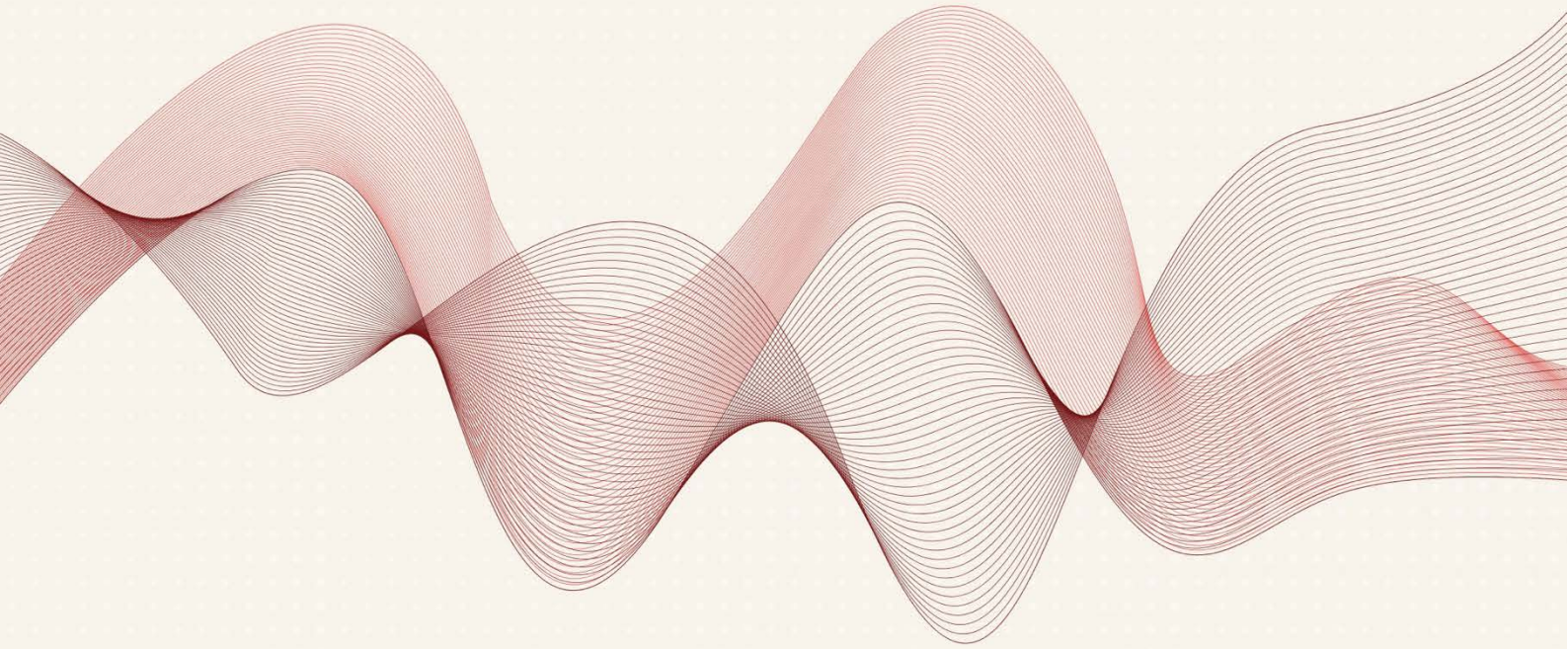

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Financing the Pandemic Cycle: Prevention, Preparedness, Response and Recovery & Reconstruction

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

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Preface

Since the early 1990s, researchers involved in the Disease Control Priorities (DCP) effort have been evaluating options to decrease disease burden in low- and middle-income countries. This working paper was developed to support the Fourth Edition of this effort. It is posted to solicit comments and feedback, and ultimately will be revised and published as part of the DCP4 series.

DCP4 will be published by the World Bank. The overall DCP4 effort is being led by Series Lead Editor Ole F. Norheim, Director of the Bergen Centre for Ethics and Priority Setting in Health, University of Bergen. Core funding is provided by the Norwegian Agency for Development Cooperation (Norad) and the Norwegian Research Council.

More information on the project is available at: https://www.uib.no/en/bceps/156731/fourth-edition-disease-control-priorities-dcp-4.

This paper was simultaneously published on the University of Bergen DCP4 website and the Center for Global Development's website (https://www.cgdev.org/publication/financing-pandemic-cycle-prevention-preparedness-response-and-recovery-and).

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

Abstract

The COVID-19 pandemic exposed critical gaps in the global response to health crises, particularly in the financing of pandemic prevention, preparedness, response, 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 policymakers in both low- and middle-income countries (LMICs) and high-income nations, providing a guide to appropriate financing tools for each stage of a pandemic, from prevention and preparedness to response and recovery. Key economic concepts such as global public goods, time preference, and incentives are explored to underscore the complexities of pandemic financing. The chapter 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. We also used the IHME 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 investments in pandemic preparedness to mitigate future risks is relatively small, on the order of $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.

Acknowledgements

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1.0 Introduction

The COVID-19 pandemic revealed significant weaknesses in the international response and action (Sachs et al., 2022). A major challenge faced by countries and multilateral entities was 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 be 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, among others. It is obvious to state that financing for pandemics is paramount—not just of the adequate amount or volume, but financing that is timely, relevant, and useful to countries in the pandemic cycle, from prevention to recovery (Agarwal & Reed, 2022). Moreover, it is important to recognize that investing in pandemic preparedness is intrinsically linked to strengthening the overall healthcare system. A robust healthcare system creates the synergies for effective pandemic response measures.

In this chapter, we present a comprehensive framework for pandemic financing that spans the entire pandemic cycle, designed to serve both governments and international funding bodies, extending its applicability beyond low- and middle-income countries (LMICs) to include high-income nations as well. This framework is structured to assist policymakers 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 our discussion, it is crucial to understand the economic principles that underpin pandemic financing. Three key concepts are particularly relevant: global public goods, time preference, and incentives. 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. Finally, incentives shape governmental 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. 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, we introduce the pandemic cycle, delineating its different phases along with categorizing actions. Next, we delve into the interplay between basic epidemiologic and economic concepts, such as public goods and time preference. Following this, we provide a formal definition of pandemic financing and the range of financing instruments available to countries and international funding agencies. Afterwards, we present a case study that examines the financial flows during the COVID-19 pandemic. Building upon these sections, we propose funding schemes tailored to each phase of a pandemic. Finally, we summarize our 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, we first introduce and define the pandemic cycle, encompassing four distinct phases of pandemic prevention, preparedness, response, and recovery & reconstruction (see **Figure 1**). The overall pandemic cycle emphasizes the recurrent nature of pandemics and their 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, as well as recovery phases considered as "interpandemic" or between pandemics, and the "response" phase as the "intrapandemic" or during the pandemic phase. Further, prevention and preparedness often occur simultaneously, i.e., before a pandemic, but these phases entail different types of actions. Similarly, it is common for recovery to overlap with response.

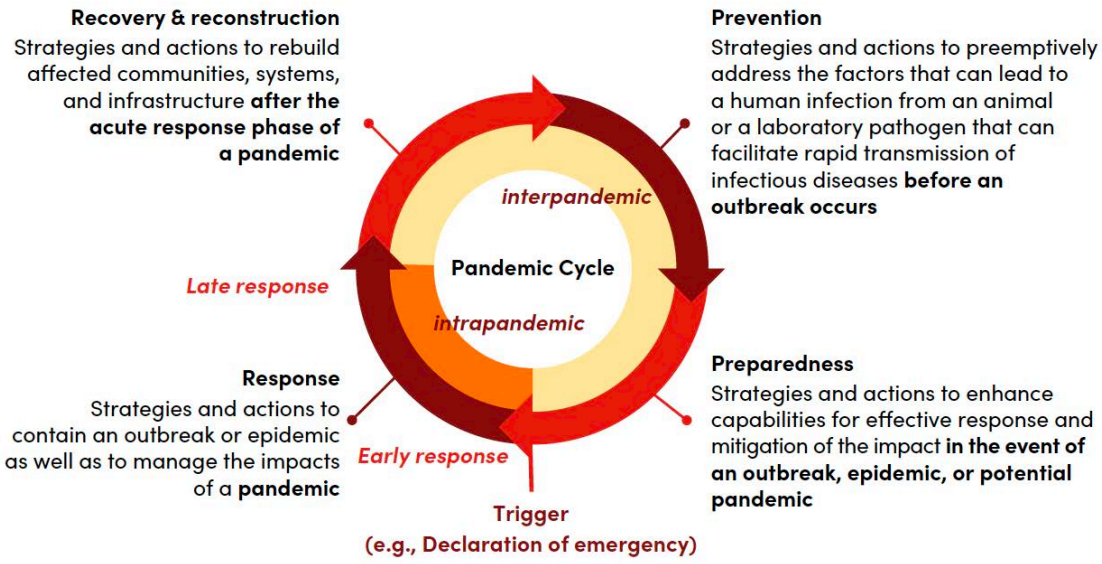


Figure 1. Framework for the Phases of the Pandemic Cycle

We aim 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 (e.g. as governed by ministry of agriculture or land) or the spread from a laboratory to humans, as well as measures to lower the natural R0, such as the use of universal precautions in healthcare settings, improved ventilation in public transport (e.g. defined by a ministry of transportation), etc.).

Second, **the preparedness phase** also refers to the strategies and actions taken before an outbreak occurs but are focused on enhancing capabilities for effective response and mitigation of the impact in the event of a potential outbreak/epidemic/pandemic[1].

