven investments in lower-income countries, recognizing the political and economic motivations of wealthier nations while leveraging their potential spillover benefits.

Policy Implications

Together these economic concepts force us to consider how the allocation of resources and responsibilities should vary throughout different phases of a pandemic, including considerations on whether funding should be withheld from countries that opt out of global efforts.

In an ideal scenario, all countries would contribute to funding for pandemic prevention, preparedness, and early response—at least for regional or global public goods—under a fair and agreed-upon funding formula. Such a formula could rely solely on countries' ability to pay, akin to assessed contributions to the regular budgets of international organizations like the United Nations Secretariat or WHO. Alternatively, it could be refined to account for the fact that larger countries derive a substantial portion of the global benefits, whereas smaller countries benefit less,

thus implying consideration of gross domestic product or population in aggregate. This approach would acknowledge that smaller countries might require a more favorable cost of participation because they have fewer incentives for engagement in global prevention and preparedness efforts.

In practice, however, existing multilateral institutions of the United Nations, and WHO specifically, remain the only global mechanism to which all countries will contribute, regardless of their level of preparedness or ability to respond. Proposals to use standard measures of preparedness as the basis for allocation funds to countries have not advanced because the COVID-19 pandemic demonstrated that such scores did not predict preparedness and health performance. The presumption that countries with higher incomes or even higher preparedness scores would necessarily be better able to respond to a pandemic did not bear out during the COVID-19 pandemic (Pablos-Méndez et al. 2022). Thus, it follows that developing an acceptable formula for allocation funding for pandemic preparedness and response remains elusive.

If an outbreak or an epidemic occurs anywhere on the planet, every country, regardless of preparedness status or contribution to a multilateral institution, should be fully eligible for global assistance—financial, human, informational, and material—as needed to contain the outbreak or epidemic. Besides obvious humanitarian reasons, not trying to contain outbreaks or epidemics in a country would not be in the enlightened self-interest of neighboring countries and the global community, because of the global public good nature of controlling the pathogen (or disease), which helps reduce the risk of cross-border spread.

Once a pandemic takes hold and containment becomes infeasible, however, the dynamic shifts. The country will primarily retain most of the benefits from country-level efforts to slow transmission or reduce the case fatality rate through treatment. In the context of a pathogen with high potential for mutation, such as COVID-19, country-level efforts to reduce transmission may have some global benefits, but even that outcome is uncertain.

A commonly understood public good, fire protection, serves as an illustrative analogy for infectious disease. It would be illogical to deny assistance from the fire department to a house lacking fire insurance. Doing so would put neighboring houses at risk. If the homeownere lacks insurance or engages in fire-prone risks, however, the community may not feel obligated to rebuild or provide temporary housing. Similarly, although the global community may opt to provide humanitarian assistance to countries whose leaders previously declined to participate in global pandemic financing mechanisms, it does not have the same global imperative to aid those that abstained from prior engagement or actively engaged in risky behavior. In this regard, the International Health Regulations could be seen as an indication of participation, good faith, and compliance with agreed-upon prevention and preparedness efforts.

Addressing Market Failures in Medical Countermeasures and Manufacturing

Among the alternatives to address these market failures, two approaches stand out and are not mutually exclusive: (1) implementing binding international agreements to ensure equitable distribution of supplies (for example, streamlining the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) waiver process during emergencies like pandemics) and (2) establishing distributed manufacturing capacity to ensure availability across all regions, not just in a select few producing or high-income countries (coupled with, for example, implementing a robust and swift protocol for technology transfer pools), and assuming that regional manufacturing improves equitable distribution.

Setting up manufacturing in different parts of the world is a strategic move to improve resiliency in pandemic response and offers several advantages. First, it allows for quicker and more accessible distribution of medical supplies and vaccines, because products can be made closer to where they are urgently needed. Regional manufacturing reduces the time and complexity involved in shipping goods across long distances, especially in crisis situations when time is of the essence.

Second, it enhances the resilience of global supply chains by diversifying the locations of manufacturing. Such diversification helps avoid the severe disruptions that occur when a key production area is hit by an outbreak or other crises, or imposes (often temporary) export bans as a result of "vaccine nationalism" to ensure national stockpiles and adequacy (Wagner et al. 2021). Decentralization also promotes equity in access to essential health products. During the COVID-19 pandemic, countries hosting manufacturing facilities—such as China, India, the Russian Federation, and the United States—had prioritized access to vaccines and supplies, leaving other countries at a disadvantage in terms of timely and affordable access. Distributed manufacturing capabilities can help address the principle of fair access to the tools needed to combat a pandemic.

Third, local manufacturing can drive economic, technological, and scientific development and capabilities in different regions. Such development and capabilities can empower regions to become more self-sufficient and less reliant on imports for critical health supplies, allowing them to serve as potential industrial producers, and with potential spillovers in other technological domains. Overall, regionalized manufacturing prepares us better for future health emergencies, making our response more resilient, rapid, equitable, and effective.

DEFINITION OF PANDEMIC FINANCING

This section moves on from an examination of epidemiologic and economic concepts to defining pandemic financing as inclusive of three aspects: health financing and two of its subcategories (official development finance and non-flow financial instruments), official development finance pertaining to a pandemic, and non-flow financial instruments[2] relevant to ministries of finance in addressing a pandemic or disaster.

Health Financing Frameworks

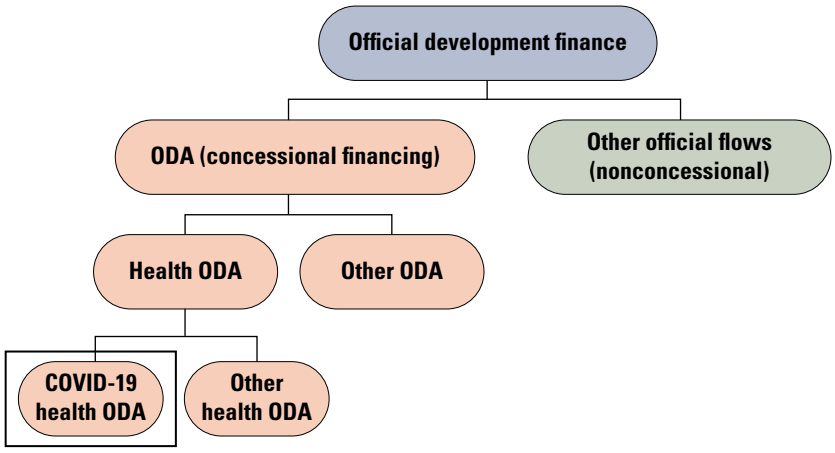
Definitions of *health financing* vary. WHO defines it from a national perspective as revenue raising, pooling of funds, and purchasing of services related to health, typically the remit of a ministry or department of health. Roberts et al. (2008) emphasize the revenue mobilization and pooling functions of financing, classified into six categories: general revenues, social insurance, private insurance, community financing, out-of-pocket financing, and external flows. That framework distinguishes between financing and payment. *Payment* is defined as the methods and incentives associated with transferring funds between the principal and the agent in a contractual relationship, often conditional on the delivery of a given service or good and with incentives as noted earlier. In contrast, the WHO framework places the purchasing function as part of financing[3] (Fan, Sharma, and Hou 2023).

Of the six different sources of financing identified by Roberts et al. (2008), external flows generally refer to the varieties of official development finance (ODF), for which the ODF addressing pandemics is the next component of this chapter's definition of pandemic financing. The Organisation for Economic Co-operation and Development formally defines external flows as inclusive of ODF, which comprises official development assistance (ODA) of a concessional nature and other official flows (OOF), which are nonconcessional. Within the ODA category, it further distinguishes between health ODA and other ODA (for example, for other sectors such as education), with an additional distinction between health ODA for pandemics compared to health ODA not explicitly for addressing pandemics (figure 13.2). The same classification can also be applied to other ODA, with some portion of other ODA addressing pandemics and the rest not, and similarly parsed for OOF (health and pandemics). Despite the necessity of considering flows for other sectors, for the purpose of quantitative analyses in this chapter, discussion is restricted primarily to external flows related to health and, within that, for pandemics. This chapter presents analyses of external flows based on this definition, supplemented by international spending on research and development for COVID-19. Note also that this analysis does not capture non-flow instruments, namely international insurance contracts, discussed later in the chapter.

Implications of Organizational Design and Structures on Pandemic Financing

The characteristics of governance and organizational structures largely determine pandemic financing rather than the other way around. The authorized ministry or agency (of a particular sector) responsible for the funds often categorizes and classifies these funds, at both the national and the international level. These sectoral or ministerial silos define who has the resources and who does the implementation—consequently, different incentives exist depending on differences in the principal-agent relationship across ministries (Das Gupta et al. 2009). The organizational design, structure, and governance within a country and between countries and agencies for international cooperation have great implications for pandemic financing. Silos remain a major, if not inevitable, challenge in ensuring synergistic coordination of resources and avoidance of duplication of efforts (or even working at cross-purposes).

Figure 13.2 Classification of Official Development Finance for Health ODA



Source: Original figure created for this publication.

Note: ODA = official development assistance. The box around "COVID-19 health ODA" highlights it as a subset of health ODA that was separately tracked because of its relevance during the pandemic response.

From a national perspective, professionals in the health sector continue to view health as the primary sector responsible for preparing, responding, and recovering from a pandemic, even though a pandemic affects all sectors and several sectors may contribute to increasing pandemic risks, such as land use and environmental planning, agriculture, animal husbandry, and One Health considerations. The organizational design and structure in which ministries relate to each other, such as hierarchically or laterally, all have implications for how financing incentives affect different ministries (Das Gupta et al. 2009; Fan 2022).

From an international perspective, different international agencies are responsible for different functions in the pandemic cycle. International financial institutions function within governance frameworks shaped by member states, shareholders, and their own internal mechanisms. These governance structures influence how decisions are made and resources are allocated. Rather than a single entity determining the course of action, pandemic response governance emerges from the interactions among multiple institutions, each operating within its own mandate, priorities, and constraints. The fragmentation in international governance reveals a fundamental tension and unresolved question about which agency should decide what happens and how—for example, should it be WHO as the leading United Nations entity on health matters or the Bretton Woods institutions that currently have the lion's share of the multilateral resources?

This chapter argues that sectoral silos are both necessary and a potential hindrance during a pandemic. During the pandemic response phase, all sectors—not only health—are stressed and responding to dynamical changes because of the pandemic; thus, a large proportion of financing in all sectors could be labeled as pandemic financing. Before and after a pandemic or health emergency, however, most countries clearly do not use most ODF and government financing to address

pandemic prevention, preparedness, response, or recovery. An overly broad notion of pandemic financing will not be pragmatic, but an overly narrow one will miss significant expenditures, especially outside of the health sector. Whereas sectors are necessary for implementation, their creation of silos also risks poor coordination, duplication of effort, and confusion in terms of authority and responsibilities—a pattern arguably seen regularly at both national and international levels during the COVID-19 response.

Definition of Pandemic Financing

A definition of pandemic financing restricted to domestic and external financing for health and specifically for pandemic-related health, adopted for this chapter, is admittedly too narrow. Unfortunately, because of data limitations, the chapter presents data only on health ODA for COVID-19. Excluded from the analysis of funding flows is a complete listing of OOF for COVID-19 including health OOF as well as other COVID-19 ODA not focused on health (refer to figure 13.2).

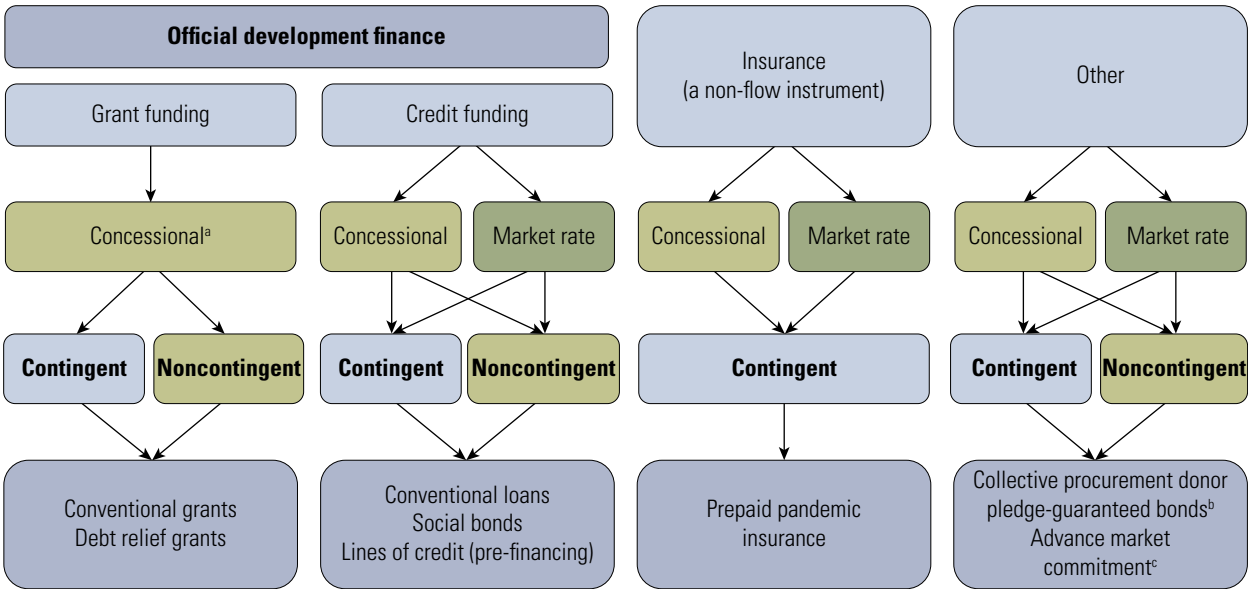
Despite the limitations of this quantitative analysis of flows, this chapter's definition of pandemic financing goes beyond health financing and health ODA for COVID-19. As noted by others, ODF is a concept limited to actual flows, rather than promises or contractual agreements or arrangements for payment, such as guarantees or insurance payouts. Such contractual agreements may not require immediate payment from one actor to another but set the conditions under which payments can be rapidly made or in some cases be suspended, in the case of debt suspension clauses that suspend debt servicing payments in the context of an emergency.

