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PREPAREDNESS AND RESILIENCE IN PUBLIC HEALTH EMERGENCIES

Rebecca Katz & Erin Sorrell

A secure and resilient nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk.

– U.S. National Preparedness Goal (U.S. Department of Homeland Security 2011)

As long as humans have existed, there have been disasters and emergencies and as long as there have been disasters and emergencies, there have been people who have responded to them and communities that have recovered and returned to normal living. Our world today, however, is presented with ever evolving threats from war, terrorism, natural disasters, and novel diseases with pandemic potential. Along with these threats is the growing knowledge that large-scale catastrophes and public health emergencies can not only affect the health of populations but also impact the economic, social, and security foundations of nations (Katz 2012).

Only in the past 10 years has the public health community endeavored to define public health emergency preparedness and identify the specific steps that nations, regions, and communities must take to identify, prepare for, respond to, contain, and recover from emergencies. In 2007, a group at the RAND Corporation offered the following definition of public health emergency preparedness:

the capability of the public health and health care systems, communities, and individuals, to prevent, protect against, quickly respond to, and recover from health emergencies, particularly those whose scale, timing, or unpredictability threatens to overwhelm routine capabilities. Preparedness involves a coordinated and continuous process of planning and implementation that relies on measuring performance and taking corrective action.

(Nelson et al. 2007: S9)

Public health preparedness includes a capable health care system, transparent communication mechanisms, human capacity, tools, and protocols in place to prevent, protect, and quickly respond to and recover from public health emergencies. Capacity does not equate to preparedness;

preparedness involves continuous assessments and improvements to plans, communication strategies, training, and gap analysis.

Events that can overwhelm routine public health capabilities fit into four basic categories: intentional or accidental release of chemical, biological, radiological, or nuclear agents; natural epidemics or pandemics; natural disasters; and man-made disasters. Most of these events, however, can be addressed through two broad functional requirements. The first is the basic function of a public health system, including event-based surveillance and broad diagnostic laboratory capacity. The second is the training, standard operating procedures, leadership, laws and regulations, and plans in place for cooperation and implementation of strategies to address the emergency (Levi et al. 2011).

Supporting the basic functions of public health systems requires developing and sustaining strong epidemiologic capacity to identify, investigate, and assess disease events in the community. This can be accomplished in part through strong biosurveillance systems, which provide a baseline assessment of routine public health events in order to quickly identify emergencies. Basic functions also include the need for community, regional, and national laboratories with diagnostic capacity that can communicate effectively with each other, move isolates safely and efficiently, and rapidly feed diagnostic results back to both the clinical and public health communities. Importantly, these basic epidemiologic and laboratory functions require a sustained, skilled workforce at the local, state, and national level.

The second broad area of public health preparedness builds on the basic core functions of the public health system to specifically address the possibility of emergencies and requires cohesive integration with a variety of sectors across all levels of government and health services. This includes the development of laws, regulations, plans, procedures, and training that bring together public health professionals, first responders, and emergency care professionals. By bringing these communities together for planning, training, and exercises, individuals and organizations begin to understand their roles and responsibilities, as well as the resources and actions available to them during crises. Each planning and training exercise is followed by an assessment in order to develop a lessons-learned approach for all sectors involved in preparing and responding to public health emergencies.

Establishing the capabilities, plans, and procedures to prepare for, respond to, contain, and recover from public health emergencies, requires an extensive range of actions. The U.S. Centers for Disease Control and Prevention defines 15 major capabilities for public health preparedness, essential for detection, response, management, and recovery from emergencies. These 15 capabilities, found in Table 17.1, span the domains of biosurveillance, incident management, information management, surge management, countermeasures and mitigation, and community resilience.

Much of public health emergency preparedness focuses on the ability to detect, assess, and respond to events. Recovery from these events – particularly at the community level, however, is also an essential function, and is captured by the term “resilience.” The U.S. National Health Security Strategy defines community resilience as “the sustained ability of communities to withstand and recover- in both the short and long terms- from adversity, such as an influenza pandemic or terrorist attack” (U.S. Department of Health and Human Services 2009: 5). The U.S. Federal Emergency Management Administration (FEMA) takes a wider range approach to defining resilience. FEMA (2011) defines disaster-resilient communities as “communities that function and solve problems well under normal conditions. By matching existing capabilities to needs and working to strengthen these resources, communities are able to improve their disaster resiliency.”

