COMMUNITY RESILIENCE, CENTRALIZED LEADERSHIP & MULTI-SECTORAL COLLABORATION
IN PANDEMIC PREPAREDNESS & RESPONSE

THIRD ANNUAL WHITE PAPER • MAY 2019

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INTRODUCTION

One hundred years ago the 1918 influenza pandemic swept the globe, killing between 50-90 million people. The loss of life was so great that cities throughout the United States struggled to keep up with burials; it is estimated that 195,000 Americans died in October 1918 alone (CDC, 2018). During the height of the outbreak, Chicago reported 1,200 people dying per day and Philadelphia had so many dead bodies they weren't able to bury them in a timely manner, with some awaiting burial for over a week (CDC, 2018). In 2006, the last remaining survivor of the 1918 outbreak was asked about his memories of the pandemic and he recalled that people would become ill in the morning and be dead by nighttime stating, "That's how quickly it happened. They disappeared from the face of the earth" (Associated Press, 2006).

Since the end of the 1918 pandemic the world has faced three more influenza pandemics, the most recent being the 2009 H1N1 pandemic which infected 2 billion people in 6 months. Additionally, we face an ever increasing frequency of emerging infectious diseases with pandemic potential. These diseases could kill millions, cost billions, and have other significant economic, social, national security, and political consequences. Technological developments of the last hundred years have brought incredible international advancements and have created a more dependent and interconnected global economy, but these same advances that promote economic prosperity, also create new and unique challenges for pandemic preparedness and response.

In an increasingly interconnected world the threat of pandemics continues to grow. It is not a matter of if there will be a major pandemic, but when. The Scowcroft Institute of International Affairs is committed to elevating the importance of pandemic preparedness and biosecurity as a national security priority, and to bringing attention to the challenges and gaps, as well as the opportunities to improve our response systems so

that when the next pandemic strikes, the catastrophic impacts can be mitigated or reduced.

In this white paper, we address four gaps and provide accompanying recommendations that we believe must be addressed in order to increase our pandemic preparedness and biosecurity. These gaps and topic areas include: 1) Establishing greater community resilience; 2) Strengthening coordination and leadership at the federal level in the United States; 3) Changing the university and funding reward systems to encourage greater interdisciplinary research, education, and service; and 4) Elevating the importance and incentives for private sector involvement in pandemic preparedness and response, as well as their involvement in overall biosecurity.

In addition to the topic areas, which are present in each annual policy white paper, we have included short inserts by experts in the fields of pandemic preparedness and biosecurity. Lastly, for the first time we have included a pandemic report card. This examines progress made, if any, on the recommendations presented in the 2018 Scowcroft Institute White Paper. The purpose of this new addition is to provide an added element of accountability for those at the national and international level tasked with pandemic preparedness and response. If the United States and international system do not make progress towards closing the gaps addressed in this and previous Scowcroft white papers, countries will remain vulnerable to a devastating outbreak.

TOPIC AREA 1: ESTABLISHING HOST COUNTRY COMMUNITY RESILIENCE

Authors: James White & Alinda Lauer

Historical experience with disease outbreaks, natural disasters, and the threat of bioterrorism reminds us of our shared vulnerability. This experience should remind policy leaders and the global health community at all levels that we also have a shared responsibility to take action. Ever evolving and virulent forms of influenza; recent outbreaks of Ebola; the presence of Zika in the Americas, India and Asia; the spread of antimicrobial resistant diseases, in addition to diseases with no vaccination or prevention options; and the threat of novel and emerging infectious diseases (including those of zoonotic origin) pose an increasing threat to human and animal welfare and development. The shared international experience responding to these crises has demonstrated several important lessons observed for effective disease prevention and response. Unfortunately, there are few, sustained lessons learned.

First, effective prevention, detection, and front-line response to epidemics all require close participation and coordination of numerous people and institutions at the local level (McClelland, 2017). Community-based nurses and health workers, civil society organizations, veterinarians, teachers, religious leaders and traditional healers are often the first people to detect a novel disease or the first cluster of cases at the start of an epidemic. National governments often face the challenge of delayed surveillance information, creating critical time delays between identifying an outbreak, reporting, and mobilizing a response effort (McClelland, 2017). Outbreaks start at the local level, and community members serve as essential links to the health system for early detection and first response before external assistance arrive. Community members and structures are essential throughout the process, from being at the front-lines to recognize and report potential outbreaks, to rapid containment and control efforts, limiting geographic spread and mitigating the impact of outbreaks on social structures (McClelland,

2017). To date, however, national governments and international global health security stakeholders have not fully acknowledged that vulnerable communities face numerous and cumulative threats requiring a collaborative focus on working with communities to prepare context-specific, bottom-up, community-focused approaches to outbreak prevention, detection, response and recovery (FEMA, 2019; Zolnikov, 2018).

The second lesson is that, historically, the international response to epidemics and other health emergencies, with the notable exception of some vaccine development efforts, have predominantly occurred at the time of a crisis, not in between or in advance of outbreaks. While it is clear that the most effective defense against epidemics is an effective and high-quality national or provincial health system, the medical and technical responses to epidemics have most often come through external donor-driven emergency systems and global health security institutions – not as part of system-wide preparations and prevention via primary health care and universal health coverage efforts already underway in resource-poor communities. It is increasingly clear that successful epidemic prevention and control efforts should occur before a health emergency occurs. Effective response requires engaging and empowering a broad range of community actors and this empowerment is at the core of developing strong community-based primary healthcare systems. Strong primary healthcare systems are an essential platform to attain universal health coverage and prepare communities to withstand external all-hazard public health threats, including high consequence infectious diseases. However, to date, national public health systems and international health security/emergency response stakeholders have typically operated in isolation. Mobilizing both the primary healthcare and universal health coverage systems in harmony at the community level is vital to strengthening effective epidemic prevention, detection, and response, and it is critical that national and provincial governments be supported in this pursuit.

The last key lesson observed is that international responses to major epidemics have not fully taken into account the interaction of multiple hazards and vulnerabilities at the community level that contribute to disease outbreaks and spread. A better appreciation and understanding of these interactions are essential to determine effective prevention, detection, and response strategies (Aitsi-Selmi & Murray, 2016). FEMA argues that, to meet this challenge, responders and external governments must better understand communities, peoples, and populations (FEMA, 2011). Even though FEMA guidance is primarily intended for communities in the United States, the guidance is generally relevant to communities world-wide. Understanding when and how communities have the means to prepare and respond effectively will increase disease prevention and containment (FEMA, 2019). The challenges of inadequate infrastructure, lack of personnel, and other compounding factors in many communities makes it difficult to effectively prepare for emergencies, let alone effectively respond and recover when outbreaks occur. Reports from recent international outbreaks demonstrate national and community-level surveillance systems did not function effectively; health systems, healthcare providers, and logistic networks were overwhelmed and unable to cope in identifying and responding to new cases; and routine primary healthcare and basic health services deteriorated during outbreaks (Kruk et al., 2017). Effective planning and preparation requires linking community health information systems to national health information systems, establishing International Health Regulation (IHR) compliant reporting protocols, estimating financing needs, and supporting ongoing community health system strengthening. This must be done prior to an outbreak and requires an understanding of community resources, threats, and areas of vulnerability.

This section explores these key lessons in further detail by, first, exploring key concepts and terms such as 'community', 'preparedness', and 'resiliency' focusing on the community's role, followed by a discussion of various resiliency and community preparedness frameworks available in the public health literature. We argue that although these frameworks have helped conceptualize the problem and described useful parameters of community resilience, there is a need to further explore how these frameworks and terms can be harmonized and made operational. Building on current case experiences in the literature, we emphasize four broad operational goals to improve community-

based capacities to prevent, detect, and respond to epidemics. We emphasize the need for synergy between primary healthcare-universal health coverage and global health security-emergency systems, and the need for operational approaches that harmonizes and align these two systems at the community level. We demonstrate the need for a systematic approach to defining, mapping, and mobilizing community assets and stakeholders and, using specific country examples, we argue for the involvement of "whole communities" in preparedness and prevention efforts before an epidemic occurs. Additionally, there is a need for clearly defined roles and resources to mobilize community actors for detection and response when a health emergency strikes. We argue working closely with communities to build their broad resiliency capabilities before, during, and after outbreaks occur is one of the single most pressing priorities in global health today, and essential for effective global health security.

What is a resilient community?

Defining a resilient community requires identifying what is meant by a community along with core functions. Community means different things in different societies and to different constituencies; however, for the purposes of this discussion, we define a community to mean the collective of all people, institutions, structures, and social practices shared by a group at a country's sub-national levels, whether county, zonal or district, municipal or sub-municipal. While geography is a core component of defining a community, it is also determined by shared beliefs, culture, religion, and social ties. We can further define a community by its leadership structures, both formal and informal, which define the community's borders and political-legal structures. A "whole community" in its broadest terms therefore also includes the full range of all public, civil society, non-profit, religious faith-based, private, and corporate actors and institutions as defined in that community's space (FEMA, 2019).

These people and sectors constitute a range of core community functions, services, and products across diverse realms such as health, water and sanitation, agriculture, environment, law, education, and military – all of which are central to effective epidemic prevention, detection, and response. Community educators and

health promoters are critical in building awareness around disease prevention and educating community members before, during, and after a health threat, and have been essential sources of early data collection for disease detection. Agricultural workers and operators at the local level are essential in preventing and reporting zoonotic disease threats; local sanitation crews and environmental workers are essential to promoting a disease-free environment; and religious and civil society actors are critical educating the public and promoting culturally appropriate responses when outbreaks occur.

Community-based health workers, agricultural extension workers, religious leaders, and civil society organization leaders or community members are often the first people to detect and report a novel disease symptom and are critical to establishing and maintaining communication between the international health security system, the primary healthcare system, and an affected community during an epidemic. It is most often public and private health providers at the community level who must serve as first responders to disease outbreaks, promote initial containment, and seek to maintain the community's other primary healthcare functions during the early stages. Community leaders, both formal and informal, are indispensable to effectively translating community norms and practices to external responders.

The private sector – including a broad range of health facilities and pharmacies, grocers, retail outlets, and industries – offer critical human and logistic resources essential to effectively preventing, detecting, and responding to disease threats at the community level. Understanding these core functions and capabilities, mapping the diverse roles of community actors, identifying and operationalizing these roles remain a key priority to more holistically defining communities and the core functions they play in disease response.

Disease outbreaks are "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (Olu et al., 2017). Drawing on the lessons from the 2014-15 West Africa Ebola epidemic, the

term resilience has become increasingly central when discussing the overall strength of a health system and a community's preparedness to prevent, detect, and respond to disasters such as disease outbreaks (Moon et al., 2015; National Academy of Medicine, 2016; UN, 2016). Resilient health systems and communities are those where "health actors, institutions, and populations are prepared for and can effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learnt during the crisis, reorganize if conditions require it" both during or after a crisis (Allenby & Fink, 2005). A resilient community is able to mobilize the human, financial, and logistic resources necessary to maintain core functions before, during, and after a crisis occurs – distinct but directly linked to the concepts of preparedness, health security, and health systems strengthening (Kruk, Myers, Varpilah, & Dahn, 2015; Kutzin & Sparkes, 2016). Further, a concept of preparedness that includes an emphasis on cultural knowledge and resources will enhance community resilience to disease, because "resilience is premised in large part on access to strengths and familiarity that come from one's own cultural system" (FEMA, 2019). As outlined by FEMA, "Building a Culture of Preparedness" means understanding how to promote disaster readiness across all sectors of society, understanding local and community risks, building partnerships before disaster occurs, and recognizing the diversity inherent in a community (FEMA, 2019).   We will now explore various international frameworks that have further defined the concepts of resilience and disaster readiness – including the concept of preparedness in the context of disease outbreaks.

Resiliency, Outbreak Preparedness, and Disaster Readiness Frameworks

At the international level, the International Health Regulations, the Global Health Security Agenda, and the Joint External Evaluation process have all guided international collaboration on global health security. Operational lessons emerging from this international cooperation during recent epidemics have highlighted that, while resources and attention has largely focused on international and national level preparedness, engaging and supporting local communities has been critical in disease outbreak and

COMMUNITY RESPONSES TO THE 1918 INFLUENZA PANDEMIC

As we seek to draw lessons from the 1918 pandemic it is worth noting that as the disease spread across the United States and the globe, communities of all types experienced and responded in many different ways. At the national level, the United States was primarily focused on keeping up public morale and utilized "the same strategy for communicating about the disease that was developed to disseminate war news" (Barry, 2009). As a result, at the local level, officials and newspapers across the country were silent or minimized the scale of the pandemic in order to reassure the public, despite the visibility of bodies piling up in the streets in major cities (Philadelphia and New York) (Barry, 2009).

Community reactions to this were diverse. Numerous cities shut down essential services, absenteeism crippled basic services, such as railways, telephone exchanges were shut down, which cut-off communication, while grocers, retailers, and coal sellers also closed (Barry, 2009; Stern, Cetron, & Markel, 2010). However, where better communication between health authorities and the public took place, the response to the pandemic substantially improved. An analysis of the success of school closures across forty-three U.S. cities demonstrated that success hinged on transparent communication and clear lines of authority (Stern, Cetron, & Markel, 2009). In San Francisco, the mayor encouraged full page newspaper ads declaring "wear a mask and save your life", which allowed society to continue functioning, transport remained active, food was delivered, and the sick were tended to (Stern 2010).