The **trigger** is the critical juncture that separates the prevention and preparedness phases from the response phase (Madhav & Oppenheim, 2023). 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, the latter typically in the form of an emergency declaration and in accordance with relevant jurisdictional law and which can benefit from having a tiered scale of alerts for improving communication (V. Y. Fan 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—"to put the genie back into the bottle." The **late response** occurs if it is not possible to stop all transmission and is aimed 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 as well as 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 which persist as naturally occurring in a seasonal fashion or which continue to spread even after an acute response phase, such as HIV or COVID-19.

Next, **the recovery or 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 recovery phase overlaps with the prevention and preparedness phases (for future pandemics) but is labeled as a distinct post-pandemic phase for which the strategies and actions address the societal changes and impacts that resulted from the pandemic.

Categorization of Pandemic Actions

Guided by the considerations outlined above, we have systematically identified and categorized pandemic actions into the four crucial phases of the pandemic cycle (**Table 1**), drawing from multiple lists such as the WHO's Pandemic Influenza Preparedness (PIP) framework and Joint External Evaluation (JEE) tool, G20 High Level Independent Panel Report, Oxford COVID-19 Government Response Tracker, IMF's COVID-19 Policy Tracker, and others(G20 HLIP, 2021; Hale et al., 2021; International Monetary Fund, 2021; World Health Organization, 2022, 2024). This categorization serves as a roadmap or a playbook of possible pandemic actions for which strategic financial planning is necessary to allocate funds at pandemic phase. Our 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 to improve coordination, collaboration, and assignment of responsibilities, particularly across ministries and sectors as well as between different authorities and agencies, and thus better address the control of a pandemic.

This categorization aligns with the WHO's new framework on Health Emergency Prevention, Preparedness, Response, and Resilience (HEPR), which emphasizes comprehensive strategies for managing health emergencies (World Health Organization, 2023). However, it differs 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. Our list of pandemic actions—or interventions—is also not comprehensive of the interventions identified in the entire volume, but instead we recognize that a common vocabulary and list or playbook of pandemic actions can help policymakers understand the decision space and options in front of them.

Table 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 (e.g., PPE) during emergencies
	Guidelines for points of entry: Establishment of guidelines for international travel, transport, 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, healthcare 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 socio-economic 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 (e.g. 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
	Healthcare Infrastructure: Strengthening of healthcare infrastructure, including the expansion of hospital beds, critical care units, medical equipment, laboratory capacity, and healthcare 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
	Supply Allocation and Distribution: Planning and managing the allocation and distribution of essential medical supplies (e.g., PPE, ventilators), vaccines, and other critical resources. This includes cold chain management, stockpiling, and developing vaccine distribution plans
	Resource Mobilization: Deployment of resources, including medical supplies and healthcare personnel, to regions heavily affected by an epidemic or pandemic
Research and Development (Vaccines, Therapeutics, Diagnostics, and PPE)	***Market Shaping:*** Utilizing 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 intellectual property 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 communi-cation and community engagement	***Public Awareness Campaigns:*** Global campaigns to raise public awareness and trust as well as 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, healthcare 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
Recon-struction 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

Notes: Green refers to prevention, yellow to preparedness, red to response, blue to recovery and reconstruction, and purple refers to multiple pandemic phases.

Legend. Color code by pandemic phase for Table 1

Color code	Prevention	Multiple
	Preparedness	
	Response	
	Recovery & reconstruction	

2.0 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 utilized. 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, and market failures, which underpin the strategies for effective pandemic preparedness and response.

Infectious Disease Epidemiology

Epidemics and pandemics, the latter classified as a disaster, possess distinct characteristics setting them apart from other types of disasters such as floods, hurricanes, volcanic eruptions, earthquakes, and tsunamis. There are a few differences including their time frames, growth patterns, detectability, and transboundary natures.

Time Frame

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 than a day, even as cases spread to many people (i.e. with a high R0) but their detection may take weeks depending on the specific biology of the pathogens, the symptoms or lack thereof.

Exponential Growth

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, and in the case of respiratory pathogens, such epidemics have the potential of eventually reaching 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, but the tapering of infectious diseases is arguably slower moving and less detectable or invisible to the human eye. 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 there is an extended period of asymptomatic infection 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 a hurricane, tsunami, or flood. Hence, addressing epidemics both early and effectively while considering the potential for sustained efforts over time for mitigation make infectious diseases quite different from natural disasters.

Transmissibility

The transmissible nature of infectious diseases implies that a disease can originate locally but have 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

There are four economic concepts that are especially important to pandemic financing: *public goods, time preference, incentives,* and *market failure*.

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 a pandemic is less likely to occur because bat guano harvesters use PPE in one cave in Liberia, it will benefit people in Uruguay, Japan and Egypt—and the benefit for someone in Japan is no less because it also benefits Egyptians. Conversely, failure to contain an outbreak does not just affect the community or country that failed to contain it, it 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 individuals will underinvest in the control and spread to others once the individual is infected, while those who are not yet infected may be able to "free ride" on others who are protecting themselves individually, e.g. through immunization and adequate herd immunity and also underinvest in protection.

Public goods have a characteristic of geographic scale or scope, be they local, national, regional, or global: local public good e.g. fire protection, national public good e.g. national defense, regional public goods e.g. regional epidemics, and global public goods e.g. pandemics and mitigation of climate change. Pathogens may vary in their local, national, regional, or global spread and thus their geographic scope as a public good, e.g. we would argue that

respiratory pathogens have greater scope to be a global public good, whereas bloodborne diseases may be mostly limited to a regional public good (V. Y. Fan 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 being able to "free ride" on the levels of preparedness from other countries. As a result, 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 a 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.

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 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 why there is far less 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 where the benefits are immediately observed (even, as we noted earlier, the immediacy of epidemics is less immediate than other natural disasters).

In countries with greater resource constraints, such as low- and middle-income countries, time preference may be more significant, especially in countries addressing immediate or basic needs, such as food security, compared to the risk of a future pandemic. Political cycles also affect time preference, as 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. Long-term view would not only imply 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 a synonym of sustainability, which was 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" (The United Nations Brundtland Commission, 1987).

Incentives

The theory of incentives and the principal-agent problem is essential to understanding any payment of financial resources and the risks of moral hazard (Laffont, 1993; Laffont &

Martimort, 2002). Paying a country to be prepared has different incentives compared to 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 impact their locale. In contrast, a country that purchases insurance on the expectation that the insurer will provide assistance may result in moral hazard, that is, engaging in risky behavior that may necessitate a pay-out from the insurer. Thus, any discussion of pandemic financing should recognize the ways in which funding flows and associated agreements and contracts have incentives in shaping behavior, particularly governmental behavior.

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. Financing flows thus have two aspects: one in its role of mobilizing revenues and resources to a country (from the perspective of the receiving country); another is the aspect of purchasing and payment, in which an international agency pays a receiving country for a contractually agreed set of services or goods. Indeed, 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 has indicated the potential for aid fungibility, i.e. an increase in foreign assistance for health may be associated with a decrease by the country for domestic government health spending, with implications for sustainability (Dieleman et al., 2013).

Market Failures

During a pandemic, market failures become evident in the allocation of scarce inputs such as diagnostic tests, antimicrobial drugs, and vaccines, where 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 in ability to pay.

The market failure in this context arises from several factors. Firstly, the global inequality in incomes underpins stark differences in ability to pay for supplies and medical countermeasures during a pandemic, not least of which is vaccines. Compounding this inequality is the lack of *timely* sharing of financial resources between high income nations to lower income nations who 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 for which resource allocation is timely, respected, and authoritative. Secondly, 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 been successfully used to accelerate 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. Thirdly, national governments have exacerbated the problem by restricting export of key products until local demand is fully satisfied (and even to enable stockpiling) prior to meeting the needs of people at greater risk in other countries. There were also temporary shortages of key products such as face masks due to short supply as well as individual hoarding behaviors even among those who were able to pay.

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 who opt out of global efforts.

In an ideal scenario, funding for pandemic prevention, preparedness, and early response—at least regional or global public goods—would be contributed by all countries based on 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 World Health Organization. Alternatively, it could be refined to account for the fact that larger countries derive a substantial portion of the global benefits, while 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 due to fewer incentives for engagement in global prevention and preparedness efforts.

However, in practice, existing multilateral institutions of the United Nations and the World Health Organization 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 regardless of preparedness status or contribution to a multilateral institution, every country should be fully eligible for global assistance—financial, human, informational, and material—as needed to contain the outbreak/epidemic. Besides obvious humanitarian reasons, it would not be in the enlightened self-interest of neighboring countries—and indeed the entire world—to not try to contain

outbreaks/epidemics in a country due to the public good nature and in particular global public good nature.

But once a pandemic takes hold and containment becomes infeasible, the dynamics shifts. The majority of the benefits from country-level efforts to slow transmission or reduce the case fatality rate through treatment will be primarily retained by the country. In the context of a pathogen with high potential for mutation, such as COVID-19, there may be some global benefits from country-level efforts to reduce transmission, but even that is uncertain.

A commonly understood public good is fire protection and may serve 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. However, if the house lacks insurance or engages in fire-prone risks, the community may not feel obligated to rebuild or provide temporary housing. Similarly, while the global community may opt to provide humanitarian assistance to countries whose leaders previously declined to participate in global pandemic financing mechanisms, there is not the same global imperative to aid those who 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 Pandemic Response

Among the alternatives to address these market failures, two approaches stand out, which are not mutually exclusive: implementing binding international agreements to ensure equitable distribution of supplies (e.g., streamlining the TRIPS waiver process during emergencies like pandemics) and 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. Firstly, it allows for quicker and more accessible distribution of medical supplies and vaccines, as 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 where time is of the essence. Secondly, it enhances the resilience of global supply chains by diversifying the locations of manufacturing, we can 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). This decentralization also promotes equity in access to essential health products. During the COVID-19 pandemic, countries hosting manufacturing facilities had prioritized access to vaccines and supplies, such as India, China, Russia, and the US, leaving other countries at a disadvantage in terms of timely and affordable access. Distributed

manufacturing capabilities can help to address the principle of fair access to the tools needed to combat a pandemic. Thirdly, local manufacturing can drive economic, technological, and scientific development and capabilities in different regions, empowering them to become more self-sufficient and less reliant on imports for critical health supplies, serving as a potential industrial producer, 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.

