



**A GLOBAL DEAL
FOR OUR
PANDEMIC AGE**



Financing the
Global Commons for
**PANDEMIC
PREPAREDNESS
AND RESPONSE**

**REPORT OF THE
G20 HIGH LEVEL
INDEPENDENT
PANEL**

Annex H

Estimated Financing Needs for Global Public Goods for Pandemic Prevention and Preparedness

This Annex explains the approach undertaken by the Panel and its Project Team to derive estimates of international and national financing needs for **pandemic prevention and preparedness**. The estimates represent the **additional investment** required in the **global public goods** that are at the core of effective pandemic prevention and preparedness. They **do not include the costs of response**, as this will depend on the nature of future outbreaks and the degree of implementation of pre-crisis pandemic prevention and preparedness measures at the national, regional and global levels.

The two tables below summarize the total public funding needs over the first five years. Investments would have to be sustained in subsequent years; a key lesson from outbreaks to date has been how the absence of continuous investments in prevention and preparedness leaves the global system vulnerable.

The explanatory notes that follow Tables 1 and 2 set out the definitions and assumptions used in this costing exercise. **It has to be emphasized that we have on the whole adopted very strict definitions of global public goods for purposes of pandemic prevention and preparedness, and conservative assumptions of the required scale.**

Table 1: Additional Public Funding for Prevention and Preparedness over 5 Years (US\$ billion)

Category	Total	International Financing	National Budgets
Robust surveillance & detection networks	74	26	49
Building resilience in health systems	63	19	44
Supply capacity for medical countermeasures	34	34	-
Total	171	78	93
Average Annual Investment	34	16	18

Table 2: Additional Public Funding for Prevention and Preparedness over 5 Years (US\$ billion) (Breakdown by Global- and Country-Level)

Category	Total	Global Level Capacities	Country-level Global Public Goods				
			HIC	MIC		LIC	
				International Financing	National Budgets	International Financing	National Budgets
Robust surveillance & detection networks	74	5	11	11	36	10	1
Building resilience in health systems	63	-	4	9	39	10	1
Supply capacity for medical countermeasures ⁶⁰	34	34	-	-	-	-	-
Total	171	39	15	20	75	20	2
Average Annual Investment	34	8	3	4	15	4	0.4

⁶⁰ This refers to the additional financing required to meet global-scale demand, and is additional to what countries would invest on their own for national needs. See 'Explanatory Notes' below.

Explanatory Notes

This report divides spending into three major gaps of global public goods: (1) robust surveillance and detection networks; (2) building resilience in health systems; and (3) supply chains for medical countermeasures.

These global public goods reside at both the national and global levels. International financing is required for both the global-level capacities and to support a portion of LICs' and MICs' national-level global public goods.

Our work benefited from the inputs of the Global Preparedness Monitoring Board (GPMB) on the scope of operations required for pandemic PPR (see **Annex G** for the GPMB's submission to the Panel).

- **Robust surveillance and detection networks.** This covers the GPMB's categories of One Health surveillance and risk assessment; data and information sharing; and R&D on future and emerging infectious diseases⁶¹. Most needs are at the national level, where ongoing data collection, integration, analysis and dissemination systems will need to be put in place. Diligent detection of infections requires a distributed infrastructure of laboratory facilities. National public health institutes play a key role in providing robust surveillance systems at national, sub-national, and local levels. At the global level, WHO with its six regional offices is the anchor to coordinate and organize global surveillance; the system also relies on key regional centres, like the Africa CDC. These different structures all need some strengthening going forward. Our cost estimates have also taken into account the need to implement the One Health approach for the monitoring and detection of zoonotic spillovers.
- **Building resilience in health systems.** This encompasses the GPMB's categories of immunisation; health system capacity and access; pandemic planning and exercising; norms, standards, evidence-based policy, technical support; and community engagement and trust. This function is mainly at the country-level. The gaps in health system resilience are primarily found in low- and middle-income countries, and include essential public health services and equipment, in particular, the ability of health systems to detect and treat infectious cases and to organize emergency operations.
- **Supply chains for medical countermeasures.** This includes the GPMB's categories of R&D on future and emerging infectious diseases; clinical trial and regulatory capacity; mechanisms for ensuring advance equitable access to countermeasures; supply chain networks and stockpiles and surge financing mechanisms. The GPMB definition covers vaccines, therapeutics, and diagnostics, as well as personal protective equipment. This will require more developed global R&D structures and investments in capacity to ensure availability for all countries.
 - For the sake of simplicity, national stockpiles of essential medical supplies are recorded within the second category above (building resilience in health systems), as they are a key component of resilience.
 - Investments in supply capacity for medical countermeasures for the current purpose are therefore focused exclusively on the global networks for research, manufacturing and procurement.
 - These investments are additional to those that countries would make for their own national needs. The major scale-up of supply capacity that we estimate to be necessary is to provide for global-scale demand, which as the report discusses extensively, is critical to containing a pandemic everywhere including within the HICs. For the present costing exercise, we have classified the incremental spending required under 'global level' spending.
 - However, it should be noted that our estimates for supply capacity for medical countermeasures are, to begin with, very conservative; alternative estimates by the Accelerating Health Technologies (AHT) group suggest much larger requirements. (See below.)