While determining when, in fact, a community is resilient and what that means in the wake of a disaster is complicated, community resilience has become an integral part of public health

Table 17.1 Public Health Preparedness Capabilities, as Defined by the U.S. Centers for Disease Control and Prevention

| Capability | Domain |
|--|--------------------------------|
| 1. Community Preparedness | Community resilience |
| 2. Community Recovery | Community resilience |
| 3. Emergency Operations Coordination | Incident management |
| 4. Emergency Public Information and Warning | Information management |
| 5. Fatality Management | Surge management |
| 6. Information Sharing | Information management |
| 7. Mass care | Surge management |
| 8. Medical Countermeasure Dispensing | Countermeasure and mitigation |
| 9. Medical Materiel Management and Distribution | Countermeasures and mitigation |
| 10. Medical surge | Surge management |
| 11. Non-pharmaceutical interventions | Countermeasures and mitigation |
| 12. Public health laboratory testing | Biosurveillance |
| 13. Public health surveillance and epidemiologic investigation | Biosurveillance |
| 14. Responder safety and health | Countermeasures and mitigation |
| 15. Volunteer management | Surge management |

Source: Centers for Disease Control and Prevention 2011

preparedness and overall health security. The framework for the U.S. National Health Security Strategy identifies both community resilience and basic and emergency health response systems as the cornerstones for achieving national health security (U.S. Department of Health and Human Services n.d.). These two integrated goals rely upon the nation’s ability to meet 10 core objectives, all of which reiterate the six core domains identified by CDC in Table 17.1.

In this chapter, we will present how the United States has addressed public health preparedness and emergency response, focusing on the legal and regulatory framework and multisectoral approaches. We will then present the international plans and agreements pertaining to public health emergency preparedness and resilience and finish with a discussion of challenges for building prepared and resilient societies.

U.S. public health preparedness and emergency response

The US government should lead efforts to detect and conquer emerging infectious disease with the same energy it devoted to tackling polio in this country during the last century.

– *The Trust for America’s Health, 2008 – Germs Go Global: Why Infectious Diseases Are a Threat to America (Hamburg et al. 2008: 2)*

Since the September 11, 2001, terrorist attacks and the delivery of anthrax letters in the weeks following, the United States has been faced with a series of public health emergencies, including devastating hurricanes, deadly tornados, mass shootings, and a novel influenza virus. On April 15, 2013, the United States faced another challenge when two improvised explosive devices were detonated at the Boston Marathon, killing three on site, and injuring an additional 264 individuals. Those who were injured received immediate aid, were triaged, and were rapidly transported

to one of eight local hospitals. Of the patients transported to a hospital, including 20 who sustained critical injuries, all survived (Biddinger et al. 2013). The medical response was enabled in part by emergency preparedness programs, the advancement of disaster medicine, and mass casualty exercises supported by federal, state, and local entities that brought together multiple sectors to work collaboratively in the face of emergencies. One Boston emergency medicine physician said, “I cannot over-emphasize the importance of training . . . whether it’s city-wide disaster drills or mock codes, the work we did together was the key to preparing us for this event” (Robert Wood Johnson Foundation 2013).

Dr. Atul Gawande, a physician at Boston’s Brigham and Women’s Hospital wrote, “Talking to people about that day, I was struck by how ready and almost rehearsed they [clinicians at the Boston hospitals] were for this event. A decade earlier, nothing approaching their level of collaboration and efficiency would have occurred. We have, as one colleague put it to me, replaced our pre-9/11 naïveté with post-9/11 sobriety. Where before we’d have been struck dumb with shock about such events, now we are almost calculating about them” (Gawande 2013).

The readiness of the Boston first responders and health care providers was in part the result of a decade of investments made by the federal government. Between 2003 and 2007, the Department of Homeland Security alone awarded over \$27 billion in preparedness grants to state and local governments (Local, State, Tribal, and Federal Preparedness Task Force 2010). In addition, the Centers for Disease Control and Prevention Public Health Emergency Preparedness cooperative agreement has provided approximately \$9 billion to public health departments since 2002, supporting a broad range of emergency preparedness activities within public health communities (Centers for Disease Control and Prevention 2013). There are a total of 62 cooperative agreements that provide support to all 50 states, four major metropolitan areas, and eight U.S. territories (Centers for Disease Control and Prevention 2013). The Hospital Preparedness Program, managed by the Department of Health and Human Services Assistant Secretary for Preparedness and Response, supports hospitals across the country, building surge capacity, safeguarding infrastructure, and supporting planning and training for large-scale emergencies. In 2012, the Hospital Preparedness Program provided over \$350 million to strengthen hospital preparedness in US states and territories (U.S. Department of Health and Human Services 2012).

