

Supplemental Appendix

Methods

Cost estimation

Our team conducted prior research estimating that US\$76 billion is required over three years to build health security capacity at the national and subnational levels, globally, based on anticipated investment needs for each of the 196 State Parties to the International Health Regulations (IHR) [1]. Briefly, public health capacity for each State Party was measured based on reported State Parties Self-Assessment Annual Reporting Tool (SPAR) assessment scores. Scores were mapped to benchmarks in the Joint External Evaluation (JEE) and analyzed alongside vaccination and workforce data from the WHO Global Health Observatory. Using the IHR Costing Tool, costs were estimated for each State Party to achieve a score of “demonstrated capacity” (i.e., an assessment score of 4 out of a possible 5) on all indicators of the JEE, annually, over a five-year period. The results described hereafter correspond to the first three years of this investment period, selected to align with Global Fund’s three-year allocation period.

Alignment of costed activities and Global Fund mandate

Based on prior estimates of investment requirements, an in-depth analysis was completed to identify which of over 700 activities contributed directly or indirectly to health systems strengthening efforts in support of HIV, TB, and/or malaria (HTM) disease programs. Existing activities were reviewed by a minimum of two members of the research team and tagged based on (1) whether the investment was required in a Global Fund-eligible country and (2) whether the investment contributed directly, indirectly, or was unrelated to HTM efforts.

For the purposes of this analysis, countries were considered eligible for Global Fund support if they were “eligible” or “in transition” to receive funding for one or more disease components in 2021. Direct contributions were defined as interventions, activities, or resources critical to the delivery of quality HTM services, including support for skilled health and public health workers whose work is significantly focused on these disease areas (e.g., personnel trained to identify and manage infections caused by AMR resistant pathogens); indirect contributions were defined as interventions, activities, or resources focused primarily on non-HTM disease areas, but that could be pivoted to use directly toward HTM efforts during times of need (e.g., diagnostics for COVID-19 that could be repurposed for TB); unrelated investments were considered to be interventions, activities, or resources that do not directly or indirectly contribute to HTM efforts, including interventions or materials that support non-HTM disease areas and/or that could not be rapidly pivoted directly toward HTM-related efforts. Of note, in the case of investments identified as “directly” or “indirectly” related to HTM efforts, the assumption was made that resources could, and would, be able to be pivoted during times of need to support multiple disease areas, including HTM. Such investments included skilled healthcare and public health workforce support, general consumable laboratory materials and laboratory training,

transportation resources, and personal protective equipment that could be shared to support cross-cutting efforts across disease verticals during times of need. Supplementary Table 1, below, provides select examples of interventions tagged as directly, indirectly, and unrelated to HTM efforts.

Relationship to HTM efforts	Type of activity
Directly related to HTM efforts	Skilled healthcare and public health trained in surveillance and infection prevention and control
	Select rapid diagnostic tests and point of care diagnostics
	Support for country-level supply chain capacity, including warehouse space to send, receive, and maintain an inventory of medical countermeasures
Indirectly related to HTM efforts	Laboratory equipment and consumable materials associated with virus culture, serology, and PCR capabilities, including genetic analyzers and real-time PCR systems
	Support for country-level risk communication specialists and broadcast time for proactive health communication
	Stipends and supplies for annual cohorts of full-time field epidemiology training programs (FETP) trainees
Unrelated interventions	Personnel and supplies to respond to chemical and/or radiological emergencies
	Physical infrastructure for Emergency Operations Center (EOC)

Supplementary Table 1. Selected examples of activities identified as directly, indirectly, and unrelated to HIV, TB, and/or malaria (HTM) efforts.

Aggregation and global analysis

Individual action-based costs were aggregated to identify trends, cost drivers, and potential areas of opportunity for the Global Fund. Costs were summarized globally, consistent with the intended use of cost estimations to provide high-level global estimates, as opposed to detailed country-level action plans, which are best developed and informed by local public health expertise. Since analyses did not estimate costs beyond a score of “demonstrated capacity”, IHR member states already reporting such scores do not have any additional costs for these respective capacities. Given the order-of-magnitude nature of cost estimates, reported costs are rounded to the nearest billion and/or the nearest percentage point; costs under US\$1 billion are

rounded to the nearest US\$100 million. This may introduce minor inconsistencies in reported numbers due to rounding approximation. All costs were reported in 2021 US\$.