In 2019, as in 1918, telling the public the truth, communicating threats and epidemic control needs effectively, and encouraging society to protect themselves, rather than empty reassurances and minimization of threats, is paramount to effective epidemic control.

epidemic prevention, detection, and response on the ground. Recent literature has highlighted how the World Health Organization (WHO) and its member states are increasingly emphasizing ways in which pursuit of the Global Health Security Agenda priorities can mutually reinforce efforts toward universal health coverage and strong health systems. That success in global health security preparedness, however, requires embedding the International Health Regulations requirements into national health systems (Kluge et al., 2018). Further, given that "a country's ability to prevent a local disease outbreak from becoming an epidemic often rests with the level of knowledge of the situation and actions taken at the community level" (Armstrong-Mensah & Ndiaye, 2018), there is a significant need to advance the Global Health Security Agenda's mandate to build capacity with an emphasis on community engagement.

Practically, the Joint External Evaluation process has provided a strong start to national level evaluation of global health security and International Health Regulations capacities and has collected significant information on community-level resources that will be useful in building community level resilience. However, there is a need to expand this level of detailed capacity assessment and preparedness planning to the local community-level in order to help epidemic-vulnerable communities effectively implement the International Health Regulations, global health security, and Joint External Evaluation mandates. In addition, several international frameworks have been proposed that highlight diverse perspectives on the components of a resilient, outbreak-prepared, or disaster-ready system. These frameworks have explored national health system resilience (Kruk et al., 2017; Kruk, Meyers, Varpilah, & Dahn, 2015), the unique aspects of disaster resilience in cities and urban settings (The Rockefeller Foundation, City Resilience Index), Disaster Risk Reduction and Disaster Risk Management at the regional (The African Union, 2004) and international (UNISDR, 2015) level, and community-based approaches to emergency management and preparedness (FEMA, 2011; FEMA 2019).

With so many frameworks, diverse actors, dissimilar terminologies and digital environments, varied leadership and funding streams, and competing

priorities in resource-poor environments – how can communities use these frameworks to strengthen their preparedness to prevent, detect, and respond to disease threats? How can global health security stakeholders better understand these priorities in the context of addressing disease outbreaks at the community level? Our interpretation, after reviewing and synthesizing various global health security-related priorities and frameworks, is that although each of them uses dissimilar terminology and conceptual guidance that would be difficult to articulate in a single conceptual vision – they all provide useful guidance on revealing the core competencies required in building stronger community epidemic resilience. Synthesizing these frameworks, concepts and priorities suggests that the key to meeting the international and national goals for health system resiliency, outbreak preparedness, and disaster readiness lies in effectively engaging, involving, and mobilizing communities and ensuring they are empowered with contextually appropriate technical and financial resources to prevent, detect, and respond to disease threats.

Developing an Operational Approach to Strengthening Community Epidemic Resilience

The international community, and in particular health security stakeholders in host countries, require a more direct operational approach to preparing, capacitating, mobilizing, and supporting communities as central actors in epidemic prevention, detection, and response. However, as outlined above, communities are diverse, complex, and exist in numerous cultural and geographic contexts. Can an operational approach be developed that is equally relevant to communities in well-resourced and advanced development settings, in middle-income countries, in resource-constrained environments, and in fragile and frail states? Systematic planning and preparedness efforts are complex even in well-resourced contexts, are often too intensive to appeal to some stakeholders, and are complicated even further in times of conflict, displacement, and large scale movement of people.

Here we present an operational approach and priority goals that would, in the broadest sense, be consistent and of equal importance in all the environments outlined above. However, we note that the levels of resourcing, functional capacities, availability of health personnel and multi-sectoral actors, and tangible community assets will be extremely diverse, highly variable, and contextually-determined depending on the specific community setting.

In the ideal situation, health system leadership and global health security stakeholders will invest in the first of these operational priorities (primary healthcare, universal health coverage, and global health security alignment) before and/or in-between epidemics, noting that starting with comprehensive and coordinated preparedness planning in advance of a health emergency is by far the most effective strategy to preventing or mitigating the impact of future epidemics.

However, this is not always feasible and there are several countries facing current epidemic threats that first and foremost require urgent investment in strengthening the emergency detection and response capacities outlined in this approach. While emergency response efforts should always seek to focus on establishing long-term capabilities and infrastructure (i.e. closing the relief-development gap), this may not be immediately possible in all settings. As explored in the text-box below, for countries facing immediate epidemic threats there are urgent community engagement priorities separate from longer-term preparedness goals.

Operational Goal 1: **To successfully align primary healthcare, universal health coverage, and global health security systems and their respective priorities at the community level.**

Building community resilience requires the ability to concurrently develop both the foundational aspects of strong community health system (e.g., adequate human resources, sound Infection Control Protocols (ICP), functional supply chain, strong surveillance systems), while also strengthening a community's rapid response capabilities in case of a crisis (e.g., emergency responders, personal protective equipment, vaccines) (Ling et al., 2017). Here we emphasize the need to break down the siloes between primary healthcare and universal health coverage strengthening efforts at the community level (focused on the foundational

aspects of health systems that can help prepare for and prevent external shocks to the health system) and global health security/emergency response (focused on rapid response capabilities that seek to reinforce community health systems during an epidemic or other health crisis). A resilient community is one where both these priorities are efficiently integrated. It is where synergies have been strengthened between the primary healthcare system and emergency response stakeholders, and where the whole community (within and external to the health system) is involved before, during, and after a health emergency.

The 2014-15 West African Ebola epidemic and the current 2018 DRC outbreak, have cast a spotlight on how the strength of community-level health systems can either prevent or facilitate a health emergency. After the first reported cases in Nigeria in July 2014, the government's response was robust and comprehensive, demonstrating strong health system resilience at the state and community-levels that successfully contained the outbreak. The Nigeria case demonstrates how outbreaks in resource-poor settings can be quickly contained "where there is commitment and determination backed by requisite resources, materials, and human capacity" (Heen, 2016).

In Liberia's outbreak in 2014-15, the health system showed early signs of resilience during and after the outbreak, but large gaps emerged in the ongoing provision of primary healthcare service delivery (Waganar et al., 2018). Lack of a skilled workforce at the community level in Guinea, Liberia, and Sierra Leone led to challenges in containing the initial outbreaks (Shoman, Karafillakis, & Rawaf, 2017). Throughout the epidemic staff turnover rates were high, which left the

APPLYING THIS OPERATIONAL APPROACH IN AREAS OF ACTIVE DISEASE OUTBREAK

In partner countries facing active disease outbreaks or epidemics, immediate investments should focus on the following urgent priorities while still seeking to stabilize the outbreak and achieving longer term preparedness objectives.

Building Trust, Reducing Fear, and Fostering Collaboration
Lessons from the Ebola responses in Mali, Liberia, and now prominently in DRC, all demonstrate that distrust of external aid workers, fear of a very visibly deadly disease, and a lack of communication between health officials, aid agencies, and community members have not only inhibited the effectiveness of emergency detection and response but, in fact turned some communities against those trying to assist. Most recently, in the DRC, fear is preventing detection and reporting efforts as families are resistant to report illnesses and death to health authorities. Distrust of external aid workers and lack of effective information exchange with community members has led to extremely violent attacks on Ebola Treatment Centers in Katwa and Butembo, and as experienced in West Africa, infection control, burial issues, and failing to translate epidemic risk via cultural channels pose major threats to effective emergency response.

Educating, Communicating, and Mobilizing Through Cultural Channels
 As explored further under operational goal four, emergency responses must be able to quickly link with, communicate with, and effectively engage community leadership (formal, religious, and traditional) in order to enable emergency detection and response efforts 'imposed' from external sources. Agreeing on culturally appropriate modifications to burial rights that meet infection control needs, translating disease threats through traditional language and folklore, mobilizing traditional systems of response to external threats, and enforcing detection and quarantine priorities in partnership rather than in opposition to community leadership are of essential importance in securing the safety of external aid workers and facilitating longer term collaboration.

remaining health personnel in affected communities without supervision and without the proper skills to respond to the outbreak (Waganar et al., 2018). Lack of adequate financing for the existing health infrastructure and a lack of supplies contributed further to poor containment and management of the Ebola epidemic (Waganar et al., 2018). Although external resources arrived as part of global health security/emergency efforts, it did not address the initial resourcing gaps in the primary health care system. Lack of existing medical supplies, personal protective equipment, electricity, and infection control protocols all increased rates of infection (Buseh, Stevens, Bromberg, & Kelber, 2015; Forrester et al., 2014; Pathmanathan et al., 2014; Trad, Jurdak, & Rana, 2015; WHO, 2015), and delays in diagnostic testing and analytics led to poor specimen transfer, and coherent collaboration between ambulances, diagnostic processing, health officials, and communities (WHO, 2015).

A lack of information and existing research infrastructure led to WHO reports of weak surveillance, poor epidemiological data collection, and statistical analysis across the region (McKay, 2015; Trad, Jurdak, & Rana, 2015). Experts working on the ground during the epidemic also highlighted how severely Ebola negatively impacted the delivery of primary health services during and after the outbreak (Hayman, 2015; Lewis, 2015; Polich, 2015; Summers, Nyenswah, Montgomery, Neatherlin, & Tappero, 2014). Basic vaccination campaigns were disrupted which led to outbreaks of other infectious disease (Bellizzi, 2014; Pillai et al., 2014), pregnant women suffering from fever were turned away from health facilities, and basic primary healthcare was disrupted as human and financial resources were concentrated on Ebola response efforts. Further, the location of Ebola treatment facilities created challenges, requiring some patients to travel long distances for care. Poor roads and infrastructure further delayed transport of patients and diagnostic specimens in a safe and timely manner. All of the issues outlined above are symptoms of a weak community-level health system. These symptoms reinforce the concept that a community's emergency response capabilities are intrinsically connected to the broader foundational aspects of a strong primary health care system and universal health coverage at the community level.

The 2014-15 West African Ebola epidemic underscores the need for significant investments in health system strengthening, interoperability, data system coordination and exchange in Ebola-affected countries and other epidemic vulnerable settings (Heen, 2016). Although it took more than a year for Liberia's health system to recover (Heen, 2016), the influx of external funding during the crisis helped establish Liberia's Short Messaging Systems (Buseh, Stevens, Bromberg, & Kelber, 2015) to connect people with Ebola symptoms (or in future other infectious diseases) to community resource. Community Event Based Surveillance system was also created to help strengthen Liberia's broader surveillance and response network to better detect future outbreaks (Crowe et al., 2015). In Sierra Leone, an Emergency Operations center was established with a toll-free national number for Ebola (or infectious disease) related health education, alerts, and referrals (Miller et al., 2015). In both countries, external funding has contributed to stronger government-led infection control training protocols, evaluation programs and quality assurance metrics (Hayman, 2015; WHO, 2015).

These developments highlight how external emergency response during an epidemic, not least the influx of external financial resources, can be an opportunity to build the foundational aspects of more resilient communities and health systems. However, despite the broad recognition that foundational health system strengthening at the community-level is of critical importance, we appear to be in a 'period of neglect' as other international issues take priority and thus investment in strengthening vulnerable health systems is declining (Yamey et al., 2017). Sustained investment in bridging the gap between primary healthcare, universal health coverage, and global health security/emergency systems is the first and primary operational goal in building a resilient community.

Operational Goal 2: **Define, map, and mobilize various assets and stakeholder roles in a community's unique context.**
Operationalizing a harmonized approach to building both the foundational aspects of community health systems as well as a community's emergency response capabilities requires a systematic way to define, map, and mobilize the various assets available within

a community. First and foremost, this requires determining who is responsible for community resiliency planning, who has oversight of various primary healthcare, universal healthcare, and global health security related functions, and which government and/or parastatal structures have authority and responsibility for health system and GHS functions within a defined community. An outbreak may occur across several populations, communities, and areas, which may be disperse and cross several political and health system boundaries. Which system will define the community, the political, legislative, and health system, or other structures? There are often different lines of authority and reporting in primary healthcare, universal health coverage, and global health security systems.

Community Health Workers (CHW) may be coordinated via the health system or via diverse clinic/NGO structures and numerous global health security related branches of government and municipal service authorities operate outside the health system structures (i.e. city engineering, sanitation, schools, and police). Aligning these platforms, lines of authority, financing and reporting structures is critical. Once leadership and reporting structures have been defined, those responsible for resiliency planning must then be supported to carry-out broad based assessments of community vulnerability, assets, and resources. This entails broadly evaluating the vulnerabilities and consequences of epidemics in terms of the social and health system issues communities are facing, the risks of infrastructure and service disruption, halted industrial production, inflated prices and food security, crisis-induced fiscal deficits and impoverishment, and the myriad social impacts created by disease outbreaks (DeWitte, Kurth, Allen, & Linkov, 2016; WHO, 2009). Determining a community's specific needs and vulnerabilities, and the roles of specific actors to address them, requires thinking through several important key questions. For example, what are the roles of the formal health system, at different levels and among different types of providers at the community level? What is the role of community pharmacies or dispensing outlets? What is the role of community health workers or health promoters? What is the role of stakeholders from outside the health system, such as the diverse range of non-profit and civil society entities? How will the vast

human and financial resources of private businesses, workplaces, and employers be mobilized? How are community engineers, firefighters, policy, and military involved? What are the formal and informal leadership structures that will guide communication and cultural appropriateness during prevention, detection, and response? Thinking through these questions highlights the vast number of individuals, institutions, private sector entities, and diverse community representatives involved in making a community function, and the various roles they might play in meeting key preparedness objectives.