Many health financing mechanisms, including for ODF—such as ODA and OOF—also have contractual arrangements or terms and conditions of what is required for a country to be eligible to receive such flows (so-called eligibility policies), how much the country should contribute (so-called domestic financing policies), and how much risk a country is responsible for (which can refer to repayment or debt servicing in the case of loans, whether concessional or nonconcessional). Non-flow tools often refer to contractual arrangements between a payer and payee, which would reflect the purchasing or payment function rather than the revenue mobilization or pooling function of financing.

Instruments for Pandemic Financing

Multiple instruments are available for external pandemic financing, each serving different purposes across the pandemic cycle (figure 13.3). These financial instruments can be categorized by their terms and conditions, including whether they are concessional or at market rate, and whether they are contingent or noncontingent. Such classifications help policy makers and stakeholders identify the most appropriate financing mechanisms to address the various stages of the pandemic cycle.

Figure 13.3 Classification of External Pandemic Financing Tools, by Key Characteristics



Source: Original figure created for this publication.

a. *Concessional* refers to various forms of subsidies by donors. Grants are typically fully subsidized but can require national cofinancing. Concessional credit usually has interest rates that are below market rates. Concessional insurance reduces the premium paid by the insured. Concessional collective procurement uses subsidies to reduce the prices paid by some purchasers.

b. For example, under the International Finance Facility for Immunisation, donor pledges guarantee private bonds that enable immediate expenditures.

c. A mechanism like an advance market commitment could be nonconcessional if the agreed minimum demand for a product is met but could trigger a donor-funded payment if the demand is not met (similar to a concessional insurance policy). The quantitative analysis used here does not capture non-flow instruments.

This chapter defines *contingent* as referring to funding that is prenegotiated but released or activated only when specific trigger conditions are met. These trigger conditions—such as a pandemic, a natural disaster, or financial crisis—are typically possible, but not likely, in any given year. Such contingent financing refers to a specific type of conditionality on financing, but other kinds of financing conditionalities exist, such as conditions on whether the recipient complies with the terms of the financing (for example, ensuring financial controls and reporting requirements, using the funding for designated purposes, and demonstrating cofinancing), common to development financing.

Figure 13.3 categorizes instruments for pandemic financing into four primary types: official development finance (subdivided into grant funding and credit funding), insurance, and other.

- Grant funding includes conventional grants and financial mechanisms such as debt relief, which can be either contingent or noncontingent in nature. Whereas conventional grants are nonrepayable funds, debt relief involves modifying or reducing existing debt obligations to alleviate financial burdens.

- Credit funding includes concessional loans (offered at lower-than-market interest rates), market-rate loans, social bonds, and lines of credit (preagreed financing). The loans can be contingent or noncontingent, depending on whether they are activated only when specific conditions are met.
- Insurance represents a non-flow instrument such as prepaid pandemic insurance, which is inherently contingent, activating upon the occurrence of specific events or conditions and with regular premium payments, which can be market rate or concessional (subsidized).
- The "other" category refers to purchasing arrangements and market-shaping instruments, as distinct from the first three instruments that function primarily for revenue mobilization and pooling (Dissanayake and Camps Adrogué 2022, 2023). Collective or pooled procurement can both reduce required outlays by reducing prices and increase access because producers prioritize large buyers (Dubois, Lefouili, and Straub 2021). The instruments can be concessional if donor subsidies reduce effective prices for some purchasers. Advance market commitments (AMCs) are binding commitments to purchase a specified product at a preset price as an incentive for producers to allocate their resources for developing the desired product (Kremer, Levin, and Snyder 2020). The AMC for a pneumococcal vaccine arranged by Gavi, the Vaccine Alliance was donor funded (concessional) with country financing. AMCs do not necessarily require pooled procurement but can benefit from pooled procurement—that is, pooling demand from multiple countries. Pooled procurement and the pneumococcal AMC have not been contingent on an epidemic or pandemic. A prenegotiated mechanism that pools country demand could be triggered in a future pandemic to collectively purchase vaccines, for example, and would be an example of a contingent collective purchase instrument. If linked to a contingent financing mechanism, it could enable LMICs to compete more effectively for scarce products with high-income countries on both volume and price.

Box 13.1 provides an overview of the types of external financing instruments, which exclude domestic revenue mobilization involving government revenue, primarily derived from taxation.

Box 13.1

Overview of the Types of External Financing Instruments

Grants do not have repayment requirements. Two broad categories of grants exist: those that fall within the on-budget framework and those that operate off-budget. On-budget grants are funds directed through the recipient country's government budget and financial system, whereas off-budget grants do not follow the recipient country's official budget and financial management systems. In the on-budget framework, the recipient government assumes ownership of the financing and is responsible for fund use. Conversely, in the off-budget framework, donors retain more control over fund allocation, enabling them to target specific projects or sectors inside or outside of government institutions.

box continues next page

Box 13.1 Overview of the Types of External Financing Instruments (continued)

Debt relief instruments are measures creditors take, often in coordination with international financial institutions, to reduce or restructure the debt burden of debtor countries. These initiatives can include forgiveness of a portion of the debt, extension of payment periods, reduction of interest rates, or conversion of debt into grants. The goal is to alleviate the financial stress on nations struggling to meet their debt obligations, enabling them to direct more resources to critical needs such as health care and social programs, particularly during economic hardship. Debt relief programs often span several years, with gradual reductions in debt burdens. Debt relief can be triggered by prespecified conditions (contingent).

Concessional loans typically have below-market interest rates because the negotiated interest rate is below market or because the loans have interest-free grace periods. The lending institution or a third party may subsidize the interest rate. The loans may also offer the option to repay in the borrower's local currency or provide other terms that reduce the exchange rate risk.

Nonconcessional loans are financial credits provided at terms and interest rates closer to market rates. They typically have shorter grace periods and repayment schedules than concessional loans. Such loans are usually used by middle-income and high-income countries for larger-scale projects with the capacity to generate economic returns.

Emergency or contingent loans are specific types of loans that have expedited approval processes to ensure rapid access to funds during emergencies requiring immediate financial intervention. To facilitate rapid disbursement, these loans often come with prenegotiated terms activated in an emergency, with interest rates and repayment schedules that reflect the situation's urgency and the borrower's repayment capacity. The preset terms allow for quick action when conventional loan procedures might be too slow to address the pressing needs of the situation. Although designed for rapid disbursement, emergency loans can be limited by the availability of emergency financing facilities and the prenegotiated terms. Similar to a contingent loan is a line of credit that can be activated by the borrower, perhaps with conditions that limit what the funds can be used for.

Insurance mechanisms are financial arrangements designed to manage risk and provide compensation in the event of specific losses or damages. They collect regular payments, or premiums, from a large group of policyholders. When a covered event occurs, the mechanism disburses funds from the collective pool to the affected parties per the terms outlined in their insurance policies. In global health, insurance can play a crucial role by offering countries a way to mitigate financial risks associated with large-scale health crises like epidemics and pandemics. Despite offering quick access to funds in the event of an incident, international insurance mechanisms are limited by the coverage scope and the ability to accurately predict and quantify risks. Concessional insurance products typically involve a donor paying a portion of the premiums.

Guarantees are commitments by a guarantor, usually an international financial institution, to assume responsibility for a debt obligation in the event that the borrower country defaults. Guarantees are often used to secure a loan, reduce the risk for lenders, and improve the borrower's credit terms. Because they mitigate the risk to the lender by providing a promise of repayment from a financially stable guarantor, guarantees can enable developing countries to access capital markets or secure loans for development projects at better rates. The timeline for guarantees depends on the underlying financial arrangements and agreements, typically aligned with the project. Guarantees may be associated with either conventional loans or contingent loans.

Mapping Instruments to External Stakeholders

Table 13.2 presents a mapping of the existing external financing instruments by the different stakeholders. It categorizes each instrument by source, type of instrument, purpose, trigger/eligibility criteria, and repayment terms. Because of time and effort limitations, 15 funding agencies were purposively selected, with a focus on the largest agencies involved in COVID-19, those with a history of substantial contributions to global health, and organizations actively adapting their instruments in response to lessons learned from the pandemic. Additionally, agencies representing diverse funding mechanisms and geographic regions were considered to ensure a comprehensive overview of the global financing landscape. For each agency, review of a number of information sources, including financial reports, funding announcements, and press releases, resulted in a catalog of 31 different instruments. Although not comprehensive, the list captures many of the primary external instruments in use or under active consideration for pandemic prevention, preparedness, response, and recovery and reconstruction.

Different types of stakeholders were examined for this chapter: international multilateral organizations (such as WHO, the United Nations Children's Fund, and the United Nations Development Programme); multilateral regional organizations such as the Africa Centres for Disease Control and Prevention, and Pan American Health Organization; international financial institutions such as the African Development Bank, Asian Development Bank, Inter-American Development Bank, International Monetary Fund, and World Bank; bilateral donor agencies (such as the German Agency for International Cooperation, Japan International Cooperation Agency, and US Agency for International Development); global health initiatives (such as the Coalition for Epidemic Preparedness Innovations; Gavi, the Vaccine Alliance; and the Global Fund to Fight AIDS, Tuberculosis and Malaria); philanthropic organizations (such as the Gates Foundation); and research institutes (such as Institut Pasteur).

Box 13.2 presents an overview of the external organizational stakeholders. Excluded from the landscaping exercise was financing for national security or defense purposes. Importantly, although the broader stakeholder list for this chapter includes some regional organizations—such as the Africa Centres for Disease Control and Prevention—box 13.2 focuses only on global and multilateral external organizations, and therefore does not include regional entities or domestic financing arrangements.

The landscaping exercise found most of the financial instruments in the response phase of the pandemic cycle, with 23 identified tools representing most of the available resources. Those instruments, primarily contingent loans, were crucial for providing immediate financial liquidity in a crisis. The emergence of several tools in the aftermath of the COVID-19 pandemic indicated a strategic pivot to developing new financial mechanisms to address health crises. The landscaping exercise revealed that reactive financing strategies are more prevalent than proactive ones that address pandemic prevention and preparedness.

Table 13.2 Pandemic Financing Instruments Matched to Pandemic Phases

Source	Facility	Instrument type	Pandemic phase(s)	Purpose	Trigger/Eligibility	Repayment terms
World Bank	Pandemic Fund	Grant	Prevention, Preparedness	A multilateral financing mechanism dedicated to providing multiyear grants for enhancing pandemic preparedness in LMICs.	Prioritize high-impact investments in (1) early warning and disease surveillance systems, (2) laboratory systems, and (3) strengthening human resources/public health and community workforce capacity.	Does not apply.
World Bank	IDA19 Scale-Up Window	Concessional loan	Prevention, Preparedness	Designed to scale up IDA financing to support high-quality, transformational, country-specific or regional or both, with a strong development impact.	Countries must have a low or moderate risk of debt problems.	Different choices of repayment schedules.
World Bank	IBRD Flexible Loan	Market-based loan	Prevention, Preparedness	Leading loan product of the World Bank for public sector borrowers of middle-income countries. Allows to customize repayment terms (that is, grace period, repayment period, and amortization profile) to meet debt management or project needs.	IBRD general lending terms.	Long maturities, up to 35 years. Market-based interest rates.
IMF	Resilience and Sustainability Facility (RSF)	Concessional loan	Prevention, Preparedness	Provides affordable long-term financing to countries undertaking reforms to reduce risks to prospective balance of payments stability, including those related to climate change and pandemic preparedness.	Linked to reform progress. Each measure is connected to one RSF disbursement. A reform measure can be a single policy action or a set of very closely related actions constituting a single reform.	20-year maturity and a 10½-year grace period during which no principal is repaid.
ADB	Ordinary Capital Resources (OCR)	Concessional or market-based loan	Prevention, Preparedness	General ADB financial mechanisms for member countries seeking to strengthen their health systems and enhance preparedness for future pandemics.	Market-based OCR loans are usually given to middle-income countries with stronger economies, whereas concessional OCR loans are for those with lower per-capita GNI.	Depending on group categorization: A, B, and C.
PAHO	Revolving Fund for Procurement	Collective procurement	Prevention, Preparedness	Designed to facilitate the procurement of essential medicines and health supplies for member countries by leveraging collective purchasing power. Operates on a revolving basis whereby member countries are expected to repay the funds they use for the procurement of health supplies.	Membership, commitment to repay; health product needs; financial integrity.	Varies per case.
World Bank	Development Policy Loan with Deferred Drawdown Options for Catastrophe Risks	Concessional or market-based loan	(Early) Response	A contingent financing line that provides immediate liquidity following a natural disaster or health-related event. Concessional for IDA members, market-based for IBRD members.	The member country's declaration of a state of emergency. Recipients must (1) have an adequate macroeconomic policy framework; and (2) be preparing, or already have, a satisfactory disaster risk management program.	Standard IDA or IBRD repayment terms.