3.0 Definition of Pandemic Financing

We now move on from an examination of epidemiologic and economic concepts to defining pandemic financing as inclusive of three aspects: (1) health financing and two of its subcategories: (2) official development finance pertaining to a pandemic, and (3) non-flow financial instruments[1] relevant to ministries of finance in addressing a pandemic or disaster.

Health Financing Frameworks

Definitions of *health financing* vary. The World Health Organization (WHO) defines health financing 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 (Roberts et al., 2008). This framework distinguishes between financing and payment as distinct. Payment is defined as the methods and associated incentives 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.[2]

[1] 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 utilized in the context of risk management and financial hedging strategies, offering flexibility and tailored solutions to mitigate various types of financial risks.

[2] For the purpose of this chapter, we mainly emphasize the former functions of revenue mobilization and pooling, while emphasizing less the function of payment and purchasing. But we recognize that many incentives, particularly between international and national stakeholders, occur in the context of the latter function, i.e. 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, while emphasizing 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 et al., 2023). This framework emphasis recognizes that the payment and purchasing function cannot be separated

Of the six different sources of financing identified by Roberts et al., external flows generally refer to the varieties of *official development finance* (ODF), for which the ODF addressing pandemics is the next component of our definition of pandemic financing. The Organization for Economic Co-operation and Development (OECD) formally defines external flows as inclusive of ODF, which comprises official development assistance (ODA) of a concessional nature as well as other official flows (OOF) which are non-concessional. Within the ODA category, there is a further distinction between health ODA and other ODA (e.g. for other sectors such as education), and an additional distinction between health ODA for pandemics compared to health ODA not explicitly for addressing pandemics (see **Figure 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, pandemics). Despite the necessity of considering flows for other sectors, for the purpose of quantitative analyses in this chapter, we restrict ourselves 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 (R&D) for COVID-19. We also note that our discussion later in the chapter on non-flow instruments, namely international insurance contracts, are also not captured in this anslysis.

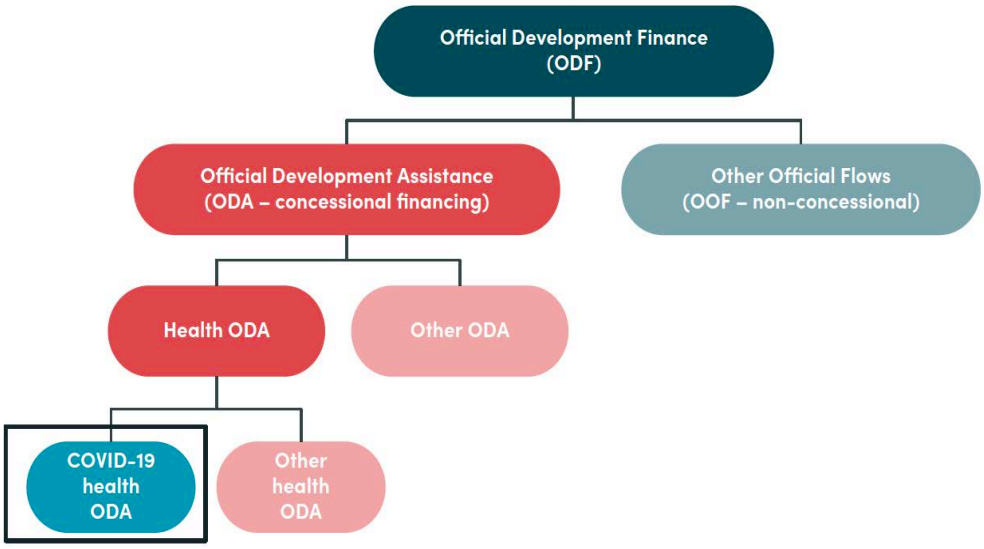


Figure 2. Classification of Official Development Finance for Health ODA

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 categorization and classification of these funds are often by which authorized ministry or agency (which sector) is responsible for the funds,

from the what and the who, and is consistent with our framework which emphasizes the list of pandemic actions, i.e. the what.

both at the national and international level. These sectoral or ministerial siloes define who has the resources and who does the implementation—and consequently there are different incentives 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-purpose).

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 as all sectors are impacted by a pandemic—and several sectors are responsible for contributing to increasing pandemic risks, such as land use and environmental planning, as well as 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; V. Fan, 2022).

From an international perspective, different international agencies are responsible for different functions in the pandemic cycle, including development finance institutions (DFIs) for whom the main counterpart is typically ministries of finance, whereas the global health agencies generally have as their main counterpart ministries of health. Yet this fragmentation in international governance reveals a fundamental tension and unresolved question about which agency should decide what happens and how, e.g. should the World Health Organization as the leading United Nations entity on health matters or should the Bretton Woods institutions that currently have the lion's share of the multilateral resources?

We argue that sectoral siloes are both necessary yet a potential hindrance during a pandemic. Indeed, during the pandemic *response* phase, all sectors—not only health—are stressed and responding to dynamical changes as a result of the pandemic and thus a large proportion of financing in all sectors could be labeled as pandemic financing. Yet before and after a pandemic or health emergency, most ODF and government financing is clearly not being used 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. But, while sectors are necessary for implementation, their creation of siloes also risks poor coordination between sectors, duplication of effort, as well as confusion in terms of authority and responsibilities—a pattern arguably seen regularly both at the national and international levels during the COVID-19 response.

Definition of Pandemic Financing

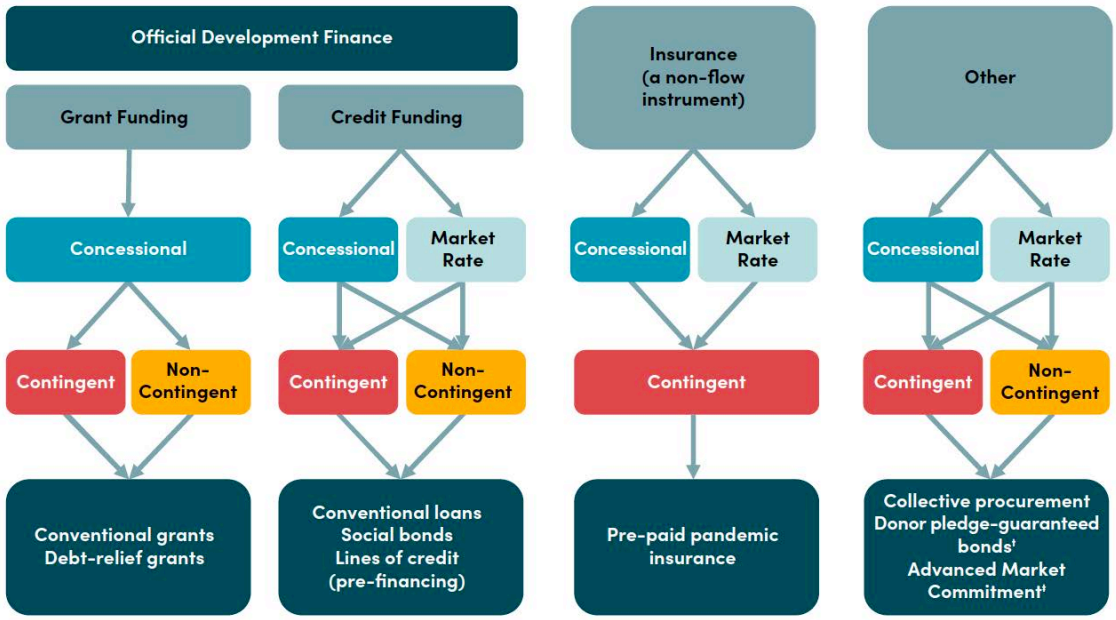
We acknowledge that a definition of pandemic financing restricted to domestic and external financing for health and specifically for pandemic-related health, adopted for this chapter, is too narrow. Unfortunately, we will be presenting data only on health ODA for COVID-19, due to data limitations. Excluded from our analysis of funding flows is a complete listing of OOF for COVID-19 including health OOF as well as other ODA on COVID-19 that is not focused on health (see Figure 2).

Our definition of pandemic financing goes beyond health financing and health ODA for COVID-19 despite the limitations of this quantitative analysis of flows. 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 pay-outs. 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 which suspend debt servicing payments in the context of an emergency.

Many of the health financing mechanisms, including for ODF and ODA, 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, be they concessional or non-concessional).

Non-flow tools often refer to contractual arrangements between a payer and payee, which would refer to the purchasing or payment function rather than the revenue mobilization or pooling function of financing.

Figure 3. Classification of external pandemic financing tools by key characteristics



Notes: Concessional refers to various forms of subsidies by donors. Grants are typically fully subsidized but they can require national co-financing. 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. †The International Finance Facility for Immunisation, or IFFIm, is one such example where donor pledges guarantee private bonds that enable immediate expenditures. ‡A mechanism like an advanced market commitment could be non-concessional 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). Non-flow instruments are not captured in our quantitative analysis.

