



HHS Public Access

Author manuscript

Health Secur. Author manuscript; available in PMC 2021 May 20.

Published in final edited form as:

Health Secur. 2020 ; 18(2): 75–82. doi:10.1089/hs.2019.0090.

Applying the Ready, Willing, and Able Framework to Assess Agency Public Health Emergency Preparedness: The CDC Perspective

Shawn C. Chiang, Holly H. Fisher, Matthew E. Bridwell, Silvia M. Trigoso, Bobby B. Rasulnia, Sachiko A. Kuwabara

Shawn C. Chiang, MPH, is a Predoctoral Research Fellow, Department of Community Health and Prevention, Dornsife School of Public Health, Drexel University, Philadelphia, PA. At the time this work was conducted, he was an Evaluation Fellow, Division of Emergency Operations, Center for Preparedness and Response, Centers for Disease Control and Prevention (CDC), Atlanta, GA. Holly H. Fisher, PhD, is Evaluation Lead, Risk Management and Operational Integrity; Silvia M. Trigoso, MPH, is a Program Manager, Incident Manager Training and Development Program; Bobby B. Rasulnia, PhD, is Deputy Director, Risk Management and Operational Integrity; and Sachiko A. Kuwabara, PhD, is Director, Risk Management and Operational Integrity; all in the Division of Emergency Operations, Center for Preparedness and Response, CDC, Atlanta, GA. Matthew E. Bridwell, MPH, is Deputy Branch Chief, Division of Global HIV and TB, Center for Global Health, CDC, Atlanta, GA.

Abstract

Public health emergencies in the United States have been complex, frequent, and increasingly costly in the past decade, at times overwhelming government agencies that are primarily resourced for routine, nonemergency health functions. Emergencies are not always predictable, and adequate resources are not always available to prepare staff in advance for emergency response roles and to mobilize them quickly when a new threat emerges. Additionally, real-world data that connect preparedness levels to response outcomes may be difficult to obtain, further limiting continuous quality improvement efforts by public health officials. In this article, we apply the Ready, Willing, and Able (RWA) framework to identify areas for improvement related to organizational and staff readiness, willingness, and ability to respond during a public health emergency. We share emergency response deployment, training, and personnel data collected as part of emergency response activations (2008 to 2018) at the Centers for Disease Control and Prevention to illustrate how the framework may be applied at government agencies to improve response processes and effectiveness. Additionally, we propose potential metrics aligned with the framework constructs that may help emergency managers consistently assess agency preparedness and, over time, be incorporated into broader standardized measurement methods. We conclude that the RWA framework is a practical tool that can complement other preparedness approaches currently in use at government public health agencies.

Address correspondence to: Shawn C. Chiang, Department of Community Health and Prevention, Dornsife School of Public Health, Drexel University, Philadelphia, PA, scc339@drexel.edu.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Keywords

Emergency preparedness; Emergency management; First responders; Disasters

Public health emergency preparedness, and what constitutes “ideal” preparedness and the factors that affect it, has been a topic of great interest in the scientific literature. In the past 10 years, scientific articles have largely focused on what it means to be prepared,^{1–3} how to measure preparedness,⁴ and specific factors that can affect preparedness, such as staff training levels^{5–7} and risk communications.^{8,9} Preparedness can be defined as the extent to which agencies, communities, and individuals are capable of preventing, responding to, mitigating, and recovering from public health emergencies and disasters.^{10,11} The extent to which a public health agency can allocate financial resources quickly, identify and deploy trained staff, and implement response operations and communications with the appropriate physical and technology infrastructure all have an impact on preparedness. Major factors can limit the ability to effectively measure preparedness, such as the complexity and unpredictability of public health emergencies, which may require implementation of multiple interventions across multiple jurisdictions over an extended period of time. Large-scale disasters and infectious disease outbreaks in recent years¹² continue to underscore the importance of public health agencies having a robust emergency response infrastructure, including a competent and prepared workforce available to serve in critical response roles.

Thousands of staff from public health agencies such as the Centers for Disease Control and Prevention (CDC) have served in scientific, operational, and leadership roles in a variety of emergency events in recent years, such as H1N1 influenza (2009), Ebola virus (2014–2016), and Zika virus (2016–2017). During an emergency event, response leaders need to ensure staff with specific skill sets are matched to the right jobs and have the training and resources necessary to conduct the work while protecting their own health, safety, and general well-being. Response staff may conduct a wide range of public health activities, such as implementing disease prevention and control strategies during an infectious disease outbreak and disseminating messages about food safety and mold exposure to the public, clinicians, and healthcare workers after a hurricane or other natural disaster. A straightforward framework that helps focus and improve preparedness efforts may complement other assessment tools that are already in use at CDC as well as other public health agencies.