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Table 13.2 Pandemic Financing Instruments Matched to Pandemic Phases (continued)

Source	Facility	Instrument type	Pandemic phase(s)	Purpose	Trigger/Eligibility	Repayment terms
World Bank	Immediate Response Mechanism (IRM)	Concessional loan	(Early) Response	Allows participating IDA countries to have immediate access to up to 5 percent of the undisbursed balances of their IDA project portfolio in the event of an eligible crisis or emergency and thus shorten IDA's response time. It complements longer-term emergency response tools available to IDA countries, such as the Crisis Response Window.	In crises like natural disasters and economic shocks, it offers immediate financing for recovery efforts, including scaling up safety nets for vulnerable groups, restoring basic assets, and protecting essential spending on health. The IRM also facilitates crisis planning and disaster risk mitigation dialogue with IDA clients.	Standard IDA repayment terms.
IMF	Rapid Financing Instrument	Concessional or market-based loan	(Early) Response	Provides rapid, low-access financial assistance to countries facing urgent balance of payments that, if not addressed, would result in an immediate and severe economic disruption. Optimal for transitory situations when a full-fledged economic program is not necessary or feasible.	All member countries. For those eligible for the Poverty Reduction and Growth Trust, there is the concessional Rapid Credit Facility.	Single disbursement. Repayment within 3¼ to 5 years.
WHO	Contingency Fund for Emergencies	Grant	(Early) Response	Ensures that WHO can respond quickly and effectively to health crises and emergencies without having to wait for external funding. Supported by voluntary contributions from countries, organizations, and individuals.	Urgency and scale of the emergency; potential for international spread; insufficient local or national resources	Does not apply.
World Bank	Crisis Response Window (CRW)	Concessional loan	(Late) Response	Provides funding to help IDA countries respond to exceptionally severe crises, including public health emergencies. The CRW offers Early Response Financing to address slower-onset crises that are at an early stage.	The member country has declared a national public health emergency, and/or WHO has declared that the outbreak is a public health emergency of international concern	Standard IDA repayment terms.
World Bank	Contingency Emergency Response Component (CERC)	Concessional loan	Response	Designed to provide an immediate response to a national or regional emergency, enhancing the capacity for disaster risk management and crisis response. CERC allows for the rapid reallocation of funds or the mobilization of additional financing to address emergency response needs after a crisis or disaster has been declared.	The member country has declared a national public health emergency, and/or the WHO has declared that the outbreak is a public health emergency of international concern.	Standard IDA repayment terms.
IMF	Flexible Credit Line	Market-based loan	Response	Designed to meet the demand for crisis-prevention and crisis-mitigation lending for countries with very strong policy frameworks and track records in economic performance. Although not specifically created for pandemic financing, it serves as a valuable tool in providing rapid and unconditional support to countries facing external shocks.	The member country or international system has declared a public health emergency. Limited to countries with very strong economic fundamentals and institutional policy frameworks.	Renewable credit line, initially for 1 or 2 years. Repayment within 3¼ to 5 years.

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Table 13.2 Pandemic Financing Instruments Matched to Pandemic Phases (continued)

Source	Facility	Instrument type	Pandemic phase(s)	Purpose	Trigger/Eligibility	Repayment terms
ADB	Countercyclical Support Facility (CSF) COVID-19 Pandemic Response Option (CPRO)	Concessional or market-based loan	Response	The CSF is a part of ADB's strategy for addressing economic challenges, especially during crises. Specifically designed under the CSF umbrella, the CPRO was created to swiftly address the unique challenges posed by the COVID-19 pandemic.	Eligibility based on (1) emergency status, (2) per capita income, and 3) credit worthiness.	Varies per case.
AfDB	COVID-19 Rapid Response Facility	Concessional or market-based loan	Response	Ensures rapid disbursement of funds to address immediate challenges, implement emergency measures, and strengthen health care systems.	Severity of the impact on the economy and fiscal stress. Degree to which denying assistance would threaten to reverse gains and undermine degree of resilience achieved in recent years.	Varies per case.
IDB	Contingent Credit Facility for Natural Disaster Emergencies	Concessional or market-based loan	Response	Includes both a one-time temporary coverage of COVID-19 given the unprecedented magnitude of the present outbreak, and a longer-term ex ante coverage for future pandemics and epidemics.	A natural disaster or health crisis of unexpected, sudden, and unusual proportions, until other sources of funding can be accessed.	Varies per case.
IsDB	COVID-19 project-specific funding	Market-based project loan	Response	IsDB focused on specific project-based interventions per country to mitigate the impact of the pandemic.	Not specified.	Varies per case; a variety of Shariah-compliant financial instruments.
UNOCHA	Central Emergency Response Fund (CERF)	Grant	Response	The United Nations' global emergency response fund to deliver funding quickly to humanitarian responders. CERF's Rapid Response window allows country teams to kick-start relief efforts immediately. CERF's window for underfunded emergencies helps scale up and sustain protracted relief operations to avoid critical gaps when no other funding is available.	Emergency declaration through the top United Nations official of the country. The CERF Advisory Group provides policy guidance to the Secretary-General on the use and impact of the fund.	Varies per case.
UNICEF	Vaccine Independence Initiative	Pre-financing	Response	Prefinancing tool managed by UNICEF, offering a support mechanism for countries using their own domestic resources for procurement of health-related supplies. The tool helps countries bridge temporary short-term funding gaps, which might otherwise lead to supply shortages and stock-outs.	Any country that has a Programme Cooperation Agreement or Basic Cooperation Agreement with UNICEF. Governments must also have sufficient budgetary resources to purchase the vaccines and injection supplies and/or cold chain equipment	Flexible credit terms, allowing governments to pay after delivery.
Gavi	COVAX (No longer active)	Advance market commitment	Response	Financial mechanism within Gavi designed to secure funding for the equitable production and distribution of COVID-19 vaccines. The appeal sought contributions from donor countries and organizations to subsidize vaccine costs for low-income countries.	Economies approved by the Gavi Board based on income level and crisis management	Does not apply.

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Table 13.2 Pandemic Financing Instruments Matched to Pandemic Phases (continued)

Source	Facility	Instrument type	Pandemic phase(s)	Purpose	Trigger/Eligibility	Repayment terms
IMF	Extended Fund & Credit Facility (ECF)	Concessional loan	Recovery	Designed for medium- to long-term financial assistance and structural reforms. Although not tailored specifically for pandemics, the ECF becomes relevant in the postpandemic recovery phase because it offers an extended engagement period, enabling countries to implement comprehensive reforms that contribute to rebuilding and strengthening the economy after the crisis.	All LICs under the Poverty Reduction and Growth Trust facing a protracted balance of payments problem.	Grace period of 5½ years and a final maturity of 10 years.
ADB	Sustainable Economic Recovery Program	Concessional loan	Recovery	Designed to support post-COVID-19 economic recovery. These loans fund projects for rebuilding infrastructure, restoring essential services, and promoting overall economic rejuvenation.	Low- and lower-middle income country members (Bangladesh, to date). Implement urgent reforms for rapid economic recovery	Depending on group categorization: A, B, and C.
EBRD	Strategic and Capital Framework	Grant, concessional loan, and market-based loan	Recovery	Accelerates transition in the countries as they work through the crisis and recovery phases in response to the COVID-19 crisis.	Responsive to market and reform conditions with a special focus on the transition to a green, low-carbon economy.	Varies per case.
IMF	Catastrophe Containment and Relief Trust (CCRT)	Debt relief grant	Response, Recovery	Provides grants for debt relief for the poorest and most vulnerable countries hit by catastrophic natural disasters or public health disasters. The relief on debt service payments to IMF frees up resources to help countries meet exceptional balance of payments needs created by the disaster and to pay for containment and recovery.	IMF members qualify for CCRT relief if a life-threatening epidemic has affected several areas of their country. Significant economic disruption is defined as a cumulative loss of the country's real GDP of 10 percent or greater, or a cumulative loss of revenue and increase of expenditures equivalent to at least 10 percent of GDP.	Debt relief grants will be used to immediately cancel debt service coming due to the IMF equivalent to approximately 20 percent of a country's quota.
EBRD	Coronavirus Solidarity Package	Grant, concessional loan, and market-based loan	Response, Recovery	Includes a set of financial instruments tailored to address the immediate and long-term challenges posed by the pandemic.	The EBRD is responsive to market and reform conditions with a special focus on the transition to a green, low-carbon economy.	Varies per case.
Global Fund	COVID-19 Response Mechanism (C19RM) Appeal	Grant	Response, Recovery	The Global Fund's main avenue for providing grant support to LMICs for COVID-19 is through the C19RM, which extends beyond the emergency phase to support long-term programs and reinvestments. Although C19RM investments were available until December 31, 2023, countries can continue implementing interventions until December 2025.	Countries that received funding in Waves 1 and 2 need to demonstrate optimal use of their approved C19RM funds, including reinvestment where appropriate.	Does not apply.

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Table 13.2 Pandemic Financing Instruments Matched to Pandemic Phases (continued)

Source	Facility	Instrument type	Pandemic phase(s)	Purpose	Trigger/Eligibility	Repayment terms
Donor countries	Bilateral aid	Grant and concessional loan	Prevention, Preparedness, Response, Recovery	Support the recipient country's health care infrastructure, provide emergency relief, enhance disease surveillance, facilitate access to medical supplies and vaccines, and bolster recovery.	Low- or middle-income country facing significant public health challenges. Agreements are based on diplomatic and developmental priorities.	Varies per case.
Gates Foundation	Philanthropic funding	Grant	Prevention, Preparedness, Response, Recovery	Comprehensive funding encompassing research, development, and equitable distribution of vaccines, treatments, and diagnostics. Supports strengthening health systems and enhancing global disease surveillance and response capabilities.	Initiatives that address public health needs with innovative, scalable solutions, particularly in LMICs. Priority is given to proposals demonstrating potential for broad, global impact.	Does not apply.

Source: Original table created for this publication.

Note: Green refers to prevention and preparedness, red to response, blue to recovery and reconstruction, and purple to multiple pandemic phases. ADB = Asian Development Bank; AfDB = African Development Bank; COVAX = COVID-19 Vaccines Global Access; EBRD = European Bank for Reconstruction and Development; GDP = gross domestic product; GNI = gross national income; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; IDB = Inter-American Development Bank; IMF = International Monetary Fund; IsDB = Islamic Development Bank; LICs = low-income countries; LMICs = low- and middle-income countries; PAHO = Pan American Health Organization; UNICEF = United Nations Children's Fund; UNOCHA = United Nations Office for the Coordination of Humanitarian Affairs; WHO = World Health Organization.

Box 13.2

Organizational Stakeholders in External Pandemic Financing

International financial institutions are multilateral development banks (and associated institutions) established by more than one country with the main purpose of providing financial support and advice to achieve development goals. The best-known international financial institutions were established after World War II to provide mechanisms for international cooperation in managing the global financial system. They include the World Bank, the International Monetary Fund (IMF), and regional development banks.

The World Bank is the largest development bank and plays a central role in providing grants and concessional loans through the International Development Agency to the poorest countries and concessional and nonconcessional loans through the International Bank for Reconstruction and Development to middle-income countries. The World Bank also provides other financial instruments such as insurance mechanisms and guarantees.

IMF serves as the international safeguard for economic stability, offering last-resort financing and expert guidance to countries for crisis management and prevention. It provides emergency loans and debt relief during fiscal emergencies that can have many causes, including epidemics and pandemics. IMF also helps countries tackle acute payment imbalances.

Regional development banks complement IMF and World Bank lending efforts, providing an array of financial instruments and playing a vital role in their respective regions thanks to their deep cultural understanding and networks. They include the African Development Bank, the Asian Development Bank, the Asian Infrastructure Investment Bank, the European Bank for Reconstruction and Development, the Inter-American Development Bank, the Islamic Development Bank, and the New Development Bank.

Bilateral aid refers to the direct transfer of financial, technical, or material (in-kind) assistance from one country to another. Funds can come in the form of grants or loans, often as part of a broader foreign policy strategy. Compared to multilateral aid, bilateral aid can be more flexible and quicker to mobilize because it involves direct country-to-country support.

Global health initiatives (GHIs) are collaborative international efforts that focus on particular health issues or diseases, as well as on strengthening health systems more generally—particularly in low- and middle-income countries. They function as public-private partnerships, and some are incorporated as a nonprofit organization in Switzerland. The strength of GHIs lies in their ability to pool resources, expertise, and efforts across multiple stakeholders, including governments, international organizations, the private sector, and civil society. High-profile, independently governed examples of GHIs include Gavi, the Vaccine Alliance; the Global Fund to Fight AIDS, Tuberculosis and Malaria; and Unitaid. GHIs differ from nongovernmental organizations because of the presence of government or United Nations agency representatives in their governance as primary financiers.

Philanthropy involves the use of private funds, often from individuals, foundations, or corporations. Philanthropic organizations can fill gaps in funding and often have more flexibility and can act more quickly than multilateral or bilateral funding bodies. The flexibility contributes to their ability to work more easily with both private, for-profit companies and nonprofit, nongovernmental entities than is often the case for multilateral and bilateral funders.