In addition to the federal funding supporting public health emergency preparedness and resilience, the last decade has seen a proliferation of laws, regulations, and best practices designed to support national efforts to detect, assess, respond, and recover from events. The first piece of contemporary legislation directly addressing public health emergencies was the Public Health Improvement Act of 2000. After the September 11, 2001 terrorist attacks, however, a string of new legislation was passed in rapid succession, followed by 10 years of new laws, regulations, executive orders, and directives (see Table 17.2).

In addition to these laws, regulations, and strategies, the United States developed a series of national planning documents. These national documents include event-specific planning guidance, such as pandemic flu plans that exist at both the federal and state level. The overarching national preparedness documents, however, are part of the National Response Framework (NRF), which evolved out of a Federal Response Plan, first put in place in 1992. Included in the NRF are annexes that address specific public health events. These include the Biological Incident Annex, which provides policy guidance for responding to intentional biological events. More broadly, Emergency Support Function #8 (ESF8) of the NRF addresses any public health or medical emergency, delineating which agencies are in charge of activities during an emergency. These plans are exercised regularly at all levels of government.

Table 17.2 Select Legislation and Presidential Directives in Support of Public Health Emergency Preparedness and Resilience in the United States

| Year | Legislation | Directive |
|------|---|--|
| 2000 | <i>Public Health Improvement Act of 2000 (Public Law 106-505)</i> | |
| 2001 | <i>USA PATRIOT Act of 2001 (Public Law 107-56).</i> | |
| 2002 | <i>Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Public Law 107-188).</i> | |
| 2004 | <i>The Project Bioshield Act of 2004 (Public Law 108-276)</i> | <i>Biodefense for the 21st Century: National Security Presidential Directive 33/Homeland Security Presidential Directive 10</i> |
| 2005 | <i>Public Readiness and Emergency Preparedness (PREP) Act of 2005 (Division C of the Department of Defense Emergency Supplemental Appropriations; Public Law 109-148)</i> | |
| 2006 | <i>Pandemic and All-Hazards Preparedness Act of 2006 (Public Law 109-417).</i> | |
| 2007 | <i>Implementing Recommendations of the 9/11 Commission Act of 2007 (Public Law 110-53)</i> | <i>Medical Countermeasures Against Weapons of Mass Destruction: Homeland Security Presidential Directive 18</i> <i>Public Health and Medical Preparedness: Homeland Security Presidential Directive 21</i> |
| 2009 | | <i>National Strategy for Countering Biological Threats, Presidential Policy Directive 2</i> <i>Establishing Federal Capability for the Timely Provision of Medical Countermeasures Following a Biological Attack, Executive Order 13527</i> <i>National Health Security Strategy</i> |
| 2011 | | <i>National Preparedness Presidential Policy Directive 8</i> |
| 2012 | | <i>National Biosurveillance Strategy</i> |
| 2013 | <i>Pandemic and All Hazards Preparedness Reauthorization Act of 2013 (Public Law 113-5)</i> | |

Community resilience

National-level plans are essential for public health preparedness; and yet, no matter the breadth, all disasters are local. Therefore, preparedness planning and community resilience are most important at the local level. The Florida Department of Health's (2013) Community Resilience Unit provides an example of the range of activities public health departments must engage in in order to promote public health preparedness and resilience, including programs in readiness, neighborhood emergency preparedness, children's disaster preparedness, disaster behavioral response, and special needs sheltering.