⁶¹ This category is covered by both 'Robust surveillance and detection networks' and 'Supply chains for medical countermeasures'.

Sources of estimates and additional assumptions

The estimates provided in these tables are primarily based on two studies: the WHO's report to the G20 "Assessment of Gaps in Pandemic Preparedness" in 2020, and McKinsey & Company's report "Not the last pandemic: Investing now to reimagine public-health systems". While a number of studies have attempted to measure pandemic PPR investment needs, recent estimates converge to a range which is higher than pre-COVID estimates, and point to a need to significantly scale up current financing. The Panel had chosen to use data from the WHO and McKinsey studies as they were the most recent and systematic estimates of needs at the global and country levels⁶². However, while these two reports are used as the primary baseline, we have modified certain estimates following our consultations with industry experts to be consistent with GPMB's categories. This included triangulating the estimates with those from the Coalition for Epidemic Preparedness and Innovations (CEPI) for the development costs of new diagnostics, vaccines, and therapeutics, and from Georgetown University on country-level financing.

Both the WHO and McKinsey studies apply a bottom-up methodology estimating total prevention and preparedness needs by identifying the set of functions or institutions necessary at global level, including coordination functions and the key functions which surveillance and health systems need to provide at country-level. The estimates at country-level are broken down according to income groups: High Income Countries (HIC), Medium Income Countries (MIC), and Low Income Countries (LIC). The Panel's approach defines international financing as the public financing needed for global commons: the global-level capacities and the funding to incentivize countries to make the necessary investment in their surveillance and health systems. McKinsey computes only total needs, while WHO estimates both total needs and international financing requirements.

The WHO and McKinsey approaches differ in a number of respects, in particular in the scope and cost calculation methods or references. It is hence difficult to make straightforward comparisons of the estimates yielded by the two approaches. Some additional triangulation of data and judgments had to be made so that the two sets of data could be incorporated within the GPMB's framework, and our best estimates derived.

The report has not retained the WHO's estimate for HIC spending as it was a significant outlier when compared with other estimates of needs⁶³. McKinsey provided additional information to the Panel to break down all prevention and preparedness estimates between global- and country-level investment requirements, according to country income groups.

Estimates provided in the report cover a five-year period; both WHO and McKinsey have identified the need for some frontloading of spending. McKinsey's approach identifies gaps compared to pre-defined targets for each function of prevention and preparedness, and distributes the total costs over a ten-year period with some degree of frontloading. For the purpose of this report, the frontloading embedded in McKinsey's calculations has been slightly amplified, reflecting the need to catch up from a long period of underfunding, and the required urgency. Our estimates for the first five years assume that they would require the spending of 60% of the total ten-year figure. However, as highlighted above, our estimates for supply capacity for medical countermeasures are very conservative.

Additionally, the cost of antimicrobial resistance (AMR) has been excluded from the McKinsey estimates, for reasons explained below. (The WHO estimates had not included AMR.) The WHO estimates for R&D and manufacturing of medical countermeasures have been updated to take into account more recent projections by CEPI and ACT-A⁶⁴. The WHO estimates have also been adjusted to incorporate annual replenishments of the Contingency Fund for Emergencies (CFE) as part of a strengthened surveillance as in McKinsey's estimates.

Calculation of public sector contribution

Finally, the report is focused only on the needs for public funding. The private sector plays a role in pandemic PPR, especially in R&D and supply of medical countermeasures. Concretely, arising from our consultations with

⁶² In particular they use the most up to date and robust country estimates: D. H. Peters, O. Hanssen, J. Gutierrez, J. Abrahams & Tolbert Nyenswah (2019): Financing Common Goods for Health: Core Government Functions in Health Emergency and Disaster Risk Management, Health Systems & Reform <https://doi.org/10.1080/23288604.2019.1660104>

⁶³ Preliminary results of Georgetown University estimates based on the IHR costing tool are very close to McKinsey's as well.