The exercise also found significant imbalance in the presence of instruments over the pandemic cycle, with only four dedicated to recovery. This finding highlights a notable deficiency in the pandemic financial architecture, which could lead to protracted and suboptimal recovery, particularly for countries experiencing high inflation and debt service payments in the aftermath of a pandemic such as COVID-19. Such an imbalance disproportionately affects lower-income countries reliant on external financing, exacerbating global health inequities and undermining the capacity to prepare for future pandemics.

The instruments can be classified across the pandemic cycle. For this exercise, selected instruments or mechanisms were curated and featured into four key areas, including instruments used during the COVID-19 pandemic as well as newer instruments or mechanisms developed afterward. Boxes 13.3–13.6 highlight the instruments selected to illustrate a range of financing approaches that have been actively used or newly introduced in pandemic preparedness and response. The selection was guided by two key criteria: (1) relevance to different phases of the pandemic cycle and (2) diversity in financial mechanisms, including grants, loans, insurance, and market-shaping instruments. Although not necessarily the only or best options available, the selected instruments represent notable examples of how different financing tools have been designed and deployed in real-world settings. Some, like the Pandemic Fund, reflect new efforts to address financing gaps in preparedness; others, like COVAX (COVID-19 Vaccines Global Access), demonstrate lessons learned from pandemic response financing. Readers should interpret these selections as illustrative rather than prescriptive, offering insights into the strengths, limitations, and design considerations of pandemic financing tools.

Box 13.3

The New Mechanism for Pandemic Prevention and Preparedness: The Pandemic Fund

The Pandemic Fund, established in 2022 and hosted by the World Bank, with the World Health Organization as the technical lead, provides long-term grants to countries for pandemic prevention, preparedness, response, and recovery. In its first funding round in August 2023, the Pandemic Fund disbursed US$338 million to 37 countries for activities like enhancing surveillance, improving laboratory capacity, and training health care workers—almost entirely for prevention and preparedness. A second round of US$500 million has been approved. The Pandemic Fund aims to offer predictable, multiyear financing, with a focus on both national and regional health system strengthening, and will require ongoing monitoring to ensure its effectiveness. It does not yet have contingent financing mechanisms that would be activated in response to an outbreak, epidemic, or pandemic.

Box 13.4

Financial Instruments for Emergency Response to Outbreaks and Epidemics

World Health Organization (WHO) Contingency Fund for Emergencies (CFE). This fund enables WHO to respond rapidly to disease outbreaks and health emergencies, often within 24 hours. CFE's flexibility allows WHO to allocate resources quickly where they are most needed, without being tied to specific purposes. In 2024, through July 23, seven countries contributed approximately US$15.4 million. These funds have been allocated across various crises, with US$7.3 million going to the Sudan conflict, US$6.5 million to the global dengue outbreak, and additional disbursements for emergencies in Ethiopia and the occupied Palestinian territories. In total, approximately US$32.5 million—drawing on both the US$15.4 million contributed in 2024 and existing funds—was disbursed to address global health crises through July 23. Since its inception in 2015, CFE has received approximately US$335 million from a relatively small number of countries, with Germany being the largest donor by far. CFE seems to be intended for WHO response to urgent, unplanned, and unbudgeted needs, but is apparently not a prenegotiated, triggerable mechanism for responding at the required scale to contain a large epidemic nor is it designed to fund associated nonhealth costs, such as those associated with suspending air travel, which response to an outbreak or epidemic can trigger.

The World Bank Group's latest Crisis Preparedness and Response Toolkit. Launched in 2023–24, this toolkit provides developing countries with tools to better respond to and prepare for crises. It includes the following:

- *Rapid response option*. Countries can quickly reallocate up to 10 percent of undisbursed World Bank financing to address immediate crisis needs, such as repurposing funds from infrastructure projects to provide emergency aid.
- *Prearranged financing*. Countries can access new budget support quickly when disasters strike, helping manage immediate impacts without compromising long-term development goals. This financing includes expanded options like the Development Policy Financing Catastrophe Deferred Drawdown Option and Investment Policy Financing with a Deferred Drawdown Option.
- *Catastrophe insurance*. Governments can embed catastrophe bonds and insurance in their financing operations, allowing them to receive payouts during crises without incurring additional debt. This insurance is supported by international reinsurance markets and private capital.
- *Climate resilient debt clauses*. Eligible countries can defer interest and fee payments on existing loans during disasters, enabling them to prioritize disaster recovery over debt repayment.

These tools aim to provide fast access to emergency funds, insurance payouts, and flexible financing options, helping countries manage crises more effectively while building long-term resilience

Box 13.5

Insurance-Like Prepaid Mechanisms

Pandemic Emergency Financing Facility (PEF). Launched by the World Bank in July 2017, following the Ebola outbreak in West Africa, PEF aimed to improve funding and coordination during severe disease outbreaks. PEF had two funding channels, an insurance window and a cash window:

- *Insurance window*. This window targeted large, multicountry infectious disease outbreaks in countries eligible for assistance from the International Development Association and was backed by reinsurance markets and a Pandemic Bond. However, strict activation criteria delayed payouts, limiting its effectiveness.

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Box 13.5 Insurance-Like Prepaid Mechanisms (continued)

- *Cash window*. Intended to function like a traditional trust fund and covering a broader range of diseases, the cash window disbursed immediate funds based on expert advice and PEF steering body approval. This functioning enabled quick response to outbreaks and was conceptually similar to the World Health Organization's Contingency Fund for Emergencies (refer to box 13.4).

Despite its aim to provide quick funding for outbreaks, PEF faced criticism for delayed payouts and limited scope, making its total disbursement of US$257.24 million insufficient to handle major health crises like COVID-19. PEF suffered from overly restrictive trigger conditions, which meant that funds were often not released until outbreaks had already escalated. Additionally, the total payout amounts were too small relative to the scale of actual pandemic response needs, and the structure of the insurance mechanism prioritized protecting investors over ensuring rapid response financing. These design flaws contributed to the lack of confidence in PEF, ultimately leading to its discontinuation.

The complete elimination rather than revision and adaptation of PEF amid the face of extensive criticism resulted in the loss of a useful mechanism that could have been improved. PEF's shortcomings highlight the need for a faster, more flexible, and better-funded mechanism for future global health emergencies.

African Risk Capacity Group's parametric insurance. African Risk Capacity Group, a specialized agency of the African Union, has launched a parametric insurance product to cover high-impact epidemic risks, with Senegal as the first African country to join. Developed in response to a 2015 request by African Finance Ministers, this insurance will provide rapid funding for outbreaks of Ebola, Marburg virus, and meningitis. The new product, supported by partners like AON, Ginkgo Bioworks, and Munich Re, and subsidized by the Swiss Agency for Development and Cooperation, aims to strengthen African Union Member States' capacity to respond to public health emergencies.

Pandemic debt suspension clauses. Barbados has completed a sovereign debt conversion focused on marine conservation, introducing the world's first "pandemic clause" in a bond issuance. This clause allows Barbados to defer interest payments for up to two years during a pandemic, as declared by the World Health Organization, giving the country fiscal space to address health emergencies. The bond, repayable over 15 years, also includes provisions for deferral during natural disasters like hurricanes and earthquakes. Supported by guarantees from the Inter-American Development Bank and The Nature Conservancy, the bond saves Barbados US$40 million to US$50 million, which will be used for marine conservation. This innovative financial tool is seen as a model for other countries to manage debt while investing in health and environmental sustainability.

Box 13.6

Instruments for Product Development, Manufacturing, Purchasing, and Distribution

COVAX. COVID-19 Vaccines Global Access—abbreviated as COVAX and launched in April 2020 by the Coalition for Epidemic Preparedness Innovations; Gavi, the Vaccine Alliance; and the World Health Organization—aimed to ensure more equitable global access to COVID-19 vaccines, especially for low- and middle-income countries. It operated through two funding streams: self-financing high-income countries paid up front to secure vaccines, whereas lower-income countries received vaccines funded by donor grants through an advance market commitment. COVAX struggled, however, because many wealthy countries bypassed the initiative by making bilateral deals, leaving COVAX at a disadvantage in securing vaccine doses, delaying

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Box 13.6 Instruments for Product Development, Manufacturing, Purchasing, and Distribution (continued)

vaccine distribution and undermining its equitable access goals. By the end of 2020, only US$400 million of the US$2.4 billion pledged had been disbursed. The initiative's challenges highlighted the importance of early pandemic financing and the need for stronger global cooperation and incentives to ensure timely and fair vaccine distribution in future pandemics.

Gavi's First Response Fund. Approved with a budget of US$500 million in June 2024, the First Response Fund is designed to secure early access to vaccines and maintain routine immunization programs during major public health emergencies. It is part of Gavi's Day Zero Financing Facility for Pandemics, which aims to provide up to US$2.5 billion in surge financing for rapid vaccine responses. As the fastest instrument in the financing facility, its purpose is to address urgent funding requirements until additional resources become available. It has three key objectives: to ensure swift vaccine access for Gavi-eligible countries, support vaccine delivery systems in those countries, and maintain routine immunization programs.

African Vaccine Manufacturing Accelerator (AVMA). A new financing mechanism launched in June 2024 to provide up to US$1 billion over a 10-year period, AVMA aims to expand the development of a sustainable vaccine manufacturing sector in Africa. AVMA operates through a pull financing mechanism, offering incentives to vaccine manufacturers to help cover the initial costs of development and production. This initiative, approved by the Gavi board in December 2023, was developed after nearly two years of collaboration among the Africa Centres for Disease Control and Prevention, the African Union, and Gavi, with input from a broad range of stakeholders, including partners, donors, industry representatives, and civil society. AVMA has two types of incentives:

- *Milestone payments*. Awarded when manufacturers obtain World Health Organization prequalification for designated priority vaccines, with payments ranging from US$10 million to US$25 million, depending on the technology used.
- *Accelerator payments*. Additional per-dose payments provided on top of standard market rates for vaccines produced under Gavi–United Nations Children's Fund tenders, with higher payments offered for comprehensive manufacturing processes of priority vaccines.

The goal of AVMA is to foster a robust vaccine manufacturing ecosystem in Africa, supporting at least four manufacturers over the next decade, thereby enhancing both the global vaccine market and Africa's capacity for pandemic preparedness. Questions remain about the adequacy of this fund to grow African manufacturing, and additional resources are expected to be required (Adeyi et al. 2024).

International Finance Facility for Immunisation (IFFIm). IFFIm is a multilateral development institution that leverages financial markets to accelerate the availability of funds for immunization programs. Established in 2006, IFFIm raises capital by issuing bonds backed by long-term donor pledges. The funds generated are then rapidly deployed through Gavi, to support vaccination initiatives in low- and middle-income countries. This innovative financing mechanism helps bridge the gap between the immediate need for vaccines and the timing of donor contributions, enhancing the impact of global immunization efforts.

IFFIm's bonds, known as Vaccine Bonds, are sold to institutional and individual investors globally, providing an attractive investment option with the added benefit of social impact. The long-term donor pledges, primarily from governments, provide robust security for these bonds, making them highly creditworthy and allowing IFFIm to secure favorable interest rates, maximizing the funds available for immunization programs. This funding model also offers flexibility in responding to health emergencies and supporting innovative vaccine delivery strategies. The quick availability of funds ensures that Gavi can act swiftly in rolling out vaccination campaigns, ultimately saving more lives and improving health outcomes.

HOW MUCH PANDEMIC FINANCING IS NEEDED?

How does the investment needed to potentially avert a pandemic compare to the pandemic's losses or impacts? Past research has concluded that a small investment is needed to potentially avert a pandemic, compared to the tremendous losses of pandemics.

The Large Economic Impact of Pandemics and Epidemics

Outbreaks, epidemics, and pandemics have had large economic impacts. Past studies have examined the tremendous losses of pandemics on an annualized or ongoing basis (Fan, Jamison, and Summers 2018; Glennerster, Snyder, and Tan 2022). Numerous studies have estimated the economic losses of recent pandemics and epidemics such as SARS (severe acute respiratory syndrome), Ebola, and COVID-19. SARS had significant impacts on the hardest hit locations—Canada; China; and Hong Kong SAR, China—with negative impacts on gross domestic product of US$3.2 billion to US$6.4 billion in Canada and US$3.7 billion in Hong Kong SAR, China (Keogh-Brown and Smith 2008). The estimated economic impact of the 2014 Ebola outbreaks in Guinea, Liberia, and Sierra Leone ranged from US$30 billion to US$50 billion (Obeng-Kusi, Martin, and Abraham 2024).

In contrast to SARS and Ebola, which had a geographically contained spread, COVID-19 had global impact. An early 2020 estimate of the economic cost of the COVID-19 pandemic suggested a cost of more than US$16 trillion globally (Cutler and Summers 2020). Gopinath (2020) called it the worst economic downturn since the Great Depression, estimating cumulative output loss over 2020–21 of about US$9 trillion. Further, countries continued to experience the economic impacts after the acute phase through the debt crises precipitated by the pandemic (Rogoff 2022).

