GHTC global health technologies coalition

advancing innovation to save lives

Response to *Preparing for the Next Pandemic*

From the Global Health Technologies Coalition

The Global Health Technologies Coalition (GHTC) is a coalition of 30 nonprofit organizations, academic institutions, and aligned businesses advancing policies to accelerate the creation of new drugs, vaccines, diagnostics, and other tools that bring healthy lives within reach for all people.

As a result of the generosity of American taxpayers and the leadership of Congress and many administrations, the United States has played a leading role in developing new technologies to combat global health challenges. A range of US agencies have supported the development of new technologies for previous emerging infectious disease (EID) outbreaks such as the ERVEBO Ebola vaccine, a phase 2 MERS-CoV vaccine, and Remdesivir, a therapeutic originally developed to treat Ebola which is now being used to treat severe cases of COVID-19.

The COVID-19 pandemic has laid bare that the extent of our preparedness for any health emergency is determined by the tools that we have to respond to it. Testimony from the leaders of our federal health and research agencies makes it clear that research and development (R&D) must be the tip of the spear of our response to global health emergencies—and that innovation is our exit strategy from the economic and social ills brought on by this unprecedented crisis.

The U.S. government has the most robust scientific infrastructure in the world and has made forward-thinking investments to build our R&D capacity and resource our scientists to develop the tools we and our global partners need to be healthy and safe. The COVID-19 pandemic has, however, demonstrated that there is more we can and must do to support this life-saving work. It is critical to sustain and build on the progress we have made on a variety of global health challenges and strengthen our preparedness for the next pandemic by investing in science and innovation.

GHTC is encouraged by Senator Alexander's recommendations for actions that Congress can take to that end, outlined in the white paper *Preparing for the Next Pandemic*, and appreciates the urgency with which he is working to advance new legislation to prepare for the next pandemic. Our coalition offers the following responses to Senator Alexander's recommendations and accompanying questions for the Senate Committee on Health, Education, Labor, and Pensions to consider.

Responses to recommendations

RECOMMENDATION 1.1: Congress and the Administration should identify and implement public-private manufacturing models to improve and maintain sustainable domestic vaccine manufacturing capacity and capabilities. One approach has been the advanced development manufacturing program.

GHTC's associated recommendations:

- The US government should invest in public-private manufacturing models, but also make foundational investments to incentivize and advance R&D for vaccine technologies designed to enable faster, less resource-intensive manufacturing and administration.

Vaccine manufacturing is a complex endeavor: most production facilities are purpose-built for specific vaccines and must be individually approved for use by the Food and Drug Administration (FDA), making it difficult and costly to repurpose such facilities. As one element of improving our vaccine manufacturing capacity, ***the US government should invest in public-private manufacturing models***, which we elaborate in more detail below. GHTC also wishes to emphasize that ***there are additional, foundational investments that must be made to incentivize and advance R&D for: 1) vaccine platform technologies that enable faster, less resource-intensive manufacturing and flexible manufacturing facilities; and 2) vaccine technologies that are easier to administer, such as oral formulations and skin-patches***. Such technologies could drastically reduce the resources needed for vaccine manufacturing and delivery and thus strengthen our domestic manufacturing capacity. Additional detail is included in our answer to question 6 on the federal role in supporting the manufacturing of medical countermeasures under the Tests, Treatments, and Vaccines section of the white paper.

RECOMMENDATION 1.2: Congress and the Administration should continue to support NIH research and its academic partnerships, which have provided key infrastructure to rapidly pivot to COVID-19 research and clinical trials.

GHTC's associated recommendations:

- Additional investment in NIH now will strengthen our ability to prevent and respond to pandemics tomorrow.
- In particular, to better support the full range of NIH institutes and centers critical to COVID-19 and other global threats, an additional $10 million should be appropriated to the Fogarty International Center (FIC) in each of the next five fiscal years, and the National Center for Advancing Translational Science (NCATS) should be empowered and resourced to play a larger role in accelerating translational research for EIDs.
- Congress must also increase investment in the full range of federal agencies that support R&D for global health security.

NIH is an essential piece of the United States' biomedical research enterprise and a world leader in global health R&D. Focusing primarily on basic, early-stage research, NIH supports researchers around the country to better understand pathogens and health conditions and unlock scientific discoveries. Within NIH, the National Institute of Allergy and Infectious Diseases (NIAID) leads work in basic and applied research to better understand, treat, and ultimately prevent infectious diseases. Forward-thinking investment by Congress over the past decade has significantly strengthened NIH's capacity to advance research for a wide range of infectious disease threats—investments that have paid incredible dividends in the rapid advancement of products to combat COVID-19.