Building on the national Joint External Evaluation process, we emphasize the need for a process to systematically map "whole community" vulnerability, primary healthcare and universal health coverage epidemic resilience needs, specific actors and roles required, and linking that to inventories of available multi-sectoral human, logistic, and financial resources in the community. In doing so, those responsible for community preparedness can systematically leverage the talent, resources, and assets available across a community's public, private, and civil society sectors.

Once community vulnerabilities have been defined, those leading community preparedness efforts can systematically define the specific training, infrastructure, communication, 'surge' response and other direct human and financial investments necessary. By similarly mapping out the various public and private sector assets and institutions in a given community, leadership can define the specific community stakeholders that might fulfill, finance, and/or operationally carry-out that function. Preparedness planning efforts, as emphasized in operational goal 3, can then seek to systematically match vulnerabilities to available assets and reveal gaps where they exist.

Operational Goal 3: **Develop "whole community" preparedness and prevention plans before epidemics occur.**
There is substantial evidence that preventing an epidemic via health system strengthening, national preparedness and community-based prevention efforts is far more cost effective than financing global health security/emergency response efforts (Sands, 2017); yet,

as the World Bank highlights, we "remain trapped in a cycle of panic and neglect, throwing money at disease events whenever they occur, but failing to sustain investment in preparedness when the panic subsides" (WHO, 2009). As highlighted by FEMA's frameworks, the "whole community" (FEMA, 2018) must be involved in building a culture of preparedness, which includes a range of individuals and families, including vulnerable populations and those with access or functional needs, corporate entities and local businesses; faith-based groups and civil society community organizations; nonprofit groups; schools and academia; media outlets; and all levels of government, including state, local, tribal, territorial and federal partners (DeWitte, Kurth, Allen, & Linkov, 2016) (including community-level administrative, law enforcement, and military structures). Involving all of these community-based actors in the development of epidemic preparedness plans and documents at the national, subnational and

community level is one of the most critical operational objectives in building community resilience, as it ensures that broad community assets, needs, and roles are considered in the development of effective preparedness and prevention strategies including primary healthcare, universal health coverage, and global health security harmonization.

To contextualize this, we highlight the need for stronger collaboration between public and private actors at the community level. While companies, businesses, and corporations have often been viewed from the angle of the environmental and health dangers they produce, it is becoming increasing clear that private sector and corporate entities of all types have a critical role to play in building community preparedness and strengthening epidemic prevention efforts (Katz et al., 2018). Experience with the HIV/AIDS epidemic in Africa demonstrated that, in addition to non-financial

humanitarian concerns expressed by private sector stakeholders, the length of an epidemic can have devastating impacts on working populations, disrupt the supply of all types of goods and services, and destroy the economic and social fabric of businesses and communities (Gilbert, Bourdeaux, & Raphaël, 2010).

Identifying how public and private entities within a defined community can partner during preparedness and prevention efforts has the potential to build community resilience in numerous ways. They "reduce the burden on the public sector to meet essential needs, which allows governments to shift their focus to other strategic priorities. Operationally, the diversity of supply sources allows the public sector to respond more effectively to changing community needs and, tactically, the pooling of public and private resources significantly improves the efficiency of outbreak response" (Busch & Givens, 2013). The broad range of private sector entities

both within and external to the health system can be critical to raising community awareness about disease threats, strengthening surveillance, and leveraging both technical and domestic resources from across all sectors of society. Here we emphasize the opportunity to develop "whole of society" and "total market approaches (TMA)" for international health security, acknowledging the broad range of private sector and corporate actors that operate in many vulnerable communities. For example, the Hong Kong hotel and travel industry demonstrates both negative and positive involvement of private actors in epidemic prevention and response.

The Metropole Hotel in Hong Kong was heavily implicated in the international spread of Severe Acute Respiratory Syndrome (SARS) in 2003, where the index cases in the Hong Kong, Toronto, Singapore and Hanoi outbreaks were all linked to the hotel (Hung, Mark, Yeung, Chan, & Graham, 2018). With no early warning systems in place

and no infection control protocols for travelers, the Hong Kong travel industry unintentionally contributed to the rapid spread of what was then an unknown disease (Gilbert, Bourdeaux, & Raphaël, 2010). SARS eventually killed 774 people in 26 countries across five continents (WHO, 2003). However, the SARS outbreak in Hong Kong led to the creation of Guidelines for Hotels in Preventing SARS and other infectious diseases (HKSAR Government, Preventing SARS Guidelines for Hotels). In 2009, these guidelines were put to the test with the emergence of the (H1N1) influenza virus. When the first imported case of swine flu was confirmed in Hong Kong on 1st of May 2009, the Prevention and Control of Disease Ordinance was invoked to establish quarantine measures at the Metropark Hotel. The quarantine ended one week later and, according to published literature, these measures likely reduced the number of people who were infected and required treatment in the Hong Kong outbreak (European Centre for Disease Prevention and Control, 2009). Collaborations between public authorities and private entities in Hong Kong's hotel and travel industry, emerging from the failed prevention efforts with SARS in 2003, were critical to minimizing impacts to the travel and tourism industry during the 2009 H1N1 outbreak. Public health authorities have subsequently involved hotel personnel in disinfection and hygiene efforts, have capacitated hotels for timely reporting and isolation of infected guests during outbreaks, and are exploring ways to more effectively launch traveler screening efforts (Gilbert, Bourdeaux, & Raphaël, 2010).

Conversely, the French public authorities' response to the 2009 A (H1N1) pdm09 "swine flu" outbreak demonstrates the dangers of not adequately involving and coordinating with key private sector entities as part of epidemic preparedness efforts. The French pandemic response plan (2004) emphasized a public health "state of emergency" response, but the protracted length of the crisis eventually motivated public authorities to consider the impact on vital infrastructure and basic services and structures of French society (Steyer & Gilbert, 2013). To address this, public authorities assembled a small number of large, private sector and state-owned companies that were recognized as "national critical infrastructure operators (CIOs)" (HKSAR Government, Preventing SARS Guidelines for Hotels). Public health authorities were faced with the challenge of how to

effectively mobilize these private entities, and the issue required a high level of cooperation between ministries, private entities, employees, and public health emergency structures.

A retrospective study of this partnership (HKSAR Government, Preventing SARS Guidelines for Hotels) reveals a true partnership structure was never achieved, private sector entities were disappointed they received information at the same time as the public, and they were not truly asked to participate in the Economy Ministry's economic continuity taskforce during the outbreak. Given the lack of a unified preparedness framework that outlined the respective assets, roles, and needs of public and private actors, public health authorities and large companies ended up taking disparate action on the flu epidemic "within the framework of a poorly organized system, which itself is a risk factor" (HKSAR Government, Preventing SARS Guidelines for Hotels) . The French experience with 2009 (H1N1) demonstrates the need for more systematic integration of private sector entities in preparedness and prevention efforts at the community level, to ensure that public-private collaboration does not occur ad-hoc at the time of a crisis.

These examples demonstrate that building effective community resilience to disease threats, public health authorities requires learning to work more closely with, define, and effectively utilize the broad range of private sector, non-governmental, religious and civil society organizations that all bring unique capabilities and perspectives to each phase of epidemic prevention and preparedness at the community level.

Operational Goal 4: **Financially and technically capacitate diverse community actors to carry-out their detection and response roles when emergency strikes.**
The first line of defense against epidemics is attention to the foundational aspects of resilient community health systems that can prevent outbreaks. However, a resilient community is one where preparedness plans include contingencies for when prevention efforts have failed. As outlined above, a resilient community will have paid attention to bridging primary healthcare, universal health coverage, and emergency response structures;

will have mapped and defined the key assets, needs, and roles of a diverse group of community partners; and will have involved those partners in early preparedness and prevention planning before emergencies occur. Unfortunately, without these foundational aspects of preparedness in place, the most vulnerable communities are often behind in detection and response even before an epidemic strikes. The international historical experience demonstrates that a surge of personnel, financing, and treatment facilities is often needed to contain an epidemic. This requires the ability to rapidly direct resources to the community actors who will have the most impact on reinforcing failing aspects of the health system and community structures. Our experience with the HIV/AIDS epidemic, the 2014-15 West African Ebola crisis, annual international flu campaigns, and other infectious disease outbreaks demonstrate that numerous community actors provide a broad range of educational, financial, technical, and cultural assets in both detecting and responding to an epidemic. Here, we highlight the importance of including these diverse community actors in detection and response strategies, and acknowledging that historically they have not always been recognized, financed, or capacitated for the critical roles they play in containing and overcoming epidemics at the community and household level. The crucial roles of community health workers and religious leaders are briefly described below to contextualize current problems and opportunities for stronger responses.

Well-trained community-based healthcare workers such as clinical officers, nurses, midwives, birth attendants, and community health workers; community healthcare committees and fora; and community health leadership structures are all crucial resources in building community-level resiliency. Community-based health workers and community health personnel strengthen community resiliency by enhancing access to essential primary healthcare services in vulnerable health system contexts. They are key sources of information and education for households about infection control protocols and disease prevention efforts, as well as for frontline detection and rapid communication to the health system. They also serve as crucial and preferred sources of service delivery during a community's response to emergencies. Community health workers can effectively promote seasonal influenza vaccination

programs (Ding et al., 2015; Hemingway & Poehling, 2004; Santibanez, Mootrey, Euler, & Janssen, 2010) and were a trusted source of advice and education (Siekmans et al., 2017) during the 2014-15 Ebola epidemic, and in conflict and situations of unrest, including the South Sudan displacements in late 2013/14 (Kozuki, Ericson, Marron, Lainez, & Miller, 2018). They remained active, sourcing supplies where they could, in order to continue key programs such as integrated comprehensive community case management.

However, community health workers are put under tremendous strain at the community-level during an epidemic and there is evidence from the 2014-15 Ebola epidemic that routine service delivery structures were overwhelmed. Numerous West African children were put at risk due to lack of common treatments for malaria, pneumonia, diarrhea, and malnutrition (Santibanez, Mootrey, Euler, & Janseen, 2019). A study from China highlights, although many community-based healthcare workers are active in national vaccination campaigns, they do not have the requisite information to confront barriers to vaccination coverage. A separate study of health personnel and community-based health workers knowledge of Ebola and antimicrobial resistance risks further demonstrates both the impact and priority for increased information campaigns among community-based health personnel. In the period following Liberia's Ebola epidemic, an overwhelming majority (95.4%) of community-based health workers had recent knowledge of the dangers of Ebola, while far fewer (17.2%) were aware antimicrobial resistance was a problem (Yusuf, Arzai, Yushau, & Garba, 2015).

Experiences responding to the 2014-2016 cholera outbreak in Kenya (one of the country's largest) also demonstrates that community-based healthcare workers are often left to respond to epidemics without the requisite supplies, financial resources, and materials (Curran et al., 2018). Health facilities lacked key materials for detecting, diagnosing, and treating cases of cholera; while weak infrastructure, lack of water, sanitation, and basic hygiene interventions led to failed infection control. Without these critical supplies and materials, community-based health workers and health personnel reported feeling helpless in their ability to detect and respond to the epidemic (Siekmans et al., 2017). The

challenge of determining appropriate surge financing to support scaled community-based health worker responses is significant. In the case of influenza (Song et al., 2017), Ebola (Miller et al., 2018; Hemingway & Poehling, 20014), and cholera (Siekmans et al., 2017) community-based healthcare workers have lacked sufficient financial support and instruction to carry out their vital detection and response capabilities. Further investment in coordinating, sufficiently staffing, managing, and mobilizing community-based health worker assets is a crucial priority to both PHC-UHC efforts before and between epidemics, and promoting rapid and effective community-based detection and response when an emergency occurs. Ensuring that community-based health workers are equipped with the information and technical tools they require is an immediate first step.

The Ebola epidemic in Guinea, Liberia, and Sierra Leone highlighted the vital role religious leaders and traditional healers played in helping communities overcome the outbreak. In the face of service delivery failures, lack of an immediate vaccine or treatment, and limited information among community members (not unlike early experience with the HIV/AIDS epidemic) – the early response to Ebola in many West African communities

necessarily focused on prevention and containment (Bah & Aljoudi, 2014). However, while national and international response efforts focused on the biomedical response, "the traditional leaders were operating from a diametrically opposite perspective" (Curran et al., 2018). Prevention and containment efforts were frustrated by false rumors, ignorance, and harmful cultural practices; in particular, public health measures to cremate bodies and enforce quarantine created tremendous social upheaval (Pellecchia, Crestani, Decroo, Van den Bergh, & Al-kourdi, 2015).

Lack of knowledge about West Africa's diverse religious landscape initially restricted formal engagement of religious leaders, and delayed formal partnerships (Curran et al., 2018); however, while many communities reported that state-led efforts created a climate of fear (Song et al., 2017), there were numerous faith-based and religious people and institutions mobilized to address the epidemic. Given the significant public distrust of government health and emergency services, these community-based organizations were of critical importance in reducing community fear, leveraging existing relationships and building trust, communicating necessary cultural adaptations (i.e. for prevention), and eventually in linking the community to broader

Ebola response efforts and facilitating the access of external aid agencies. For example, initiatives from Caritas Internationalis and the Methodist Church provided bedside care through community health workers, delivered health messaging to congregations, and offered care for abandoned orphans (Marshall & Smith, 2015). Strengthening two-way communication with communities is a critical component of building their resilience, and therefore due respect should be paid to community expertise concentrated in religious institutions (Miller et al., 2018). Change in funeral practices, explaining to communities why burial or cremation was necessary, and reducing the fear, isolation, and social-breakdown community members felt was critical to reversing the Ebola epidemic (Song et al., 2017; Miller et al., 2018). Of key importance, these successful community-based efforts were led by a broad range of modern and traditional, Muslim and Christian religious leaders working largely in isolation from state-led efforts. Public health authorities and international stakeholders must therefore seek to fully appreciate and benefit from the immense cultural and geographic presence of religious leaders and faith-based institutions already present in vulnerable communities. A resilient community is therefore one that includes religious actors in both primary healthcare and universal health coverage

systems strengthening broadly, and in well-defined epidemic preparedness plans for prevention, detection, and response.