The Small Investment Required to Address Pandemics

By comparison, the amount of investment required to address pandemics is small. There is broad agreement about the need for more financing for pandemic preparedness and response, including by other researchers in this volume (Sureka et al. 2023). Questions about what to invest in and how much to invest for pandemic preparedness and response are joint questions, and researchers have examined the financing requirements in different ways. Table 13.3 provides a crude range of different estimates, each of which uses different methodologies (Fan, Smitham, et al. 2023). Estimates range from US$1.6 billion annually to US$65 billion needed in the first year, with similarly high levels expected in the second year.

Table 13.3 Cost Estimates for Pandemic Preparedness and Response Using Different Definitions and Methodologies

Source	Estimate
G20 High-Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response (G20 HLIP 2021)	US$10 billion annually, plus US$5 billion to strengthen WHO and other existing institutions
World Bank and WHO for the G20 Joint Finance and Health Task Force (WHO and World Bank 2022)	US$10.5 billion annually in international financing for minimum priority PPR financing gap
McKinsey & Company (Craven et al. 2021)	US$20 billion to US$50 billion annually, after initial global investment of US$85 billion to US$130 billion over two years
Becker Friedman Institute, University of Chicago (Glennerster, Snyder, and Tan 2022)	US$5 billion annually, after US$60 billion up-front investment for vaccine production capacity and supply chain inputs
Center for Global Health Science & Security, Georgetown University (Eaneff et al. 2022)	US$124 billion over five years toward "demonstrated capacity" on JEE indicators
WHO (Clarke et al. 2022)	From US$1.6 billion per year for 139 LMICs to improve capacities to US$43 billion per year including for R&D

Source: Fan, Smitham, et al. 2023.

Note: G20 = Group of Twenty; JEE = Joint External Evaluation; LMICs = low- and middle-income countries; PPR = pandemic preparedness and response; R&D = research and development; WHO = World Health Organization.

Table 13.4 Health Expenditure, by Country Income Group, 2019

Country income group	Number of countries	Population (million)	Health expenditure per capita		Total health expenditure (billion)
			Mean	Standard deviation	
Low	25	587	39.4	16.4	20.7
Lower-middle	53	3,308	141.9	127.5	306
Upper-middle	52	2,521	515.0	320.8	1,384
High	60	1,203	3,093.6	2,345.2	6,745

Source: Original table compiled using World Health Organization Global Health Expenditure Database.

Note: Total health expenditure is in current US dollars. The table does not show more recent data on health expenditure because they reflect expenditures during the pandemic, which were much higher than normal and are unlikely to be maintained in the intrapandemic period.

Unequal Distribution of Financial Resources as Measured by Health Expenditures

The amounts required to invest in pandemics represent a fraction of available resources in high-income countries, which collectively spent US$6.7 trillion on health care in 2019 (table 13.4). By contrast, the needed funds would greatly exceed the available resources of low- and lower-middle-income countries. Health expenditure in low-income countries averaged US$39 per person and collectively, for 24 countries, totaled US$20.7 billion in 2019.

CASE STUDY OF COVID-19 PANDEMIC FINANCING

This section explores pandemic financing using the COVID-19 pandemic as a case study and examines primarily development assistance for health and specifically for pandemics. This analysis uses data from the Institute for Health Metrics and Evaluation's Development Assistance for Health on COVID-19 Database (2020–2023) to assess the total volume of resources.[4] Table 13.5 provides an overview of the financial contributions made by various organizations and entities in response to the pandemic. It segments the data by year, detailing the annual funding amounts from 2020 to 2023, and shows the total for each contributor.

Table 13.5 Development Assistance for Health (COVID-19) during the Pandemic, 2020–23

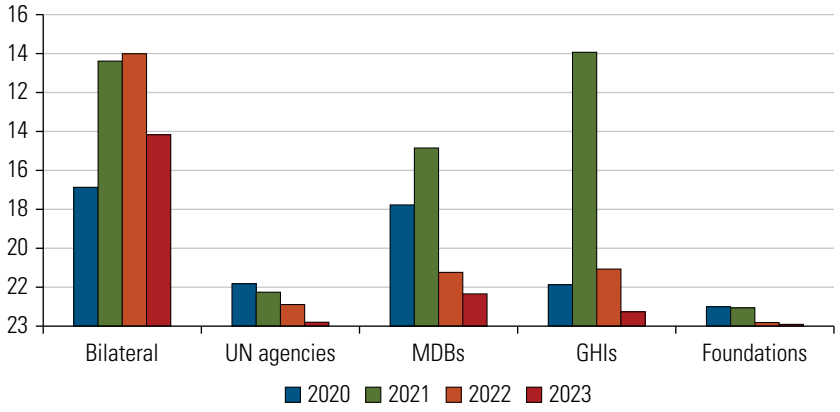
		2020	2021	2022	2023	Total
UN agencies	PAHO	122,292	250,044	74,694	0	447,030
	UNAIDS	9,711	0	0	0	9,711
	UNFPA	109,282	28,181	7,541	0	145,004
	UNICEF	662,194	199,996	156,136	0	1,018,326
	WHO	1,318,499	1,265,464	861,201	135,505	3,580,669
MDBs	ADB	2,023,172	2,330,388	955,787	903,588	6,212,935
	AfDB	711,222	74,162	32,630	69,918	887,932
	IDB	406,835	222,430	221,032	203,397	1,053,694
	WB_IBRD	2,175,341	4,278,387	1,069,294	478,631	8,001,653
	WB_IDA	924,215	2,234,265	465,515	0	3,623,995
GHIs	CEPI	317,634	530,147	143,343	25,561	1,016,685
	Gavi	770,927	8,038,491	2,280,597	0	11,090,015
	Global Fund	975,089	5,461,119	504,618	698,399	7,639,225
	Unitaid	50,400	56,128	5,055	1,918	113,501
Foundations	Gates Foundation	325,511	270,047	93,032	75,354	763,944
	Other	646,643	632,243	40,077	0	1,318,963
Bilateral	Bilateral	7,174,648	13,647,397	14,000,446	9,835,250	44,657,741
Total (US$, thousand)		**18,723,615**	**39,518,889**	**20,910,998**	**12,427,521**	**91,581,023**

Source: Original table compiled using the Institute for Health Metrics and Evaluation's Development Assistance for Health on COVID-19 Database 2020–2023. ADB = Asian Development Bank; AfDB = African Development Bank; CEPI = Coalition for Epidemic Preparedness Innovations; Gavi = Gavi, the Vaccine Alliance; GHIs = global health initiatives; IDB = Inter-American Development Bank; MDBs = multilateral development banks; PAHO = Pan American Health Organization; UN = United Nations; UNAIDS = Joint United Nations Programme on HIV/AIDS; UNFPA = United Nations Population Fund; UNICEF = United Nations Children's Fund; WB_IBRD = World Bank, International Bank for Reconstruction and Development; WB_IDA = World Bank, International Development Association; WHO = World Health Organization.

Over the period 2020–23, the grand total of development assistance for health for COVID-19 reached nearly US$91.6 billion. Annual contributions varied, with the highest funding in 2021 at US$39.5 billion, reflecting the global surge in response efforts during the peak of the pandemic. Bilateral contributions were the largest source of funding overall, followed by the World Bank (both the International Bank for Reconstruction and Development and the International Development Association), Gavi, the Global Fund, and WHO. Figure 13.4 shows the changes in contributions over time for each category of contributors. Overall, the substantial peak in funding in 2021 corresponds with the intensified global response efforts, including vaccine distribution and health care system support. The subsequent decrease in funding in 2022 and 2023 indicates a shift to long-term recovery efforts, which appear to be insufficient.

Figure 13.4 Development Assistance for Health (COVID-19), 2020–23

(US$, billion)



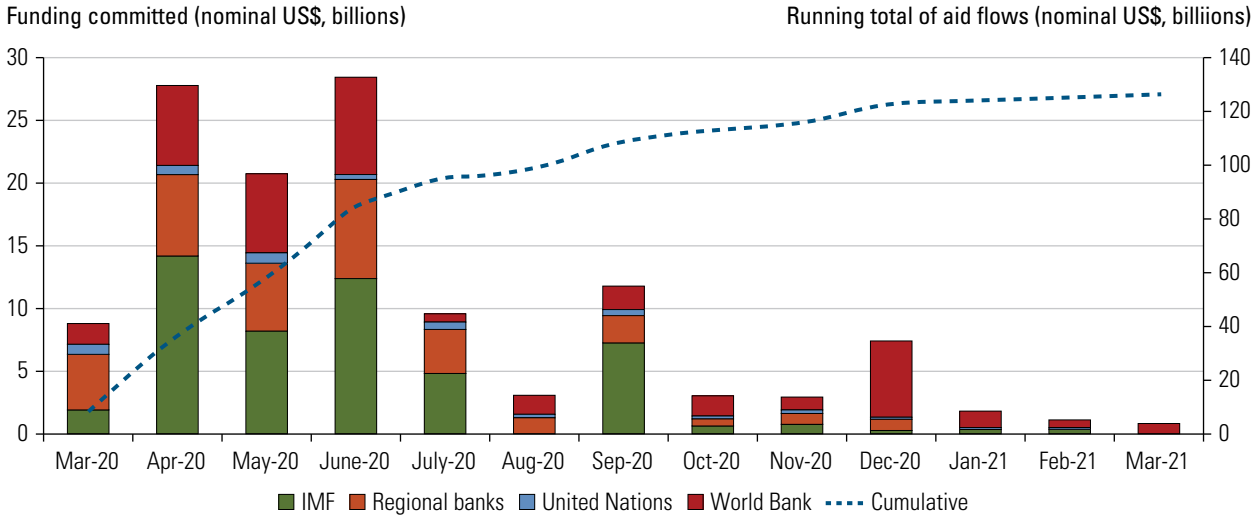
Source: Original figure created using the Institute for Health Metrics and Evaluation's Development Assistance for Health on COVID-19 Database 2020–2023.

Note: GHIs = global health initiatives; MDBs = multilateral development banks; UN = United Nations.

Specifically, whereas bilateral contributions remained steady but declined after 2022, financial assistance from most other agencies dropped to less than half of the 2021 disbursement levels in 2022, with a similar trend observed in 2023. Additional significant funding sources not incorporated in this analysis include the Asian Infrastructure Investment Bank's COVID-19 Crisis Recovery Facility, the International Monetary Fund's Rapid Credit Facility and Rapid Financing Instrument, and the New Development Bank's COVID-19 Emergency Program Loans. Primarily allocated for broader social and economic responses and recovery efforts, these funds did not appear in the Institute for Health Metrics and Evaluation health data.

Although figure 13.4 illustrates the year of funding distribution, it does not specify the precise timing of financial assistance. Past research has found that the timing of pandemic financing mattered greatly but that financing was delayed. Despite the size of resources available from multilateral development funds, their disbursement was slow (figure 13.5). Nevertheless, as noted by the World Bank (2022), the timing of the release of these resources was still faster than usual timescales (figure 13.6). Lagged financing has been found to be a major determinant of lagged purchase and thus lagged delivery of financing (Agarwal and Reed 2022).

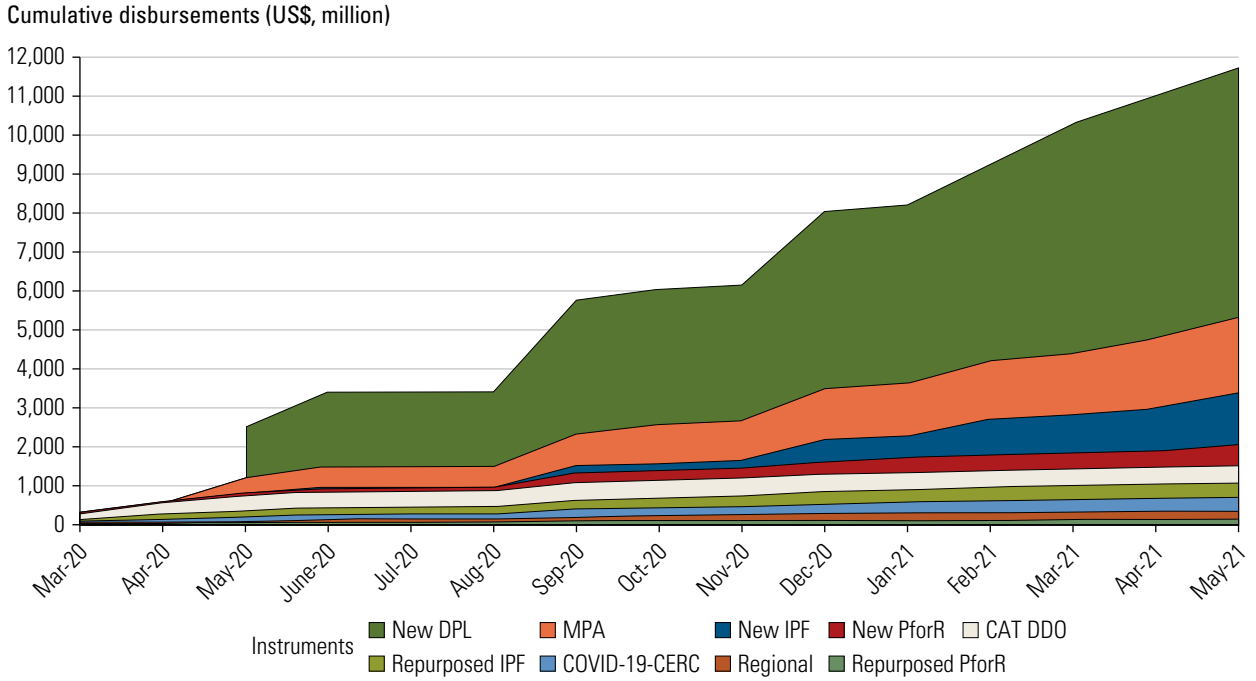
Figure 13.5 Multilateral Funding for the COVID-19 Response, March 2020 to March 2021



Source: Based on Hill et al. 2024.