McCabe and colleagues proposed the Ready, Willing, and Able (RWA) framework as a simple model to conceptualize preparedness across a range of entities in the public health emergency preparedness system (eg, government agencies, media, public safety, healthcare delivery systems, and communities).¹³ The authors posit that such a framework should be comprehensive across all aspects of preparedness, allow scientific testing and inquiry such that the model can be tested and validated, and ultimately lead to standards that are useful for continuous quality improvement. As described in the article, the 3 constructs are applicable to all aspects of the public health emergency preparedness system in the United States (eg, government public health infrastructure, homeland security, public safety, healthcare delivery systems).¹³ They argue that while the 3 different components of the framework are equally important to preparedness, when combined, the presence of these

factors increases the likelihood of successful response operations and long-term improvement in planning and evaluation activities.¹³ While several studies provide empirical evidence that responder willingness is an important component of preparedness,^{14–16} we did not find any publications that provide evidence for the readiness and ability components of the model. It is therefore critical for public health agencies to have a better understanding of these constructs and how they can be used to evaluate various preparedness and response activities.

In this article, we aim to (1) explore the feasibility of applying the RWA framework to assess emergency preparedness and response at a government public health agency (using CDC as a use case), and (2) identify potential metrics that may guide application of the model at public health agencies. Using data from past CDC response operations to illustrate, we considered the extent to which the framework applies to the following elements: (1) readiness of the agency and staff to respond to public health emergencies; (2) agency and staff willingness to engage or participate in response work; and (3) ability of staff to serve in emergency response roles and ability of the agency to inventory and monitor this type of information. We provide examples from various emergency responses and activations supported by CDC from 2008 to 2018, using internal deployment and administrative data sources.

Throughout this article, we aim to apply the constructs from the RWA framework at 2 levels: individual (referring to response staff skills, expertise, competencies, experience, and willingness) and organizational (referring to information systems, infrastructure, policies, and partnerships).

Readiness

In the RWA framework, readiness is defined as having “staff, structure, and stuff” available to respond quickly to public health emergencies, such as infectious disease outbreaks, natural disasters, and man-made disasters (eg, oil spills).¹³ When a major public health emergency occurs, response leaders identify and assemble staff across their agency who have necessary emergency management and scientific expertise for the specific response (which may include staff who normally work in nonemergency roles). Staff with emergency management expertise may be recruited to perform nonscientific functions (eg, general operations, travel, deployment logistics), while epidemiologists, health communications specialists, and laboratorians may fill scientific roles. Collectively, these staff provide the foundation for the incident management system (IMS), an emergency management structure with predefined teams, functions, and protocols.¹⁷ For the purposes of this RWA framework implementation, we define agency readiness as having organization or system-level capacity to respond to emergencies, including having knowledgeable and trained personnel in place and necessary infrastructure and resources to support.

One way to assess agency readiness is to determine how quickly response leaders can identify and deploy staff who have the appropriate skillset and experience. Prior to 2014, CDC typically deployed teams of 4 to 10 staff at a time to respond to infectious disease outbreaks. However, the urgency of the 2014 Ebola epidemic required not only more rapid

deployment of staff to Africa, but also large-scale deployments.¹⁸ The World Health Organization declared the outbreak a public health emergency of international concern (PHEIC) in August 2014, and by September, approximately 100 CDC staff were working in West Africa. The number of CDC deployed staff doubled by January 2015.

To increase staffing surge capacity during the 2014 Ebola response; minimize constant rotation of staff with varying skill sets; and decrease time needed to identify, recruit, and deploy staff, CDC created the Global Rapid Response Team.¹⁹ This new team established a pool of on-call, trained, and pre-vetted staff who were ready to deploy for extended periods of time and who met all requirements necessary to deploy to international settings. An agency-wide roster of pre-identified surge staff may facilitate the rapid mobilization of qualified responders who have wide-ranging experience and expertise and are available to assist and reduce time needed to identify, prepare, and deploy them. Determining the specific number of staff needed to effectively support a response (and for how long) may not be straightforward, depending on the nature of the emergency, the role of the agency (and other response partners), and the like. If response leaders systematically collect staffing and deployment data for each event, that type of information could help them better project the level and type of staffing needed when a new event occurs.