In the wake of the SARS and MERS outbreaks, significant investments were made to build NIAID's coronavirus research portfolio. Advancements made with those resources, including the development of a DNA vaccine candidate for SARS at the NIAID Vaccine Research Center, prepared scientists to quickly

assess the severity and transmission potential of the SARS-CoV-2 virus when it emerged and begin developing novel countermeasures. Within just two weeks of the discovery of COVID-19, NIAID researchers determined how the virus enters cells, and within two months, NIAID sites had begun Phase 1 trials of both a treatment (Remdesivir) and vaccine (mRNA-1273) candidate. NIAID's investments in coronavirus research over almost two decades enabled rapid progress on COVID-19.

Beyond NIAID, many other NIH centers and institutes contribute unique capabilities that strengthen our ability to respond to global health threats. FIC plays an important role in accelerating science, partnerships, and technical assistance to advance new technologies for some of the world's most pressing global health challenges. With less than one-quarter of one percent of the total NIH budget, Fogarty delivers significant scientific returns for global and American health, forging international partnerships to facilitate truly global research and training scientists who make critical contributions to long-standing global public health challenges such as HIV/AIDS and emerging threats like antimicrobial resistance, Zika, Ebola, and now COVID-19. Fogarty-trained scientists are embedded in scientific research agencies and ministries of health worldwide on the frontlines of the COVID-19 response. Progressively increasing Fogarty's base budget would allow them to pursue a wider range of research priorities with extramural partners around the world. ***GHTC joins other advocacy organizations in calling for an additional $10 million to be appropriated to Fogarty's modest budget in each of the next five fiscal years***, which would support sustainable growth and long-term planning in pursuit of their mission of building research capacity in partner countries.

NCATS is another key NIH resource. NCATS was established in 2011 and is authorized to support clinical trial research through phase IIB clinical trials for all health products and through phase III clinical trials for products for rare diseases. Congress should expand NCATS' capability to support later-stage clinical trials for all health products in order to strengthen their role in pandemic preparedness. NCATS is authorized to do research on global health conditions and has supported some research on HIV, malaria, Chagas disease, and other neglected diseases. Emerging infectious diseases (EIDs), however, have not been part of NCATS' portfolio. ***GHTC recommends that NCATS be empowered and resourced to play a larger role in accelerating translational research for EIDs***, conditions which by their nature particularly require accelerated translational research to enable new products to be developed in time to be of use as threats unfold.

One policy provision to consider would be that included in Sec. 4040 of H.R.3, the Elijah E. Cummings Lower Drug Costs Now Act, which would establish an NIH pilot program that, in consultation with NCATS and FDA, would award multi-year contracts to eligible entities to support phase II clinical trials and phase III clinical trials for "high-need cures," defined in the Public Health Service Act as a drug, biological product, or device that is a priority to "diagnose, mitigate, prevent, or treat harm from any disease or condition…for which the incentives of the commercial market are unlikely to result in its adequate or timely development," conditions that describe EIDs with the potential to become pandemic threats.

Additional investment now—in NIAID, FIC, NCATS, and other institutes and centers across the NIH—will strengthen our ability to prevent and respond to pandemics tomorrow. While much work remains, NIH researchers were in a much stronger position to rapidly assess and begin developing medical countermeasures for SARS-CoV-2 because of investments made in the wake of the SARS and MERS epidemics. We can and should use the tragedy of the COVID-19 pandemic as the impetus to boldly increase funding for research into a wide range of infectious disease threats to speed and strengthen our response to the next pandemic. ***Congress must also increase investment in the full range of federal***

agencies ***that support R&D for global health security***, including the Centers for Disease Control and Prevention (CDC), the Biomedical Advanced Research and Development Authority (BARDA), the United States Agency for International Development (USAID), and the Department of Defense (DOD).

RECOMMENDATION 1.4: Engage and partner with the private sector early to develop diagnostic tests, ensure flexibility to develop and use laboratory-developed tests in a public health emergency, and ensure that the stockpile is better prepared to address diagnostic needs.