Multiple instruments are available for external pandemic financing, each serving different purposes across the pandemic cycle (**Figure 3**). These financial instruments can be categorized based on their terms and conditions, including whether they are concessional or at market rate, and whether they are contingent or non-contingent. Such classifications help policymakers and stakeholders identify the most appropriate financing mechanisms to address the various stages of the pandemic cycle.

For this chapter, we define "contingent" to refer to funding that is pre-negotiated but only released or activated when specific trigger conditions are met. These trigger conditions are typically possible in any given year, but not likely–such as a pandemic, a natural disaster, or a financial crisis. Such contingent financing refers to a specific type of conditionality on financing, but there are other kinds of financing conditionalities, such as conditions on whether the recipient complies with the terms of the financing (such as ensuring financial controls and

reporting requirements, using the funding for designated purposes, demonstrating co-financing, etc.), common to development financing.

In **Figure 3** we categorize instruments for pandemic financing into four primary types: Official Development Finance (subdivided into Grant Funding and Credit Funding), Insurance, and Other. **Box 1** provides an overview of the types of external financing instruments, which excludes domestic revenue mobilization involving government revenue, primarily derived from taxation.

- **Grant funding** includes conventional grants and financial mechanisms such as debt relief, which can either be contingent or non-contingent in nature. While conventional grants are non-repayable 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 (pre-agreed financing). These can be contingent or non-contingent, depending on whether they are only activated when specific conditions are met.

- **Insurance** represents a non-flow instrument such as pre-paid 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 which function primarily for revenue mobilization and pooling (Dissanayake & 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 et al., 2021). They can be concessional if donor subsidies reduce effective prices for some purchasers. Advance market commitments (AMC) are binding commitments to purchase a specified product at a pre-set price as an incentive for producers to allocate their resources for developing the desired product (Kremer et al., 2020). The AMC for a pneumococcal vaccine arranged by Gavi was donor funded (concessional) with country financing. AMCs do not necessarily require pooled procurement but can benefit from pooled procurement i.e. pooling demand from multiple countries. Pooled procurement and the pneumococcal AMC have not been contingent on an epidemic or pandemic. A pre-negotiated 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 1. Overview of the types of external financing instruments

Grants are without repayment requirements. There exist two broad categories of grants: 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 utilization. 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.

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 towards critical needs such as healthcare 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 pre-specified conditions (contingent).

Concessional loans are typically below-market-interest-rate loans because the negotiated interest rate is below market and/or there are interest-free grace periods. The interest rate may be subsidized by the lending institution or a third party. They may also offer the option to repay in the borrower's local currency or provide other terms that reduce the exchange rate risk.

Non-concessional 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 that require immediate financial intervention. To facilitate rapid disbursement, these loans often come with pre-negotiated terms activated in an emergency, with interest rates and repayment schedules that reflect the situation’s urgency and the borrower’s repayment capacity. These pre-set terms allow for quick action when conventional loan procedures might be too slow to address the pressing needs of the situation. While designed for rapid disbursement, the emergency loans can be limited by the availability of emergency financing facilities and the pre-negotiated 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, premiums, from a large group of policyholders. When a covered event occurs, the mechanism disburses funds from this 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. While it offers quick access to funds in the event of an incident, these 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 IFI, 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. Guarantees can enable developing

countries to access capital markets or secure loans for development projects at better rates, as they mitigate the risk to the lender by providing a promise of repayment from a financially stable guarantor. 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 2 presents a mapping of the existing external financing instruments by the different stakeholders. Each instrument is categorized by its source, type, purpose, trigger/eligibility criteria, and repayment terms. Due to time and effort limitations, we selected 15 funding agencies purposively with a focus on the largest agencies involved in COVID-19, those with a history of substantial contributions to global health, and organizations that are actively adapting their instruments in response to lessons learned from the pandemic. Additionally, we considered agencies representing diverse funding mechanisms and geographic regions to ensure a comprehensive overview of the global financing landscape. For each agency, we reviewed a number of information sources, including financial reports, funding announcements, and press releases, ultimately cataloging 31 different instruments. While this catalog is not comprehensive, the list captures many of the primary external instruments in use or under active consideration for PPRR.

Different types of stakeholders were examined for this chapter:

- International multilateral organizations (e.g., World Health Organization, UNICEF, United Nations Development Programme),
- Multilateral regional organizations (e.g. Pan American Health Organization, Africa Centres for Disease Control and Prevention),
- Development finance institutions (World Bank and International Monetary Fund, Asian Development Bank, African Development Bank and Inter-American Development Bank),
- bilateral donor agencies (e.g., Japan International Cooperation Agency, US Agency for International Development and German Agency for International Cooperation),
- Global health initiatives (e.g., Gavi, CEPI, and the Global Fund to Fight AIDS, Tuberculosis and Malaria),
- Philanthropic organizations (e.g., the Gates Foundation), and
- Research institutes (e.g., Institut Pasteur).

See **Box 2** for an overview of the external organizational stakeholders. Excluded from our landscaping exercise was financing for a national security or defense purposes. Importantly, similar to the list of external financing instruments, this list of external organizations does not capture the domestic financing and organizational arrangements as well as regional entities such as the Africa Centers for Disease Control.

Box 2. Organizational stakeholders in external pandemic financing

Development Finance Institutions (DFIs) 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 DFIs 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 such as the Asian Development Bank (ADB).

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

The **International Monetary Fund (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 which can have many causes, including epidemics and pandemics. The IMF also helps countries tackle acute payment imbalances.

Complementing the World Bank and IMF lending efforts, the **Regional Development Banks** provide an array of financial instruments and play a vital role in their respective regions thanks to their deep cultural understanding and networks. These include the African Development Bank (AfDB), the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the Inter-American Development Bank (IDB), and others like the Islamic Development Bank (IsDB), the New Development Bank, and the Asian Infrastructure Investment 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 and are often part of a broader foreign policy strategy. Compared to multilateral aid, bilateral aid can be more flexible and quicker to mobilize, as 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, functioning as public-private partnerships, and some are incorporated as a non-profit 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 the Global Fund to Fight AIDS, Tuberculosis and Malaria, the Gavi alliance, and UNITAID. GHIs are differentiated from non-governmental organizations by the presence of government and/or UN agency representatives in their governance as primary financiers of the GHI.

Philanthropy involves the use of private funds, often from individuals, foundations, or corporations. Philanthropic organizations can fill gaps in funding and are often more flexible 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 as well as with non-profit, non-governmental entities than is often the case for multilateral and bilateral funders.

From our landscaping exercise, we found most of the financial instruments in the response phase of the pandemic cycle, with 23 identified tools representing the majority of available resources. These 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 towards developing new financial mechanisms to address health crises. Our landscaping exercise revealed that reactive financing strategies are more prevalent than proactive ones that address pandemic prevention and preparedness.

We also found significant imbalance in the presence of instruments over the pandemic cycle, with only four dedicated to recovery and highlighting 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 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. We have curated and featured selected instruments or mechanisms into four key areas, including instruments that were used during the COVID-19 pandemic as well as newer instruments or mechanisms that have been developed afterward:

- Box A: Mechanisms for prevention and preparedness
- Box B: Mechanisms for emergency response
- Box C: Insurance-like mechanisms
- Box D: Instruments and mechanisms for product development

Box A. The new mechanism for pandemic prevention and preparedness: The Pandemic Fund

The Pandemic Fund, established in 2022 and hosted by the World Bank, with WHO as the technical lead, provides long-term grants to countries for pandemic prevention, preparedness, response, and recovery (PPRR). In its first funding round in August 2023, the Fund disbursed $338 million to 37 countries for activities like enhancing surveillance, improving laboratory capacity, and training healthcare workers—almost entirely for prevention and preparedness. A second round of $500 million has been approved. The Fund aims to offer predictable, multi-year 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 B. Financial instruments for emergency response to outbreaks/epidemics

WHO's Contingency Fund for Emergencies (CFE)

The Contingency Fund for Emergencies (CFE) enables the WHO to respond rapidly to disease outbreaks and health emergencies, often within 24 hours. This fund is flexible, allowing the WHO to allocate resources quickly where they are most needed, without being tied to specific purposes. In 2024, through July 23rd, approximately $15.4 million has been contributed by seven countries. These funds have been allocated across various crises, with $7.3 million going to the Sudan conflict, $6.5 million towards the

global dengue outbreak, as well as additional disbursements for emergencies in the occupied Palestinian territories and Ethiopia. In total, about $32.5 million has been disbursed to address global health crises in 2024 through July 23rd. Since its inception in 2015, the fund has received approximately $335 million from a relatively small number of countries, with Germany being the largest donor by far. This fund appears to be intended for WHO response to urgent, unplanned, and unbudgeted needs, but to our knowledge this fund is not a pre-negotiated, triggerable mechanism for responding at the required scale to contain a large epidemic nor is it designed to fund associated non-health costs, such as those associated with suspending air travel, that can be triggered by response to an outbreak or epidemic.

The World Bank Group's Crisis Preparedness and Response Toolkit

The World Bank Group's latest Crisis Preparedness and Response Toolkit launched in 2023-24 provides developing countries with tools to better respond to and prepare for crises. It includes:

1. **Rapid Response Option (RRO)**: Countries can quickly reallocate up to 10% of undisbursed World Bank financing to address immediate crisis needs, such as repurposing funds from infrastructure projects to provide emergency aid.
2. **Pre-arranged Financing**: Countries can access new budget support quickly when disasters strike, helping manage immediate impacts without compromising long-term development goals. This includes expanded options like the Development Policy Financing Catastrophe Deferred Drawdown Option (DPF Cat DDO) and Investment Policy Financing with a Deferred Drawdown Option (IPF DDO).
3. **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.
4. **Climate Resilient Debt Clauses (CRDC)**: 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 C. Insurance-like prepaid mechanisms

Pandemic Emergency Financing Facility (PEF)

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

- Insurance Window was for targeted large, multi-country infectious disease outbreaks in IDA-eligible countries and backed by reinsurance markets and a Pandemic Bond. However, strict activation criteria delayed payouts, limiting its effectiveness.
- Cash Window intended to function like a traditional trust fund, covering a broader range of diseases. It disbursed immediate funds based on expert advice and PEF steering body approval, enabling quick response to outbreaks and conceptually similar to WHO's CFE (see above).