Conclusion

As outlined above, a resilient community is one where multiple vulnerabilities, needs, and capacity gaps have been well-defined and where those needs have been systematically mapped to all possible human and institutional assets in the community; where synergies have been strengthened between the primary healthcare system and emergency response stakeholders, and where the whole community (within and external to the health system) is involved before, during, and after a health emergency. In seeking to operationalize GHS priorities, communities must be capacitated financially and technically to carry-out the planning, coordination, and infrastructure improvements required as part of building preparedness now. It is important to note, however, that the challenge of establishing community resilience in fragile or failing states is different from that of low-and-middle income countries. The operational goals and recommendations may not apply in part or in full to fragile or failing states. We outlined below several priority recommendations based on the lessons and operational guidance raised in this chapter, and advocate for immediate and strong support to assist communities in building their own cultures of preparedness.

RECOMMENDATIONS

1) Continue investments in health systems strengthening at the community level with specific attention to Global Health Security Agenda related priorities.

Utilize health systems strengthening investments to strengthen local health management systems, and build global health security related capacities in human resources for health, diagnostic, surveillance, transport, medical supply, and sanitation at the community-level. By doing so, investments in primary healthcare-universal health coverage and global health security can be cross-leveraged to build both the foundational aspects of resilient health systems, as well as the emergency capabilities for detection and response when needed. In addition, by coordinating health information

management systems and ensuring strategic data exchange between primary healthcare and global health security stakeholders, interoperability can be built to take full advantage of data collected.

2) Reinforce and rethink the critical role of community health workers, religious leadership, and cultural factors in epidemic response.

As outlined in this chapter, lack of capacity among community health workers weakened responses to Ebola, Zika, cholera, and other disease outbreaks. Community health workers are central in providing primary healthcare-universal health coverage and global health security emergency response functions, and are historically insufficiently resourced, prepared, or supported in their critical roles. We must rethink and reinforce the critical role community health workers play in community-level health systems. Similarly, recent Ebola outbreaks have underscored the critical role religious and cultural leaders or institutions play in either supporting or inhibiting outbreak responses. We must rethink the role of community-based religious leadership in communicating key information (i.e. quarantine or burial protocols) to their community. As such, religious and cultural leaders are key resources to be included in early preparedness planning exercises.

3) Invest immediately in developing community-level rapid detection and reporting platforms, aligned closely with the existing primary healthcare-universal health coverage systems, for multiple infectious diseases and all-hazard public health threats.

Preparing communities for early detection and response involves, first and foremost, ensuring there are ways to quickly report a wide variety of novel threats or outbreaks from the community-level to national health stakeholders. This includes developing technical infrastructure and performance capacities of health workers in outbreak vulnerable settings, leveraging digital technology in strategic ways, ensuring community-level stakeholders are aware of and updated on their roles, capacitated with necessary equipment and information, and participate in routine detection and response exercises.

4) Invest in and promote community-level preparedness mapping exercises to systematically reveal and inventory a community's epidemic resiliency vulnerabilities, needs, and assets.

Mapping exercises should build on the national level Joint External Evaluation process and build on existing community health and emergency management structures. Mapping should be focused on "whole communities" including and involving a broad range of multi-sectoral and community representatives to create inventories of a specific community's resiliency gaps and human or financial assets. By investing in creating and implementing a systematic approach to community preparedness mapping, communities will be able to involve a broad range of community-based, religious, and private sector partners who can fully participate in creating preparedness, detection, and response strategies. This process should also seek to uncover information and data points that are most essential to community leaders, in order to help ensure they routinely receive this information to help make more informed preparedness decisions.

5) Provide financial and technical assistance to help community leadership develop community-based epidemic preparedness and response plans before and between outbreaks.

This assistance should include an emphasis on the co-creation of plans with the full range of community actors identified during mapping exercises. Planning exercises should ensure that core vulnerabilities are matched to available assets, noting where various community actors can contribute one or more core technical, financial, prevention, detection, or response competencies. This includes clarifying roles, reporting requirements, communication, and data collection systems early – to ensure all actors are fully involved and informed throughout planning processes. Historically, private sector and non-state actors have been weakly involved or involved too late in outbreak preparedness. Ensuring that the full range of private sector actors are provided with or possess the financial and technical capacity to carry-out their preparedness and prevention functions is a critical priority at the community-level.

TOPIC AREA 2: STRENGTHENING UNITED STATES FEDERAL COORDINATION & LEADERSHIP

Authors: Elizabeth Cameron & Gerald W. Parker Jr.

Our 2018 White Paper focused on the need to develop a strategic direction for United States and international leadership in pandemic preparedness and response; more clearly define leadership roles for governments, international organizations, and other actors involved in pandemic response; and promote communication between agencies and with the public during biological crises. The 2018 recommendations also emphasized the need for strong U.S. leadership on an international scale for health emergencies and the importance of establishing a clear, coordinated, and tiered international response framework for pandemics. Against the backdrop of the ongoing and second largest Ebola outbreak in history, our 2019 recommendations emphasize the urgency with which the U.S. and international partners need to resolve these and other longstanding challenges with leadership, command and control, and crisis coordination and communication. In 2019, we also urge the Administration to designate a

senior-level White House lead for pandemic response, as well as pandemic preparedness that devotes full attention to biodefense and global health security. Finally, we recommend routinized, rigorous and targeted pandemic simulations at all levels of government and within the non-governmental and academic sectors and to train the next generation for biological crises of the future.

Last year, following the issuance of our 2018 recommendations and pursuant to a Congressional requirement in the 2017 National Defense Authorization Act, President Trump signed National Security Presidential Memorandum (NSPM)-14 and issued a new National Biodefense Strategy (Strategy). The new Strategy supersedes the previous biodefense strategies issued by President George W. Bush (Homeland Security Presidential Directive-10) and President Barack Obama (Presidential Policy Directive-2).

The Strategy takes several important steps forward. First, it defines the requirement and mandates an implementation plan that designates clear roles and responsibilities for U.S. departments and agencies involved in the broader biodefense enterprise needed for pandemic prevention, preparedness, detection, response, and recovery. Second, it defines biodefense comprehensively to include U.S. international, as well as domestic, and prioritizes prevention, detection and response to pandemics – whether from naturally occurring, deliberate, or accidental threats to humans, animals, agriculture, and the environment. And finally, it emphasizes the need for a stronger and well-integrated budget process for biodefense, recognizing the many disparate appropriations involved in biodefense, pandemic preparedness, response, and global health security.

In signing NSPM-14, President Trump designated the Department of Health and Human Services (HHS) as the lead federal agency for biodefense and created a new Biodefense Steering Committee chaired by the HHS Secretary. The Steering Committee is to oversee and coordinate the implementation of the Strategy. Additionally, NSPM-14 creates a Biodefense Coordination Team to support the Biodefense Steering Committee, but provides the Assistant to the President for National Security Affairs (National Security Advisor) with the responsibility for policy coordination, review, and integration for federal biodefense efforts. Unfortunately, however, while the HHS Secretary and National Security Advisor are certainly key players for biodefense, pandemic preparedness, and response, the new NSPM and Strategy stop short of identifying a senior-level White House lead for coordinating the U.S. response to pandemics that cross borders. High consequence biological threats with pandemic potential will cross borders impacting our national security, economy, and health; and are by definition international crisis.

Meanwhile, Congressional interest in pandemic preparedness, response, and global health security is on the rise. In 2018, non-governmental health and security organizations came together to prioritize Congressional outreach for Members and staff to increase awareness of emerging risks, encourage cross-jurisdictional coordination, and even participate in pandemic simulations. Nevertheless, Congressional interest and ability to effect synergist authorities and appropriations remains fragmented, in large part owing to circumscribed remits for relevant committees that focus either on domestic matters or international priorities – but which rarely or equally prioritize both. Unfortunately, this structure doesn't serve U.S. pandemic preparedness and response well. For example, CDC, USAID, DOD, and State resources are all vital in preparing for and responding to different aspects of natural, deliberate, and accidental biological crises. No matter where a fast-spreading pandemic originates, it is likely to spread to the United States in a matter of hours. And despite the often-siloed approach to pandemics that has occurred in Congress in the past, some strong, non-partisan efforts emerged in the 115th Congress to bridge these gaps. These include continued bipartisan support for the Pandemic and All-Hazard Preparedness and Innovation Reauthorization Act and recognition that global health security is a core national security interest. We encourage these efforts to continue and grow in the 116th Congress.

Importance of White House-Level Leadership

There is still no clear designated lead for pandemic response in the White House; this situation should be

clarified immediately. While the Trump Administration has rightly placed an emphasis on pandemic preparedness, there is not yet a clear interface between the new HHS-led Biodefense Steering Group and the existing and vital National Security Council (NSC)-led coordination for global health security and biodefense.

NSPM-14 designates the HHS Secretary as the lead for coordinating implementation of the new National Biodefense Strategy. The NSPM also designates the National Security Advisor, and thus the White House, as the overall lead for policy coordination, review, and integration for federal biodefense efforts. Additionally, the new Strategy codifies the Executive Order on Advancing the Global Health Security Agenda, which created a senior-level White House-led Global Health Security Agenda Interagency Review Council to oversee coordination of U.S. efforts to advance health security preparedness with international partners. Each of these efforts is important for advancing relevant U.S. and international preparedness policy, and they rightly recognize the intersection between U.S. domestic pandemic preparedness and global health security – the Administration should be commended for prioritizing them.

However, none of these processes clarify who would be in charge of providing strategic-level coordination of U.S. operations during a pandemic crisis with – inevitably – a domestic and international nexus. HHS will play a major role in both instances, but during a major biological crises will be unable to coordinate, provide direction for, or gain resource commitments from Department of State Chiefs of Mission; Department of Defense assets and operators; arbitration for disputes regarding movement and monitoring policy, calls for travel bans, and Disaster Assistance Response Team assets; international investigations and forensics to attribute deliberate attacks from natural outbreaks. In addition, each responsible U.S. department and agency will carry a different culture, risk tolerance, and aversion to action. One Cabinet official will not be able to overcome these with another. Past outbreak experience tells us that senior level leadership in the White House is essential to effect a strategic level response, and must be in place before the crisis.

In 2014 the United States spent several months juggling federal leads for coordinating different aspects of the Ebola response until Ron Klain was designated as the White House Ebola Response Coordinator. Those intervening months inevitably cost lives. The designation of a senior White House official with the authority to communicate directly with the President and White House Chief of Staff, and then to cabinet heads and multinational organization leaders was a turning point not only for coordinating the U.S. Ebola response domestically and internationally, but also for driving an effective multi-national international response. It is important to note that the White House Ebola Response Coordinator provided the necessary strategic level coordination and action, but did not micromanage leaders in the field. The response coordinator ensured strategic level decisions were made and effectively communicated amongst the Cabinet, so leaders in the field had the resources to respond more effectively. This not only had a positive impact on Ebola response, but also on U.S. national security.

In 2016, the Obama Administration designated the position of Deputy Homeland Security Advisor to serve as the lead U.S. coordinator for Ebola, Zika, and ultimately pandemic response. In addition, the Administration stood up a new National Security Council staff Directorate on Global Health Security and Biodefense to focus on domestic and international pandemic preparedness, and to bridge the gap between biodefense and global health security, reporting to the Deputy Homeland Security Advisor, Assistant to the President for National Security Affairs (National Security Advisor), and the Assistant to the President for Homeland Security and Counterterrorism. While the Trump Administration maintained much of this structure for several months, it has since been largely dissolved.

RECOMMENDATIONS

1) Designate senior-level White House leadership for pandemic response and pandemic preparedness.

In order to fully increase America's ability to prepare for and respond to the next pandemic, there must be a designated senior-level White House official tasked with leadership in both pandemic preparedness and response. We argue that this position should be housed in the White House because this person must have the authority to make recommendations and get timely decisions requiring multi-level, multi-agency action. Key attributes of this position include an absolute need to have the ear of the President and have easy access to he, or she, when presidential-level input is necessary. The intent is not to micromanage field-level operators, but provide strategic-level decisions to ensure field leaders have the resources needed through streamlined interagency action. This position must be permanent and cannot effectively be established ad-hoc after a disease outbreak is ongoing. Without this permanent, White House-level position and elevated attention on biodefense, the United States will remain unprepared for the next pandemic.

2) Designate specific roles and responsibilities for U.S. Departments and Agencies during a pandemic response.

Each U.S. department and agency should know – and exercise – its specific roles and responsibilities in a pandemic response. These should be clear to other departments and agencies. NSPM-14 directs the development of, "…a proposal for metrics, milestones, end states, and roles and responsibilities of agencies, with respect to biodefense activities, particularly in meeting the goals, objectives, and sub-objectives of the Strategy." This requirement was due by February 2019. Once finalized, we recommend that these deliverables will be published and transparently communicated to the broader biodefense enterprise at state, local, tribal, non-government organizations, and private sector stakeholders; and to the American public at large.