GHTC's associated recommendations:

- The US government should support and join partnerships leading efforts to develop and scale up COVID-19 diagnostic tests in low- and middle-income countries, complementing and leveraging those being led by the World Health Organization (WHO).
- While strengthening partnerships with the private and nonprofit sectors will increase our diagnostic capacity for the next pandemic, additional investment in key federal government agencies that contribute to diagnostic development and validation is also essential.

Diagnostic tools are fundamental to our ability to detect and respond to pandemic threats, but diagnostic development has typically been one of the most underfunded segments of biomedical research and product development. The COVID-19 pandemic has thrust diagnostics into a long-deserved spotlight, illustrating in stark relief the importance of the timely development and roll-out of diagnostic tools for novel health threats. A rather prophetically titled article published in BMJ Global Health in January 2019, "Importance of diagnostics in epidemic and pandemic preparedness," begins, "Diagnostic tests are a fundamental component of a successful outbreak containment strategy, being involved at every stage of an outbreak, from initial detection to eventual resolution," but warns, "Development of diagnostic tests suitable for epidemic prevention and containment is technically challenging, and processes for development, validation and implementation are complex and time consuming."

Many promising partnerships have emerged to strengthen diagnostic development capacity for neglected and emerging diseases, including COVID-19. GHTC member FIND is tracking efforts to develop COVID diagnostics and co-convening, with the Global Fund, the Access to COVID-19 Tools (ACT) Accelerator Diagnostics Partnership. As FIND elaborates, "Without mass testing – which relies on availability of high-performing, rapid tests – [COVID-19] will continue to spread. Innovation and scale up of these tests must be accelerated for deployment in all countries. For low- and middle-income countries, this investment would contribute to saving 9 million lives and strengthen health systems to overcome the COVID-19 pandemic. An investment of US$6 billion is required to harness innovation and secure access to vital diagnostic tests over the next 12 months for low- and middle-income countries. US$2 billion of this is required immediately to expedite development, manufacturing and scale-up of the rapid tests that will enable mass testing to be introduced globally—as well as procurement of tests to fill critical short-term gaps in low-income countries." ***The US government should support efforts to develop and scale up COVID-19 diagnostic tests in low- and middle-income countries,*** with consideration of global and equitable access, transparency, oversight and accountability, to ensure that the progress we are making in combatting the pandemic here at home is durable—since we will not be truly safe from COVID-19 until the pandemic is ended everywhere. Diagnostic development and delivery is foundational to that effort.

While strengthening partnerships with the private and nonprofit sectors will increase our diagnostic capacity for the next pandemic, ***additional investment in key federal government agencies that contribute to diagnostic development and validation is also essential***. Within CDC, the National Center for Emerging Zoonotic and Infectious Diseases (NCEZID) provides advanced laboratory services, including biosafety labs which enable CDC to study hazardous pathogens, and advanced molecular detection techniques that allow CDC to identify infectious diseases of unknown origin—capabilities that have been critical to the global response to COVID-19. NCEZID also leads the R&D of diagnostic tests for enduring health threats, such as the bubonic plague, rabies, Zika, Ebola, Lyme disease, and parasites, as well as emerging and potentially pandemic threats and serves as an international reference hub for vector-borne viral and bacterial diseases. These functions are essential for strengthening our capacity to detect and respond to the next pandemic, are unique to NCEZID, and require increased investment to be maximally effective. Appropriations to NCEZID must rise to the level of the ever-growing global threat of emerging and zoonotic infectious diseases.

Responses to questions

Tests, Treatments, and Vaccines – Accelerate Research and Development

1. What incentives can the federal government offer to the private sector to encourage development of more medical countermeasures with no commercial market?

GHTC's associated recommendations:

- The US government needs to consider specific incentive programs for naturally occurring global health threats, such as EIDs, particularly via BARDA.

The federal government currently has several ways of incentivizing the private sector to engage in medical countermeasure development. These include partnerships through BARDA and subsequent acquisition of new products to the Strategic National Stockpile. Since 2016, companies that develop material threat medical countermeasures have also been eligible to receive priority review vouchers through the US Food and Drug Administration.

Other valid proposals exist. For example, to incentivize the creation of new antibiotics—which face market failures similar to medical countermeasures—experts have proposed that the US government, through the Centers for Medicare and Medicaid Services, use a population-based payment system to contract with companies to have those antibiotics available when needed. This ensures that companies are recompensed for their research contributions and remain solvent to produce their products when needed in the future.