This single example of community resilience programs at the state level demonstrates the wide range of activities public health departments support to promote public health preparedness and resilience. The Public Health Ready Program works with local health departments in the state to assess capacity for detecting and responding to public health emergencies. The Cities Readiness Initiative is a federal program to ensure that localities are prepared to distribute medical countermeasures, should they be needed in an emergency. The Neighborhood Emergency Preparedness Program works with small neighborhood teams to increase preparedness capacity. The Children's Preparedness Program works to ensure the safety and security of children during an emergency. The Vulnerable Populations Program ensures that all disaster planning addresses the needs of the most vulnerable members of society. Disaster Behavioral Health Teams are available to help populations deal with the emotional and physical effects of disasters. Lastly, the Special Needs Sheltering program assists localities with planning and execution of emergency shelters that can provide for special needs populations, including those requiring specific medical assistance (Florida Department of Health 2013).

These programs and others like them throughout the country are designed to provide resources and support so that communities are able to identify and outline their requirements for preparedness, plan accordingly, and work with the population, community leaders, and the private sector to ensure that they can recover as quickly as possible following an emergency. Community resilience programs, as well as local and national preparedness plans, are essential for a nation to be ready to address public health emergencies. As demonstrated in the next section, however, public health emergencies are not always contained within national borders. Our interconnected world makes global cooperation and coordination essential for the protection of populations around the world.

Going global: Public health preparedness at the international level

At the international level, public health emergency preparedness and resilience requires an array of infrastructure, capacity, and plans for approaching an event. Mounting an effective response to an international incident requires a coordinated effort that includes the same core competencies and planning on the national level, with the addition of coordination and cooperation of the incident-case country with its immediate neighbors and the global community, all while dealing with different languages, priorities, and cultures. Preparing for, detecting, responding to, and recovering from public health emergencies are ongoing concerns that must evolve to meet the needs of the international community. Infectious disease epidemics, natural disasters, terrorism, and major events like the nuclear incident in Fukushima, Japan, pose serious challenges to a nation's public health preparedness and response plans and illustrate the diverse and complex forms threats to public health can assume. No country is immune to large-scale public health emergencies. Over the past 12 years, there has been a range of global events. In the United States alone, there have been 11 major natural disasters, one large-scale man-made disaster, three major terrorist events, and five emerging infectious disease events (Lurie et al. 2013). These events, combined with major public health emergencies from around the world during this same time period, provide an indication of what we may expect in the future.

Public health emergency preparedness and response on an international scale includes detection systems, skilled and properly equipped personnel, authorities, methods, and tools to coordinate different governing bodies, which possess varying levels of preparedness, capacity, and resources in a timely manner to prevent additional events. Communication and transparency of information during an emergency enables comprehensive analysis of the event and its possible consequences, allowing for a harmonized approach by affected governments, organizations, and

communities on disease control and other mitigation strategies. National resilience is crucial to reducing disease spread and morbidity and mortality internationally. The faster nations are able to rebound and again reach pre-event conditions, the less burdened the public health system will be. This resilience, however, requires mobilization of people and equipment and an understanding of the needs and challenges of affected populations. Sustainable capacity building relies on the long-term availability and commitment of effective resources. An international response relies on national and subnational capacities; capacities that require sustained commitments, in the form of budget and policy, from international organizations, national leaders, and from within the health sector.

International agreements and networks for international preparedness and response

The international public health emergency preparedness and response system is linked to every nation in the world. Many low- and lower-middle income countries carry heavy infectious disease burdens and are challenged by an ever-changing environment. Despite a new global emphasis on health systems strengthening as an agenda for preparedness to public health emergencies, many initiatives have focused on detecting and responding to a single disease at a time, creating obstacles in many countries to surveillance of and response to high-priority endemic diseases. Countries must therefore consider and prioritize initiatives internally as well as based on donor nation assistance and interests. The requirement for these nations to build capacity, sustain skilled personnel, and maintain a public health system capable of preparing for and responding to public health emergencies is a huge expectation. Therefore, it is of interest to every nation to assist and prepare for public health emergencies and do so with a global approach.

An event, whether it be a disease outbreak, natural disaster, or terrorist attack in one country can spread globally in a matter of days and become a public health event of international concern. These events require local, regional, and global preparedness, alert, and response mechanisms. Most nations, however, face substantial shortfalls in biosurveillance and early warning systems and diagnostic and forensic capacities, as well as law enforcement-public health collaboration. In particular, with an international incident and response there are legal barriers to information sharing, based on proprietary and national security interests. This can lead to possible delayed or under-reporting, inconsistent sampling and transport standards that complicate and/or delay diagnostics, and inconsistent licensing standards among nations that can delay or restrict approvals of capacities in an emergency. Complicated mechanisms for stockpiling and distribution of medical countermeasures lack central command structures that assign responsibilities. However, there are several global frameworks and entities that are at work to address these weaknesses and build capacity around the world.