Having an established infrastructure and operational capacity to conduct emergency response activities is critical to maintaining agency readiness.^{1,20,21} CDC established its Emergency Operations Center in 2003 in response to the events of 9/11 and the anthrax attacks.²² An emergency operations center is an important component of preparedness for public health agencies and can serve as a dedicated location to conduct response functions 24 hours a day, 7 days a week. An emergency operations center also serves as a communication hub, allowing staff to monitor and coordinate activities at different geographic locations and share information with federal agencies, health departments, international health agencies, clinicians, and the public. Electronic tools and data systems that facilitate sharing of hazard-related information across partners and stakeholders are critical to an effective response.

Another type of structural support that health departments and federal agencies such as CDC implement during an emergency is the incident management system structure.¹⁷ This system is based on the Department of Homeland Security's National Incident Management System (NIMS),²³ and many public health agencies, including CDC, have adapted the structure to coordinate activities during public health emergencies.²⁴ CDC has activated its incident management system more than 20 times during the past decade to coordinate response activities and facilitate the mobilization of staff and resources quickly for various emergencies.¹²

Because of the length and complexity of the 2014 Ebola and 2016 Zika responses, more staff were needed to fill incident management system roles than in any prior responses. For example, during the 2014 Ebola response, 23 CDC staff rotated through the incident management system logistics section, a team typically staffed by 2 or 3 people at the start of an event.¹⁸ In addition, during both the 2014 Ebola and 2016 Zika responses, CDC staff were deployed on average for longer periods of time compared to past events because of the

severity of the emergency and the level of effort needed to control the outbreak (average annual deployment length was 15.6 days for 2008–2013 and 25.1 days for 2014–2016). Having an emergency management system in place that allows rapid scale-up of important response functions, with predefined staff roles, is an important element of preparedness.

Table 1 describes potential metrics that may be useful for evaluating the extent to which public health agencies are ready to respond, considering readiness of the organization and of response staff to provide necessary support for effective response operations.

Willingness

According to the RWA framework, willingness to respond during an emergency refers to the state of being inclined or favorably predisposed (individually or collectively as an organization) to take action and provide assistance during an emergency.¹³ At the organizational level, pre-established mutual aid and data use and data-sharing agreements across partners are critical to ensure resources and information can effectively flow across agencies and jurisdictional boundaries. In some cases, there are legal authorities that guide development of international and interstate mutual aid agreements; however, there are circumstances in which such agreements are not legally required but are still critical to response success.²⁵ The establishment of such agreements reflect an agency's willingness to assist other entities during an emergency.

If a large number of staff are unwilling to assist during an emergency event, critical health interventions could be delayed and incident management system functions may not be fully or successfully implemented, which would have a serious impact on populations affected by the disaster or health emergency.^{26–29} CDC was originally created with a primary mission to control malaria and other communicable diseases,³⁰ but it has expanded its scope over the years to address a large variety of public health issues that affect the general population.

The ongoing need to manage public health emergencies, while continuing to support important nonemergency public health functions, has required the development of a volunteer-based system to recruit and staff response roles. At CDC, staff can volunteer for response work by specifying their preferences for working in domestic or international settings and self-report their skills and past training in an internal administrative database. As of July 2018, among 7,396 full-time employees who volunteered to conduct response work, 5,365 (73%) were willing to serve in the emergency operations center, and 4,779 (65%) were willing to deploy domestically or internationally. Although these data are not event-specific (and willingness may vary significantly depending on type of emergency, location, etc), they suggest a large majority of CDC staff are willing to support emergency response work. Emergency operations center staff use these data throughout a response to identify and recruit willing responders with desired skill sets and background. Data collections that assess responder experiences during a current, ongoing event could be an opportunity to assess general willingness to support future emergencies.

For example, during the 2017 response when 3 major hurricanes made landfall in the United States, 93% of CDC field responders who completed a post-deployment survey indicated

they would be willing to deploy again in the future. Given the devastating consequences of those storms and the austere conditions in the field, it is meaningful that these responders remained willing to assist again should the need arise. Post-deployment surveys also provide a mechanism to probe on a variety of practical issues that could affect willingness to assist during an emergency (eg, satisfaction with deployment services).

Understanding a variety of individual, organizational, and scenario-specific factors that could influence a person's decision to volunteer can further guide how an agency approaches staff to serve in a response. Factors such as concern for family and loved ones,^{31,32} inherent sense of responsibility,^{33,34} and the nature of the emergency event^{34–36} may influence responder willingness and are important to consider during recruitment.

Furthermore, research has found willingness to respond to be consistent with risk perception theory.^{37–39} That is, a responder's perception of risks associated with this kind of public health work (eg, severity of the threat) and the expectations about the role a staff member will play (eg, self-efficacy to respond) may significantly influence staff's willingness to get involved. A varying level of willingness to respond to different types of events has been demonstrated among health department workers, medical providers, and other first responders,^{36,40} underscoring the importance of scenario-based understanding of willingness to overall preparedness in the all-hazards spectrum. Post-event debriefs are useful forums to learn about various risk and protective factors that may have affected how responders felt about their health, safety, and well-being during the event (eg, helping response leaders identify areas where additional responder support is needed).