The US government needs to consider specific incentive programs for naturally occurring global health threats, such as EIDs. One way is by implementing an EID funding line at BARDA, an agency that since its founding following the anthrax attacks, has historically prioritized funding for man-made rather than naturally occurring threats. One mechanism that could enable BARDA to invest more in EIDs is for the US government to introduce a Biological Threat Assessment process. Through Project BioShield, the Department of Homeland Security, in consultation with the Department of Health and Human Services, already has a Material Threat Determination process, which includes chemical, biological, radiological, and nuclear agents—but Congress should consider creating a separate Biological Threat Assessment process that is tied to incentive programs and would allow DOD and BARDA to substantially expand R&D

efforts aimed at emerging infectious disease threats. At the very least, Congress should request clarification from BARDA on how it invests its base appropriations.

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3. What could the federal government have done to be better positioned with diagnostics, vaccines, and treatments for COVID-19?

GHTC's associated recommendations:

- Increased base appropriations for BARDA to address naturally occurring threats and greater clarity from BARDA into the use of its existing funding streams and prioritization of disease threats is needed. Delays in utilizing the full capability of partners like BARDA because of uncertain or insufficient funding cost lives in the COVID-19 pandemic, and, if not addressed by Congress now, will cost lives in the next pandemic.
- Significant new resources should be appropriated across the range of CDC centers that contribute to global health security and pandemic preparedness, including through the development and roll-out of new tools—in particular, NCEZID and the Center for Global Health (CGH).
- The US government should partner with multilateral institutions and global health R&D collaboration mechanisms to sustainably expand our capacity to develop tools to combat health threats.

Since its founding in 2006, BARDA has been authorized to engage in the development of medical countermeasures for naturally occurring threats, including EIDs. This work was bolstered in the Pandemic and All-Hazards Preparedness and Advancing Innovation Act of 2019, which specifically authorized BARDA to implement "strategic initiatives" to develop countermeasures against emerging infectious diseases, pandemic influenza, and antimicrobial-resistant pathogens. However, BARDA was founded in the aftermath of the anthrax attacks and has had a legacy of focusing primarily on chemical, biological, radiological, and nuclear man-made health threats. Their incredible capabilities to advance products for naturally occurring threats have not been maximally resourced through their base appropriations: the majority of BARDA's work on naturally occurring threats such as Ebola and Zika has been advanced through one-time emergency supplemental appropriations. Increased funding for the full range of health threats, along with a specific, protected funding line for EIDs, could have supported a larger portfolio of medical countermeasures for pandemic threats like coronaviruses. Indeed, at the outset of the COVID-19 outbreak, as agencies like NIH announced large investments in COVID-19 research, BARDA's then-director, Dr. Rick Bright, publicly stated that his agency did not have resources on hand to contribute to COVID-19 R&D. Several weeks passed before BARDA announced a Market Research Initiative to identify medical countermeasures with the potential to help address the outbreak. The first supplemental funding to support the advancement of products did not arrive until the Coronavirus Preparedness and Response Supplemental Appropriations Act was passed in March. ***Delays in utilizing the full capability of partners like BARDA because of uncertain or insufficient funding cost lives in the COVID-19 pandemic, and, if not addressed by Congress now, will cost lives in the next pandemic.***

Today, we are at a peak of the boom-and-bust cycle of pandemic preparedness investments, with BARDA having been appropriated $6.5 billion to advance medical countermeasures for COVID-19 across the first four supplemental funding packages—more than elevenfold BARDA's base fiscal year 2020

appropriation. A more consistent and proactive investment by Congress in BARDA's capabilities to advance products for EIDs and other naturally occurring threats might have staved off the need for this major spike in funding now.

Increased base appropriations for naturally occurring threats and greater clarity from BARDA into the use of existing funding streams and prioritization of disease threats is needed. This will enable BARDA to continue bridging the *valley of death* between basic research and later-stage product development for urgently needed medical countermeasures for the full spectrum of naturally occurring threats, including EIDs, pandemic influenza, and antimicrobial-resistant pathogens—an area where more traditional US government research enterprises do not operate and where private sector investment is scarce.