International Health Regulations (2005)

The International Health Regulations (IHR) are a legally binding international agreement that govern the roles of the World Health Organization (WHO) and all of its Member States in identifying, sharing information on, and responding to any event that may constitute a public health emergency of international concern (PHEIC) that includes events of any origin, whether biological, chemical, radiological, nuclear, or other disasters. IHR (2005) (World Health Organization 2008) contributes to public health preparedness by obligating its Member States to build public health capacity. The eight core capacities identified by the WHO for IHR implementation include national legislation and policy, coordination and National Focal Point communication,

surveillance, response, preparedness, risk communication, human resources and laboratories. Countries must also have capacity to detect and respond to events at Points of Entry, and to be able to address zoonotic events, food safety, chemical safety, and radiation emergencies, all categorized as “other hazards.” These core capacities outline the operational meaning of each state party’s obligation to detect, assess, report and respond to potential public health emergencies (World Health Organization 2011a). IHR (2005) provides a global framework for preparedness in its fifth core capacity, Preparedness.

Preparedness in the IHR (World Health Organization 2008) context includes the development of national, intermediate, and community level public health emergency response plans for relevant biological (including zoonotic and foodborne), chemical, radiological, and nuclear hazards. These plans must consider cross-cutting issues such as human resources, infrastructure, mobilizing relevant resources, transportation, and monitoring and evaluation. The legal authority required to address the PHEIC and to authorize the guidelines in the preparedness plan must also be considered. Table 17.3 outlines the checklist and indicators for meeting the preparedness capacity as provided by the WHO. Indicators in determining whether countries meet core capacity 5 include whether a multihazard national public health emergency preparedness and a response plan are developed and whether primary public health risks and resources are mapped.

Although IHR implementation has faced challenges, there has been success in developing national capacities including the development and implementation of public health emergency plans, the prioritization of these plans as an area of focus among nations, improved communication networks between and among nations, and increased reporting of potential emergencies to the WHO. The IHR framework assumes that Member States will build their core capacities on the foundations of functional health systems. Member States lacking the capacity to develop and/or implement preparedness plans can request assistance through Article 44 of the Regulations. Article 44 encourage states to share technical cooperation and assistance, logistical support, and financial resources through bilateral and multilateral channels in order to develop, strengthen, and maintain public health capacities (World Health Organization 2008).

Global Outbreak Alert and Response Network (GOARN)

The Global Outbreak Alert and Response Network (GOARN) is a network of individuals, laboratories, and organizations that link technical and human resources to rapidly identify, confirm, and respond to disease outbreaks of international concern. GOARN provides an operational framework to alert the international community to the threat of disease outbreaks and supports countries responding to outbreaks. The network specifies standards through its Guiding Principles for International Outbreak Alert and Response and operational protocols to standardize epidemiological, laboratory, clinical management, research, communications, logistics support, security, evacuation, and communications systems. The Guiding Principles focus on improving the delivery of international assistance in support of local efforts by GOARN partners. GOARN has become an essential aspect of global preparedness and response. Since its establishment GOARN and WHO have responded to over 50 global events with over 400 subject matter experts providing field support to 40+ countries. GOARN utilizes technical and operational expertise from scientific institutions in WHO Member States, medical and surveillance initiatives, regional technical and laboratory networks, United Nations organizations, and international humanitarian nongovernmental organizations (World Health Organization n.d.).

Table 17.3 Checklist and Indicators for Monitoring Progress in Meeting Capacity on Preparedness