Historically, particularly in the absence of designated senior-level White House leadership for pandemic response, the U.S. Government has experienced challenges with developing pandemic response plans that are flexible enough to adapt to any emerging scenario. During the 2014-2016 West African Ebola epidemic and the 2015-2016 Zika outbreak, U.S. officials were unable to rely on existing response plans crafted for pandemic influenza. This was because the U.S. Government did not anticipate a large-scale Ebola outbreak with global consequences, Zika carried an

unusual and unexpected threat to pregnant women and unborn children, and both diseases originated from world regions that lacked preparation and needed public health response capacities. These outbreaks also presented novel diplomatic and security challenges not previously contemplated but must be factored into future whole of government response plans that currently lacks a coherent U.S. policy foundation. Former officials point to the existence of a pathogen-independent interagency rubric for pandemic response, spearheaded by the White House near the end of the Obama Administration, which also instituted regular monitoring of circulating diseases with pandemic potential and leadership reporting to prevent future flat-footedness.

3) Unify and integrate biodefense priorities in the federal budget process.

The Administration should clarify the way in which biodefense requirements and gaps will be prioritized in the federal budget process. In 2015, the Blue Ribbon Study Panel on Biodefense recommended a unified budget process within the Executive Office of the President for identifying and requesting biodefense-related resources (Blue Ribbon Panel on Biodefense, 2015). NSPM-14 requires departments and agencies to include biodefense priorities in the annual budget cycle, submit those priorities to the HHS-led Biodefense Coordination Team, and send a report to the National Security Advisor and the Office of Management and Budget (OMB). However, the NSPM does not clarify the

process by which – or direct any change to – how OMB should integrate and prioritize those budget requests. Additionally, there is no requirement within NSPM-14 or the National Biodefense Strategy for OMB to prioritize those requests – and for Department/Agencies to elevate biodefense requirements at the expense of other programs– in the context of competing budgetary public health, animal health, national security, and other defense requirements. The President should direct OMB to prioritize biodefense spending, including domestic preparedness and global health security, in a manner more consistent with U.S. defense spending. Congress should also find innovative ways to work across committees and disparate appropriations to create a more integrated budgeting approach to pandemics preparedness and response, biodefense, and global health security recognizing the dual importance of domestic spending at home and development assistance abroad to stop outbreaks at the source wherever they may occur and before they become pandemic threats.

4) Significantly enhance pandemic-related coordination across Congressional committees, members, and staff.

Congress should establish clear mechanisms to coordinate policy, as well as budgetary, requirements for pandemic preparedness and response across Committees. We recommend consideration of a dedicated bicameral working group at the staff level for these issues. Recently, the Global Health Council and the CSIS Health Security Commission, in collaboration with the Johns Hopkins Center for Health Security, held pandemic simulations for Congressional staff and Members. Throughout 2018, non-governmental organizations prioritized briefings for Members of Congress and staff, with an emphasis on cross-committee discussion. While progress has been made in prioritizing the issue, domestic and internationally-facing health security legislation remains largely stove-piped.

5) Pandemic simulations should be conducted regularly, on a specific timeline, across agencies, with international counterparts, and with Congressional involvement.

Simulations are a powerful tool for creating and maintaining political will and momentum to solve critical

challenges in pandemic preparedness and response. Much progress has been made since the Ebola crisis of 2014-2016 to prioritize national and international simulations of complex biological crises. For example, the 2017-2018 and 2019-2020 U.S. National Exercise Program cycles designate pandemics as a major objective for simulations conducted at the Cabinet-level (FEMA, 2018; FEMA, 2018b). On an international level, in 2017 during the German G-20 Presidency, G-20 Health Ministers conducted their first-ever pandemic simulation (Bundesministerum für Gesundheit, 2017). Finally, the World Health Organization (WHO) has prioritized simulation exercises to help countries identify and fill gaps in pandemic preparedness and International Health Regulations implementation (WHO, 2019). However, pandemic simulations involving international leaders remain relatively ad-hoc and usually do not involve relevant political leaders, health officials, and finance and security sectors. We recommend national and international leadership simulations should occur on an annual basis. These should involve political directors and Heads of State, as well as Health Ministers, Finance Ministers, and security and defense sector leaders.
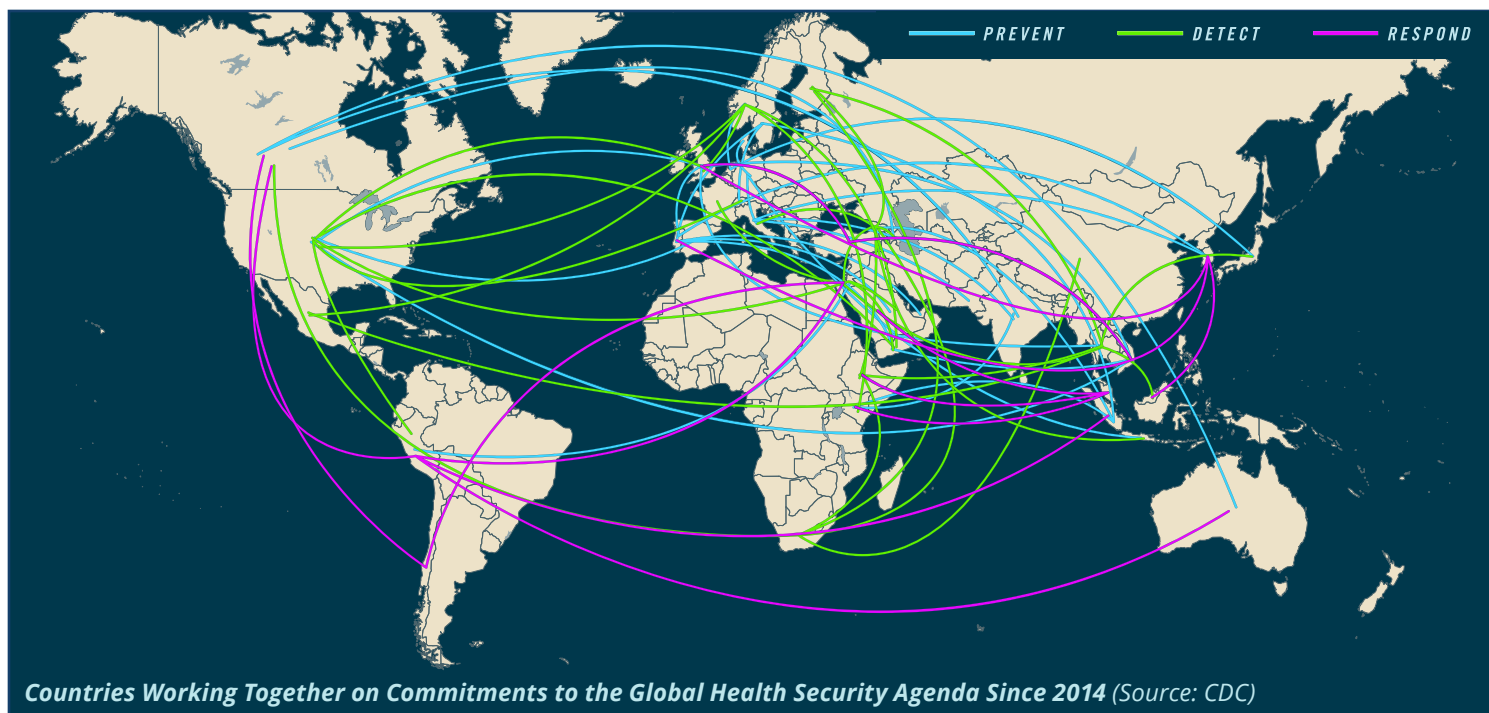
Specifically, we recommend:

1. At least one annual pandemic exercise for Cabinet-level officials within the U.S. Government that focuses on one or more specific aspects of response to a complex pandemic event, including plausible scenarios for deliberate biological attacks;

2. G-20 and/or G-7 pandemic simulations should include Ministers and other senior officials with responsibilities across health, security, finance, defense, and development;

3. A Heads of State-level simulation should be conducted in 2019 or 2020 by the G-7 and/or G-20;

4. The WHO and World Organization for Animal Health should prioritize annual simulations in each region with a publicly available after action report identifying key recommendations;

5. Bilateral efforts to advance health security and biosecurity should include pandemic simulations of unusual and high consequence biological events; and

6. A new program of pandemic simulations should be identified, funded, and coordinated for undergraduate and graduate students among universities that prioritize global health security with demonstrated success enabling transdisciplinary collaborations. Specific opportunities should be created that includes the integration of science and policy for international collaboration among students through such simulations.

6) The United States should provide leadership for biodefense, global health security, and biological crisis response.

Some recommendations are worth repeating. Our sixth and final recommendation for strengthening coordination and leadership is that the U.S. should not only remain engaged, but should provide critical international leadership before and during high consequence pandemic events. During the 2014-2016 Ebola response, CDC and USAID funding received a significant increase, funding which has led not only to measurable international preparedness and international security gains but has also protected U.S. jobs and exports (CDC, 2019) and deployed a core group of biodefense personnel who have enhanced epidemic intelligence at home. The funding provided for these activities under the Ebola supplemental is largely spent and will expire at the end of Fiscal Year 2019. Continued U.S. leadership to advance preparedness abroad is essential to stop outbreaks at their source and before they become epidemics or pandemics.

PREVENT — DETECT — RESPOND

Countries Working Together on Commitments to the Global Health Security Agenda Since 2014 (Source: CDC)

NOT JUST BIRD TALK: REFLECTIONS FROM THE FOURTH PANDEMIC INFLUENZA SUMMIT*

Author: Emmanuel Agogo

The opinions expressed here are those of Dr. Agogo, personally, and not of the Nigeria Centre for Disease Control (NCDC).

An estimated 50-90 million people worldwide (500,000 in the United States of America (US)) perished during the deadly 1918 Influenza outbreak. A hundred years later, more than 11,000 deaths and nearly 30,000 cases occurred across 10 countries during the 2013-2016 West African Ebola outbreak. Liberia, Sierra Leone and Guinea experienced an economic loss of $2.2 billion. Additionally, the outbreak spurred panic, social upheaval, and increased physical insecurity. The failure of international leadership, country coordination, and local ownership characterized the response. The erosion of trust culminated in the brutal murder of health workers that came to help.

Infectious disease outbreaks are inevitable due to rapid population growth, dietary transitions of emerging economies, irrational antibiotic use and the narrowing human-wildlife interface. Current vertical programs and disease focused surveillance and programming have fractured health systems in vulnerable countries where the majority (>70%) of the last decade's outbreaks occurred.

A review of the weaknesses that led to these unfortunate events, have promoted the Global Health Security Agenda and the Joint External Evaluations (JEE), which help countries meet the obligations of the International Health Regulations (2005). The JEE's have shown low levels of pandemic preparedness, especially in high-risk countries. Also in response, the US biodefense strategy developed in 2018, addresses threats from biosecurity and bioterrorism, but emphasizes interventions that protect US borders. Fortunately, the flexibility of the biodefense strategy and the continuing support for the Global Health Security Agenda still provide an opportunity for the US to lead international action against future pandemics.

RECOMMENDATIONS

1) Committed leadership is required at subnational, national, regional and international levels.

Investments in leadership development and establishment of national public health institutes is necessary to deliver essential public health functions (surveillance, response and coordination) as part of a national and global health security infrastructure.

2) Multi-sector coordination and whole-of-government planning, aimed at building resilient health systems guided by the One Health approach, can advance efforts to integrate human, animal, and environmental sectors in pandemic preparedness.

Supporting a One Health approach implemented by multidisciplinary teams (of health and non-health professionals) developing a whole of society strategy for pandemic preparedness and response can build resilience where the risks exist.

3) Culturally sensitive interventions informed by contextual anthropological and sociological evidence are required.

For effective community engagement, we should change the paradigm of working in silos focused on narrow priorities and investigate the cultural ecologies and belief systems, which drive infections. Lack of situational awareness undermined post-mortem interventions in 1918 and during the 2014-16 Ebola outbreak. Local conflict still complicates the ongoing Ebola response in Congo DRC (2018-19).

4) Building trust between stakeholders of pandemic preparedness and response is crucial.

Trust building should start with redefining 'health security'. Understanding the continuum from health system strengthening, universal health coverage, and the linkage with health security (figure 1) is an important step in the de-securitization of health. We could progress from 'global health security' and aspire towards 'Universal Health Security' as a human right.

