Few natural hazards threaten more loss of life, economic disruption, and social disorder than large-scale infectious disease outbreaks. An influenza pandemic or similarly transmissible disease could infect billions, kill millions, and reduce trillions of dollars from global economic output. Even a more localized epidemic could lead to a catastrophic loss of life, GDP, and cost millions to contain. The economic effects occur by closing businesses, schools, public offices, and often, the healthcare system itself. Further, effects of disease outbreaks include interruptions in transportation (of goods), trade, and travel. While most disease outbreaks are localized to a region, they can quickly become global, as we have seen with Ebola, Severe Acute Respiratory Syndrome (SARS), and Zika. With other related challenges, such as the rise in antimicrobial resistance (AMR) and deliberate human-engineered threats, we must ensure that a preparedness program is in place to combat these risks.

Compared to the resources devoted to mitigating other global risks such as terrorism, climate change, or war, the world invests strikingly little in infectious disease outbreak preparedness. The problem is not a lack of knowledge, as the public health community knows what steps are needed to mitigate risk. However, preventive measures are rarely prioritized. In fact, the typical pattern of infectious disease preparedness today can be characterized as a cycle of panic and neglect: a flood of resources during outbreaks followed by lack of interest and diminished investments. The resulting dependence on crisis-response is both costly and ineffective (in preventing the next outbreak).

The most recent Ebola outbreak in West Africa is a good example. Governments and response agencies poured more than $3.6 billion into containment, 11,000 lives were lost, 28,000 were infected, and the regional economy lost $2.2 billion in GDP in one year. Three years post-Ebola, funds to reduce future outbreaks have dwindled, and Ebola has all but disappeared from the news. Since 1976, dozens of Ebola outbreaks have struck Africa, and the next one is merely a question of time.

In addition to Ebola, we have a long and costly history with other infectious disease outbreaks. Just over the past 15 years, Zika, MERS-CoV, SARS, cholera, tuberculosis, HIV/AIDS, and various strains of the influenza virus have affected hundreds of millions of people around the world. One could argue that we have been lucky in avoiding a major pandemic, such as that of the 1918 influenza, which resulted in an estimated 50-100 million lives lost or 3-5% of the global
population at that time, which today would be the equivalent of more than 200 million people.

Why do we fail to adequately invest in the prevention of disease outbreaks? We know that major disease outbreaks have an expected economic cost of tens of billions of dollars annually; yet, little preventive action is taken. Indeed, following the Ebola outbreak in West Africa, more than 40 expert reports were written, each of which outlined, in strikingly similar ways, significant failures in the response of the international community and what needs to change to avoid the same mistakes. The Commission on the Global Health Risk Framework estimated that the costs of implementing robust measures would cost the world less than $5 billion annually, which is far less than the cost of a major disease outbreak or pandemic. A new course of action is needed. We must act to ensure the world is better prepared.

**Sustained monitoring to drive preparedness.** One way to spur action is to implement a global monitoring mechanism that tracks preparedness over time and holds key stakeholders accountable. Consistent public reminders of progress and gaps can be used strategically to increase investment in disease outbreak preparedness and inform the global public how much progress is being made. A global monitoring program can highlight weaknesses in our global efforts, and where additional resources or efforts may be needed. As political attention on pandemics fades, there is a corresponding loss of momentum on investments that can help keep the world safer. Therefore, sustaining and enhancing the energy that policymakers expend on this topic is vitally important. An independent, objective monitoring mechanism is one way to do so.

**Co-benefits of monitoring preparedness.** Sustained monitoring can also directly benefit all nations around the world by decreasing the chance that future outbreaks will develop into major epidemics or even pandemics. By spurring investment in essential public health capacities, human resources, and the infrastructure needed to prevent, detect, and contain infectious disease outbreaks, human health and economic development will benefit more broadly. Improvements in public health infrastructure, surveillance, detection, and response capabilities will benefit other health areas such as endemic disease management (including malaria, tuberculosis, HIV/AIDS, and vector-borne illnesses). Low-income regions and fragile states are likely to benefit the most from such investments as the positive spill-over into other health areas can be significant. According to experts, the total cost of disease outbreak risk mitigation could be as less than $5 billion annually to substantially reduce the risk. This is also a fraction of what we spend on other serious risks to humanity, and a small fraction of the expected economic benefits which are estimated to be at least $60 billion annually.

**Global monitoring to drive preparedness.** Recognizing the value of such a monitoring mechanism, scholars from the Harvard Global Health Institute (HGHI) and Georgetown University, with input from scholars from around the globe, have developed a global monitoring framework. In April of 2017, HGHI and the National Academy of Medicine (NAM) convened more than 50 leading experts from around the world to review a draft monitoring framework with qualitative and quantitative indicators across a range of content areas.