Potential metrics that can help agencies assess organizational and staff willingness at different time intervals (through data collected during or after a specific event, or through routine assessments across different event types) are shown in Table 1.

Ability

In the RWA framework, ability refers to actual operational power (ie, skill, expertise, know-how) of an individual, organization, or community to implement emergency response-related activities.¹⁰ Having trained and skilled responders is essential to a high-quality response and plays a major role in whether the incident management system functions (and related activities) are effective.⁴¹ After the passage of the Pandemic and All-Hazards Preparedness Act in 2006,⁴² the Association of Schools and Programs of Public Health (ASPPH), with support from CDC, developed the Public Health Preparedness and Response Core Competency Model.⁴³ The model identifies public health responder roles and competencies associated with prevention, preparedness, response, and recovery and stipulates that the responder's ability to perform proficiently during a response is grounded in (1) foundational public health competencies, (2) generic health security or emergency core competencies, and (3) position-specific or professional competencies. There have been other attempts in the literature to describe desirable characteristics and/or important core competencies of public health emergency responders, such as having completed NIMS training,^{5,41} past experience working in a specific response,⁴¹ and event-specific expertise.⁴¹

Having a system in place to routinely assess staff core competencies, skills, and expertise relevant to different emergencies may help public health agencies identify staff training needs and anticipate skills and experience needed for future events. Routine assessments can help identify gaps in competencies and skills and guide the development and implementation of training to build capacity. CDC has a training curriculum centered on preparedness and response, covering a variety of topics, such as general incident management, response leadership, responder safety and health issues during deployment, and working in international field settings. The number of annual response-related training sessions completed by CDC staff has risen steadily over the years from 1,945 training sessions in 2008 to 5,588 in 2017 (a 187% increase).⁴⁴ A recent analysis of past CDC responses^{7,45,46} revealed an urgent need for role-specific training focused on the role of the CDC incident manager. As a result, in 2015 CDC's Incident Management Training and Development Program (IMTDP) was created, which delivers an accredited, competency-based curriculum comprised of modules, assignments, and leadership assessments that connects strategic leadership concepts with the technical aspects of leading a CDC incident management system activation.

The number and percentage of staff who complete IMTDP and serve in leadership positions in a response is expected to increase over time. As of October 2018, 58 CDC response leaders have graduated from the program. Graduates are improving CDC's ability to respond to different types of events simultaneously (ie, if there are concurrent emergency response events that require more than 1 trained incident manager). Of those who have graduated from the program, 20% were recruited for and served in 4 CDC incident management system activations, and 25% in 3 preparedness exercises. Following up with program alumni on a regular basis (eg, annually) to learn how they have applied skills and knowledge in real-world preparedness and response contexts will help IMTDP staff improve their training curriculum and better meet the needs of CDC response leadership.

The ability of staff to serve effectively in a response role is likely affected by their past response experiences—for example, if they have experience working long hours in an emergency operations center as a new emergency is unfolding or working near a disaster site with local and federal health officials to mitigate the effects of an environmental hazard. Tracking how many first-time responders at the agency participate in emergencies over time can help leaders anticipate when additional time and resources might be needed to prepare and train staff who are new to response operations. There has been a decreasing trend in the percentage of first-time CDC responders supporting emergencies at the agency in recent years—59% (994/1,687) of 2014 Ebola responders (2014–2016) had no previous response experience, while 50% (360/726) of 2016 Zika responders (2016–2017) and 26% (78/302) of the 2017 hurricane responders had no previous experience.

Likewise, there has been a corresponding increase in recent years in the percentage of CDC responders who are able to deploy immediately because they already have met basic training requirements for deployment. When the 2014 Ebola response began, only 23% (389/1,687) of CDC staff who would later deploy to West Africa had completed the necessary predeployment training requirements (indicating extra time was needed to train those staff before they could deploy). However, at the start date of the 2017 hurricane response, more

than 60% (182/302) of CDC responders already had completed that training (with little effort required to deploy them). The more staff who have previous response experience and who have completed required training in advance, the less effort may be required to prep and train responders when a new emergency occurs—and the faster resources can be mobilized and response operations scaled up. Table 1 provides example metrics that may be used to assess the ability of staff to respond, including organizational metrics that emergency managers may find helpful for tracking staff abilities over time.