| Core Capacity 5: Preparedness ¹ | | Development of IHR Core Capacities by Capability Level | | | Additional Achievements | |
|---|---|---|---|---|--|--|
| Component of Core Capacity | Country Level Indicator | Foundational | Inputs and Processes | Outputs and Outcomes | | |
| Public health emergency preparedness and response | Public health emergency preparedness and response | Assessment ² of the ability of existing national structures and resources to meet IHR core capacity requirements (Annex 1A, Paragraph 2) A national plan to meet IHR core capacity requirements has been developed (Annex 1A, Paragraph 2) | National public health emergency response plans ³ developed. National public health emergency response plans in-corporate IHR related hazards and PoE Procedures, plans or strategy in place to reallocate or mobilize resources from national and sub-national levels to support action at community/primary response level | The national public health emergency response plan(s) is tested in actual emergency or simulation exercises and updated as needed Surge capacity ⁴ to respond to public health emergencies of national and international concern is available and tested through an exercise or actual event (e.g., as part of the response plans) | Country experiences and findings on emergency response and in mobilizing surge capacity, are documented and shared with the global community | |
| Risk and resource management for IHR preparedness | Priority public health risks and resources are mapped | A directory of experts in health and other sectors to support a response to the IHR related hazards is available | A national risk assessment ⁵ has been conducted to identify potential “urgent public health events” and the most likely sources of these events National plan ⁷ for management and distribution ⁸ of stockpiles in place | National resources have been mapped ⁶ for IHR relevant hazards and priority risks Stockpiles (critical stock levels) for responding to priority biological, chemical, and radiological events and other emergencies are accessible | The national risk profile and resources are assessed regularly to accommodate emerging threats Contributes to international stockpiles | |

¹Preparedness for development of public health emergency systems including implementation of the IHR.

²i.e., mapping of local infrastructure, PoE, health facilities, major equipment and supplies, staff, funding sources, experts, equipment, laboratories, institutions, NGOs to assist with community-level work, and transport.

³As appropriate for country context (federal vs. central government).

⁴Surge capacity: the ability of the health system to expand beyond normal operations to meet a sudden increased demand. (Health Care at the Crossroads: Strategies for Creating and Sustaining Community-wide Emergency Preparedness Strategies. JCAHO 2003).

⁵The risks are not only due to the source, but also the vulnerabilities and the absence or presence of capacities. This risk assessment should include the mapping of various hazards, disease outbreaks patterns, local disease transmission patterns, contaminated food or water sources, etc., as well as possible hazard sites or facilities which could be the source of a chemical, radiological, nuclear, or biological public health emergency of international concern, vulnerable populations.

⁶i.e., mapping of local infrastructure, PoE, health facilities, major equipment and supplies, staff, funding sources, experts, equipment, laboratories, institutions, NGOs to assist with community-level work, and transport.

⁷Could include management of international resources if needed.

⁸This includes the rotation of stocks in respect to their expiry dates, proper storage conditions for various drugs, logistic requirements, and distribution to pharmacies and hospitals around the country.

Adapted from: Checklist and Indicators for Monitoring Progress in the Development of IHR Core Capacities in States Parties (World Health Organization 2011a).

Global Early Warning System (GLEWS)

The Global Early Warning System (GLEWS) is a joint system that combines and coordinates alert and disease intelligence from the World Organisation for Animal Health (OIE), the United Nations Food and Agriculture Organization (FAO), and WHO to assist in prediction, prevention, and control of threats, including zoonoses, through sharing of information, epidemiological analysis, and joint risk assessment. Information gathered from GLEWS provides a direct feed to OIE, FAO, and WHO, providing each the ability to respond to and cover a wider range of public health emergencies. In addition to the support of WHO, FAO, and OIE, GLEWS is supported by international reference laboratories, national authorities, nongovernmental organizations, laboratory networks, and epidemiology networks. Sharing of information on disease alerts avoids unjustified duplication of efforts and combines the verification processes of OIE, FAO, and WHO, providing rapid, efficient, and coordinated assistance to affected nations (Global Early Warning System n.d.).

Global Health Security Initiative (GHSI)

The Global Health Security Initiative (GHSI) is an international partnership established in 2001 by Ministers/Secretaries of Health of Canada, France, Germany, Italy, Japan, Mexico, the United Kingdom, the United States, and the Health Commissioner of the European Union to address issues of protecting public health and security globally. GHSI calls for concerted global action to strengthen public health preparedness and response to the threat of international biological, chemical, and radio-nuclear terrorism as well as pandemic influenza. The Initiative is not intended to replace or duplicate existing organizations or networks; however, the GHSI works to protect public health and security globally, focusing on many issues related to preparedness and response including supporting WHO, information sharing and cooperation in developing plans, countermeasures, risk communication, regulatory frameworks, and surveillance and laboratory linkages. This informal partnership allows like-minded, resourced nations to align policies and actions related to public health preparedness and response on an international scale (Global Health Security Initiative n.d.). At the time this chapter went into print the U.S., in partnership with other national governments and international organizations launched the Global Health Security Agenda to promote progress on preventing epidemics, detecting biological threats, and rapidly responding to disease outbreaks, whether they be natural, intentional or accidental.