During the April 2017 workshop, participants discussed the framework, indicators to track progress, operationalization of the monitoring, data collection, results dissemination, and a governance structure. To catalyze discussion, a draft framework consisting of a set of indicators was shared by a team comprised of researchers from HGHI, the Harvard Kennedy School, and Georgetown University. Because infectious disease outbreak preparedness is inherently multisectoral and requires both the private and public sectors, the monitoring framework had to reflect a “whole of society” approach. The proposed framework is meant to serve as a starting point which will evolve over time in response to experience and inputs from stakeholders as the monitoring work begins. The report that came out of the April 2017 workshop, entitled “Global Monitoring of Disease Outbreak Preparedness: Preventing the Next Pandemic,” incorporates comments and feedback from the workshop, suggestions that followed from workshop participants, and input from other outside experts, totaling more than 350 unique comments.

**Monitoring Framework and Coalition.** A monitoring framework and the notion of a global coalition of institutions and organizations monitoring progress over time is consistent with the recommendations of the 2017 United Nations Secretary General’s Global Health Crises Task Force. In the Task Force’s final report, the group called for an independent, objective monitoring mechanism, highlighting the importance of regular monitoring to increase accountability and reform (Global Health Crises Task Force 2017). The April 2017 workshop participants similarly agreed with the Task Force that any monitoring program must be rigorous, independent, and reflect the best data and analysis possible.

We believe that a cohesive framework with a consistent set of indicators will facilitate collaboration among contributors and strengthen its impact. Regular, independent, and clearly communicated monitoring (using the proposed framework) will enable policymakers and civil society to better understand the risks and tradeoffs, and ultimately, to invest in preparedness more adequately.

The proposed framework is divided into four separate, interrelated domains:

1. Strengthening public health core capacity as a foundation;
2. Improving science, technology, and access;
3. Reinforcing risk analysis and incentives for action; and
4. Strengthening global mechanisms (such as the UN and WHO).

In each of the four domains, the report describes the indicators that will be critical to track. The indicators are a mix of country-level, regional, and international data. Where critical data elements are missing, new, original research will be needed. Wherever possible, existing data collection structures will be used for greatest efficiency and cost-effectiveness which in turn will minimize the burden on any given country, especially those with fewer resources. Because the field of
disease outbreak monitoring and prevention is a dynamic one, we expect that the framework and the specific indicators that underlie it will evolve over time.

Four domains of the monitoring framework. The four domains of the framework cover a wide range of areas to be monitored. Starting with the first domain, the focus is on country-level readiness. Domain 1 involves tracking public health systems, both veterinary and human, and their ability to perform the core functions of detecting, preventing, and responding to infectious disease outbreaks. In Domain 2, the focus is on improving investments in the science and technology needed to prevent, identify, and combat disease outbreaks. Here, tracking key issues like data-sharing, development of new diagnostics, vaccines, and therapeutics is critical. Domain 3 focuses on risk assessment, and outlines an approach to tracking subnational, national, regional, and global risk. Much of the intellectual and analytical work for this domain is currently being performed by global scholars such as climate and health scientists, veterinarians, ecologists, economists, political scientists, anthropologists, those studying zoonoses, and institutions developing health security indices. Finally, Domain 4 of the framework will track progress among major international institutions, such as the WHO, the World Bank, and UN agencies, to ensure that the global governance mechanisms are better suited for identifying and responding to a crisis.

Research dissemination. Annual reports and other written outputs generated through the monitoring effort will paint a much-needed picture of the world’s state of epidemic and pandemic preparedness. The work will provide a useful, evidence-based body of knowledge for decision-makers to allocate resources and set appropriate policies. Importantly, the monitoring framework will not duplicate existing work and data sources. Recognizing that existing programs already generate valuable data and analyses, the monitoring will build on, amplify, and coalesce these efforts. With a broad coalition of academic, institutional and other partners participating from around the world, a more complete picture of global epidemic preparedness will be generated, through a single lens and on a sustained basis.

A shared framework. This monitoring framework is designed to engage as many experts and institutions as possible from around the world in order to be effective. The goal, coming out of the April 2017 workshop, was to build a Monitoring Coalition, whose members contribute to data collection and analysis, report-writing and results dissemination, and jointly own the report. A planned International Oversight Committee will provide strategic direction to the initiative and assist in research dissemination and policy translation to political leaders (see Figure).

The way forward. Routine, transparent, and objective monitoring will ultimately help ensure sustained financial support and effective prioritization from international organizations, donor agencies, national governments, and the private sector. As one of the first comprehensive, objective monitoring frameworks that brings together multiple sectors in a participatory structure, this initiative is an important step forward in epidemic and pandemic preparedness.
The rise of antimicrobial resistance (AMR) is a public health threat on the scale of an influenza pandemic. 


Ibid

Ibid

Zoonoses are the pathogens that spread from animals to humans and vice versa. 60% of new human infections originate in animals. Ebola, influenza, HIV, MERS and SARS all originated in animals.

Cover photo: Healthcare providers leave a village after completion of a culling operation in response to a bird flu outbreak in Budgebudge, West Bengal, India. © 2008 Sudipto Das, Courtesy of Photoshare.

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