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DomPrep Journal is electronically delivered by the IMR Group Inc., P.O. Box 810, Severna Park, MD 21146, USA; phone: 410-518-6900; email: subscriber@domprep.com; also available at www.DomPrep.com

Articles are written by professional practitioners in homeland security, domestic preparedness, and related fields. Manuscripts are original work, previously unpublished, and not simultaneously submitted to another publisher. Text is the opinion of the author; publisher holds no liability for their use or interpretation.

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About the Cover: Mosquitos are just one challenge facing preparedness and resilience professionals striving to improve community health. Closing gaps in readiness, response, recovery, and resilience efforts with other sectors is another. Public health spans all phases of the disaster cycle and should be integrated as such. (Source: ©iStockphoto/TacioPhilip)

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Public Health – Opportunities for Action

By Catherine L. Feinman

On 7 June 2016, the DomPrep team convened 14 subject matter experts from various disciplines to address issues surrounding community resilience and public health. The purpose of the roundtable was to align the missions and identify action items to create synergy among various community stakeholders. This article summarizes the key takeaways from the roundtable participants.

Oscar Alleyne, senior advisor for Public Health Programs for the National Association of County and City Health Officials (NACCHO) moderated the discussion, beginning with a summary of the highlights of the 2016 Preparedness Summit, which focused on "Planning Today for Rebuilding Tomorrow: Resiliency and Recovery in the 21st Century." By examining the disaster lifecycle, the Summit addressed the need to push science into the recovery and resilience stages, including but not limited to: unique partnerships; disaster risk reduction; and behavioral health recovery. This is in line with the efforts of the Rockefeller Foundation's 100 Resilient Cities initiative.

Sustaining Healthy, Resilient Communities

The June DomPrep roundtable took the Summit discussion a step further to address gaps that exist between public health and other sectors, which could hinder resilience and recovery efforts. The public health sector must infuse disaster risk reduction into currently existing disaster preparedness and recovery plans – and to some extent a jurisdiction's overall community health assessment planning initiative – and distill this information into tactical actions. The National Academies of Science, Engineering, and Medicine released a report in April 2015 with recommendations pointing to the importance of integrating disaster recovery planning into currently existing community-based planning efforts in order to build communities that are better, stronger, and healthier.

As an outgrowth of that report, the Academies is working on a toolkit aimed to translate this 504-page report into an actionable, adaptable community tool, including: suggestions for engaging politicians and other community leaders; ideas for expanding engagement beyond traditional planning stakeholders; inventory tools; and a facilitation guide to include exercises and worksheets to aid in planning. Participants described the outcome product as not a standalone process, but rather a "plug-and-play" module with appropriate choices of processes to diverse community needs and requirements.

Participants agree that conversations must move away from the "what ifs" to address community events that are already occurring. By building resilience to health events based on scientific and policy principles, communities can slowly transition to disaster planning that involves a public health component. As groups meet to discuss resilience, one participant warned not to lump every project into the resilience theme. Resilience for public health has a different meaning than resilience in other sectors. The challenge is to prioritize the needs of the community versus public health resilience, which may be at the

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bottom of these priorities. Disparities and inequity can be significant, but translating the science and asking communities about their concerns can build a stronger foundation to ensure that needs are met. Also suggested is the importance of conveying public messages that are digestible and actionable, as well as determining which innovative programs are not being integrated and why.

A digital dashboard was suggested as a capability that could provide a visual depiction of the various interagency connections. For example, first responders and public safety partners regularly acquire data that should be passed on for public health analysis. They are able to more readily identify when something is atypical, so public health agencies can leverage this information. Unfortunately, some disaster plans and policies are not scientifically supported and not addressed with programs to best facilitate actions.

"By building resilience to health events based on scientific and policy principles, communities can slowly transition to disaster planning that involves a public health component. . . . 'We cannot respond ourselves out of all disasters that are coming'."

As one participant noted, "We cannot *respond* ourselves out of all disasters that are coming." Resilience and risk reduction address underlying vulnerabilities, ways to reduce exposures, and capacity to cope with disaster. Public health agencies need to leverage infrastructures such as pharmacies, which are often trusted within the community and can identify vulnerable populations. Resilience should be community-led rather than entity-led. Preparedness tends to be about preparing for a response, whereas resilience requires looking at trends (e.g., in healthcare) and bringing people into a neutral space to better "sell" the concept of resilience on a national platform, incentivize risk reduction, and organize around a multisector platform. Although such platforms exist, participants noted that they are not well-funded or balanced between response and resilience.

Risk Reduction

The fire service is a successful example of changing community cultures, processes, and requirements to promote prevention and reduce risk. For many years, the fire community at large has leveraged existing community networks and infrastructures to create broad and well-received risk and preparedness campaigns. It has collaborated with standards bodies for the development and implementation of wide-ranging product and service enhancements, with the indemnification community to reward compliance (e.g., the 1973 America Burning Report).

However, as noted by a representative from the fire service, such successful campaigns changed some of the core missions of firefighters and, in some, reducing the need for or eliminating some jobs. Successful communities break resilience into day-to-day steps (but with a long-term mindset) and utilize tools that already exist. Difficult choices need to be made, so sectors need to recognize the choices and evaluate the acceptable and unacceptable risks, as well as analyze the innovations and barriers to innovations or operations when they are encountered. By siloing public health authorities, it is difficult to see the full picture.

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One participant cautioned that, when making efforts to reduce risk, not to rely on past incidents and practices for current solutions because the environment is constantly changing and the results could be significantly different under different conditions. With uncertainty in the climate, economy, and infrastructure, it is critical to move forward with the appropriate partners and the right tools, actions, and leadership. Otherwise, the opportunity may be missed. Community-led participatory preparedness is the key to gaining broad stakeholder involvement.