⁶⁴ See CEPI's report titled "The Urgency of Now: Turning the Tide Against Epidemic and Pandemic Infectious Disease" published in March 2021.

various experts, it is estimated the private sector will cover 15% of research needs⁶⁵ for global countermeasures, and 30% of the cost of building and maintaining manufacturing capacity⁶⁶. These private sector costs have been excluded from the estimates presented in our costing tables here.

Calculation of international financing

In line with the global public goods approach adopted by the Panel, international financing is needed to support prevention and preparedness expenditures at the global level, but it should also account for some spending at country-level. National-level financing needs encompass measures that should be executed nationally, whose success, however, has direct global implications given the existence of global externalities. To avoid underinvestment and in light of existing budget constraints, we propose a formula for partial external financing of national level measures in low- and middle-income countries.

The estimates provided are computed under the assumption that low-income countries receive international support to cover 88%⁶⁷ of financing needs. While a certain degree of local ownership is beneficial, these countries face severe budget constraints and a large opportunity cost to financing prevention and preparedness activities. They also cover a set of conflict states which are more fragile. Further, the benefits of these investments in global public goods do not accrue primarily to the countries themselves; this is in their nature as global public goods. The report uses the WHO's assumption on international support covers one-off capital expenditures; and a large share of recurrent expenditures.

Similarly, the estimates provided are computed under the assumption that middle-income countries will cover 76%⁶⁸ of expenditure domestically, and receive international support for the remaining 24%. The WHO also assumes that support should be especially concentrated on capital expenditure, with recurrent expenditures being largely nationally financed. When using McKinsey's figures, the estimates in the report assume a higher international co-financing rate for surveillance (30%) than for resilience in health systems (15%) which should be a national responsibility.

The ranges provided can generally be considered conservative. First and foremost, the cost focuses on the needs within the health sector. It does not make a costing of the whole-of-government approach, which would include prevention and preparedness activities in other sectors, such as water and sanitation or continuity of key services such as electricity supplies or transportation. Moreover, there is no unique definition of PPR and more or less extensive scope can be defined for some categories of prevention and preparedness.

In particular, some restrictive assumptions have been made in four areas to exclude certain activities that have indirect but still significant impact on prevention and preparedness.

- Firstly, antimicrobial resistance (AMR) which erodes the capacity to treat infections has been referred to as one of the big threats to future global health, which will be compounded by pandemics. AMR containment measures are considered to be an integral part of effective infection prevention and preparedness systems. The World Bank (2017)⁶⁹ estimated the cost of AMR containment measures at US\$9 billion annually. This cost is partly integrated into the McKinsey estimates but we exclude it from the values presented in our report. While there is some overlap and synergies between pandemic prevention and preparedness and AMR containment, AMR requirements for both animal and human health are relatively distinct. The World Bank's estimates would increase investment needs presented for LMICs by nearly 40%, compared to the estimates presented in this report.

⁶⁵ This is in line with the G-Finder survey: https://policy-cures-website-assets.s3.ap-southeast-2.amazonaws.com/wp-content/uploads/2021/04/15055816/G-FINDER-2020_Final-Report.pdf

⁶⁶ The assumption of a 30% funding share for the private sector in establishing scaled-up at-ready manufacturing capacity is in-line with the analyses by the AHT group and others. The large majority of funding will have to come from the public sector to enable these investments in capacity. This is discussed fully in Section B (Item 3) of the Panel's Report.

⁶⁷ The Panel used the overall intensity of aid provided by the WHO with more granular assumptions: for LICs, domestic budgets cover 15% of recurrent costs but no capital costs over 5 years.

⁶⁸ WHO assumes that Lower-middle income countries cover 50% of capital costs and 70% of recurrent costs over 5 years, while Upper-middle income countries cover 100% of capital and recurrent costs over 5 years.

⁶⁹ See World Bank's report titled "Drug-Resistant Infections: A Threat to Our Economic Future" published in March 2017.