In addition to BARDA, other key agencies could have been better prepared and resourced to contribute to the rapid development of diagnostics, vaccines, and treatments for COVID-19. CDC is a leader in the development and validation of diagnostic tools for novel health threats. While significant new funding has supported the expansion of NIH's capabilities and capacities primarily in basic research into infectious disease threats over the past decade, CDC's capacity in translating the knowledge base generated by NIH into the development and delivery of tools to prevent and respond to global health emergencies has not been prioritized equally. Americans are paying a tragic price for that lack of investment now: the first three emergency supplemental funding bills collectively appropriated more emergency funding for CDC to respond to the COVID-19 pandemic than CDC's entire FY20 appropriated budget for the entire range of public health threats the agency is tasked with tracking, preventing, and responding to both domestically and internationally. ***GHTC recommends that significant new resources be appropriated across the range of CDC centers that contribute to global health security and pandemic preparedness, including through the development and roll-out of new tools—in particular, NCEZID and CGH***.

In addition to supporting the full range of US agencies which contribute to R&D for global health security, ***the US government should partner with multilateral institutions and global health R&D collaboration mechanisms to sustainably expand our capacity to develop tools to combat health threats***. Recognizing that diseases know no borders, the US government must continue to engage with global institutions like WHO that can reach places the US cannot and receive key scientific data, health intelligence, and insights globally to advance medical countermeasures. Regrettably, the US is not currently participating in the WHO Solidarity Trial, the world's largest clinical trial looking at COVID-19 treatments. According to WHO, the Solidarity Trial will reduce the amount of time it normally takes for a drug trial to determine effectiveness by 80 percent. This, combined with the size and geographic breadth of the trial, will provide a strong evidence base for specific therapies that can then be utilized quickly by health systems. Only WHO—with its broad membership, global reach, and international legitimacy—can bring this to bear. When the US helped found WHO in 1948, it did so on the understanding that collective efforts to combat shared health threats are more effective than any single country going it alone. No matter how strong we are scientifically, politically, economically, or militarily, the US will not fare any better taking on global health threats alone: it is imperative that we maintain a strong partnership with WHO to tackle this pandemic and better prepare for those to come.

In April 2020, WHO, in partnership with a number of member states, nonprofits and private-sector partners, came together to launch the Access to COVID-19 Technologies Accelerator (ACT Accelerator), an effort to speed up the development and production of vaccines, diagnostics, and therapeutics for

COVID-19 and ensure their equitable distribution throughout the world. To date, the United States has not engaged with the ACT Accelerator, including any direct commitment to the Vaccine Partnership lead CEPI, the Coalition for Epidemic Preparedness Innovation. This means that Americans will not immediately benefit from the fruits of this global scientific collaboration or tools advanced through these mechanisms. Initiatives like Operation Warp Speed, the Rapid Acceleration of Diagnostics (RADx) and Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) partnerships are mobilizing incredible resources to develop new tools for the pandemic, but we urge Congress and the Administration to leverage every opportunity America has to secure tools to combat, and ultimately end, the pandemic.

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6. What is the appropriate federal role in supporting the manufacturing of medical countermeasures, especially vaccines?

GHTC's associated recommendations:

- The US government should amplify research for vaccine technologies that are simpler, faster, and less costly to manufacture and administrate in the United States and globally.
- The US government should also be investing in fast and flexible vaccine platforms for emerging infectious diseases (EIDs) and other global health threats. US government investment to advance these innovative technologies would significantly lower the cost of manufacturing and distributing vaccines to combat the next global health crisis.

Vaccine manufacturing is a complex endeavor, so most production facilities are purpose-built for specific vaccines and must be specifically approved by FDA, making it difficult and costly to repurpose those facilities. Because the startup cost of building a facility, sourcing raw materials, and hiring personnel for a single product is so high, a developer does not usually invest in building a new facility until it has confidence that its vaccine will be successful. This creates delays in market entry ranging from several months to several years, depending on the complexity of the vaccine.

The US government is currently funding such efforts through BARDA which has provided funding to scale the manufacturing capacity of at least four COVID-19 vaccine candidates in partnership with Moderna, Janssen (Johnson & Johnson), AstraZeneca, and Sanofi. BARDA has also provided funding over the past decade to increase our nation's capacity to fill and finish vaccines, establishing a program for direct manufacturing capabilities. But these investments alone are unlikely to be sufficient to support COVID-19 vaccine manufacturing to meet the full need for protection in the United States and around the world. To prepare for the next pandemic, the US government should make more funding and contracts available to proactively build or repurpose facilities so that, when a new global threat appears, leaders can make bets on enough vaccine candidates so that, once one candidate is successfully approved, we will have sufficient supply and capacity to serve the world. In addition, building the capacity of partner countries to support quality-assured vaccine manufacturing will help ensure that the development and approval of a successful vaccine does not initiate a race for access, but rather a collaborative effort to ensure we are able to meet global needs.