Despite its aim to provide quick funding for outbreaks, the PEF faced criticism for delayed payouts and limited scope, making its total disbursement of $257.24 million insufficient to handle major health crises like COVID-19. The complete elimination rather than revision and adaptation of the PEF amidst the face of extensive criticism resulted in the loss of a useful mechanism that could have been improved. The 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

The African Risk Capacity (ARC), 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. ARC's new product, supported by partners like Ginkgo Bioworks, Munich Re, AON, 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 WHO, 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 $40-$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 D. Instruments for product development/manufacturing/purchasing and distribution

COVAX

COVID-19 Vaccines Global Access, abbreviated as COVAX, launched in April 2020 by WHO, Gavi, and CEPI, 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 upfront to secure vaccines, while lower-income countries received vaccines funded by donor grants through an Advance Market Commitment (AMC). However, COVAX struggled as many wealthy countries bypassed the initiative by making bilateral deals, leaving COVAX at a disadvantage in securing vaccine doses. This delayed vaccine distribution and undermined its equitable access goals, along with only US$ 400 million of the US$ 2.4 billion pledged being disbursed by the end of 2020. 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

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

African Vaccine Manufacturing Accelerator (AVMA)

The African Vaccine Manufacturing Accelerator (AVMA) is a new financing mechanism designed to provide up to US$1 billion over a ten-year period, starting from its launch in June 2024, 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 Gavi, the African Union, and the Africa Centres for Disease Control and Prevention (Africa CDC), with input from a broad range of stakeholders, including partners, donors, industry representatives, and civil society.

AVMA's incentives are structured as:
- **Milestone Payments**: These are awarded when manufacturers obtain WHO prequalification for designated priority vaccines, with payments ranging from $10 million to $25 million, depending on the technology used.
- **Accelerator Payments**: These are additional per-dose payments provided on top of standard market rates for vaccines produced under Gavi-UNICEF 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)

The International Finance Facility for Immunisation (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, which are backed by long-term donor pledges. The funds generated are then rapidly deployed through Gavi, to support vaccination initiatives in LMICs. 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.

Table 2. Pandemic Financing Instruments Matched to Pandemic Phases

Source	Facility	Instrument	Pandemic Phase	Purpose	Trigger / Eligibility	Repayment Terms
WB	Pandemic Fund	Grant	Prevention & Preparedness	A multilateral financing mechanism dedicated to providing multiyear grants for enhancing pandemic preparedness in low- and middle-income countries.	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
WB	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
WB	IBRD Flexible Loan (IFL)	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 (i.e., 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, while 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 where member countries are expected to repay the funds they utilize for the procurement of health supplies.	Membership, commitment to repay; health product needs; financial integrity	Varies per case
WB	Development Policy Loan (DPL) with Deferred	Concessional or market-based loan	(Early) Response	A contingent financing line that provides immediate liquidity following a natural disaster, and/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 (i) have an adequate macroeconomic policy framework; and (ii) be preparing, or already have, a	Standard IDA or IBRD repayment terms

	Drawdown Options for Catastrophe risks (Cat DDO)				satisfactory disaster risk management program.	
WB	Immediate Response Mechanism (IRM)	Concessional loan	(Early) Response	Allows participating IDA countries to have immediate access 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
WB	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
WB	Crisis Response Window	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 (ERF) to address slower-onset crises that are at an early stage.	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	Rapid Financing Instrument (RFI)	Concessional or market-based loan	(Early) Response	Provide 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 where a full-fledged economic program is not necessary or feasible.	All member countries. For those eligible for the Poverty Reduction and Growth Trust (PRGT) there is the concessional Rapid Credit Facility (RCF).	Single disbursement. Repayment within 3¼ to 5 years
IMF	Flexible Credit Line (FCL)	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. While 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 one or two years. Repayment within a 3¼ to 5-year period

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 the 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% or greater, or a cumulative loss of revenue and increase of expenditures equivalent to at least 10% of GDP.	Debt relief grants will be used to immediately cancel debt service coming due to the Fund equivalent to approximately 20 percent of a country's quota.
ADB	Countercyclical Support Facility (CSF) COVID-19 Pandemic Response Option (CPRO)	Concessional or market-based loan	Response	The CSF is a part of the ADB's strategy for addressing economic challenges, especially during crises. Specifically designed under the CSF umbrella, the COVID-19 Pandemic Response Option (CPRO) was created to swiftly address the unique challenges posed by the COVID-19 pandemic.	Eligibility based on (i) emergency status, (ii) per capita income and (ii) credit worthiness.	Varies per case
AfDB	COVID-19 Rapid Response Facility (CRF)	Concessional or market-based loan	Response	Ensures rapid disbursement of funds to address immediate challenges, implement emergency measures, and strengthen healthcare 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
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 Bank is responsive to market and reform conditions with a special focus on the transition to a green, low-carbon economy.	Varies per case
IDB	Contingent Credit Facility for Natural Disaster Emergencies (CCF)	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.
UN OCHA	Central Emergency	Grant	Response	UN's global emergency response fund to deliver funding quickly to humanitarian responders. CERF's Rapid	Emergency declaration through the top UN official of the country. The CERF Advisory	Varies per case

	Response Fund (CERF)			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.	Group provides policy guidance to the Secretary-General on the use and impact of the fund.	
WHO	Contingency Fund for Emergencies (CFE)	Grant	(Early) Response	Ensure that the 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
UNICEF	Vaccine Independence Initiative (VII)	Pre-financing	Response	Pre-financing tool managed by UNICEF, offering a support mechanism for countries utilizing 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 (AMC)	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
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. While 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
IMF	Extended Fund & Credit Facility (ECF)	Concessional loan	Recovery	Designed for medium to long-term financial assistance and structural reforms. Though not tailored specifically for pandemics, the ECF becomes relevant in the post-pandemic recovery phase as 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 (PRGT) 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 (SCF)	Grant, concessional and market-based loan	Recovery	Accelerate transition in the countries as they work through the crisis and recovery phases in response to 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
Donor Countries	Bilateral Aid	Grant and concessional loan	4 phases	Support the recipient country's healthcare 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
Bill and Melinda Gates Founda-tion (BMGF)	Philanthropic Funding	Grant	4 phases	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 low- and middle-income countries. Priority is given to proposals demonstrating potential for broad, global impact.	Does not apply

4.0 How Much Pandemic Financing is Needed?

How does the investment needed to potentially avert a pandemic compare to their 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

The economic impacts of outbreaks, epidemics, and pandemics have been large. Past studies have examined the tremendous losses of pandemics on an annualized or ongoing basis (V. Y. Fan et al., 2018; Glennerster et al., 2022). Numerous studies have estimated the economic losses of pandemics and epidemics in recent history such as SARS, Ebola, as well as the COVID-19 pandemic. SARS had significant impacts on the hardest hit regions of China, Hong Kong, and Canada, with negative impact on GDP of USD3.7 billion in Hong Kong and US$3.2 to US$6.4 billion in Canada (Keogh-Brown & 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 et al., 2024).

In contrast to SARS and Ebola which had a geographically contained spread, the COVID-19 pandemic 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 & Summers, 2020). Gopinath (2020) called it the worst economic downturn since the Great Depression, estimating cumulative output loss over 2020-21 around US$9 trillion (Gopinath, 2020). Further, countries continued to experience the economic impacts after the acute phase through the debt crises that were precipitated by the COVID-19 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 for 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 3** provides a crude range of different estimates, each of which different methodologies (V. Fan et al., 2023). Estimates range from $5 billion annually to $65 billion needed in the first year for two years (**Table 3**).

Table 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)	$10 billion annually, plus $5 billion to strengthen the WHO and other existing institutions
World Bank and WHO for the G20 Joint Finance and Health Task Force (WHO & World Bank, 2022)	$10.5 billion annually in international financing for minimum priority PPR financing gap
McKinsey & Company (Craven et al., 2021)	$20-$50 billion annually, after initial global investment of $85-$130 billion over two years
Becker Friedman Institute, University of Chicago (Glennerster et al., 2022)	$5 billion annually, after $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)	$124 billion over 5 years towards "demonstrated capacity" on JEE indicators
World Health Organization (Clarke et al., 2022)	Ranged from $1.6 billion per year for 139 low- and middle-income countries to improve capacities to $43 billion per year including for R&D

Source: Fan et al. 2023

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 4). But 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.

Table 4. Health expenditure by country income group, 2019

Country Income Group	Number of countries	Population (millions)	Health expenditure per capita		Total health expenditure (billions)
			Mean	Standard Deviation	
Low	25	587	39.4	16.4	20.7
Lower-middle	53	3308	141.9	127.5	306
Upper-middle	52	2521	515.0	320.8	1,384
High	60	1203	3093.6	2345.2	6,745

Source: Prepared by authors using the WHO Global Health Expenditure Database. Currency refers to health expenditure in the current US$. More recent data on health expenditure are not shown here because they reflect expenditures during the pandemic, which were much higher than normal and are unlikely to be maintained in the intra-pandemic period.

