US GLOBAL HEALTH SECURITY INVESTMENTS IMPROVE CAPACITIES FOR INFECTIOUS DISEASE EMERGENCIES

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IN THE PAST 5 YEARS, the world has been challenged by a series of high-profile epidemics, among them an unprecedented and devastating outbreak of Ebola in West Africa and the rapid spread of Zika virus throughout the Americas and discovery of the virus's potential to cause serious birth defects, fetal deaths, and adverse neurological disorders. We have also seen a hospital-associated outbreak of MERS in South Korea, a deadly plague outbreak in Madagascar, and a difficult-to-contain, vector-driven outbreak of Lassa fever in Nigeria. This year, we have seen the return of Ebola—first in an outbreak in the Equateur province of the Democratic Republic of Congo (DRC) and then, weeks after containment, a second, unrelated epidemic in North Kivu, DRC. The sequence and impact of these events suggest that we may well be in an age when the prevailing human, animal, and environmental conditions favor the continued emergence and spread of deadly pathogens. As a result, continued vigilance and preparedness is necessary.

The potential for infectious disease outbreaks to cause significant levels of death and disease, and to destabilize economies and governments, is a central reason that countries including the United States work to improve global health security capacities at home and abroad. Pandemics and epidemics can pose a significant economic and political threat to governments. Just a few cases of Ebola in the United States had big political repercussions and some loss of confidence in the ability of the country to prevent spread.¹ Outbreaks can also have serious economic consequences: disruptions in workforces that are sickened or

afraid to work, trade and travel upheaval, and high levels of uncertainty. The World Bank reports the Ebola epidemic in West Africa is estimated to have cost the 3 affected countries \$2.2 billion in lost GDP in 2015.² It further estimates that even a moderate pandemic can cause millions of deaths and decrease global gross domestic product by 0.7% to 1%.

These tolls can be avoided if disease outbreaks are contained before they become epidemics. During the Ebola epidemic in West Africa, the importation of the disease into populous, internationally connected Lagos, Nigeria, raised alarms about the potential for transmission of the virus to accelerate and, potentially, to spread throughout the continent. But what ultimately unfolded was much different. Thanks to public health capacities that had been developed with investments from preexisting programs, such as the Field Epidemiology Training Program, PEPFAR, and polio eradication, as well as experience in tracking down contacts, the virus was contained in Nigeria within weeks, with fewer than 2 dozen cases.³

Similar successes were achieved when an outbreak of Marburg occurred last year in Uganda. Armed with well-trained staff, a world-class virology laboratory, and practiced protocols for transporting and testing specimens, Uganda detected the outbreak quickly and contained the spread of a deadly hemorrhagic fever within weeks.⁴ In both of these examples, a well-prepared public health system snapped into place to quickly contain the outbreaks before the disease spread across borders. These examples show us that containment is possible if countries

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have the capacities and experience necessary to respond quickly when outbreaks occur.

Since 2014, the US government has invested more than \$1 billion in emergency supplemental funding to support the Global Health Security Agenda's (GHSA) goals to work to strengthen vulnerable countries' public health capacities to prevent, detect, and respond to infectious disease threats. With this funding, US agencies work bilaterally and multilaterally to strengthen capacities in the 11 focus areas of the GHSA. In addition to providing technical assistance and direct support to countries, this funding enables the United States to recruit other countries to work at home and abroad to strengthen public health capacities. US investments in global health security have been catalytic, prompting G7 and other nations to make additional commitments, thereby increasing political will, momentum, and resources available to support capacity-building efforts in more than 60 countries.⁵ South Korea, which has pledged to spend \$100 million to build capacities in 13 countries, recently awarded Ghana \$7.2 million to strengthen its capacities in 3 focus areas of the GHSA: laboratory systems, workforce development, and emergency preparedness.⁶ This funding includes a memorandum of understanding that tasks the US Centers for Disease Control and Prevention (CDC) to work collaboratively with the partners and provide in-country technical oversight.