But being prepared to invest in manufacturing facilities early on is not enough. ***The US government also needs to amplify research for vaccine technologies that are simpler, faster, and less costly to manufacture and administrate in the United States and globally.*** For example, mRNA-1273, developed initially by NIAID scientists in partnership with Moderna, is a new vaccine technology in which the

vaccine is produced using only one bioreactor—a novel process that significantly simplifies vaccine manufacturing.

The US government should also be investing in fast and flexible vaccine platforms for emerging infectious diseases (EIDs) and other global health threats, building on the President's Executive Order to modernize influenza vaccines through government investment in faster, more flexible flu vaccine manufacturing platforms. Having these manufacturing platforms available for additional global health threats would make it easier to repurpose manufacturing facilities and begin production on new vaccines. Because the advanced investment for vaccine R&D is so high and profit margins are so low relative to other health products, creating these new technologies will require direct government investment and incentives to encourage public-private partnerships—such as with the IAVI-Merck product development partnership, an effort to develop a COVID-19 vaccine using the same rVSV platform that was used to develop the highly effective ERVEBO Ebola vaccine.

Platform technologies can accelerate production of the biological vaccine product, but there also remains serious limitations to filling, finishing, transporting, and distributing vaccines on such an unprecedented scale. New technologies are needed to prepare to deliver an unprecedented scale of vaccines—for COVID-19 and future pandemics. One example of such an innovation, which was developed by PATH and USAID, is Uniject, a low-cost, auto-disable, single-injection syringe that can be used with minimal training. However, with the global scope of COVID-19, there are serious concerns that the need to vaccinate the entire global population will lead to a shortage of syringes, needles, and other delivery tools. This will only be exacerbated if a successful vaccine candidate requires multiple doses. The IAVI-Merck vaccine development partnership, backed by BARDA, is attempting to circumvent this challenge by developing a single-dose, oral vaccine. Other promising high-volume, low-cost delivery designs include a thermo-stable, stamp-sized skin patch that vaccinates individuals through invisible microneedles. These patches are created through a scalable printing process and are easily applied to the skin like a bandage to vaccinate the recipient. Another device that could circumvent the need for needles is Cellectra, which was developed by INOVIO Pharmaceuticals with funding from DOD. Cellectra is a AA battery-powered device that uses a brief electrical pulse to deliver a vaccine through skin pores. According to the company, the device is designed to "function reliably in challenging environments and can be stockpiled in large quantities without maintenance." Such low-cost, high-volume delivery systems will be essential for mass production and distribution of a vaccine for COVID-19, and ***US government investment to advance these innovative technologies would significantly lower the cost of producing, transporting, and delivering vaccines to combat the next global health crisis.***

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8. How can the United States better leverage public-private partnerships, industry, and academic institutions?

GHTC's associated recommendations:

- US government agencies should increase funding for and participation in product development partnerships.
- Congress can better leverage diverse partnerships by investing in global health R&D at USAID. In the near-term, the next emergency supplemental funding package for COVID-19 should include funding for USAID to launch a Grand Challenge program to advance COVID-19 innovations designed for use in low- and middle-income countries.

- Congress should authorize US participation in and funding for CEPI.

The US can build and fully leverage the strengths of its agencies engaged in pandemic preparedness and research by making targeted investments in high-impact partnerships. Since the 1990s, a new form of public-private partnership—called a product development partnership (PDP)—has emerged. PDPs facilitate partnerships that harness expertise, resources, and investments from the public, philanthropic, and private sectors to target defined public health goals. Through the PDP model, partners share risk as well as costs and focus on issues like affordability and access. Because private-sector companies are less likely to assume the full risks and costs of product development targeting poverty-related and neglected diseases (PRNDs), PDPs take on this risk by covering costs throughout the product development life cycle in exchange for licensing agreements and intellectual property rights to ensure that products are affordable and available in adequate supply in the countries where they are needed. In this way, the PDP model creates incentives for the pharmaceutical and biotechnology industries to take up R&D for PRNDs. PDPs manage a portfolio of candidates that are typically at various stages of development and work across the product development process—from basic research through product development and introduction.