Conclusions

In this article, we aimed to apply the RWA framework to emergency preparedness and response at a government public health agency and identify relevant metrics that may operationalize elements of the framework (using CDC as a use case). The RWA framework shows promise for helping emergency managers and response leaders at government public health agencies to assess organizational and individual preparedness. Further, the framework may be valuable for assessing the current state of preparedness at an agency (at any point in time) as well as trends over time across different response events supported by the agency. Incorporation of standardized measures and methods into public health response operations can further improve preparedness and may lead to establishment of benchmarks and improvement of quality processes to facilitate decision making.

Despite the utility of the framework, there are a few areas of preparedness that may be difficult to assess, regardless of assessment method. First, there is no formula that dictates the appropriate level of “staff, structure, and stuff” that must be in place to ensure a high level of readiness. There is general consensus among emergency response staff that every emergency is different, which makes it difficult to know when an optimal amount of readiness has been achieved. However, having a methodological approach to analyze past response activities and identify areas for future improvement is important for continuous quality improvement. To that end, in 2017, CDC initiated the Excellence in Response Operations Initiative to develop prevention and mitigation strategies to address various response-related risks that have been identified in past events (ie, risks that could have a negative impact on mission success if left unchecked). CDC subject matter experts in science, public health, and emergency management collaborate routinely to identify response-related risks and develop and implement mitigation strategies.

Second, it is challenging to anticipate the range of skills and competencies that would be important for a variety of different public health threats and also have the resources to train staff in all areas in advance. Beyond foundational public health emergency response principles, role-specific training and experiential opportunities to reinforce concepts and practice are also critical.⁷ In the early phase of a new emergency, when it may be more clear which skills and competencies are important, there may be limited time and/or resources to get responders prepared, trained, and deployed to affected areas. Threat and risk assessments may help response leaders focus their preparedness efforts and guide the development of training programs that align with these priorities.⁴⁷ In addition, training all potential responders on core response-related competencies; building data systems that routinely

capture staff training, skills, and competencies; and strategic rostering will help increase staff's ability (and the agency's ability) to respond.

Although we considered each component of the RWA framework separately, it is important to recognize the interrelatedness of the components and their collective influence on emergency preparedness. For example, in gauging agency preparedness at any point, it would be shortsighted to limit the assessment to current training and experience levels of staff (ability) without considering whether staff members are available, given current duties, and interested in conducting this type of work (willingness). Further, high levels of staff ability and willingness to support response work are not enough for mission support—an agency like CDC needs an effective system to deploy staff and resources and sufficient infrastructure to support operations at headquarters and in the field (readiness). Additionally, it is important to consider the underlying factors that influence readiness, willingness, and ability, such as types and frequency of response-related training offered, work- and family-related support available to responders, and resource allocation to operate an emergency operations center. Future studies should examine the interrelatedness of this framework, its impact on preparedness, and how it can be better operationalized for different public health organizations.

To our knowledge, this is the first time that the RWA framework has been applied at a federal public health agency. CDC may be unique among government public health agencies, given its large budget, organizational structure, and ability to utilize public health professionals with emergency deployment requirements. However, individual and organizational readiness, willingness to respond, and ability are important aspects of preparedness at any agency with a role in emergency response.

CDC funds 62 state, city, and territorial health departments to build and sustain preparedness and response capabilities such as emergency operations coordination and surveillance and epidemiologic investigation.⁴⁸ Advancing such capabilities requires a strong but flexible emergency management system; a motivated, skilled, and trained workforce; and mechanisms to quickly mobilize personnel (emergency and nonemergency) and resources. The RWA framework may help response leaders in these jurisdictions regularly assess and refine their capabilities, improving their effectiveness to respond to public health threats and meet federal government standards. The value of the RWA framework lies in the ability to apply the RWA constructs broadly—across a variety of public health agencies, response contexts, and incidents—ultimately bringing greater standardization and consistency to evaluation of emergency response efforts at different levels of government.

Overall, the RWA framework is notable for its conceptual simplicity and broad applicability, and with the appropriate data sources, it allows a straightforward evaluation of different aspects of preparedness at a public health agency. The framework is strengthened, however, by incorporating metrics that allow measurement of each component at different points in time in the context of specific response events (or more broadly through analysis of trends across different events). Metrics such as these may be tested empirically by local, state, tribal, territorial, and federal public health agencies, revising as needed, to produce standardized indicators that have value at different levels of government. As the authors of

the RWA framework have noted, future efforts should identify specific preparedness standards and benchmarks and continue the discussion across sectors to reach consensus on how to operationalize each component of the RWA framework.