- Secondly, the zoonotic nature of many viruses calls for a One Health approach to surveillance, meaning surveillance that also covers animal health and veterinary services. The estimates take a One Health approach when considering surveillance requirements for research, data collection and processing or, in the case of the McKinsey costing, some cost of biosecurity in farms and of wildlife and wild meat trade. However, it would have been difficult to provide comprehensive and up-to-date estimates of the wider approach for this report, thus estimates for a full One Health approach are not included in our calculations⁷⁰.
- Thirdly, the estimates presented in this report include R&D investment, specifically research linked to new pathogens, as part of surveillance and research into vaccines, therapeutics and diagnostics. However, basic research is excluded from these estimates. Basic research has been defined as scientific investigation that involves the generation of new knowledge or development of new theories. That is, research with results that often cannot be applied directly to specific clinical situations and therefore will only be indirectly beneficial to pandemic prevention and preparedness. Pre-clinical and basic research can nonetheless have a significant impact on pandemic prevention and preparedness⁷¹.
- Fourthly, in the category of medical countermeasures, our estimates for the cost of manufacturing are very conservative. The dedicated stream of work from the AHT group for the Panel indicates that investing in US\$60 billion upfront to expand production capacity for vaccines and supply chain inputs (US\$2.2 billion per year thereafter to maintain capacity) would provide far greater benefits⁷².
- Finally, outbreaks occur more frequently in countries that have overall weak health systems and building resilience in health systems to best prepare them against pandemics requires, as a prerequisite, a much broader strengthening in many low- and middle-income countries. The cost of such measures has also been excluded from the main estimates of the report as being only indirectly related to the global public good approach on which the report focuses. The WHO estimates the health system financing needs towards the objective of universal health coverage at US\$555 billion over five years. Following the same financing formula employed for the main estimates, **this would result in an additional US\$89 billion in international finance over five years — compared to the estimate we have given of US\$75 billion.** The broader strength of the health system can be a determinant to countries' ability to contain and manage an outbreak and as such is an important source of externalities. It is not part of the prevention and preparedness global public goods but should be properly integrated in country programs and allocation of ODA to the health sector.

Based on the methodology we have described above, Tables 1 and 2 show the estimates that the Panel has employed in this report. For more details referencing the respective estimates based on those by the WHO and McKinsey, please refer to Tables 3 and 4 below. (There are two estimates for each item in these tables. The figures on the left have been derived on the basis of WHO estimates, while those on the right have been derived from McKinsey.)

⁷⁰ The World Bank's study titled "People, Pathogens, and Our Planet: The Economics of One Health", published in June 2012, shows that the total cost of One Health prevention and preparedness comprised 45% for animal health, 41% for human health, and 14% for joint planning and communication.

⁷¹ Di Masi et al. (2016): Innovation in the pharmaceutical industry: New estimates of R&D costs. In Journal of Health economics — May 2016.

⁷² In the event of a pandemic, this investment would have expected benefits of US\$1.6 trillion, relative to a scenario where countries made no further advance investments. This would fund 25 billion units of capacity, enough to vaccinate 80% of the global population with each of four vaccine candidates. This differs from the methodology of McKinsey which computes the costs for producing 7.5 billion courses of vaccine in six months: the AHT methodology takes into account that the production capacity is shared by different technology platforms (mRNA versus traditional platforms) and with the non-negligible probability of failure of different vaccine candidates, part of the capacity will have to be repurposed. Since repurposing capacity takes time, it would be hugely beneficial to install substantially more capacity to cover the reference needs of 7.5 billion of vaccination courses.

Table 3: Additional Public Funding for Prevention and Preparedness over 5 Years (US\$ billion)

Category	Total	International Financing	National Budgets
Robust surveillance & detection networks	53/94	20/35	33/59
Building resilience in health systems	60/66	19/18	41/48
Supply capacity for medical countermeasures	19/34	19/34	-
of which R&D	8/13	-	-
of which manufacturing	11/20	-	-
Total	131/194	58/87	74/107
Average Annual Investment	26/39	12/17	15/21

Table 4: Additional Public Funding for Prevention and Preparedness over 5 Years (US\$ billion) (Breakdown by Global- and Country-Level)

Category	Total	Global Level Capacities	Country-level Global Public Goods				
			HIC	MIC		LIC	
				International Financing	National Budgets	International Financing	National Budgets
Robust surveillance & detection networks	53/94	5/5	5/15	8/18	27/43	7/11	1/2
Building resilience in health systems	60/66	-	6/1	10/8	33/45	8/10	1/1
Supply capacity for medical countermeasures	19/34	19/34	-	-	-	-	-
of which R&D	8/13	-	-	-	-	-	-
of which manufacturing	11/20	-	-	-	-	-	-
Total	131/194	24/39	11/16	19/26	60/88	15/22	2/3
Average Annual Investment	26/39	5/8	2/3	4/5	12/18	3/4	0/1