Note: This figure is not limited to development assistance for health. IMF = International Monetary Fund.

Figure 13.6 Cumulative World Bank Disbursements for COVID-19 Health and Social Response, by Financing Instrument, March 2020 to May 2021



Source: World Bank 2022.

Note: This figure includes assistance for both health and social response. CAT DDO = Catastrophic Deferred Drawdown Option; CERC = Contingent Emergency Response Component; DPL = Development Policy Loan; IPF = Investment Project Financing; MPA = Multiphase Programmatic Approach; PforR = Program-for-Results.

PANDEMIC FINANCING CONSIDERATIONS

Similar to the challenge posed by climate change, effectively combatting the threat of pandemics demands a strategic and coordinated financial approach. Addressing a global health crisis necessitates more than just good intentions; it requires substantial financial resources allocated throughout the pandemic cycle. This section outlines the kind of financing needed to address the distinct needs of each phase of the pandemic cycle: prevention, preparedness, response (early and late), and recovery and reconstruction.

Further, this chapter has primarily focused on, and has mostly limited its scope to, financing the health-related aspects of the pandemic cycle while acknowledging the broader economic and social financing needs that arise during pandemics—such as social protection measures, business support programs, and economic stimulus packages. Future work would benefit from considering how health financing is weighed and prioritized relative to economic and social support mechanisms from a policy perspective, as well as how pandemic financing strategies for health can be better integrated with broader economic resilience measures to create a more comprehensive and sustainable pandemic financing architecture.

Prevention and Preparedness

The funding approach for pandemic prevention and preparedness is grounded in the recognition that such efforts constitute a public good, at least regional (in the case of viral hemorrhagic fevers) if not global (in the case of highly transmissible pathogens, particularly respiratory pathogens). Pandemics transcend borders, and investments in one country's preparedness efforts can yield benefits for global health security. However, disparities exist in the benefits and costs of pandemic preparedness across countries, influenced by factors such as outbreak likelihood, development level, infrastructure use, and variations in input costs, particularly labor.

Prevention and preparedness (P&P) are not candidates for contingent financing instruments because their costs, based on current capacity and needed capacity, are largely predictable. Instead of requiring funds to respond to a pandemic, P&P funds are needed to (1) create capacity to prevent and respond according to the level of pandemic risk and (2) maintain such capacity. These funds can be thought of as an initial fixed cost to create capacity (that could be credit-financed, spreading the cost over a number of years) combined with an annual maintenance cost (that would normally not be credit-financed other than to cover a short-term financing shortfall).

The cost of creating P&P capacity should be funded with a mixture of national funding, grants, and concessional or nonconcessional credits. As countries become richer, the funding mix should be decreasingly concessional, from pure grants and highly concessional financing for low-income countries to nonconcessional funding or less concessional funding for middle-income countries. Concessional and nonconcessional financing have as an important feature the role of government financing for repayment, ensuring that governments have "skin in the game" by co-investing external resources alongside external financing.

A fair global P&P financing system would consider both countries' funding of their own P&P efforts and their obligation to contribute to efforts regionally, globally, and in other countries. In some sense, the existing proportional contribution system (namely, the assessed member contributions to WHO) should support response to the pandemic cycle. This contribution system is based mainly on country gross domestic product, along with other factors. In practice, however, most of WHO's budget comes from discretionary sources rather than assessed member contributions; moreover, WHO played a smaller role in financing the pandemic cycle relative to other agencies. The Pandemic Fund considers whether the grant leverages other resources such as cofinancing from other donors and what it calls co-investment from the government itself, either in cash or in kind. A key objective for the Pandemic Fund is for its resources to expand overall health expenditures by even more than the size of its grant (and certainly not substitute for national P&P funding).

What proportion of its national P&P funding needs (as well as regional and global P&P funding needs, including subsidies to other countries) a particular country should pay is not simple, because a fair funding formula or allocation framework would consider a number of factors. The use of allocation frameworks or formulas is common among multilateral development banks and global health initiatives such as the Global Environment Facility; the Global Fund to Fight Aids, Tuberculosis and Malaria; and the International Development Association (Fan 2023; Fan, Glassman, and Silverman 2014).

Many have argued that the allocation framework should necessarily incorporate indexes based on pandemic preparedness, such as the International Health Regulations Joint External Evaluation Tool; however, this chapter eschews that approach because, among reasons explained elsewhere, preparedness indexes are not predictive of pandemic risk (Fan and Smitham 2023). Nevertheless, a lack of predictive power does not mean that these capacities are irrelevant or that they should not be invested in. Rather, these capacities may need to be improved or supplemented with more actionable indicators.

There will be reasonable disagreement about how the exact formula should be designed and which factors should be incorporated. Some of the factors to consider include the following:

- *Level of pandemic risk*, as measured in average annual loss or spark index (Fan 2023). It can incorporate or reflect other related aspects of pandemic risk, such as the likelihood of pathogen spillover, regional transmission patterns, and the potential for cross-border spread.
- *Ability to pay*, whether by income classification or per capita gross national income, adjusted by size of the population, and similar to the formulas used to calculate assessed contributions to the United Nations System.
- *Ability to benefit from P&P efforts*. Larger countries like China or the United States may derive more benefits themselves from localized outbreak containment, thereby limiting its impact to a specific state or province. In contrast, smaller

nations like Guatemala or Liberia could face nationwide repercussions even from minor outbreaks with a larger proportion of the total benefits of containment accruing to other countries. The return on investment and thus the ability of a country to benefit from P&P efforts and investment undoubtedly vary with significant implications for equity.

- *Need for P&P efforts*. The appropriate level of effort for P&P is related to the probability that a spillover event will occur and that an outbreak will need to be contained. Belize and Iceland have similar population sizes and both are small countries, but Belize has a much greater probability of zoonotic spillover events. Other measures of need could be need for surveillance capacity as measured by data capacity (for example, birth registration coverage), health worker capacity (for example, nurse availability per capita), and network capacity and connectivity (for example, mobile subscribers per capita) (Fan 2023), without which conducting surveillance will be very challenging.
- *Cost of P&P efforts.* Ability to pay (noted earlier) is strongly correlated with the cost of implementing P&P efforts in a country primarily because labor costs are strongly correlated with per capita gross national income and are the largest cost category. However, other differences between countries affect the difference in cost. One obvious factor is the previous category (need), which will determine the level of required effort. Another is the difference in the cost of implementation. For example, the population of Rwanda is more than four times that of Namibia but Namibia's land area is more than 30 times that of Rwanda, suggesting substantial per capita differences in the cost of a surveillance system. Using a cost-based approach on specific P&P functions (such as surveillance, laboratory networks, and workforce training) is one of multiple factors to determine the level of investments, but it differs from the notion of capacities as measured by aggregate scores.

The lack of annual and comprehensive data collected for all countries means that not all these factors can be included (Fan 2023). One challenge of the Joint External Evaluation data is that collection takes place only every five years at best. Thus, the use of a simple and objective indicator for which there are widely available and regularly reported data is preferred over aggregated, subjective indicators or indicators that are unavailable or unmeasurable.

This financing formula would create a set of countries that would be net recipients because their expected contribution is less than their domestic estimated cost, and a set of net contributors because their expected contribution is greater than their estimated domestic cost (for example, using work by Eaneff et al. 2022 as the basis for estimates of global needs and countries' obligations). These estimates will need to be regularly revised with better data on the cost of implementing P&P in different settings and should be formally adopted by WHO as the standard for estimating costs for pandemic P&P.

Achieving a global mechanism to ensure proportional contributions for pandemic preparedness involves several practical challenges. First, pandemic preparedness

investments yield highly asymmetrical benefits. Wealthier nations, which tend to have stronger health and surveillance systems, have both the capacity and the incentive to invest in P&P for their own national security, even without external enforcement or creation of a separate proportional contribution mechanism. Second, the diversity of national interests, governance structures, and fiscal capacities makes it difficult to establish and enforce a universally accepted burden-sharing framework for pandemic financing, although the same could have been said for the original creation of United Nations agencies such as WHO or even of the multilateral development banks. The core challenge of pandemic financing is a lack of agreement on which mechanism to use as much as on the amount to be contributed.

Because some countries will not achieve acceptable P&P without major investment in basic health system infrastructure, the financing agreement could include the cost of upgrading infrastructure where possible. In some settings, such as conflict zones, resources may not be the binding constraint, or the level of acceptable P&P will need to consider what is possible with existing infrastructure.

Financing should also consider the time horizon of investments, such as whether the investments provide short-term capacity creation or long-term maintenance. The Pandemic Fund, with its project-based approach to funding, is arguably better placed to provide shorter-term, capacity-development resources, given the small amount of funding available globally as well as the short time horizon. The long-run horizon for maintenance or expansion of capacity requires ongoing, predictable funds as well as third-party independent evaluation using clear metrics to assess progress toward both improved capacity and sustainability.

Trust (and therefore participation) in a global P&P financing scheme will be achieved only if countries are confident not just that other countries are making the required investments but also that those investments are being translated into the desired P&P capacity. Funds that leave a country to fund regional or global capacity, or that fund P&P efforts in other countries, are relatively easy to track, at least from the perspective of donors. More difficult is tracking domestic expenditures on health, and specifically across the pandemic cycle (Fan and Smitham 2023).

Additionality of domestic resources can be assessed ex ante and ex post. Ex ante, additionality could be assessed by looking at project design—explicit arrangement for domestic finance has been set out in the assessment criteria of the Pandemic Fund's Technical Advisory Panel or auditable records through the public financial management and budgeting stage. Ex post, the use of WHO's Global Health Expenditure Database offers the possibility of detecting additional increases in government spending on health, despite a risk that conditionality on this metric may alter the unbiased nature of this data source, especially because the database is the benchmark methodology and tool for measuring government spending in comparison to external assistance on health. However, using the Global Health Expenditure Database to track whether government spending on pandemic preparedness has specifically increased will be very challenging. A third mechanism is a costing methodology employed by Eaneff et al. (2022) in estimating

the amounts required for pandemic prevention and preparedness (refer to table 13.3). Thus, the alternative is to require financial control and clear accounting of spending, which returns to the core question of public capacity and governance, particularly in the area of public financial management and budget execution and implementation rates (Fan and Gupta 2024).

This chapter argues that the main kind of additionality to be assessed should relate to improved performance on preparedness (surveillance, laboratories, or human resources), rather than simply financial additionality. It is more important to track the capacity of P&P built and sustained by investments than to track domestic financial flows, if tracking only one of these is possible. Importantly, however, the limitations of existing metrics, such as the Joint External Evaluation and the States Parties Self-Assessment Annual Report, necessitate a broader approach. Their limited predictive power during COVID-19 suggests the need to supplement them with measures focused on functions or outcomes. Such measures could include real-time response capabilities, such as the speed of outbreak detection and containment; simulation-based evaluations, through which countries undergo regular stress tests of their pandemic preparedness systems; surge capacity readiness, measuring the ability to mobilize medical countermeasures, health workers, and emergency funding on short notice; and cross-border collaboration metrics—such as the timeliness and transparency of data sharing—to help assess whether countries are contributing to global health security.

The emphasis on inclusivity and solidarity as fundamental principles for pandemic P&P, although perhaps appearing idealistic, aligns with the pragmatic understanding that pandemics do not respect borders. COVID-19 underscored the interconnectedness of our global community, revealing that the virus's spread in one region could eventually affect all nations, regardless of their initial success in containment. This interconnectedness suggests that investing in universal pandemic P&P is a matter of enlightened self-interest. That it also respects the values of altruism and humanitarianism is an added benefit.

An efficient global preparedness system does not require every country to be fully prepared for all eventualities. Instead, it relies on the ability of countries to support one another, and on the flexibility of regional and global institutions to respond to acute needs in countries with less capacity. Global preparedness requires a well-articulated network of institutions that can work together to provide such cross-national, regional, or global technical and material support. The promising emergence in some countries of national institutes of public health that concentrate technical capacity independent of political cycles combined with regional institutions like the Africa Centres for Disease Control and Prevention (or perhaps enhanced capacity in regional WHO offices) should be further developed and included in P&P budgets at the national and regional levels. Networks, however, require institutional relationships built over time, transcending interpersonal relationships, and activities in the network that maintain those relationships.

Finally, investing in P&P does not occur in a vacuum, independent of other investments in health and social welfare. As examples, countries with generous

national sick-leave policies can more easily detect outbreaks and more easily prevent workers from going to work when sick and spreading an infection. Countries with well-developed primary health care systems can use that infrastructure for surveillance of fevers of unknown origin. Countries with generous unemployment insurance can impose lockdowns with less impact on poverty. Countries with ubiquitous household internet access can more easily teach remotely, and so on. Although it is unreasonable to expect pandemic P&P financing streams to broadly develop a country's health and social services, a country with rudimentary services would need significantly more funding to achieve comparable levels of P&P, which can be unrealistic. No country experiencing famine or war could be expected to continue to prioritize P&P for its own human and financial resources, as demonstrated by the polio outbreak in Gaza in 2024. Thus, a universal P&P formula may have advantages of objectivity and fairness, but may miss out on the subjective characteristics for which country-specific adjustments would be merited in order to be fair.