References

1. Rose DA, Murthy S, Brooks J, Bryant J. The evolution of public health emergency management as a field of practice. *Am J Public Health* 2017;107(S2):S126–S133. [PubMed: 28892444]
2. Savoia E, Lin L, Bernard D, Klein N, James LP, Guicciardi S. Public health system research in public health emergency preparedness in the United States (2009–2015): actionable knowledge base. *Am J Public Health* 2017;107(S2):e1–e6.
3. Moore M The global dimensions of public health preparedness and implications for US action. *Am J Public Health* 2012;102(6):e1–e7.
4. Potter MA, Houck OC, Miner K, Shoaf K. Data for preparedness metrics: legal, economic, and operational. *J Public Health Manag Pract* 2013;19(Suppl 2):S22–S27. [PubMed: 23903389]
5. Kohn S, Barnett DJ, Galastri C, Semon NL, Links JM. Public health-specific National Incident Management System trainings: building a system for preparedness. *Public Health Rep* 2010;125(Suppl 5):43–50.
6. Potter MA, Miner KR, Barnett DJ, et al. The evidence base for effectiveness of preparedness training: a retrospective analysis. *Public Health Rep* 2010;125(Suppl 5):15–23.
7. O’Meara MG, Sobelson RK, Trigos SM, et al. Ensuring a competent public health responder workforce: the CDC experience. *J Emerg Manag* 2019;17(3):199–209. [PubMed: 31245830]
8. Savoia E, Lin L, Viswanath K. Communications in public health emergency preparedness: a systematic review of the literature. *Biosecur Bioterror* 2013;11(3):170–184. [PubMed: 24041193]
9. Khan Y, Sanford S, Sider D, et al. Effective communication of public health guidance to emergency department clinicians in the setting of emerging incidents: a qualitative study and framework. *BMC Health Serv Res* 2017;17(1):312. [PubMed: 28454548]
10. Stoto M Measuring and assessing public health emergency preparedness. *J Public Health Manag Pract* 2013;19(Suppl 2):S16–S21. [PubMed: 23903388]
11. Nelson C, Lurie N, Wasserman J, Zakowski S. Conceptualizing and defining public health emergency preparedness. *Am J Public Health* 2007;97(Suppl 1):S9–S11. [PubMed: 17413078]
12. Centers for Disease Control and Prevention. CDC emergency operations center activations. Reviewed 1 13, 2020. <https://emergency.cdc.gov/recentincidents/index.asp>. Accessed March 12, 2020.
13. McCabe OL, Barnett DJ, Taylor HG, Links JM. Ready, willing, and able: a framework for improving the public health emergency preparedness system. *Disaster Med Public Health Prep* 2010;4(2):161–168. [PubMed: 20526139]
14. Barnett DJ, Thompson CB, Errett NA, et al. Determinants of emergency response willingness in the local public health workforce by jurisdictional and scenario patterns: a cross-sectional survey. *BMC Public Health* 2012;12(1):164. [PubMed: 22397547]
15. Rutkow L, Vernick JS, Thompson CB, Pirralo RG, Barnett DJ. Emergency preparedness law and willingness to respond in the EMS workforce. *Prehosp Disaster Med* 2014;29(4): 358–363. [PubMed: 25046354]
16. Taylor HA, Rutkow L, Barnett DJ. Willingness of the local health department workforce to respond to infectious disease events: empirical, ethical, and legal considerations. *Biosecur Bioterror* 2014;12(4):178–185. [PubMed: 24963648]
17. Papagiomas SS, Frank M, Bruce S, Posid JM. From SARS to 2009 H1N1 influenza: the evolution of a public health incident management system at CDC. *Public Health Rep* 2012; 127(3):267–274. [PubMed: 22547857]
18. Rouse EN, Zarecki SM, Flowers D, et al. Safe and effective deployment of personnel to support the Ebola response— West Africa. *MMWR Suppl* 2016;65(3):90–97. [PubMed: 27387289]
19. Stehling-Ariza T, Lefevre A, Calles D, et al. Establishment of CDC global rapid response team to ensure global health security. *Emerg Infect Dis* 2017;23(Suppl 1):S203.