5.0 Case Study of the COVID-19 Pandemic Financing

In this section, we explore pandemic financing using the COVID-19 pandemic as a case study and examine primarily development assistance for health and specifically for pandemics. For this analysis, we utilize data from IHME's Development Assistance for Health on COVID-19 Database (2020-2023) to assess the total volume of resources (Institute for Health Metrics and Evaluation, 2024). **Table 5** provides an overview of the financial contributions made by various organizations and entities in response to the pandemic. The data is segmented by year, detailing the annual funding amounts from 2020 to 2023, and summarized with a total for each contributor.

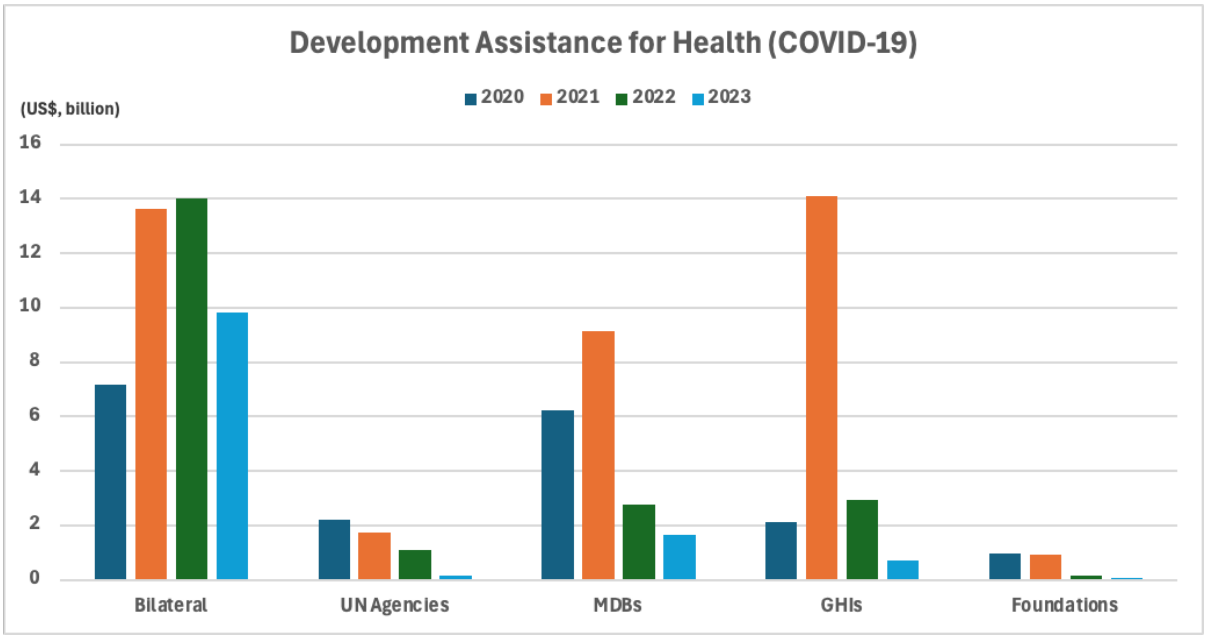
Table 5. Development Assistance for Health (COVID-19) during the Pandemic, 2020-2023

		2020	2021	2022	2023	Grand 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
Foun-dations	BMGF	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
Grand Total (Thousand USD)		**18,723,615**	**39,518,889**	**20,910,998**	**12,427,521**	**91,581,023**

Notes: Data are analyzed by authors using IHME's Development Assistance for Health on COVID-19 Database 2020-2023. PAHO - Pan American Health Organization UNAIDS - Joint United Nations Programme on HIV/AIDS. UNFPA - United Nations Population Fund. UNICEF - United Nations International Children's Emergency Fund. WHO - World Health Organization. ADB - Asian Development Bank. AfDB - African Development Bank. IDB - Inter-American Development Bank. WB_IBRD - International Bank for Reconstruction and Development, World Bank. WB_IDA - International Development Association, World Bank. CEPI - Coalition for Epidemic Preparedness Innovations. GAVI - Gavi, the Vaccine Alliance. BMGF - Bill and Melinda Gates Foundation.

Over the period from 2020 to 2023, the grand total of development assistance for health for COVID-19 reached US$91.5 billion. The 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 (IBRD and IDA), Gavi, the Global Fund, and WHO. **Figure 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 healthcare system support. The subsequent decrease in funding in 2022 and 2023 indicates a shift towards long-term recovery efforts, which appears to be insufficient.

Figure 4. Development assistance for health (COVID-19), 2020-2023



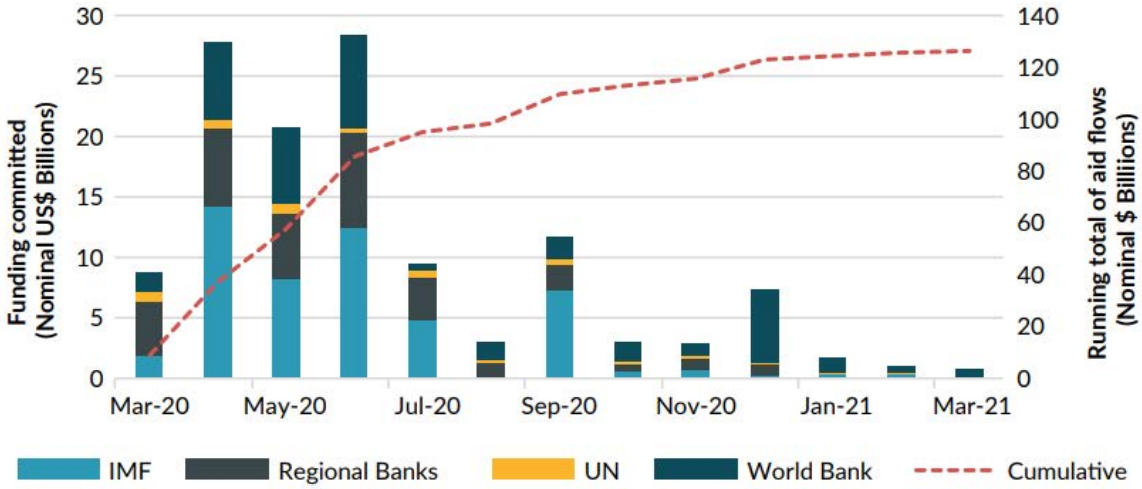
Source: Authors analysis and visualization of Table 5 using IHME's Development Assistance for Health on COVID-19 Database 2020-2023

Specifically, while 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 IMF's Rapid Credit Facility (RCF) and Rapid Financing Instrument (RFI), the AIIB's COVID-19 Crisis Recovery Facility (CRF), and the New Development Bank's (NDB) COVID-19 Emergency Program Loans (CEPLs). These funds are primarily allocated for broader social and economic responses and recovery efforts, and therefore did not appear in the IHME health data.

Figure 4 illustrates the year of funding distribution but does not specify the precise timing of financial assistance. Past research has found that the timing of pandemic financing mattered greatly but was delayed. Despite the size of resources available from multilateral development

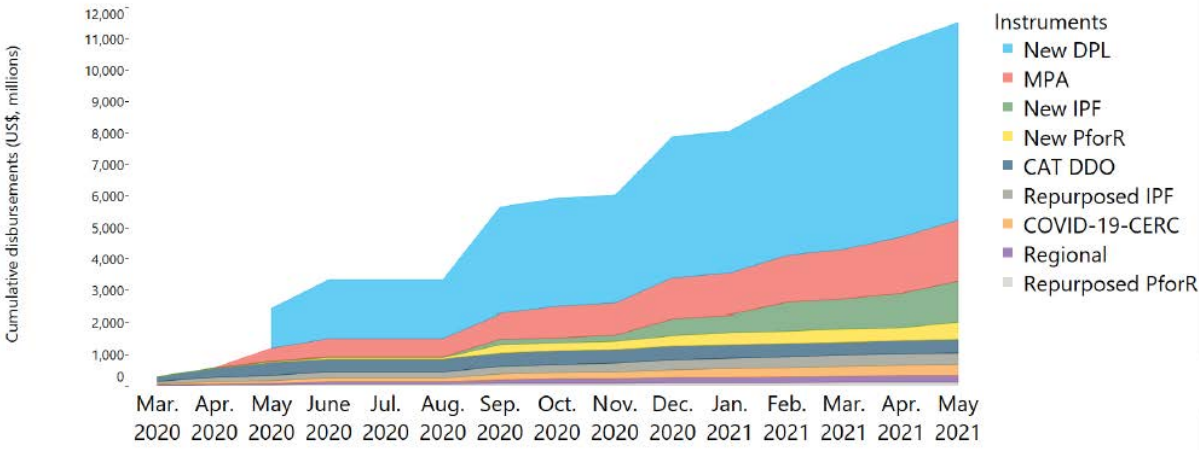
funds, their disbursement was slow (see **Figure 5**). Nevertheless, the timing of the release of these resources was still faster than usual timescales, as noted by the World Bank (**Figure 6**). Lagged financing has been found to be a major determinant of lagged purchase and thus lagged delivery of financing (Agarwal & Reed, 2022).

Figure 5. Multilateral funding was large but slow compared to COVID's spread



Source: Stefan, Cristina et al from Yang, Yi, Dillan Patel, R. Hill, and Michèle Plichta. "Funding covid-19 response: tracking global humanitarian and development funding to meet crisis needs." (Centre for Disaster Protection, 2024).

Figure 6. Cumulative World Bank disbursements for COVID-19 health and social response by financing instrument, March 2020 to May 2021



Source: World Bank IEG report (World Bank, 2022)

6.0 Pandemic Financing Considerations

Similar to the challenge posed by climate change, effectively combating 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 that would be needed to address the distinct needs of each phase of the pandemic cycle: Prevention, Preparedness, Early and Late Response, and Recovery & Reconstruction.