U.S. government engagement in global public health emergency preparedness and response

To stop disease that spreads across borders, we must strengthen our systems of public health. We will continue the fight against HIV/AIDS, tuberculosis and malaria. We will focus on the health of mothers and children. And we must come together to prevent, detect, and fight every kind of biological danger – whether it is a pandemic like H1N1, a terrorist threat, or a treatable disease. This week, America signed an agreement with the World Health Organization to affirm our commitment to meet this challenge. Today, I urge all nations to join us in meeting the WHO’s goal of making sure all nations have core capacities to address public health emergencies in place by 2012. That is what our commitment to the health of our people demands.

– President Obama’s Address to the United Nations General Assembly, September 22, 2011 (The White House Office of the Press Secretary 2011)

The United States has many strategies outlined for engaging in public health emergency preparedness and response. As the largest financial contributor to global health assistance, many U.S. government agencies include international policies and regulations, like IHR (2005), in developing their preparedness and response plans for public health emergencies. Fifteen federal agencies, plus the American Red Cross, are identified within the National Planning Frameworks (NPF) as involved in public health emergency preparedness. Of these 15 federal agencies, over half (8) are involved with supporting international engagements. These agencies include the Departments of Agriculture, Defense, Energy, Homeland Security/Federal Emergency Management Agency, State, Health and Human Services, USAID, and the Environmental Protection Agency.

However, proper preparedness and resilience plans are constantly evolving strategies that must be assessed and adapted to meet the array of public health emergency threats that may impact both domestic and international communities. The United States has evolved its policies and plans to address public health preparedness and emergency response through regulatory frameworks and multisectoral approaches with a focus on building capacity, collaboration, and outreach.

Lessons in public health emergency preparedness and resilience

Lessons learned: pH1N1 – first declared PHEIC by WHO Director-General under IHR (2005)

The 2009 H1N1 influenza A virus pandemic (pH1N1) was the first PHEIC declared by the WHO Director-General under the revised IHR (2005). In March, Mexican health officials detected a large number of influenza-like illness cases. On April 11, Mexican authorities began discussions with officials from the Pan American Health Organization (PAHO – the regional office of WHO). On April 18, the US National Focal Point (NFP) notified PAHO that southern California confirmed two cases of novel influenza, followed shortly by Mexico formally notifying PAHO of a potential PHEIC. In response, the WHO Director-General convened the IHR Emergency Committee, and declared pH1N1 a PHEIC on April 25, setting in motion WHO's pandemic influenza plan and issuing temporary recommendations under the IHR (2005) (Fischer & Katz 2010; Katz 2009). Mexico and the United States' quick response and reporting of the pH1N1 to WHO acted as an early warning allowing other countries to implement their pandemic plans and prepare for the potential spread within their borders. A majority of reports indicate that the overall response under the IHR (2005) was efficient, particularly when compared to the response to the SARS outbreak of 2002 (World Health Organization 2011b).

The 2009 pH1N1 highlights the importance of preparedness and local capacity, both in response and risk communication. Fortunately, both Mexico and the United States had these systems in place to act relatively quickly. However, as with any public health emergency there are lessons learned. The major problems identified include delays in disease confirmation from laboratory testing in Mexico and the recommendation by many countries against travel to North America, even quarantining North American citizens regardless of exposure, as well as banning pork imports from North America, even with reports that contracting pH1N1 was not associated with eating properly cooked pork (Katz 2009). WHO's Report of the Review Committee on the Functioning of the International Health Regulations (2005) and on Pandemic Influenza A (H1N1) 2009 noted that even with success in this first PHEIC, "the core national and local capacities called for in the IHR are not yet fully operational and are not now on a path to timely implementation worldwide" (World Health Organization 2011b). Had the pH1N1 initiated in a region less prepared and capable, or if the virus itself had been more lethal, the impact not only

to the region of origin but to the global community could have been great. It will be critical moving forward to implement mechanisms so WHO Member States will be capable of detecting and responding to public health emergencies quickly.