20. Posid JM, Bruce SM, Guarnizo JT, O'Connor RC Jr, Papagiotas SS, Taylor ML. Public health emergencies and responses: what are they, how long do they last, and how many staff does your agency need? *Biosecur Bioterror* 2013; 11(4):271–279. [PubMed: 24219494]
21. Redd SC, Frieden TR. CDC's evolving approach to emergency response. *Health Secur* 2017;15(1):41–52. [PubMed: 28146366]
22. Leidel L, Groseclose SL, Burney B, Navin P. CDC's emergency management program activities—worldwide, 2003–2012. *MMWR Morb Mortal Wkly Rep* 2013;62(35):709. [PubMed: 24005225]
23. Federal Emergency Management Agency. NIMS doctrine supporting guides & tools. Updated 2 18, 2020. <https://www.fema.gov/nims-doctrine-supporting-guides-tools>. Accessed March 12, 2020.
24. Centers for Disease Control and Prevention. CDC emergency operations center. Reviewed 4 10, 2019. <https://www.cdc.gov/cpr/eoc.htm>. Accessed March 12, 2020.
25. Stier DD, Goodman RA. Mutual aid agreements: essential legal tools for public health preparedness and response. *Am J Public Health* 2007;97(Suppl 1):S62–S68. [PubMed: 17413085]
26. Balicer RD, Reznikovich S, Berman E, et al. Multifocal avian influenza (H5N1) outbreak. *Emerg Infect Dis* 2007;13(10):1601. [PubMed: 18258019]
27. Irvin CB, Cindrich L, Patterson W, Southall A. Survey of hospital healthcare personnel response during a potential avian influenza pandemic: will they come to work? *Prehosp Disaster Med* 2008;23(4):328–335. [PubMed: 18935947]
28. Tippett VC, Watt K, Raven SG, et al. Anticipated behaviors of emergency prehospital medical care providers during an influenza pandemic. *Prehosp Disaster Med* 2010;25(1):20–25. [PubMed: 20405456]
29. Barnett DJ, Balicer RD, Thompson CB, et al. Assessment of local public health workers' willingness to respond to pandemic influenza through application of the extended parallel process model. *PLoS One* 2009;4(7):e6365. [PubMed: 19629188]
30. Centers for Disease Control and Prevention. Our History – Our Story. Reviewed 12 4, 2018. <https://www.cdc.gov/about/history/index.html>. Accessed March 12, 2020.
31. Ogedegbe C, Nyirenda T, DelMoro G, Yamin E, Feldman J. Health care workers and disaster preparedness: barriers to and facilitators of willingness to respond. *Int J Emerg Med* 2012;5(1):29. [PubMed: 22716272]
32. Burke RV, Goodhue CJ, Chokshi NK, Upperman JS. Factors associated with willingness to respond to a disaster: a study of healthcare workers in a tertiary setting. *Prehosp Disaster Med* 2011;26(4):244–250. [PubMed: 22008278]
33. Chiang SC, Fisher HH, Bridwell M, Rasulnia BB, Kuwabara SA. Enhancing workforce planning for public health emergencies: an evaluation of CDC responders' motivation to respond. Presented at: 6th Annual CDC Evaluation Day; 9 12, 2018; Atlanta, GA.
34. DiMaggio C, Markenson D, Loo GT, Redlener I. The willingness of US emergency medical technicians to respond to terrorist incidents. *Biosecur Bioterror* 2005;3(4):331–337. [PubMed: 16366842]
35. Balicer RD, Catlett CL, Barnett DJ, et al. Characterizing hospital workers' willingness to respond to a radiological event. *PLoS One* 2011;6(10):e25327. [PubMed: 22046238]
36. Barnett DJ, Thompson CB, Semon NL, et al. EPPM and willingness to respond: the role of risk and efficacy communication in strengthening public health emergency response systems. *Health Commun* 2014;29(6):598–609. [PubMed: 23799806]
37. Burns WJ, Peters E, Slovic P. Risk perception and the economic crisis: a longitudinal study of the trajectory of perceived risk. *Risk Anal* 2012;32(4):659–677. [PubMed: 22150242]
38. Slovic P, Finucane ML, Peters E, MacGregor DG. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Anal* 2004;24(2):311–322. [PubMed: 15078302]
39. Slovic P, Fischhoff B, Lichtenstein S. Characterizing perceived risk. In: Kates RW, Hohenemser C, Kasperson JX, eds. *Perilous Progress: Managing the Hazards of Technology*. Boulder, CO: Westview Press; 1985. <https://ssrn.com/abstract=2185557>. Accessed March 12, 2020.
40. Barnett DJ, Levine R, Thompson CB, et al. Gauging US emergency medical services workers' willingness to respond to pandemic influenza using a threat- and efficacy-based assessment framework. *PLoS One* 2010;5(3):e9856. [PubMed: 20352050]