Figure 1: Linking health security and health systems *(Source: WHO, 2017)*
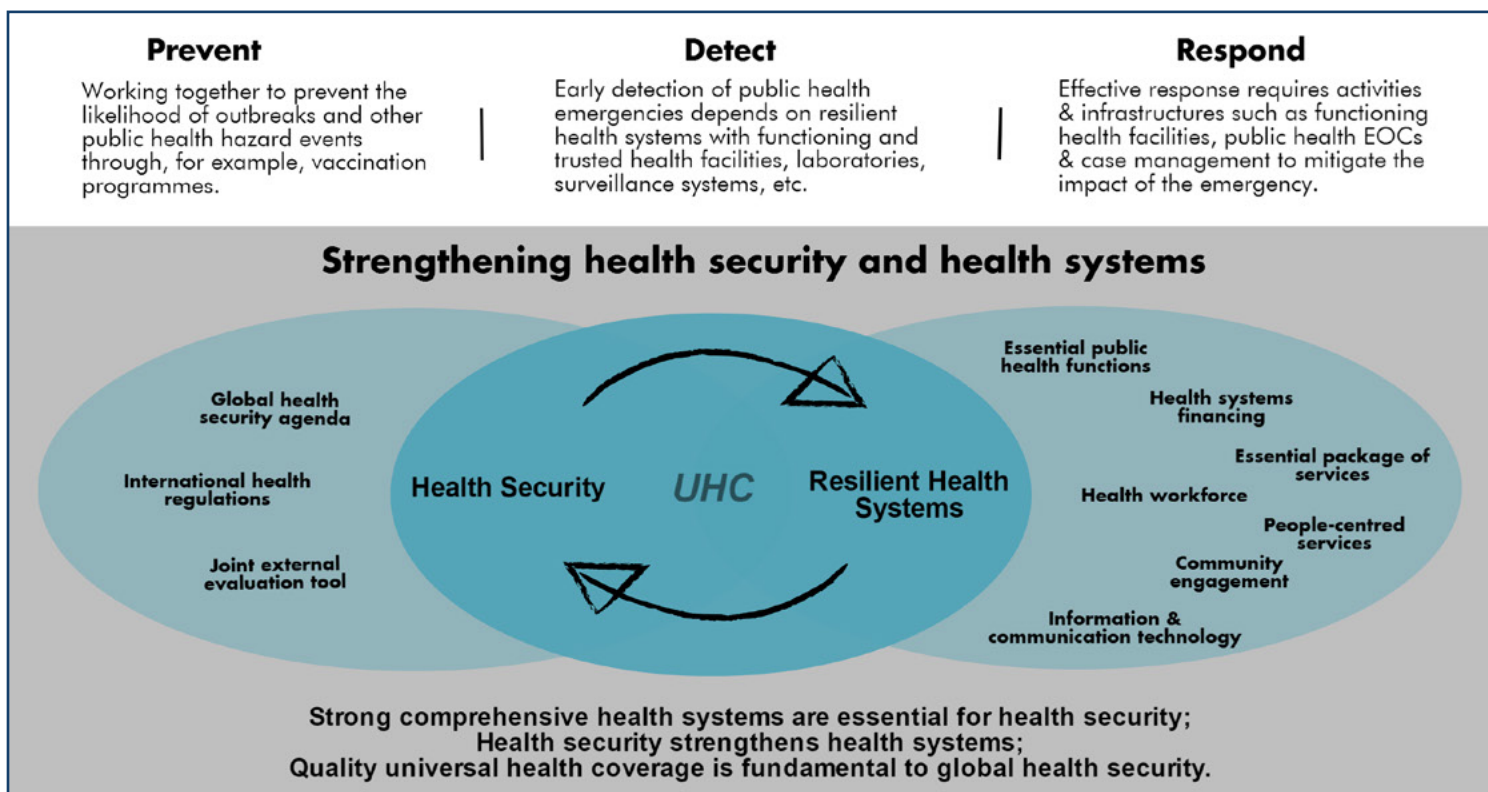
TOPIC AREA 3: CHANGING THE REWARD STRUCTURE
Author: Christine Crudo Blackburn

The University Reward Structure

The academic structure, particularly universities, are indispensable to biodefense, global health security, and pandemic preparedness and response. Research centers, institutes, and individual faculty are producing innovative work in the areas of the humanities, social sciences, and bench sciences, which are helping to address some of the biggest gaps and challenges in preparing for the next pandemic. While the role of universities in pandemic preparedness and response is extremely important, effective university engagement will require new models to encourage interdisciplinary research, next generation education, and service.

For decades, faculty and administrators alike have debated whether the traditional tenure system is antiquated. Specifically, many criticize the university reward structure as a whole for rewarding narrowly focused, non-applied research that clashes with the broader mission of universities themselves (Reskin, 1977; Boyer, 1990; Wolcott, 1997; Seigel, Waldman, Atwater, & Link, 2003; Boardman & Ponomariov, 2007). As Boardman & Ponomariov (2007) explain, "… the traditional academic reward system is ill suited to provide university scientists incentive to perform research and other activities that diverge from the publication of peer-reviewed basic research…" (p. 64). Furthermore, the reward systems of universities does not match the daily tasks that are required of its faculty, with research as the single most important component of tenure and teaching, applied work holds much less value (Kasten, 1984; Boardman & Ponomariov, 2007). With regards to teaching, which is an important and time consuming requirement for most faculty members, excellence is not viewed as sufficient for tenure or promotion (Kasten, 1984). Put differently, excellent teaching in the absence of excellent scholarship does not qualify a faculty member for promotion within the

university reward structure, while excellent research in the absence of excellent teaching, does.

Other duties aside, the traditional university reward structure also constrains the type of research that can be conducted. A study conducted by Siegel, Waldman, Atwater, and Link (2003) found that there is bias in tenure and promotion. Specifically, tenure and promotion decisions favor single-discipline and basic research over applied and commercially relevant research (Siegel et al., 2003). Thus, if a faculty member, specifically a junior faculty member would like to focus on interdisciplinary and/or applied research, they do so at the risk of career advancement. Boardman & Ponomariov (2007) found that most junior faculty view working in research centers as time that is taken away from advancing their careers and those that choose to do applied, interdisciplinary work in research centers do so not for career advancement, but to do good in society. The study concluded that, "...the current university reward system in the U.S. may indeed be deterring junior-level scientists from performing the applied and commercially relevant research the 'Research 1' universities encourage and tout in their research mission statements" (Boardman & Ponomariov, 2007, p. 54).

In the area of infectious disease and pandemic preparedness and response, this is concerning because solutions cannot be developed within one discipline. As Armstrong (2006) stated, health issues are complex and "It is now abundantly clear that no single discipline can or should have a monopoly on the search for creative solutions" (p. 761). Not only should interdisciplinary research be encouraged rather than discouraged, but teaching should be awarded greater value in the tenure and promotion process. Through teaching, faculty are training the next generation of pandemic experts and responders and this contribution should be valued as such.

The Funding Reward Structure

The university reward system is not the only deterrent of applied, interdisciplinary research. In addition to tenure and promotion, funding priorities can discourage certain types of research. A 1985 study by Porter and Rossini found that that National Science Foundation (NSF) reviewers favored proposals that were

familiar to them, i.e. related to their fields of expertise. Additionally, the study found that NSF reviewers discriminated against interdisciplinary research.

If both the university reward structure and the funding reward structure dissuade interdisciplinary, applied work, the global health community is at a significant disadvantage. Universities have enormous expertise and resources which, utilized correctly, to include partnering with international universities, could provide indispensable knowledge and solutions to some of the greatest pandemic preparedness and response challenges. As it stands now, however, doing such work is at the expense of career advancement and funding opportunities.

RECOMMENDATIONS

1) Place more value on applied interdisciplinary work within the university reward structure.
The most significant threats facing the world--whether they are disease, climate change, nuclear threats, etc.--cannot be solved within one disciplinary box. University reward structures should recognize the need for and value of interdisciplinary, applied research and service. Work within private sector companies and publications outside of single-discipline journals should be viewed as valuable contributions and apply toward tenure.

Some concern has been raised about the difficulty with establishing a standardized evaluation system for interdisciplinary research, but this challenge can be overcome by creating interdisciplinary review panels. With interdisciplinary panels, portions of publications and projects could be evaluated by experts in those specific areas, which would provide a full picture of the quality and value of the work.

2) Encourage interdisciplinary research in the next generation.

The traditional graduate school model often discourages students from pursuing interdisciplinary education and research. Many of the societal challenges today, however, require multi-sectoral solutions, including pandemic preparedness. Faculty must do more to promote interdisciplinary education and research, but the siloed structure of academia inhibits faculty and creates the feeling for students that they will not be able to build a successful career if they cross traditional disciplinary boundaries. While some universities are working to change this, more must be done to encourage faculty to promote, and for students to pursue, interdisciplinary work. Texas A&M University has recognized this problem and initiated an internal Tier-One educational grant

program (TOP) to promote interdisciplinary and new transformative learning models. The Scowcroft Institute of International Affairs was awarded a TOP grant in 2018 and is establishing a new curriculum-focused on pandemic preparedness and biosecurity. This effort is already bringing together like-minded faculty and students from political sciences, microbiology, engineering, veterinary sciences, public health, and numerous other disciplines to learn and work together. It is allowing the Scowcroft Institute to train the next generation of pandemic experts and provide leadership for much needed transformational learning models.

3) Provide more grant funding for interdisciplinary research.

As we discussed in this section, there is bias among reviewers toward single-disciplinary research. This bias makes it difficult for important interdisciplinary projects to get the funding they need. Funding institutions, such as NSF and NIH, should encourage interdisciplinary research by providing grant opportunities that require interdisciplinary teams and projects. This would provide an avenue for funding interdisciplinary research, and it could also serve to encourage researchers who have previously been hesitate, to engage in cross-disciplinary, applied work.

TAKING ON ANTIMICROBIAL RESISTANCE

Authors: Linda Venczel, Josh Klett, and Maria Soc

Introduction

Antimicrobials are essential medicines for maintaining health, both within human and animal populations. Access to antimicrobials represent a major contribution to the continued improvements in human health, demonstrated in the progress made in reducing morbidity and mortality worldwide in line with targets identified in the Millennium Development Goals. Prior to the invention and introduction of antimicrobials, and especially antibiotics, an infection from a small cut could potentially have deadly consequences. In present times, most common infections can be combated and cured through a typical course of antibiotics, antivirals, or antifungals. Resistance to antimicrobials, however, is becoming increasingly common across the globe and thus the international community is now grappling with the question of how to collectively combat the emergence and spread of antimicrobial resistance.

Antimicrobial resistance has already been described and researched in many diseases, including malaria, Methicillin-resistant *Staphylococcus aureus* (MRSA), and influenza. Antibiotic resistance in particular has become a major concern worldwide, and as such there are many recommended implementations to combat its spread, including surveillance, prevention, and antibiotic stewardship. From gonorrhea to tuberculosis, antibiotic resistance threatens the health security of every nation and any person. In the past decade, the public health priority of antimicrobial resistance has quickly risen, and is now well accepted as one of the biggest threats to the health of populations in every corner of the world.

Due to our incredibly interconnected world, it is our reality that someone from anywhere can travel to the United States (US) with a resistant bug and transmit it. The direct impacts of antimicrobial resistance on health

are severe, with increased morbidity and mortality in countries of all income levels. When the ability to effectively treat disease is diminished, patients are expected to have extended illness and complications resulting in more costly treatments.

Antimicrobial drugs are at the very heart of modern medicine. Antibiotics allow for both preventative and curative medicine, including surgeries, chemotherapies, and a wide range of common and serious bacterial infections. As antimicrobial resistance continues to worsen and spread around the world, the core of global health security is threatened. As a multifaceted issue, there is no quick fix to curb antimicrobial resistance, but interventions can help. Increased vaccination coverage, improved surveillance, and antibiotic stewardship in both the human and animal health sectors can contribute significantly to reducing the threat of antimicrobial resistance.

The One Health Perspective

The challenges faced in combating antimicrobial resistance are multi-faceted and multi-sectoral. To control antimicrobial resistance, interventions must take a holistic, one health approach. The use of antibiotics as prophylaxes in animals contributes to growing antimicrobial resistance in agriculture, the environment, and humans. If only one part of the cycle is addressed, the other two will falter. The importance of antibiotic

stewardship, therefore, is equally prudent in all sectors. Policies that restrict the use of antibiotics in animals for growth or preventative purposes are just as important as policies that promote stewardship in humans.

PATH is a member of the Northwest Antimicrobial Resistance Coalition. Established in 2017. The Coalition is a collection of stakeholders based in the Pacific Northwest whose purpose is to create and integrate effective interventions to stop antimicrobial resistance emergence and spread before it begins, both around the world and in the US. With a focus on One Health approaches, the Northwest Antimicrobial Resistance Coalition believes in utilizing the abilities of its members to track and understand the spread of antimicrobial resistance from international hot spots into the U.S. in order to provide a cohesive integrated system of global surveillance and support.

The Extended Spectrum Beta-Lactamase producing *E. coli* Tricycle Project

In response to the need for international, integrated surveillance of antimicrobial resistance, the WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance has begun to develop a project for international monitoring of Extended Spectrum Beta-Lactamase producing *E. coli*. Dubbed the Tricycle Project for its three pronged One Health approach, the focus is on allowing for a simple and affordable method of monitoring antimicrobial resistance in all WHO regions by focusing on a single indicator; Extended Spectrum Beta-Lactamase producing *E. coli* prevalence in the human, animal (food chain), and environmental sectors.

While some WHO regions have the resources to monitor antimicrobial resistance to a wide and thorough extent, this is not the case in most low- and middle-income countries. To have a global picture of antimicrobial resistance, the WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance underlines the need to monitor antimicrobial resistance in a simple, cost-effective, and standardized fashion. Extended Spectrum Beta-Lactamase producing E. coli was chosen as the sole indicator due to its association with severe morbidity and mortality as well as high associated health costs. It is also useful as a monitoring tool for antimicrobial resistance interventions, as its prevalence

decreases as antibiotic control increases. Though there are limitations to such a project, including this narrow scope, it is an important step forward in the facilitation of an international system of surveillance that can be implemented in countries of different wealth and resources.