Preparing for the unknown: Challenges to implementing public health emergency preparedness and resilience plans at the national and international levels

As previously mentioned in this chapter, public health emergencies require proper planning in order to minimize morbidity and mortality and to enhance community resilience. The role of globalization in the rapid dissemination of infectious disease and access to susceptible populations is indisputable. It is impossible to predict the exact nature of the next public health emergency, where it will emerge, and what its magnitude will be. Early detection, rapid public health response, and all-hazards coordination are more important now than ever. That is why it is essential that preparedness plans focus on establishing strong basic capacities that can adapt, regardless of the public health emergency. These plans must span from local to global communities, affording the best possible public health emergency preparation and enhancing the ability to respond and recover.

Progress has been achieved in both national and international preparedness and response planning in the last decade. However, more remains to be done, particularly improving linkages between domestic and global health systems and the response time in resourced countries and international organizations assisting low to middle-resourced countries. It is imperative that we expand upon lessons learned, sharing information among international networks and organizations to prevent a public health emergency in one region of the world from spreading globally in a matter of days. As we enter an era of budget cutting and global austerity, we are at risk of losing ground. Progress can be stalled if local, national, and international authorities do not invest in preparedness planning and assessment for emerging threats to public health. It will take a concerted effort and participation of all community sectors, and it will require strong political leadership.

Similar challenges exist at both the national and international levels for planning and preparedness. National preparedness plans require a trained and skilled workforce capable of development and implementation if and when that plan is necessary. This workforce includes skilled epidemiologists trained in both human and veterinary health as well as laboratory technicians capable of rapidly diagnosing cases the epidemiologist or clinical teams report. Without laboratory capacity, biosurveillance is unsuccessful. Challenges to sustaining this workforce include budgetary constraints for state and local health systems and loss of highly skilled personnel to private companies and nongovernmental organizations. As limited as the public health sectors are in many nations, the veterinary services are even worse off, leading to delays in disease detection, reporting, and risk communication in cases of zoonotic diseases. For example, only after the human cases of H7N9 were confirmed did the Ministry of Agriculture of the People's Republic of China expand and enhance surveillance in live bird markets, poultry farms, swine farms, and slaughterhouses for H7N9 surveillance. The first human cases presented in February 2013 and were confirmed as H7N9 in March, and the first avian isolates were characterized in April (World Health Organization 2013). A recent study concluded that H7N9 viruses had circulated in the animal reservoir in Asia for several months prior to their detection in humans and animals (Jonges et al. 2013). As approximately 75% of all emerging diseases are zoonotic, the need for an integrated animal/human health system is ever more important.

A major challenge for both high and low-resourced countries is the lack of available funding to support and sustain preparedness activities. Within the current fiscal environment it is difficult to justify and prioritize funding preparedness activities – including preparedness plans for natural

disasters or nonendemic diseases – to a state or national budget committee. However, lack of preparation may have grave consequences. Preparedness and resilience plans must be regularly tested to assess and adapt to ever-evolving threats. In order for public health systems to advance and improve on preparedness and resilience plans there must be objectives, goals, and measurable targets. Metrics are imperative to demonstrate the value of a state and/or federal government's past, present, and future investment. Major challenges include determining what and how to measure. What constitutes a successful investment? How do you calculate return on investment? How do you measure success if being prepared means that you may not have as many public health emergencies to respond to or that you do not have to request assistance outside of your local community or country because you have effective rapid response teams? How do you measure something you were able to prevent or contain? In these instances success lies in not having to activate response and resilience plans. This type of success is very hard to quantify in budget negotiations at the regional, national and international level. Yet, public health professionals need to be ready to make a business case for preparedness and reliance planning and be able to deftly describe the costs and benefits, both in monetary figures and in lives saved.

Public health emergencies impact many entities; political will and support outside the health and veterinary sectors including agriculture, tourism, trade, finance, law enforcement, and defense is critical. As we have seen over the last decade, every nation is susceptible to multiple events capable of leading to public health emergencies. We have also seen that some of the most low-resourced nations have the most resilient populations. Not every country will have the resources available to develop, test, and refine all-hazards preparedness plans that engage multiple sectors, yet all nations must act. The scope of planning and exercising can vary, but it is necessary for every country and community to develop basic planning documents and outreach. At the end of the day, every citizen has a responsibility to be prepared. It is only then that lives will be saved, economic burdens decreased, and life returned to normal following public health emergencies.

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