In addition to advancing lifesaving products, PDPs also contribute to building a stronger global infrastructure for R&D. For instance, they help strengthen the capacity of research and manufacturing partners in disease-endemic countries through their partnerships with research institutes in low- and middle-income countries. They also work closely with regional and national regulatory authorities, as well as other regulatory stakeholders, to develop and clarify regulatory pathways for global health products and improve the alignment of regulatory requirements. In addition, PDPs advocate for policies and resources needed to strengthen R&D for PRNDs and shine new light on the health needs of low- and middle-income countries.

By channeling investments through PDPs, the US government's support for global health R&D can have a a multiplier effect by leveraging inputs from the philanthropic sector and the pharmaceutical and biotechnology industries. ***GHTC recommends that US government agencies increase funding to and participation in PDPs*** to fully capitalize on their strengths in research towards a variety of global health goals, including pandemic preparedness and global health security.

In addition to strong investments in BARDA, NIH, AND CDC, which all collaborate extensively with industry and academic institutions, ***Congress can better leverage diverse partnerships by investing in global health R&D at USAID***. Increasing funding for Global Health Programs at USAID to advance and deliver innovations to help low- and middle-income countries prevent, prepare for, and respond to future pandemic threats is a key element of preparedness for the next pandemic. As the only US agency with a mission focused exclusively on global development, USAID has a long history of supporting the definition, design, development, and delivery of global health tools. USAID should be better resourced to advance vaccine candidates and delivery systems well suited for delivery in very low-resource settings, in addition to other medical countermeasures such as diagnostics; therapeutics; medical devices and health technologies; personal protective equipment for frontline health workers; health facility innovations; and the financing, manufacturing, and delivery systems these essential resources require—all tailored to the unique constraints of pandemic response in very low-resource settings.

USAID's Grand Challenge open innovation model has been deployed to great effect during previous health emergencies including Ebola and Zika and could be used to better leverage the diverse strengths

of global innovators to combat the pandemic. Past Grand Challenges have mobilized governments, companies, and foundations around important issues. Through these programs, USAID and public and private partners bring in new voices to solve development problems. They source new solutions, test new ideas, and scale what works. All Grand Challenges offer challenge grants, but many use additional tools depending on the problem they intend to solve. These can include prizes, hack-a-thons, capacity-building services, and more. Together, the Grand Challenges partners have funded more than 450 innovations in 60 countries over the course of the past decade through 10 Challenges.

In 2014, as the largest Ebola epidemic in history unfolded in West Africa, USAID, working with the White House Office of Science and Technology Policy (OSTP), CDC, and DOD, issued the Fighting Ebola Grand Challenge to identify innovations to address barriers faced by health care workers in combating the epidemic. International experts reviewed more than 1,500 ideas and rapidly selected 14 promising innovations to support, including a low-cost battery-powered infusion monitor to deliver IV fluids in settings without reliable electricity and the STAMPS Sensor, a disposable, Bluetooth-enabled vital signs sensor which goes on like a band-aid and remotely monitors key vital signs including heart rate, respiratory rate, temperature, and oxygen saturation of Ebola patients in Ebola Treatment Units.

In 2016, faced with the growing threat of the Zika virus across Latin America, USAID launched the Combating Zika and Future Threats Grand Challenge to crowdsource and advance innovative approaches to fight the outbreak and prevent other infectious disease outbreaks, including a multiplex point-of-care diagnostic test that uses Blu-ray technology to diagnose Zika and dengue from a single drop of blood. In just nine weeks, USAID received nearly 900 submissions from across the globe in response to the Challenge. Following a rigorous review process, 21 potentially game-changing solutions that covered vector control, personal and household protection, vector and disease surveillance, diagnostics, and community engagement were selected for funding for accelerated development, testing, and deployment. Five additional awards have been announced, including unmanned aerial vehicles that deliver critical medical supplies to remote areas and the use of big data and machine learning to prevent future disease outbreaks.

In response to the growing global reach of the COVID-19 pandemic, USAID issued a Request for Information on March 30, seeking proposals for low-cost, scalable products; service innovations; and information channels that could support the international COVID-19 response. In just 9 days, USAID received 230 responses. USAID leadership is very supportive of launching a Grand Challenge to advance these innovations, but ***funding will be needed in the next emergency supplemental package to enable the launch***.