As countries work to improve health security capacities, it is essential that data be gathered to provide evidence of the impact of these efforts. As such, it is important that we measure progress, rapidly identify gaps in countries' public health capacities, and use data to support the design and implementation of future programs aimed at improving countries' capacities. We also need to assess and compare the timeliness, feasibility, and response to infectious disease threats and determine the cost of various implementation approaches to inform decisions about how to invest limited resources most effectively.

Scientific work of this nature is often labeled as implementation science. Pioneered by political scientists decades ago, implementation science methods are increasingly being used to assess the impact of global health programs "with the basic intent being to understand not only what is and isn't working, but how and why implementation is going right or wrong, and to test approaches to improve implementation."^{7,8(p27)} This discipline has direct applications to the fundamental need in global health security to understand where our efforts are working and where a change in approach may be needed.

This supplement to *Health Security* presents results from some of the global health security projects that the US CDC has supported with GHSA funding. The articles, written by CDC technical experts and GHSA implementing partners in the field who are directly involved in the public health capacity building, describe work going on in a range of environments and against a number of

different health security threats. These articles help to build the evidence base for the public health capacity development efforts needed to address infectious disease threats globally. They also offer strong evidence that US investments have resulted in key improvements in countries' capacities to prevent, detect, and respond to infectious disease outbreaks.

These analyses represent an important contribution in global health security. As a recipient of a large part of the GHSA funding, the CDC has provided direct financial support and technical assistance to 17 countries in Africa, South Asia, and Southeast Asia and technical assistance to an additional 14 countries all over the globe.⁹ The CDC is well-poised to be a leader in global health security implementation science. Such evidence is essential to both inform CDC's own programs as well as other countries' efforts to prevent, detect, and respond to outbreaks.

The articles in this supplement also provide evidence that the assets needed to combat health security threats will require more than one-time investments. The impact of the programs described make a compelling case for the United States' continued commitment to this work. Just as data from the past few years suggest that health security threats will continue to emerge and threaten health, peace, and prosperity across the globe, the capacities needed to address such threats must also be sustained and developed over time. Public health capacity development efforts are generally less costly and more effective than mounting a response operation in the midst of a crisis. Therefore, investments in working to boost countries' capacities should be seen as a cost-saving measure for governments, including the United States, which will be called on to respond during infectious disease emergencies. The United States and other nations should "end the cycle of panic and neglect" that tends to occur during and following events like Ebola outbreaks, and ensure a sustained commitment to improving health security capacities across the globe. For these reasons, we have argued that the US government should allocate a minimum of \$100 million to \$200 million annually to strengthen countries' health security capacities.¹⁰

The recent occurrence within weeks of 2 significant Ebola outbreaks in the DRC demonstrates the increasing frequency with which disease outbreaks are occurring, spreading, and threatening nations' health, prosperity, and economies. Despite the existence of a vaccine, the current outbreak in the DRC continues to spread and serves as a warning for the need for ongoing vigilance for health security threats and the importance of continued work to develop countries' public health capacities to prevent, detect, and respond to such threats.

While much progress has been made, the current challenges in the DRC illustrate how newly built capacities remain fragile in some countries, especially in areas of conflict. This signals the importance of the work ahead. We should

plan for such needs and continue to evaluate the impact and effectiveness of this work.

This year marks the 100-year anniversary of the great influenza pandemic, which spread across the globe and killed an estimated 50 million individuals. As the global public health community commemorates this event, it is important to remember that we don't have to look back 100 years to observe the key lessons of the 1918 pandemic. We have only to examine events of the past 5 years to realize that when deadly outbreaks emerge and spread unchecked, they can threaten the health, security, and prosperity of countries across the globe. The best defense against such threats will be to ensure that capacities are in place to rapidly contain outbreaks at their source before they spread across national borders. This will require sustained commitment on 2 fronts: financial resources to develop and maintain these capacities, and dedicated effort to continually assess their effectiveness. It is in the self-interest of the United States to do both.

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