Response: Early and Late

In the response phase of a pandemic, urgency and timeliness are paramount and require defining and establishing a clear trigger. The trigger specifies when the response should be activated and should be defined in national and global pandemic preparedness and response plans. In theory, the world has an existing mechanism for reporting potential pathogens of pandemic potential through the International Health Regulations; however, in practice, significant gaps remain in the definition of a tiered system for communication about different tiers of responses (Fan, Cash, et al. 2023).

Financing and triggers both need to be designed in ways that account for reticence to report potential outbreaks, due to the negative economic consequences, as well as lack of capacity to adequately identify potential outbreaks. Delays in international reporting put other countries at risk because those countries cannot initiate appropriate complementary containment efforts. Thus, financing mechanisms may need to build in additional incentives (such as the liability for the costs incurred by other countries or a sanction mechanism similar to those imposed by the World Trade Organization for violations of trade agreements).

Day-zero financing or surge financing is crucial in this context, providing funds at the onset of a deadly outbreak to quickly purchase necessary resources, including products still in development through at-risk financing (Fan et al. 2024). The early and swift release of these funds is vital because delays can undermine intervention effectiveness and exacerbate the outbreak. Such resources should be allocated both to immediate containment efforts and to mitigate the economic and social impacts of these measures, ensuring that countries are not discouraged from early reporting.

Outbreaks tend to grow exponentially, and their containment becomes increasingly challenging with time. Unlike the fixed and recurrent expenditures necessary for

P&P, releasing financing for mounting a response is contingent upon the occurrence of an outbreak or epidemic. At the local level, such funding might come from a reserve fund within the ministry of health or finance, or from staff being diverted from their usual jobs to contain an outbreak, generating opportunity costs rather than a need for additional budget, or approvals from funders to reallocate resources for a given budget line or service area to the response. Response expenditures occur in addition to normal annual expenditures for P&P and do not occur except in response to an event.

The response phase comprises two critical stages: early and late. Early response focuses on containing the outbreak or epidemic, striving to prevent it from escalating into a pandemic. This stage mirrors the containment strategies employed during outbreaks like MERS (Middle East respiratory syndrome) and SARS. Rapid mobilization of resources is imperative to control the spread, reflecting a globally shared interest in averting a wider crisis.

Given the global benefit of early, effective response, funding should not be contingent upon a country's history of cooperation or prior investment in pandemic P&P. Although perhaps understandable, reluctance to assist nonparticipating countries is imprudent policy. Reserving fire brigades for houses that have paid a fire insurance premium is foolish because fires in uninsured houses will lead to fires in neighboring houses. Similarly, the rapid control of an outbreak benefits the world, regardless of individual countries' past actions or readiness levels. By dissociating funding from past behaviors and investments, the early response phase maximizes global welfare, recognizing that containing an outbreak anywhere benefits the world at large. In other words, withholding early response funding is not an effective means to incentivize the achievement of appropriate levels of P&P.

Several other mechanisms could be considered to incentivize better performance or good behavior in terms of P&P. Subsidies of pandemic insurance premiums could be made conditional on improvements to P&P capacity (to reward good behavior) while also giving higher subsidy for lower P&P capacity and higher P&P need (because rewarding need can also be interpreted as rewarding low performance or achievement). Donors could also condition other forms of assistance on P&P capacity, such as increasing a country's borrowing rates or insurance premiums as a penalty for having increased pandemic risk or failing to transparently report pandemic information in a timely manner. Taxes on international flights as well as taxes on the factors associated with spark risk, such as presence and size of wildlife markets, could also be used to account for the increased risk of pathogen spread, and so on.

Moreover, early response efforts should incentivize prompt reporting of cases by providing financial resources not just to curb the virus's spread but also to mitigate the social and economic repercussions of early reporting and early response. Measures such as airport closures and lockdowns, although crucial for

public health, can significantly affect communities and businesses. Therefore, part of the funding could be allocated to compensate for such losses, although it may not be necessarily counted as part of the official development financing for health and pandemics. This approach not only alleviates the economic strain on affected areas but incentivizes early reporting good practices. Such funding should be very rapidly available, although it could come with riders that specify that countries not meeting certain conditions must return portions of it (for example, a country cannot retain funding to compensate for closure of airports if it never closed them).

Because of limited health personnel, especially in the short term before regional assistance can arrive, plans should be in place to provide appropriate additional funding to workers assuming additional risk and those working overtime. These efforts can be complemented with plans to pull in currently inactive workers, much as the military does with reserve troops. The rapidly available financing will not be useful if the mechanisms do not exist to channel the funds to workers, specifically through digital payment and banking. Similarly, and only somewhat less urgent, predesigned mechanisms need to exist to channel sick leave and unemployment compensation to recipients to enable local isolation and quarantine to contain an epidemic. Finally, commandeering resources to enable an effective early response will require predesigned compensation mechanisms. They can include prearranging hotel rooms for isolation and quarantine, or diverting oxygen supplies from commercial to health use, or using existing infrastructure such as call centers for expanded pandemic functions, before surges occur (Fan et al. 2021; Fan et al. 2022). Although properly considered P&P, these predesigned mechanisms are mentioned here because of their relationship with response instruments. Many questions persist about whether the investments made from response financing during the COVID-19 pandemic were durable and carried over to the future.

Late response occurs when containment efforts prove futile and the inevitability of a pandemic becomes apparent. Modeling can support an understanding of the unbiased forecast of the epidemic situation as well as trade-offs of different policy scenarios (Lee et al. 2022; Patouillard et al. 2024). At this stage, the primary focus shifts to minimizing the broader impacts—ranging from loss of life to economic repercussions—associated with the pandemic. Strategies and resource allocations in this phase pivot from containment to mitigation and the effective management of the pandemic's effects.

Early and late responses are not always easily distinguished, but modeling can assist. A country with a large epidemic may already be focused on mitigating the health impact of infections and the economic impact of the epidemic. Most other countries may still be focused almost entirely on preventing entry of the pathogen and rapidly extinguishing any outbreaks, with the goal of ultimately preventing a pandemic.

The most significant economic divergence between early and late response lies in the transition from actions serving as almost pure global public goods to those

primarily benefiting domestic interests. Consequently, the economic rationale for global investment in national response differs. Although humanitarian considerations may still warrant assistance to countries that did not contribute to global preparedness, the argument for collective self-interest is less compelling in late-stage responses.

To extend the fire analogy, all countries should have immediate, unconditional access to the financial, human, and physical resources to put out a fire or contain an outbreak or epidemic, including the resources to compensate countries for the economic impact of reporting and containment efforts. However, the fire department is not responsible for securing an individual's property, finding them alternative housing, or paying the cost of rebuilding and refurnishing the house. For that, the individual must have purchased insurance. In the case of late response, this requirement could take the form of purchasing (at market or concessional rates) pandemic insurance, or prenegotiating contingent loans or grants, or accessing reserves or issuing bonds.

Pandemic financing for response may need to be linked to some other globalized sectors, such as trade and transportation, to create incentives for participation in prevention, preparedness, response, and recovery mechanisms.

This chapter has adopted mostly economic arguments for investing in pandemic preparedness and response. However, it does not discount the role of political arguments made for investment throughout the pandemic cycle, particularly from the lens of geopolitics and vaccine diplomacy, which unfolded during the COVID-19 pandemic when high-income countries were slow in sharing or selling vaccines to LMICs and China and Russia stepped in to offer their own domestically developed vaccines (Suzuki and Yang 2023).

Pandemic insurance mechanisms can also be intended for early response; however, in the case of the Pandemic Emergency Financing Facility, its failure to rapidly disburse on the order of days rather than months was its downfall (Boyce, Sorrell, and Standley 2023; Buckley and Pittluck 2016). Nonetheless, the potential of insurance-based mechanisms should not be dismissed entirely. Innovative models, such as parametric insurance, regional epidemic risk pools, and catastrophe bonds, offer ways to provide rapid payouts based on preagreed triggers. Although insurance alone cannot replace core preparedness investments, prefinanced, trigger-based mechanisms could complement existing pandemic financing tools by ensuring immediate release of funds when an outbreak crosses a predefined threshold. The limited adoption of pandemic insurance to date reflects both technical and political challenges—such as moral hazard, determining appropriate premiums, and setting effective triggers—rather than a fundamental lack of viability. Future designs should address these constraints while learning from past experiences to ensure that insurance plays a meaningful role in pandemic financing. Insurance mechanisms for pandemic response and reconstruction remain uncommon (refer to box 13.5). Development of such mechanisms at scale could harness private capital markets and

still offer opportunities for donor financing to reduce effective premiums. Similarly, multilateral mechanisms (such as through the International Monetary Fund) exist for contingent responses to financial crises and could be adapted for responses to health crises.

Finally, late response can also be divided into subphases with different needs for financing. First, in the event of a pandemic with serious morbidity and mortality, countries will likely recognize the importance of attempting to minimize the number of infections until an effective vaccine or treatment is available. This phase is the most disruptive because personal protective equipment, physical distancing, isolation, and quarantine are the only available tools. Depending on the severity of the pathogen, countries may be willing to impose progressively stricter lockdown restrictions that have serious economic, social, and educational consequences of their own. Trade-offs between measures should consider multiple outcomes and considerations, not only health impacts, and can be illustrated through integrated modeling (Patouillard et al. 2024). Some interventions are less socially restrictive than others—for example, masks and hand washing are less invasive and draconian than individual home quarantine and border control, which are less draconian than mandatory mass lockdowns. The more draconian the measures, the greater the need to alleviate their impact.

Second, once vaccines or treatments are available, countries will seek to scale up coverage as quickly as possible in order to relax the restrictive measures imposed to reduce infections. In the event of partial effectiveness of the vaccine or treatment (whether because of limited efficacy or limited uptake), countries will seek to keep the incidence below the threshold that would saturate health services and cause the needless deaths of infected people. Dose optimization to maximize population-level benefits when vaccines are in short supply, with a transition to dose optimization to maximize individual benefit as supply constraints are relaxed, is an example of areas that require creative (public) financing of product development because such trials do not generate returns for vaccine companies (Więcek et al. 2022). Although research and development is a form of P&P, this chapter does not include it.

This section has discussed considerations for pandemic financing along the pandemic cycle, but detailed analyses for each remain necessary as part of any national preparedness planning process, particularly of pandemic insurance or contingent financing for late response actions, which were arguably underused during the COVID-19 pandemic. Such financing mechanisms will likely focus on ensuring effective medical care (for example, access to oxygen) for those infected across all of the subphases. Before the development of effective vaccines and therapies, enabling people to reduce contact and protect themselves will require financing. Once vaccines and therapies become available, they will need to be purchased, distributed, and delivered. Contingent financing could also fund massive scale-up (or repurposing) of production capacity for the vaccines or therapies.

Recovery and Reconstruction

The recovery and reconstruction phase occurs in the aftermath of a pandemic. It involves facilitating comprehensive rebuilding and recovery from the multifaceted damage inflicted by the pandemic, such as restoring health care systems, addressing economic disruptions, compensating from disruptions in education, and supporting societal and behavioral rehabilitation. The international financial institutions of the World Bank, established as a means to provide financial assistance earmarked for recovery and reconstruction from war, could be applied to any major shock (war, natural disaster, or pandemic), with the notion that countries responsible for a war should not be penalized during the recovery process, lest such penalties reinvigorate chances of future war. Unlike financing for early response, however, this assistance could be highly conditional upon a country's level of preparedness and the effectiveness of its response efforts during the pandemic.

To continue the firefighting analogy, communities expect to put out fires without consideration of whether the property owner has insurance. If the owner lacks insurance, there is no expectation that the government or community will rebuild their house for them; however, the pandemic situation has an important difference. National leadership that did not buy insurance or appropriately prepare for a pandemic may well no longer be in power when the consequences of a pandemic occur. Furthermore, those who suffer most from the lack of foresight by leadership likely had no role in the decision to be unprepared. Thus, the threat of future refusal to provide assistance is likely less effective in this case than with homeowner's insurance. Using the firefighting analogy in this case may thus lend to extreme or impractical conclusions.

More immediate incentives that affect the leadership currently in power will be needed. To return to the homeowner's analogy (some of whom also may postpone paying for insurance), a highly effective incentive is that banks will refuse to provide a mortgage for an uninsured property. Similarly, countries could face restrictions on their ability to access global financial markets in the present if they do not participate to reduce future risk. Institutions such as the International Monetary Fund already offer, or even demand, a range of conditionalities for participation in the international financial system but currently lack any consideration of performance throughout the pandemic cycle.

By anchoring financial support to a country's readiness, or at least to improvements in these measures, policy makers not only incentivize investments in resilient health systems but also ensure that recovery efforts align with long-term resilience goals. As noted earlier in the allocation formula section, these incentives also need to be balanced with considerations of need, which can create perverse incentives to be unprepared, have greater need, and require greater external funding.