41. Jensen J, Waugh WL Jr. The United States' experience with the incident command system: what we think we know and what we need to know more about. *Journal of Contingencies and Crisis Management* 2014;22(1):5–17.
42. Pandemic and All Hazards Preparedness Act, S. 3678. 109th Congress, 2nd Session, 2006. Reauthorized 3 13, 2013. <http://www.gpo.gov/fdsys/pkg/PLAW-113publ5/pdf/PLAW-113publ5.pdf>. Accessed March 13, 2020.
43. Association of Schools and Programs of Public Health. Public health preparedness & response model. <https://www.aspph.org/teach-research/models/public-health-preparedness-response/>. Accessed March 13, 2020.
44. Fisher HH, Yaemsiri S, Chiang SC, Bridwell M. Monitoring trends in CDC preparedness and capacity development to inform agency readiness: from Hurricane Katrina to Zika. Poster presented at: NACCHO Preparedness Summit; 4 18, 2018; Atlanta, GA.
45. Centers for Disease Control and Prevention. Ready, Set, Go: CDC's incident manager training program prepares the next generation of response leaders. Reviewed 10 15, 2018. https://www.cdc.gov/cpr/partnerships/story_zika_imtp.htm. Accessed March 9, 2019.
46. Centers for Disease Control and Prevention. Public Health Preparedness and Response: 2018 National Snapshot. https://www.cdc.gov/cpr/pubs-links/2018/documents/2018_Preparedness_Report.pdf. Accessed March 9, 2019.
47. Federal Emergency Management Agency. Comprehensive Preparedness Guide (CPG) 201: Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR) Guide. 5 29, 2018. <https://www.fema.gov/media-library/assets/documents/165308>. Accessed March 9, 2019.
48. Centers for Disease Control and Prevention. Public Health Emergency Preparedness Cooperative Agreement (PHEP) Program. <https://www.cdc.gov/cpr/pubs-links/2019/documents/National2019.pdf>. Accessed February 3, 2020.

Table 1. Metrics to Assess Agency Preparedness Using the Ready/Willing/Able Framework

	Ready	Willing	Able
Definitions ^{1,2}	Availability of a public health agency—and the individuals who work in the agency—for prompt action, service, or duty to respond with appropriate resources to a public health emergency	The state of being inclined or favorably predisposed, individually or collectively as an agency, toward a public health emergency	The actual operational power (ie, skill, expertise, knowledge) of an organization or individual to perform response-related tasks during a public health emergency
Potential metrics to assess framework components	<p><i>Organizational:</i></p> <ul style="list-style-type: none"> Roster of staff with skills/expertise appropriate for emergency response (yes/no) Established rapid response team program that supports training, ongoing preparedness, etc of staff who could serve in response roles (yes/no) Time to identify staff with necessary skills/expertise and assign them to emergency response roles Established emergency operations center (yes/no) Time to activate emergency operations center Number of response partners with whom data-sharing systems have been established/exercised Established incident management system (yes/no) Time to activate incident management system <p><i>Individual:</i></p> <ul style="list-style-type: none"> Number/percent of staff with specific skills/expertise available to serve in appropriate response role Number/percent of staff with necessary skills/experience who can be deployed in timely manner 	<p><i>Organizational:</i></p> <ul style="list-style-type: none"> Number of response partners with pre-established mutual aid agreements that support sharing of supplies and resources Number of response partners with pre-established data use agreements that support information sharing Number/percent of staff who report willingness to participate in future events (not event-specific) Number/percent of staff who report willingness to participate in future events (during current, ongoing event) Number/percent of staff who have served in a response role in past events Number/percent of staff serving in a response role in current, ongoing event Number/percent of staff willing to participate in specific types of events (ie, natural disasters, infectious disease, nuclear radiological events) Qualitative themes in risk and protective factors that have potential effect on future willingness to participate (reported by responders during or after an event) <p><i>Individual:</i></p> <ul style="list-style-type: none"> Number/percent of staff who report willingness to participate in future events Number/percent of staff who have served in a response role in past events Number/percent of staff serving in a response role in current, ongoing event Number/percent of staff willing to participate in specific types of events (ie, natural disasters, infectious disease, nuclear radiological events) Qualitative themes in risk and protective factors that have potential effect on future willingness to participate (reported by responders during or after an event) 	<p><i>Organizational:</i></p> <ul style="list-style-type: none"> Database that inventories response-related competencies, skills, and experience of agency staff (yes/no) Number and types of response training available/offered to staff <p><i>Individual:</i></p> <ul style="list-style-type: none"> Number/percent of staff with specific core competencies and skills relevant to response work Number of response training sessions completed annually Number/percent of staff who have completed response training Number/percent of staff serving in a response role who have completed response training Qualitative themes in applying skills/knowledge learned from training to response work Number/percent of first-time responders participating in an event Number/percent of responders with specific competencies or who are compliant with training requirements at the start of a new event