Finally, ***Congress should authorize and fund CEPI*** as an international organization (IO). CEPI is advancing nine vaccine candidates for COVID-19 and has put forward a US$2 billion global ask to advance this portfolio. The US has not yet made a commitment to CEPI, which could limit our access to any vaccine developed by the partnership, costing valuable time in mitigating the pandemic if a CEPI-supported candidate advances faster than a US-supported candidate. A relatively modest US investment in CEPI is a smart way to diversify and strengthen our COVID-19 vaccine portfolio and will ensure that a COVID-19 vaccine is designed with global access in mind.

Who Is on the Flagpole? – Improve Coordination of Federal Agencies During a Public Health Emergency

6. How can federal departments and agencies more effectively work together to respond to public health emergencies?

GHTC's associated recommendations:

- Congress should require the public release of the Global Health Innovation Act report to improve transparency on the scope of USAID's collaboration and coordination with other federal agencies and external partners engaged in global health innovation activities.
- Congress should instruct leaders at the State Department and USAID to work together with other US agencies to develop a whole-of-government global health R&D strategy to ensure that US investments in global health research—including for the prevention of and response to public health emergencies—are efficient, coordinated, and streamlined.
- FDA's global leadership, coordinated with other federal agencies and initiatives and global partners, should be strengthened to speed the deployment of life-saving new health products.

To maximize our capacity to respond to both enduring and emerging health threats, including public health emergencies such as the COVID-19 pandemic, GHTC has long advocated for increased coordination and collaboration between US federal agencies.

Many US government departments, agencies, and programs contribute to global health R&D. Coordination between USAID, the State Department, DOD, CDC, NIH, BARDA, and FDA is critical to ensuring that US investments in global health R&D are efficient, coordinated, and streamlined.

The Global Health Innovation Act (P.L. 115-411) requires USAID, for five years, to annually report on the development and use of global health innovations in the programs, projects, and activities of USAID and to provide a description of the agency's collaboration and coordination with other US departments and agencies, including CDC, in support of global health product development. ***Requiring the public release of this report would improve transparency on the scope of USAID's collaboration and coordination with other federal agencies and external partners engaged in global health innovation activities***.

In addition, ***Congress should instruct leaders at the State Department and USAID to work together with other US agencies to develop a whole-of-government global health R&D strategy to ensure that US investments in global health research—including for the prevention of and response to public health emergencies—are efficient, coordinated, and streamlined***. Each federal agency engaged in health research offers unique capabilities, but effective coordination is essential to maximize our ability to respond to public health emergencies through accelerated R&D activities. The National Biodefense Strategy released in 2018 explicitly calls for increased federal alignment and prioritization of R&D funding focused on global health security, including sub-goal 3.1.2 to "Establish procedures for prioritizing, funding, and coordinating R&D efforts during bioincidents." In the wake of COVID-19, Congress should support efforts to better delineate the role of each research agency—and the norms and procedures for coordination between them—during future health emergencies.

Finally, strong regulatory systems play a critical role in epidemic preparedness. FDA is one of the world's leaders in the safety, efficacy, and security review of biomedical products with a priority focus on interventions that serve US public health, but FDA has also played a major role in global health through

initiatives such as its tentative approval process for antiretroviral drugs for use by the President's Emergency Plan for AIDS Relief (PEPFAR).

As new innovations to respond to emerging infectious diseases come through the pipeline, regulatory bodies will be required to ensure they are safe and effective and ultimately approve them for use in a timely manner to ensure populations have access to new tools as soon as possible. FDA leads the world in regulatory expertise and can play a stronger role in providing more technical support to less developed regulatory bodies, particularly in an epidemic setting where novel innovations are being developed and require fast-track approval. A more coordinated international regulatory environment, supported by FDA leadership, could save lives.

GHTC encourages legislative provisions that promote FDA's global leadership, coordinated with other federal agencies and initiatives and global partners, such as by encouraging FDA to provide technical support and maximize transparency and work-product sharing with international partners; promoting international inter-agency capacity building, convergence, and information sharing, such as through improved clinical data interoperability and evidence sharing; promoting the formation and scope-expansion of mutual recognition agreements (MRAs) between international regulatory agencies; and promoting FDA coordination with WHO on its prequalification (PQ) process through initiatives like the recently launched pilot program to share minimally redacted FDA reviews of HIV antiretrovirals with WHO to speed up PQ decision making.

These provisions would support a more cohesive global regulatory environment, lowering the burden for product developers and speeding the deployment of life-saving new health products.