Prevention and Preparedness

The funding approach for pandemic prevention and preparedness is grounded in the recognition that these 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 utilization, and variations in input costs, particularly labor.

Prevention and preparedness (P&P) are not candidates for contingent financing instruments because these costs are largely predictable based on current capacity and needed capacity. Instead of requiring funds to respond to a pandemic, P&P funds are needed to (i) create capacity to prevent and respond based on level of pandemic risk and (ii) maintain such capacity. This 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 non-concessional credits, and, as countries become richer, the funding mix should be decreasingly concessional, from pure grants and highly concessional financing for low-income countries to non-concessional funding or less concessional funding for middle-income countries. Concessional and non-concessional 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 as well as their obligation to contribute to efforts regionally, globally, and in other countries. The Pandemic Fund considers whether the grant is leveraging other resources such as co-financing from other donors and what they call 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 PP funding).

What proportion of their 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 formulae is common among multilateral development banks and global health initiatives such as IDA, the Global Fund to Fight Aids, Tuberculosis, and Malaria, the Global Environment Facility, and others (V. Fan, 2023; V. Y. Fan et al., 2014).

Many have argued that the allocation framework should necessarily incorporate indices based on pandemic preparedness, such as the International Health Regulations Joint External Evaluation Tool, but we eschew this approach for the reason that preparedness indices are not predictive of pandemic risk among reasons explained elsewhere (V. Fan & Smitham, 2023).

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

- *Level of pandemic risk*, as measured in average annual loss or spark index (V. Fan, 2023)
- *Ability to pay*, whether by income classification or per capita GNI, adjusted by size of the population, and similar to the formulas used to calculate assessed contributions to the UN 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 Liberia or Guatemala could face nationwide repercussions even from minor outbreaks with a larger proportion of the total benefits of containment accruing to other countries.
- *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. Iceland and Belize have similar sized populations and both are small countries, but the probability of zoonotic spillover events is much greater in Belize. Other measures of need could be need for surveillance capacity as measured by data capacity (as measured by, e.g., birth registration coverage), health worker capacity (e.g. nurse availability per capita), and network capacity and connectivity (e.g. mobile subscribers per capita) (V. Fan, 2023), without which conducting surveillance will be very challenging.
- *Cost of P&P efforts.* Ability to pay (above) is strongly correlated with the cost of implementing P&P efforts in a country primarily because labor costs are strongly correlated with per-capita GNI and they are the largest cost category. However other differences between countries affect the difference in cost. One obvious one is the previous category (need) which will determine the level of required effort. Another is

the difference in the cost of implementation. To cite one obvious difference that needs to be considered, the population of Rwanda is more than four times that of Namibia while the land area of Namibia is more than 30 times that of Rwanda. This suggests substantial per-capita differences in the cost of a surveillance system.

Not all these factors can be included due to lack of available data that are collected annually and comprehensively of all countries (V. Fan, 2023). Indeed, one challenge of the JEE data are its collection only every 5 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 which 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, such as based on the work by Eaneff et al. as the basis of estimates of global needs and countries' obligations (Eaneff et al., 2022). These estimates will need to be regularly revised based on better data on the cost of implementing P&P in different settings and should be formally adopted by the WHO as the standard for estimating costs for pandemic preparedness and prevention.

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, e.g. 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 better placed to provide could be argued as providing shorter-term, capacity-development resources, given the small amount of funding available globally as well as their 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 assessing progress towards both improved capacity and sustainability.

Trust (and therefore participation) in a global P&P financing scheme will only be achieved if countries are confident that other countries are not only making the required investments, but 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 (V. Fan

& Smitham, 2023). Additionality of domestic resources can be assessed ex ante and ex post. Ex-ante, additionality could be assessed in the way that a project is designed—explicit arrangement for domestic finance has been set out in the assessment criteria of the Pandemic Fund's Technical Advisory Panel (TAP) or auditable records through the Public Financial Management (PFM) and budgeting stage. Ex post, the use of the WHO's Global Health Expenditure Database (GHED) for detecting additional increases in government spending on health is possible, although there is a risk that conditionality on this metric may alter the unbiasedness of this data source, especially as the WHO GHED is the benchmark methodology and tool for measuring government spending in comparison to external assistance on health. But using the GHED 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, and others (see **Table 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 PFM and budget execution and implementation rates (V. Fan & Gupta, 2024).

We argue 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 that is built and sustained by investments than it is to track the domestic financial flows, if only one of these are possible.

The emphasis on inclusivity and solidarity as fundamental principles for pandemic prevention and preparedness, while perhaps appearing to be 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 prevention and preparedness is a matter of enlightened self-interest. That it also respects the values of altruism and humanitarianism is an added benefit.

An efficient system of global preparedness will not consist of all countries being fully prepared for all eventualities because of the ability of countries to support each other and the ability of regional and global institutions to flex to support an acute need in a country. 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 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 CDC (or perhaps enhanced capacity in regional WHO offices) is promising and should be further developed and included in P&P budgets at the national and regional level. 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 utilize 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, etc. While it is unreasonable to expect pandemic P&P financing streams to broadly develop a country's health and social services, at the same time, a country with rudimentary services would need significantly more funding to achieve comparable levels of P&P and 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. Defining and establishing a clear trigger is essential for timeliness and urgency. The trigger defines 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, but in practice, significant gaps remain in the definition of a tiered system for communication about different tiers of responses (V. Y. Fan 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 they are unable to 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 WTO 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 (V. Fan et al., 2024). The early and swift release of these funds is vital, as delays can undermine intervention effectiveness and exacerbate the outbreak.

Such resources should be allocated to both 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 prevention and preparedness, 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 are those that are in addition to normal annual expenditures for P&P that 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 SARS and MERS. 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 prevention and preparedness. While reluctance to assist non-participating countries may be understandable, it is imprudent policy. Reserving fire brigades for houses that have paid a fire insurance premium is foolish because it 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 (as rewarding need can also be interpreted as inversely reward low performance or achievement). Donors could also condition on 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, etc.

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 or early reporting and early response. Measures such as airport closures and lockdowns, while crucial for public health, can significantly affect communities and businesses. Therefore, part of the funding could be allocated to compensate for these losses, although this may not be necessarily counted as part of the ODF 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 portions of it would be returned if certain conditions are not met (e.g. a country cannot retain funding to compensate for closure of airports if they are never closed, etc.).

Because health personnel are limited, especially in the short-term before regional assistance can arrive, plans should be in place to provide appropriate additional funding to workers who are assuming additional risk and those who are working overtime. These efforts can be complemented with plans to pull in workers who are not currently active, 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 the workers, and specifically through digital payment and banking. Similarly, and only somewhat less urgent, pre-designed mechanisms need to exist to channel sick leave and unemployment compensation to recipients to enable local isolation and quarantine to contain an epidemic. Finally, pre-designed compensation mechanisms are needed to commandeer resources to enable an effective early response. These can include pre-arranging 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 (V. Y. Fan et al., 2021, 2022). These pre-designed mechanisms properly should be considered P&P, but we mention them here because of their relationship with response instruments. Indeed, there are many questions about whether the investments made from response financing during the COVID-19 pandemic were durable and were 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 towards 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 modelling 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. While 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 the fire* or contain an outbreak/epidemic, including the resources to compensate them for the economic impact of reporting and the containment efforts. However, the fire department is not responsible for securing your property, finding you alternative housing or paying the cost of rebuilding and refurnishing the house. For that, you need to have purchased insurance. In the case of late response, this could take the form of purchasing (at market or concessional rates) pandemic insurance, or pre-negotiating 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, transportation, etc.) to create incentives for participation in PPRR mechanisms.

This chapter has adopted mostly economic arguments for investing in pandemic preparedness and response, but we also do 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 & Yang, 2023).

Pandemic insurance mechanisms can also be intended for early response, although 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 et al., 2023; Buckley & Pittluck, 2016). But that does not preclude the possibility of an insurance mechanism that can, in theory, support early phases of response. Insurance mechanisms for pandemic response and reconstruction have great potential but have barely been introduced (see **Box C**). Development of such mechanisms at scale could harness the private capital markets and still offer opportunities for donor financing to reduce effective premiums. Similarly, multilateral mechanisms exist for contingent responses to financial crises (e.g. IMF mechanisms) that could be adapted for responses to health crises

Finally, late response can also be divided into subphases with different needs for financing:

- In the event of a pandemic with serious morbidity and mortality, we assume that countries will 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 PPE, 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 which 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 e.g. masks and hand washing is less invasive and draconian than individual home quarantine and border control, which is less draconian than mandatory mass lockdowns. The more draconian the measures, the greater the need to alleviate their impact.
- Once vaccines or treatments are available, countries will seek to *scale-up coverage as quickly as possible,* so that the restrictive measures to reduce infections can be relaxed.
- Lastly, in the event of partial effectiveness of the vaccine or treatment (whether because of limited efficacy or limited uptake), they will seek to *keep the incidence below* the threshold that would *saturate health services* and cause people who are infected to die needlessly. Dose optimization of vaccines to maximize population-level benefits when they are in short supply, transitioning to dose optimization to maximize individual benefit as supply constraints are relaxed is an examples of areas that require creative (public) financing of product development because such trials don't generate returns for vaccine companies. (Więcek et al., 2022). While R&D is a form of P&P, we have excluded it from this paper.