In Senegal

Access to quality and relevant laboratory data is a crucial piece of health system monitoring, and especially so in antimicrobial resistance. PATH supported the Direction of Laboratories of the Ministry of Health to aid in building Senegal's laboratory workforce capacity to detect potential public health threats and improve the timeliness and quality of laboratory reporting and surveillance of antimicrobial resistance. The Minister of Health in Senegal reactivated the National Antibiotic Stewardship Committee, which allowed for key progress to be made.

In line with improving laboratory workforce capacity, PATH helped guide the updating of meta data in the District Health Information System in Senegal as well as conducting training on information systems data integration and decision making in District Health Information System. We first developed a system to map laboratories in Senegal and identified 168 functional medical biology laboratories (compare to estimates by Director of Laboratories of 125-130 labs). Data was collected from 135 of 168 of the registered laboratories and on-site supervision missions were conducted in 36 laboratories to validate the data collected from District Health Information System and control for self-reporting errors, while other laboratories were contacted by phone to verify data. This monumental progress in optimizing health data is a leap forward in the quest to understand and combat the use of antibiotics and antimicrobial resistance.

In Vietnam

PATH continues to chair and host meetings of the infection prevention and control/antimicrobial resistance Joint Coordination Group, a consortium of international organizations active in infection prevention and control and antimicrobial resistance in Vietnam. The group brings together key implementing partners in Vietnam involved in antimicrobial resistance-related work, and

provides opportunities for sharing information and improving coordination and collaboration. In Hanoi, six model hospitals were selected to serve as archetypes for infection prevention and control. As these model hospitals build their capacity, their example will trickle down to tertiary clinics in rural areas, especially in terms of new guidelines that are developed as a result of positive results in model hospitals.

By looking forward towards what else can be done at the community level to bolster antimicrobial resistance stewardship, we are positioning to develop an existing application that will support retail pharmacists in Vietnam to guide their prescribing practices and provide data to the Ministry of Health. By utilizing a user-centered approach, PATH hopes to improve data collection on antibiotic prescribing as well as improving prescribing practices through learning tools and logic gate decision tools.

Conclusion

The threat of antimicrobial resistance is a pressing public health issue that deserves the attention of the global health community. If left unaddressed, antimicrobial resistance will continue to worsen and spread, leading to massive mortality and morbidity, not only in low- and middle-income countries, but in wealthy nations as well. Inappropriate antibiotic and antimicrobial use is the single most important contributing factor of antibiotic and antimicrobial resistance, but with thoughtful and poignant interventions, inappropriate use can be stopped. Communities are poised to be invaluable players on the world stage. By getting communities informed and engaged, they can be involved in prescribing decisions, more aware of the importance of

(Source: PATH/Ngo Thi Than Thuy)

infection prevention and control, and more engaged with governmental policies that support a healthy community through antimicrobial resistance control.

RECOMMENDATIONS

1) Strong national surveillance system that can help detect and monitor trends and risk factors for antimicrobial resistance.

Having a strong national surveillance system in place can help detect and monitor trends and risk factors for antimicrobial resistance and aid in the process of enhancing antibiotic stewardship. Without proper monitoring systems, it is not possible to track and understand how antimicrobial resistance emerges and spreads, which impedes the development of relevant policy and intervention in healthcare settings. The importance of national surveillance is relevant in all healthcare settings, including hospitals, outpatient settings, and pharmacies, especially in rural areas, in order to have local, regional, and national data.

Surveillance of antimicrobial resistance in animal populations is also a salient aspect of antimicrobial resistance data. Many antimicrobials used in human medicine are also used to treat illnesses in animal populations. Previously, antimicrobials were included as feed supplements to intensively farmed animals in order to increase productivity. While this use of antimicrobials has declined in recent years, with many countries limiting the use of antimicrobials in food-producing animals, there are still instances of overuse especially in low- and middle-income countries where oversight is limited. Since animal populations play a key role in antimicrobial resistance emergence, surveillance in agriculture, aquaculture and veterinary practices is essential. Not only is it an invaluable means of tracking antimicrobial resistance in and of itself, it is vital for the tracking of policy effects on animal antimicrobial practices.

2) Proper sanitation and hand-washing limit the spread of bacteria and reduce infections, leading to a decrease in the need for antimicrobials.

Vaccines are a key aspect of antimicrobial resistance prevention, as they reduce the need for antimicrobials immensely. Prevention serves as a key series of interventions that can strongly galvanize communities to be a part of antimicrobial resistance reduction.

In many low-income countries, there is a lack of hygienic facilities and practices in healthcare settings, resulting in high rates of infection, and, as a result, high mortality, morbidity, and antimicrobial use. Proper water supply, sanitation, and hygiene (referred to as WASH) interventions can reduce the risk of infection in all healthcare settings as well as improving community engagement and trust. Coverage estimates of these interventions in healthcare facilities is limited, and only recently has data been aggregated across countries. For instance, Tanzania has national guidelines on proper water supply, sanitation, and hygiene but there are huge gaps in this coverage in clinics. PATH developed a protocol to test proper WASH interventions to reduce the spread of pathogens and antimicrobial resistance in Tanzania. This protocol was used to assess proper WASH coverage in 100 health care facilities in Monduli, Hai, and Itilima districts. The team is summarizing the findings from this study for publication in a peer-reviewed journal, but early results indicate drastically improved rates of hand-washing when proper water supply, sanitation, and hygiene interventions are executed.
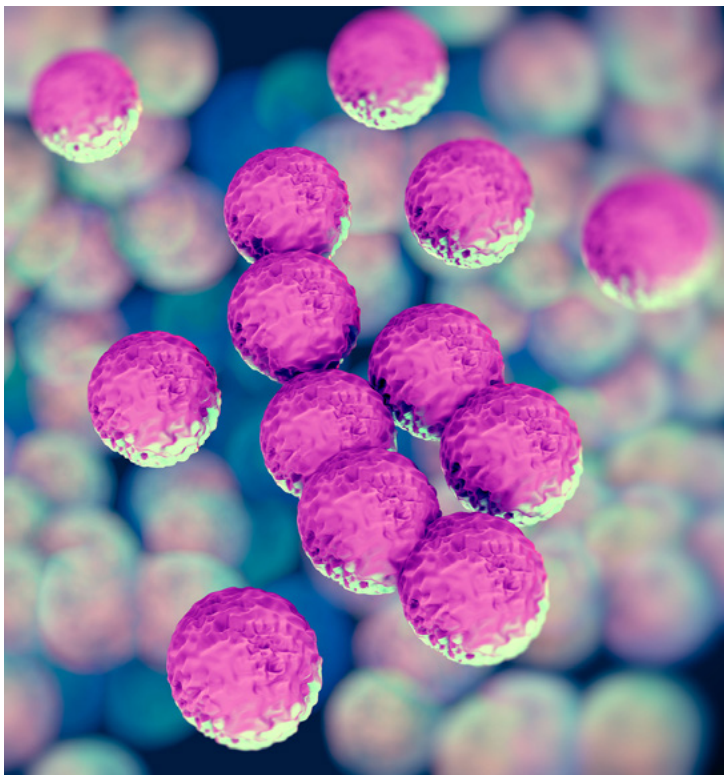
TOPIC AREA 4: MULTI-SECTORAL COLLABORATION
Author: Richard Crespin

Weak Social Networks Threaten Response to Next Pandemic

"Recall, if you will, the promise of the Internet," wrote Adam Elder in the April 2019 issue of Esquire, "Democracy would be upgraded, distant peoples would be brought together in perfect harmony, and all of human knowledge would be a click away. Let's just say the bugs haven't been worked out quite yet." Indeed, the world has changed a lot since the 1918 influenza pandemic and the 1957 Hong Kong Flu pandemic and most of this change has been for the better. Not just the Internet, but much of the technology and innovation over the past decades has driven vast improvements in people's lives. Fewer people live in extreme poverty, go to bed hungry, or die of preventable diseases than at any time in human history.

Specialization and continuous improvement—doing what you are good at and working to constantly get better at it — drove the majority of those improvements and continues to upgrade lifestyles while decreasing costs. The twin forces of the Walmart Effect (Fishman, 2006) and Moore's Law continuously drive down costs, improve quality, and increase connectivity. Amazon will deliver almost anything overnight and the previously disconnected and unorganized can create social movements, like Occupy Wall Street, Black Lives Matter, and the Gilet Jaunes.

But, specialization has also led to increasing silos with an increasing number of people focusing on narrower and narrower fields and talking less and less across sectors. And, perhaps more importantly, trust has plummeted. "We are living in an era of backlash against authority," according to Matthew Harrington (2017), "For 17 years the Edelman Trust Barometer has surveyed tens of thousands of people across dozens of countries about their levels of trust in business, media, government, and NGOs. This year [2017] was the first time the study found

a decline in trust across all four of these institutions. In almost two-thirds of the 28 countries we surveyed, the general population did not trust the four institutions to 'do what is right…'"

The next pandemic will require a "whole of society" response across entire communities. When no community is spared, each individual community will need to marshal its own response. Yet, with trust at all-time lows and community bonds frayed, local communities around the world may find themselves particularly vulnerable. In Bowling Alone, author Robert Putnam described the decline of civic society. The social clubs and organizations that used to bind local communities together have experienced falling membership and participation for decades. These basic bonds—the ability to know and trust your neighbor, your local authorities, and your local institutions—have frayed and may leave many of us afraid and alone come the next pandemic.

Couple this with ever increasing specialization and the trouble only mounts. While fewer people stay in the same job for their whole careers, most still stick to a

single career field or sector. Complex challenges, like responding to pandemics, however, will require people who have insider knowledge of the bureaucracies, motivations, and functions of the public, private, and civil sector organizations that will lead the response. "Yet as the tri-sector leaders needed to address such challenges are becoming more valuable, they are also becoming harder to develop — particularly in the United States, owing to a widening disparity between business, government, and nonprofit incomes; the onerous confirmation process for senior government jobs, and the differing incentives and cultures of the three sectors" (Lovegrove & Thomas, 2013).

Now is the time to rethink preparation plans and to go beyond first responders and healthcare professionals. Now is the time to engage governments at all levels, particularly the local level, and to create purposeful and pre-positioned agreements on response that bridge these divides.

In the wake of Hurricane Harvey, organizations from across the United States came to the aid of Houston. The cavalry rode to the rescue. For pandemics on the scale of the 1918 Spanish Flu or the 1957 Hong Kong Flu, however, capitals like Washington, DC or Brussels will have limited capacity to aid distant provinces, able only to deal with their own sick and dying. The cavalry won't ride to the rescue.

Instead, communities need to prepare to respond alone. A 2018 modeling exercise for the insurance industry concluded that the annual risk of an outbreak on the scale of 1918 lies between 0.5% and 1.0% (Madhav et al., 2018). While that might seem low, "[p]andemics know no boundaries. That is especially true now, when factors such as international travel, climate change, deforestation, and human-animal interactions are all accelerating the spread of infectious diseases."

Increasing numbers of us live in cities without knowing our neighbors or belonging to religious or civic organizations. We know people within our own career fields or the parents of our children's friends, but few of us know our local government officials, local business owners, or first responders on a first name basis. What will happen when the next pandemic inevitably strikes? Will we be prepared and will our communities rebound?
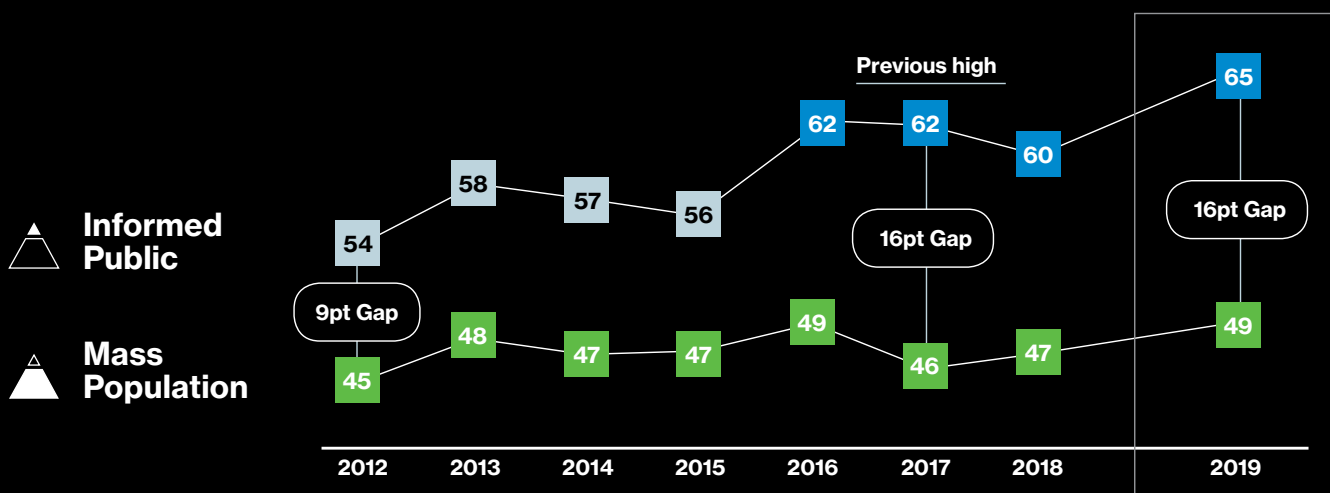
TRUST INEQUALITY RETURNS TO RECORD HIGHS

Trust Index (23-market average)

From the 2019 Edelman Trust Barometer Executive Summary (Source: edelman.com/trust-barometer)

Consider this: companies produce much of our food, clothing, technology, transportation, and many of the things that make up our modern lives. More people interact with, work for, or live near businesses than almost any other institution in modern society. The local Starbucks, to take one example, often stands in for the community "living room" where people of all classes intermingle. Companies like these are often well placed to play critical roles in times of disaster, including the outbreak of epidemics and pandemics. Governments at all levels need to think about how they could work now with businesses, civic organizations, faith-based organizations, and other nongovernmental organizations to put in place plans for how they will work together before the inevitable occurs. Below we lay out six recommendations for encouraging greater multi-sector collaboration to prepare for pandemics or large scale epidemics.