Prenegotiated financing mechanisms, such as cofinanced insurance, offer a range of advantages, particularly in their capacity to tailor premiums or fees according

to a country's level of preparedness and preventative measures. This mechanism would be analogous to paying a lower homeowner's premium for homes with a fire-resistant roof and a sprinkler system. Even if preparedness cannot prevent a pandemic, it will reduce the impact of the pandemic and thus the need for recovery financing, in turn fostering incentives for investing in resilient health care systems and reducing overall risk exposure. Moreover, such mechanisms empower countries with autonomy over their recovery priorities, akin to receiving an insurance payout to rebuild after a disaster, as opposed to the negotiation process inherent in seeking a bank loan to finance reconstruction efforts.

A fundamental aspect of prenegotiated financing whether through insurance or contingent loans, is the principle of risk sharing. By engaging in these mechanisms, countries can distribute the financial burden among all participating nations at risk, fostering a collective responsibility for managing pandemic aftermaths. In contrast, postdisaster negotiations may lack this shared accountability from sharing burden, analogous to the difference between accessing insurance funds ahead of time and applying for a bank loan after a disaster.

LESSONS, RECOMMENDATIONS, AND CONCLUSIONS

This review of pandemic financing has defined essential concepts in epidemiology and economics for informing pandemic financing throughout the pandemic cycle, framed pandemic financing in the context of health financing and its notable features of different financing instruments as well as the relevant organizations, emphasized the small amounts of financing needed relative to the costs and losses that pandemics impose, examined the flows of pandemic financing during the COVID-19 pandemic by key agencies and reviewed the key financial instruments used as well as those not used, and analyzed key pandemic financing considerations as policy makers plan for the pandemic cycle.

This review of the essential epidemiologic and economic concepts for the pandemic cycle also informs the selection of the following key principles for designing effective pandemic financing:

- *Timely (and therefore prearranged) financing*
  - Because the next pandemic could happen anytime, countries should make the needed investments in prevention and preparedness to get ready now, even if they need to borrow to create the capacity. Maintaining capacity will be much more affordable and will pay for itself in reduced risk of pandemics.
  - Given that outbreaks grow exponentially, time is of the essence in addressing an outbreak or epidemic, because these emergencies get worse and harder to contain by the hour. Prearranged financing is essential to eliminate delays in mounting an effective containment response.
  - If containment is not possible, avoidable delays in developing and deploying drugs and vaccines at scale can translate into some combination of trillions of dollars in economic costs and avertable death and disability.

Eliminating financing-caused delays can speed development, manufacturing, procurement, and distribution.

- *Public goods, market failures, and incentives.* Like the other public good–defined global challenge such as climate change, failure to act harms us all but also comes with incentives to free ride on others: Why should we pay if others will? Financing mechanisms for any investments in public goods (or preventing public harms) need to account for these problems and design accountability mechanisms that help to counteract incentives to free ride.

Lessons from COVID-19

Amid the large array of pandemic financing tools available during the COVID-19 pandemic, the vast majority focused on response. Analysis of the strengths and weaknesses of the financing system and architecture during the COVID-19 pandemic results in the following five key messages.

First, the pattern of global financial assistance for COVID-19 was broadly similar to that for health official development assistance. Bilateral development agencies provided the largest share of resources, followed by the multilateral development banks, Gavi, and the Global Fund. WHO and other United Nations agencies provided miniscule financial contributions relative to the total resources made available.

Second, the lack of an existing dedicated facility for pandemic preparedness and response was notable and justified the creation of the Pandemic Fund. The current design of this facility focuses primarily on financing country-by-country, project-based, preparedness efforts. Other existing mechanisms, from bilateral official development assistance to multilateral development banks, could also fund these efforts. Questions remain about the additionality of the Pandemic Fund as well as whether it should develop contingent financing mechanisms to fund response efforts (early or late) in the future.

Third, the pandemic financing architecture is fragmented in terms of both number of organizations and number of financing tools, with significant implications for burden on receiving countries during a pandemic. The role of governance and coordination in reducing unnecessary delays and accessing funding cannot be underestimated. Similar problems became apparent with respect to the logistics of procurement and distribution of commodities, with both developed in the moment, creating considerable delays. Newly created mechanisms, such as COVAX, were too little, too late, and largely superseded by individual and bilateral efforts by countries (refer to box 13.6).

Fourth, concessional financing (primarily bilateral official development assistance, concessional loans, Gavi, the Global Fund, and philanthropy) represented the largest share of financing, followed by market rate loans. The analysis for this chapter did not measure the role of tools designed to respond to crises, such as

contingent financing, debt service suspension, and insurance mechanisms, but their role is believed to be negligible. Contingent financing and prearranged agreements offer the potential to eliminate the delay in the flow of funds that marked most of the COVID-19 response. Promising examples that have emerged include the African Risk Capacity group, the new pandemic bond in Barbados, the Pandemic Emergency Financing Facility (improving its insurance mechanisms and triggers), and the World Bank's new Crisis Preparedness and Response Toolkit.

Finally, the response was too slow not only during the early response, when ultimately unsuccessful efforts to contain the virus were under way, but also during the late response as countries attempted to reduce its morbidity and mortality. This insufficient speed was most visibly apparent in lack of access to vaccines, but unnecessary delays due to lack of timely financing were apparent for diagnostics, monoclonal antibodies, ventilators, oxygen, drugs, and other supplies and equipment. These delays, resulting from the need to negotiate and execute financing instruments, were compounded by delays in comparative product evaluation (especially for diagnostics and vaccines), which hampered decision-making about product selection, and procurement delays caused by the lack of prenegotiated agreements. Delays also resulted from the free-for-all in which the largest, wealthiest countries hoarded supplies because they could negotiate purchase agreements more quickly. There remains a need for a new at-risk response or surge financing mechanism that ensures equitable access to medical countermeasures. Negotiations for the Pandemic Accord, particularly on the pandemic access and benefits-sharing system, reflect the high priority and urgency of addressing this fatal weakness in the COVID-19 response.

Pandemic prevention, preparedness, response, and recovery and reconstruction will be effective only with the development of effective mechanisms to finance the required actions—and through the necessary organizational and governance mechanisms, the latter of which this chapter has not discussed at length. Although this chapter has outlined key principles and recommendations for future pandemic financing, translating them into actionable funding strategies requires further assessment of how existing instruments can be improved and where new mechanisms are needed. Some financing tools, such as contingent credit lines, emergency response grants, and pooled procurement mechanisms, already exist and could be scaled up or modified to better align with future pandemic needs. Others, such as prefinanced insurance mechanisms and at-risk financing for medical countermeasures, remain underused or largely undeveloped. Figure 13.7 provides a framework for future financing instruments, but an important next step will involve more detailed mapping—that is, distinguishing between what already exists, what can be adapted, and what must be newly created. Given the technical and political complexities involved in restructuring global pandemic financing, this chapter does not prescribe a definitive path forward. Nevertheless, future research and policy discussions should critically assess which existing instruments can be optimized and which gaps require entirely new solutions, ensuring that pandemic financing mechanisms are both practical and politically feasible.

Figure 13.7 Instruments and Financing Mechanisms for Pandemic Phases

Domestic funding is ubiquitous and dominant (except for low-income countries) across all cells	Pandemic phase: Prevention	Preparedness	Early response	Late response	Recovery and reconstruction
Instruments used for COVID-19	• Minimal ODA funding beyond small amounts built into other health ODA projects		• Minimal		Traditional ODA instruments: • Conventional grants • Concessional loans • Market-rate loans • Debt-relief grants
Instruments for future pandemics	Traditional ODA financing instruments either through existing mechanisms (multilateral banks, bilateral ODA, GFATM) or new ones (Pandemic Fund): • Conventional grants • Concessional loans • Market-rate loans • Others[a]		Preadetermined, contingent emergency financing for each country based on type of threat, estimated need, and ability to tap domestic reserves. Not prenegotiated with individual countries		• Contingent (triggered) • Prefinanced (that is, premiums); concessional or nonconcessional • Can be national (for example, for unemployment insurance), regional (for example, for scale-up of manufacturing capacity or collective purchase), or global (for example, to increase WHO coordination capacity)

Source: Original figure created for this publication.

Note: GFATM = Global Fund to Fight AIDS, Tuberculosis and Malaria; ODA = official development assistance; WHO = World Health Organization.

a. Loans appropriate for start-up costs or if the country is in short-term crisis; maintenance costs should incorporate a mix of grants and domestic financing.

Recommendations

Drawing from those key messages, the chapter offers the following recommendations.

Prevention and preparedness

- To ensure adequate financing of prevention and preparedness, establish clear and transparent indicators that define a minimum acceptable level of pandemic prevention and preparedness that can be improved by financing. Indicators should be simple, measurable, achievable, relevant to pandemic financing, and time-bound. Although this chapter does not discuss the existing array of international regulations and rules—such as the International Health Regulations, the negotiations under way on the Pandemic Accords, or prevailing tools like the Joint External Evaluation tool and others—its key message is that financing needs to be linked to progress that is independently and rigorously evaluated by a third party.
- Establish principles for how to distribute a global pandemic financing resource such as the Pandemic Fund across countries, on the presumption

that prevention and preparedness are global public goods. On the basis of those principles, define and use an allocation formula that can incorporate expected country costs for financing pandemic prevention and preparedness as well as standards for how much country and international sources should be expected to finance.

Response and recovery and reconstruction

- *Early response*. Establish clear and transparent triggers or a tiered scale of triggers for swift activation and deployment of financial, human, and material resources in response to an outbreak or epidemic of a new or reemerging pathogen (chapter 14 in this volume).
- Ensure that funding mechanisms are prearranged and are designed to enable rapid release when different types of outbreak or epidemic triggers occur. Financing must be much faster, more transparent, reimbursable if not used or justified, and used to fund actions within and outside of the health sector. Similar mechanisms are needed for human and material resources, particularly in planning for surge response, but such mechanisms are outside of the scope of this review.
- *Late response and recovery and reconstruction*. Develop a suite of contingent financing mechanisms to enable countries to cope with the late response to and recovery from large epidemics and pandemics. Mechanisms can include contingent grants, contingent loans, and insurance (refer to figure 13.7). These tools can be adapted to a country's ability to pay, with different levels of subsidy from the global community, comparable to other global development efforts. These mechanisms can be similar to those developed for response to and recovery from other major shocks. They differ from traditional grant and credit-based development assistance for health because, unlike much current development assistance for health, they are prenegotiated and contingent upon the occurrence of an epidemic or pandemic.

Governance and continuous learning

- Although extensive review of governance options for prevention, preparedness, response, and recovery was beyond the scope of this chapter, the public good nature of pandemics needs to be considered with respect to governance of financing mechanisms for global public goods.
- Pandemics are subject to the cycle of panic and neglect for many reasons, including the low frequency and high impact of such events, as well as the short time horizons of politicians. Leadership and governance, however, can ensure that lessons are learned and that pandemic preparedness and response plans evolve in response to those lessons. Learning can occur using real-world scenarios or simulation exercises of new potential pandemics to test and enhance preparedness plans, at hospital, local, national, and international levels. Review of best practices and lessons should be periodic and routine.

By exploring these strategies, the international community can create a resilient and equitable framework for pandemic preparedness, ultimately leading to stronger global health security.

Conclusions

Global health financing mechanisms have historically not been designed to provide immediate or timely financial, material, and human support at the scale required to adequately respond to outbreaks and epidemics and prevent pandemics. Development assistance for health is designed to address ongoing health challenges, but pandemics require financing mechanisms that are triggered by an event or a set of conditions. This situation is much more akin to public and private insurance mechanisms than to traditional project-based or sectorwide development assistance. Such contingent mechanisms need to be implemented at the required scale and speed.

Reducing the risk of pandemics requires global cooperation with an effective system of rules and regulations that include positive and negative incentives. Just as homeowners in high-risk areas are required to clear flammable brush from around their houses, with inspectors verifying compliance, so too are transparency, verifiability, and accountability key to global financing mechanisms for pandemic prevention, preparedness, response, and recovery and reconstruction.

NOTES

1. For more on the International Monetary Fund's tracker, refer to its "Policy Responses to COVID-19" web page, https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19.
2. *Non-flow financial instruments* refer to financial mechanisms that do not involve the continuous flow of funds from one entity to another over time. Unlike traditional grants or loans, which typically entail ongoing financial transactions, non-flow instruments may include options, swaps, guarantees, insurance contracts, or other derivative instruments that provide contingent coverage or protection against specific risks without necessitating regular payment streams. These instruments are often used in the context of risk management and financial hedging strategies, offering flexibility and tailored solutions to mitigate various types of financial risks.
3. This chapter mainly emphasizes the former functions of revenue mobilization and pooling, whereas it emphasizes less the function of payment and purchasing, recognizing that many incentives, particularly between international and national stakeholders, occur in the context of the latter function (that is, in the context of a contractual agreement involving payment). A third financing framework by Fan, Sharma, and Hou (2023) labeled the categories of the Roberts et al. (2008) framework as the means of financing, but emphasized two other aspects shared by both financing and purchasing, which pertains to the benefit package of services offered and the population eligibility or who is covered under such financing (Fan, Smitham, et al. 2023). This framework emphasis recognizes that the payment and purchasing function cannot be separated from the what and the who, and is consistent with the framework in this chapter, which emphasizes the list of pandemic actions—that is, the what.
4. Institute for Health Metrics and Evaluation, "Development Assistance for Health on COVID-19 Database 2020–2023," https://ghdx.healthdata.org/record/ihme-data/development-assistance-health-covid-2020-2023.

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