In this section, we discussed at high-level considerations for pandemic financing along the pandemic cycle, but detailed analyses for each of these remain necessary as part of any national preparedness planning process, particularly of pandemic insurance and/or contingent financing for late response actions which were arguably underutilized during the COVID-19 pandemic. Such financing mechanisms will likely focus on ensuring effective medical care for those infected across all of the sub-phases (e.g. access to oxygen). Prior to effective vaccines and therapies, financing will be needed to enable people to reduce contact and protect themselves. 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 & Reconstruction

The Recovery & Reconstruction phase occurs in the aftermath of a pandemic. This phase 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. Indeed, the international financial institutions of the World Bank were established as a means to provide financial assistance earmarked for recovery and reconstruction from war and could be applied to any major shock (war, natural disaster, pandemic), with the notion that countries responsible for a war should not be penalized in its recovery, lest it reinvigorate chances of future war. However, unlike financing for early response, this assistance could be highly conditional upon a country's level of preparedness and effectiveness in its response efforts during the pandemic.

To continue the firefighting analogy, communities expect to put out fires without consideration of whether the property owner is insured. However, if the owner lacks insurance, there is no expectation that the government/community will rebuild their house for them. However, there is an important difference. If national leadership does not buy insurance or appropriately prepare for a pandemic they 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 that it is with homeowners 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 are not participating to reduce future risk. Institutions such as the IMF already offer, if not demand, a range of conditionalities in order to participate 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 improvements in these measures, policymakers 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.

Pre-negotiated financing mechanisms, such as co-financed insurance, offer a range of advantages, particularly in their capacity to tailor premiums or fees based on a country's level of preparedness and preventative measures. This mechanism would be analogous to paying a lower homeowner's premium if your home has a fire-resistant roof and a sprinkler system. Even if preparedness is unable to 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 healthcare 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 post-disaster, as opposed to the negotiation process inherent in seeking a bank loan to finance reconstruction efforts.

A fundamental aspect of pre-negotiated finance, 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, post-disaster negotiations may lack this shared accountability from sharing burden, analogous to the difference between accessing insurance funds, versus applying for a bank loan after a disaster.

7.0 Conclusions and Recommendations

In this review of pandemic financing, we have:

- 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 policymakers plan for the pandemic cycle.

Our review of the essential epidemiologic and economic concepts for the pandemic cycle also informs the selection of **key principles** needed to design effective pandemic financing:

- *Timely (and therefore pre-arranged) financing:*
    - Because the next pandemic could happen anytime, we should make the needed investments in prevention and preparedness to get ready now, even if we need to borrow to create the capacity. Maintaining it 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. They are emergencies that get worse and harder to contain by the hour. Pre-arranged the 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, climate change, failure to act harms us all, but this creates 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 be free-riders.

Lessons from COVID-19

Amidst a large array of pandemic financing tools available during the COVID-19 pandemic, the vast majority were for response. We summarize five key messages of our analysis in examining the strengths and weaknesses of the financing system and architecture during the COVID-19 pandemic:

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

(2) 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 is primarily focused on financing country-by-country, project-based, preparedness efforts; efforts that can also be funded via many existing mechanisms, from bilateral ODA to multilateral banks. Questions remain about the additionality of this facility as well as whether it should develop contingent financing mechanisms to fund response efforts (early or late) in the future or not.

(3) The pandemic financing architecture is fragmented both in terms of 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 cannot be underestimated to reduce unnecessary delays in accessing funding. Similar problems were observed with respect to the logistics of procurement and distribution of commodities, with both being 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 (see **Box D**).

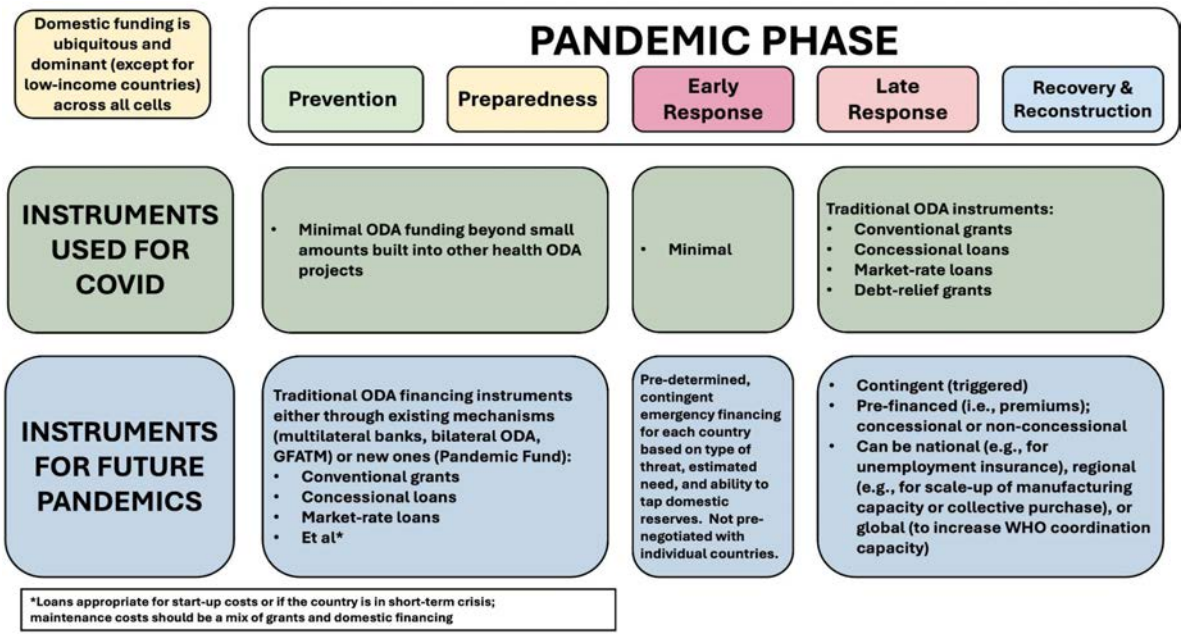
(4) Concessional financing (primarily bilateral ODA, concessional loans, Gavi, the Global Fund, and philanthropy) represented the largest share of financing, followed by market rate loans. Our analysis did not measure the role of tools designed to respond to crises, such as contingent financing, debt service suspension, and insurance mechanisms, but they are believed to be negligible. Contingent financing and pre-arranged agreements offer the potential eliminating the delay between the crisis and the flow of funds that

marked most of the COVID response. Promising examples that have emerged include the new pandemic bond in Barbados, the World Bank's new Crisis Preparedness and Response Toolkit, the Pandemic Emergency Financing Facility (improving its insurance mechanisms and triggers), and the African Risk Capacity group.

(5) Speed of the response was not only too slow during the early response, when ultimately unsuccessful efforts to contain SARS-CoV-2 were underway, it was also too slow during the late response as countries attempted to reduce its morbidity and mortality. This 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 due to the need to negotiate and execute financing instruments were compounded by delays in comparative product evaluation (especially for diagnostics and vaccines) that hampered decision-making about product selection, and procurement delays caused by the lack of pre-negotiated agreements. Finally, delays were caused because the resulting free-for-all resulted in the largest, wealthiest countries hoarding supplies because they were able to 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, reflects the high priority and urgency of addressing this fatal weakness in the COVID-19 response.

Pandemic prevention, preparedness, response and reconstruction will only be effective if effective mechanisms are developed to finance the required actions–and through the necessary organizational and governance mechanisms, the latter of which we have not discussed at length.

Figure 7. Instruments and financing mechanisms for pandemic phases



We summarize below our recommendations:

Recommendations

Prevention and Preparedness

- In order to ensure adequate financing of prevention and preparedness, there must be clear and transparent indicators that define a minimum acceptable level of pandemic prevention and preparedness that can be improved by financing, indicators that are simple, measurable, achievable, relevant to pandemic financing, and time-bound. Although this chapter did not discuss the existing array of international regulations and rules, such as the International Health Regulations or the negotiations underway on the Pandemic Accords as well as prevailing tools such as the Joint External Evaluation tool and others, our 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 a global pandemic financing resource such as the Pandemic Fund should be distributed across countries on the presumption that prevention and preparedness are global public goods. Based on those principles, define and use an allocation formula which can incorporate expected country costs for financing pandemic prevention and preparedness as well as standards for how much should be expected to be financed by the country and international sources.

Response & 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 re-emerging pathogen (N. Madhav & Oppenheim, 2023).

- Ensure that funding mechanisms are pre-arranged and are designed to be rapidly released in response to different types of outbreak/epidemic triggers. Financing must be much faster, more transparent, reimbursable if not used/justified, and used to fund actions within and outside of the health sector. Similar mechanisms are needed for human and material resources, and in particular, planning for surge response, but they are outside of the scope of this review.

- *Late response and reconstruction*: Develop a suite of contingent financing mechanisms to enable countries to cope with the late response to and recovery/reconstruction from large epidemics and pandemics. These can include contingent grants, contingent loans, insurance mechanisms and more (see **Figure 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 they are pre-negotiated and contingent upon the occurrence of an epidemic/pandemic in contrast to much of DAH at present.

Governance and continuous learning

- We have not extensively reviewed governance options for PPRR as that is beyond the scope of this chapter, but the public good nature of pandemics needs to be considered with respect to governance of financing mechanisms for global public goods.
- There are many reasons why pandemics are subject to the cycle of panic and neglect, including that they are low-frequency, high-impact events, as well as the short time horizons of politicians. But leadership and governance can ensure that lessons are learned, and pandemic preparedness and response plans evolve in response to learning. Learning can occur with using real-world scenarios or 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.

Conclusion

- 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 it is akin to traditional project-based or sector-wide 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 with positive and negative incentives. Just as homeowners in high-risk areas are required to clear flammable brush from around their houses and inspectors verify that they are compliant, so too are *transparency, verifiability, and accountability* key to global financing mechanisms for pandemic prevention, preparedness, response, and reconstruction.

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