Conclusions

Acting on the recommendations provided below will require leaders at all levels and from multiple disciplines and sectors to think more broadly about their roles in society. Specifically, those involved in pandemic and

disaster response can broaden their circle of inclusion. Think about how you might formally and informally build the kinds of relationships or create the kinds of convening opportunities outlined above. Business leaders can accept invitations from governments and nonprofits to participate in pandemic preparedness.

Perhaps most importantly, we should all consider how we might build relationships that create more resilient communities now. The world has changed a lot since the last pandemic and we do have many more tools, gadgets, networks, and innovations at our disposal. It will take deliberate planning and action now, though, to ensure we can actually use them when the time comes. By acting now we can make sure we are strong and united ready to face down the crises to come.

RECOMMENDATIONS

1) Establish multi-sectoral relationships.

The level of trust and understanding between and among government agencies, healthcare NGOs, and the private sector remains low. Additionally, many in the scientific and medical fields, responsible for pandemic

response, rarely work with individuals outside their field. Yet major breakthroughs and innovations most often come from the intersection of multiple disciplines. Thus, we need to make it easier for people outside these fields to share their ideas before disaster strikes.

People outside the business world often think of the private sector as a monolith; that all companies act the same. This inhibits effective engagement. If a government or NGO wants to "engage the private sector," they must think about how to engage specific companies, departments, units, and people within those companies. This requires developing an intimate understanding of their motivations, priorities, and business strategies. Not all companies are created equal nor will they all be equally interested or well-placed to assist in times of crisis. This deeper understanding of the players within the private sector also includes meeting them where they are. It requires going to them — meeting with them at their conferences and other gathering points and coming armed with specific requests.

If you're a leader in local government (mayor, city manager, state agency head), academic and research institution leader (deans of medical schools, heads of academic research departments), and/or a local

business leader (chamber presidents, plant and worksite executives) consider how you might create informal connections and discussions with people from sectors different than your own around disaster — and specifically pandemic — preparedness, response, and recovery.

Again, keep in mind that big breakthroughs most often occur at the intersection of multiple disciplines. So, if you want to systematically encourage breakthroughs for pandemic response, governments and donors should fund the intermingling of disciplines. This could take the form of encouraging more:

- Multi-disciplinary programs and courses in universities, e.g., public policy and epidemiology or communications and health

- Mashups at conferences or events that bring together diverse disciplines. Examples might include hosting mashups with:

  - Fashion designers to redesign clothing and equipment (not for "fashion" but for greater comfort and function)

  - Media and advertising professionals on communications in a crisis or on behavior change communications

  - Retailers to redesign healthcare facilities for greater speed/convenience of service

Remember that companies make their money by specializing — by being the very best at a very small set of things. People within those companies are rarely encouraged to think big thoughts about existential questions, like what to do in a pandemic. They need permission to focus their attention on these kinds of issues. Donors and government agencies, through their brands and convening power can focus the minds and attention of key staff on these vital issues. They can use that power to engage companies to participate in simulations, exercises, and other events that would create the basis for collaboration before a crisis hits (see below).

Donors and governments should also use their convening power to create greater levels of trust.

The very best way to create trust — in fact the most fundamental way — is through the act of breaking bread together. Well-intentioned rules that limit the ability of some actors to pay for meals and alcoholic beverages restrict the ability to build trust. Donors and other actors should work together to modify and/or comply with ethics rules while creating environments that will actually build trust.

Lastly, if and when you do meet with business leaders, come armed with specific requests that go beyond donations or corporate social responsibility. Tap into companies' supply chains, talent, skilled volunteers, and other assets.

2) Pre-position agreements, simulations, and practice.

Similar to the agreements and advanced planning established for natural disaster response and recovery among some governments and key companies, relevant agencies and NGOs should establish cooperation agreements and conduct joint exercises and simulations to build up the muscle memory among key actors for pandemic response. This should include:

- Pharmaceutical, medical supply, and medical technology companies, and their supply chain partners

- Transportation, logistics, and supply chain management companies

- Telecommunications (especially mobile) and utilities

- Media (for assistance in public messaging and managing panic)

- Retailers, food service, distributors, lodging, hospitality, and other firms with "last mile" footprints

Simulations/exercises should include representatives of all of the above along with representatives from relevant agencies from the national, regional, and local governments, legislative staff, faith-based organizations, local charities, and donors.

3) Create open meta-data standards and require their use.

After the last Ebola crisis, we helped lead an after-action review among healthcare information systems providers. That review revealed that many healthcare providers and health ministries struggled to track patients through the hastily organized system of care. Ministries within a single country — much less across multiple countries — couldn't effectively share data about patients. Did a mobile trailer "count" as a health clinic? How could the ministry of tourism share information about a traveler with the ministry of health when they didn't have common data dictionaries?

While remaining cognizant of data privacy needs and intellectual property protections, donors and governments should consider how to make it easier to appropriately share data across healthcare information systems. Creating a common personal identifier or at least a common meta-data tag for a person, a facility, and other common data dictionary terms would dramatically improve response in a pandemic. Donors and governments should support the creation and require the use of open/standard APIs (application programming interfaces), and the use of the common data dictionary and data standards mentioned above. They should also require that implementers and relevant agencies have pre-negotiated plans for how to share data in times of emergency — including data that would normally be subject to data privacy restrictions.

4) Create effective chains of communication.

Especially in democratic societies, effective collaboration, even in times of crisis, requires less command-and-control and more communicate-and-coordinate. Therefore, either as part of the pre-positioned agreements or in the absence of them, local communities should be encouraged to create clear chains of communication and coordination. These should map the various stakeholders and key actors, outline criteria for when to engage them (e.g., by defining what constitutes a crisis), prescribe mobilization plans, and set forth communication and coordination protocols. These could be as simple as "call trees" that indicate who to call about what and when, all the way to more advanced scenario-based plans.

5) Be prepared to counter fake news and fake science.

Public trust in institutions is at an all-time low. Media and "official" sources of information are increasingly fractured and distributed. We have never faced a major global crisis in the social media era. It is therefore increasingly likely that in societies of all sizes and levels of development that large swaths of the population will distrust official news, information, and science. This will lead to delays and even active obstruction of coordination and response. Responsible agencies should actively engage with digital and traditional media companies and personalities, key influencers (e.g., celebrities, religious and traditional leaders, teachers, etc.), as well as communications professionals, academics, and researchers to understand and plan for how pandemics might play out in the modern media landscape.

6) Avoid the high cost of free.

Past experience has shown that disasters attract large sums of money. In the immediate aftermath of a disaster, this kind of philanthropy can be immensely helpful in dealing with humanitarian needs. But, as communities start to recover, "free" can begin to work against the long-term recovery of markets and the business community. Therefore, local authorities should encourage a rapid return to commerce in the aftermath of a pandemic encouraging people to buy products and services in the impacted areas to ensure these businesses and economies recover.

ANNUAL **PANDEMIC POLICY** SUMMIT

The Scowcroft Institute Annual Pandemic Policy Summit is held every fall at Texas A&M University in College Station, Texas. The 5th Annual Summit will be held November 11–12, 2019.

The Summit brings together political leaders, researchers, practitioners, and the private sector to discuss issues in pandemic preparedness and biosecurity. Participants come from diverse backgrounds including biodefense response organizations, U.S. Government institutions, multilateral and non-governmental organizations, private sector partners, host countries, foundations, think tanks, and institutions critical for improved pandemic response, biodefense, and health security.

The first day of the Summit takes place under Chatham House Rule to allow keynotes and panelists to speak openly about challenges surrounding pandemic preparedness and biosecurity. The second day of the Summit is open to the public and provides an opportunity for the broader community to learn from some of the world's leading experts in this field.

At the end of every Summit, a white paper is produced that details the major issues of debate and provides recommendations for closing some of the remaining gaps.

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Richard Crespin is a successful entrepreneur, business community organizer, and award-winning filmmaker. Her is the CEO of CollaborateUp, an elite consulting firm advisi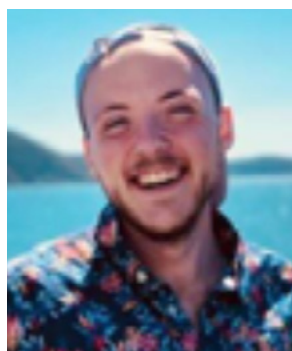ng businesses and non-profits on how to work together to solve big problems. He uses the CollaborateUp Formula to work with firms to find their unique social mission, where they can make significant impact. He also works with governments and non-profits to build programs that attract companies as partners and donors. In addition to his work with CollaborateUp, Crespin serves as a Senior Fellow for the U.S. Chamber of Commerce Foundation, on the executive education faculty at the Harvard School of Public Health, as a regular lecturer at the Georgetown School of Foreign Service, and as an adjunct professor at the George Washington University.

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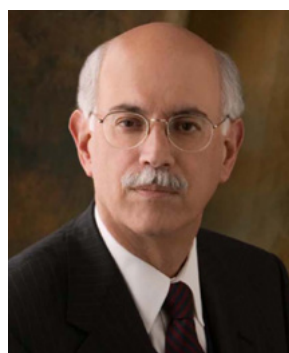
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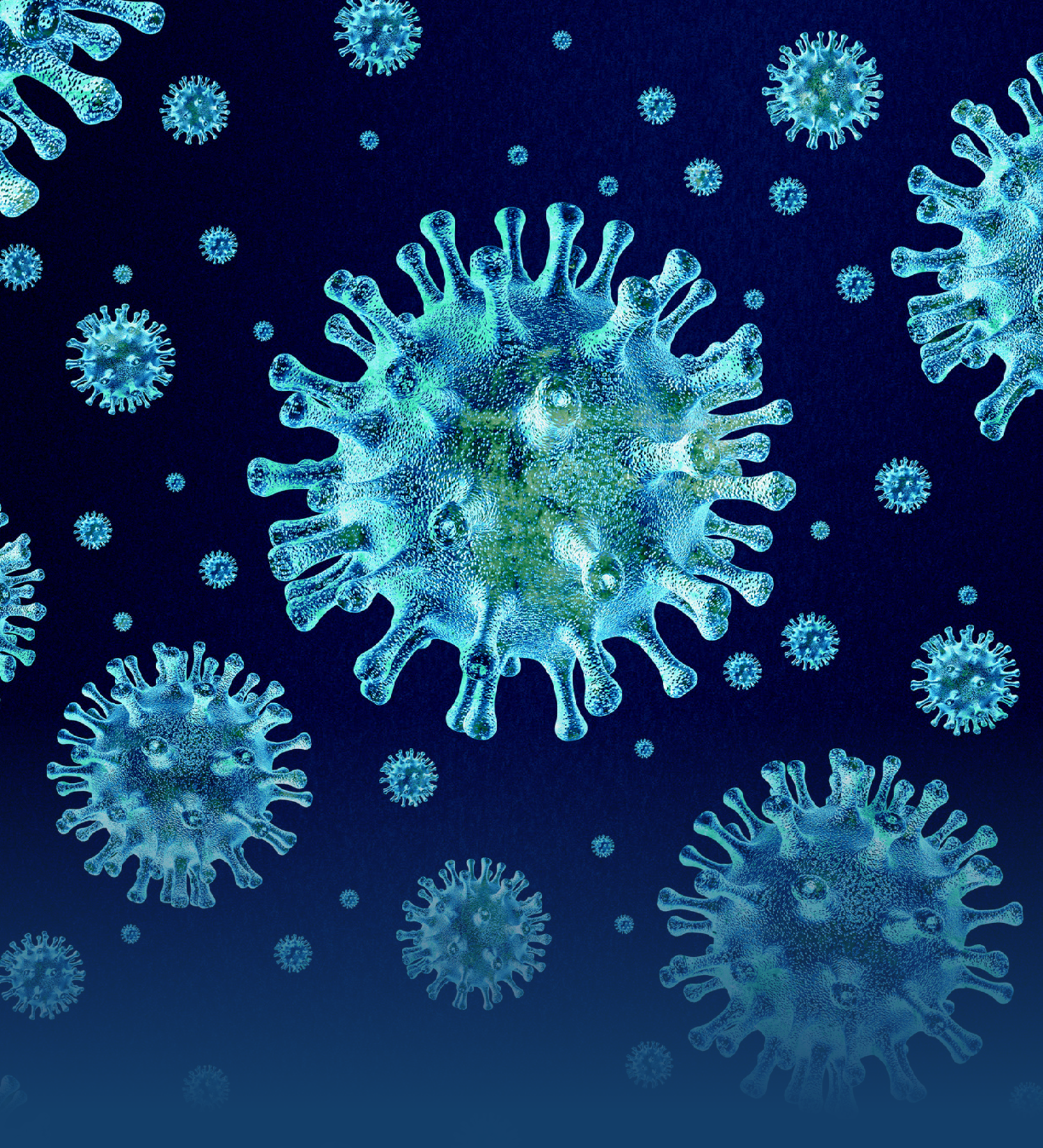or Texas A&M University.

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