Much more work is needed to increase community involvement in health resilience efforts – at the individual, family, organizational, community, and national levels. Participants suggested that a near-term strategic accomplishment would be as simple as getting sectors to understand public health community's core and secondary mission-critical capabilities, key assets and capabilities they have at their disposal, and how to more effectively integrate them at the community level. In order to affect change, all stakeholders must be on a level playing field. Participants agree that strategic communication on mission and messaging need to become ubiquitous and communicate it in a simple format that could even fit on a bumper sticker or tweet.

Unfortunately, it can be difficult to persuade people unless either the task is easy or they are financially motivated or mandated. Roundtable participants mentioned four key individual motivators: (a) personal experience with past disasters; (b) system changes being nonexistent; (c) personal calling/altruism to make a difference; and (d) frustration with progression. In essence, the motivations vary, but they share a common theme and ultimate goal.

Practical Applications of the National Health Security Strategy

The public health community needs to define its role in (and support of) resilience and ways in which it can build relationships and trust. Some roundtable participants expressed frustration with how public health is progressing. Although resilience is not a new concept, they noticed that not much has changed in the public health system. One example cited was that mental health response teams were onsite during the Paris-Brussels attacks, but they did not provide services for the firefighters. The gravity of the response and timeframe of government response is not in line with long-term recovery, especially for behavioral and mental health concerns.

Such health concerns usually cannot be cured, but instead must be mitigated. In most cases, eradication should not be used as a measure of success. In fact, defining success can be hindered by various factors, including: federal regulations; credentialing roadblocks; simultaneous incentives and disincentives; and frustration at higher levels. Changing the way the government works and changing the way people think are two very different issues. Therefore, what is needed to prepare versus what is needed to truly recover are not in accord. There needs to be a better way of quantifying and qualifying mental health to effectively apply disaster risk reduction strategies to health concerns.

Although some may think that particular interventions work, the outcomes do not always provide adequate proof. The science behind public health needs to improve. For example, health personnel can identify a significant amount of people who are likely to develop mental illnesses, but disaster behavioral health needs to better describe how stress risk manifests. In short, mental health is a health risk with economic consequences.

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Another hurdle mentioned is that improvement plans are sometimes never finished or adopted (or health is not a component). Completing the disaster lifecycle is predicated on having adequate time and space between disasters. If lessons learned are not integrated into an after action report and/or performance improvement plan, then they are not useful for subsequent incidents. For example, the 2009-2010 H1N1 pandemic lessons still have not been integrated into a newer improved plan, and subsequent disasters continually push integration lower on the priority list. When working with multiple sectors and agencies, an agency may choose to write the plan, but there is often no specific entity assigned to the task. Such ambiguity needs to be avoided.

Behavioral health systems are another sector that are already overwhelmed. It is necessary that the health systems perspective examines how many people will recover, benefit, and have behavioral health problems. Physical illnesses are studied after a disaster, but studies on behavioral and mental health issues are equally needed. Possible solutions to minimize the "worried well" (i.e., people reporting to hospitals who do not need medical attention) include behavioral health personnel managing fear by better explaining the disease, by better quantifying the issue, and by engaging the whole community. Discovering existing root causes and spending pre-disaster time with credible and trusted sources could avoid some exposure.

All of the above require some form of funding, but there was consensus that there needs to be a shift from dependence on federal dollars toward new public-private partnerships. Unfortunately, a single lump sum of money will not fix the issues at hand. Leveraging funds that force the recipient to rethink how they will be used could incentivize sustainable outcomes at the local level. Possible solutions are social impact bonds and other value-added benefits for private sector investors. Of course, no single investor can sustain or be responsible to fund a never-ending expense.

In public-private partnerships and collaborative efforts, both trust and value are critical. If the private sector does not feel that what it is doing is valuable or profitable, then it has no incentive to assist. As such, the public health sector needs to translate the National Health Security Strategy in a way that speaks to the potential investors. Indicators that identify data elements and strategies to help drive the dialog are needed. An illustrative example shared by one participant was that, if 30 percent of the population contracts influenza at the same time, the food supply would shut down. The facts must be put in place.

Healthcare has undoubtedly become a huge industry, which is why it needs to be integrated in all preparedness and resilience efforts. Better planning would help the public health sector better integrate into communities and assist all sectors in creating more surge capacity and mutual aid agreements to support coordinated activities and to share resources, facilities, services, and other support required during emergency response.

In This Issue

Emily Lord leads this July 2016 edition of the *DomPrep Journal* with an article on the preparedness gap that persist across the country. Changes are needed to better prepare for and address current and emerging public health threats. This change is critical because, according to Robert Hutchinson, public health threats are evolving at a faster rate than the efforts to prepare for them.

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Justin Snair and Megan Reeve Snair then discuss social impact bonds, which may enable communities to not only prepare better, but also to reduce costs. Collaborative efforts using a whole community approach would enable communities to expand their abilities to plan for, respond to, and recover from health threats, as described in Thomas Russo's article.

George Morgan shares information on the benefits of employing the National Incident Management System during the response phase, when an incident cannot be avoided. The next phase of a disaster is recovery, which may not be easy, but Natalie Grant offers some advice to tackle this complex process. In Baltimore, Kathleen Goodwin, Leana Wen, and Jennifer Martin use Baltimore's Health Department as an example of how public health practices can be integrated to assist all stakeholders in making critical decisions.

Rounding out the issue is a follow on to last month's issue on "Risk" and long-term power grid failure. According to J. Michael Barrett, the electrical grid is not ready for communities' constantly growing power needs. Good decisions now that incorporate actionable research will better prepare all sectors for an imminent or future short-term or long-term threat.

Special thanks go to the many people who contributed to this edition of the DomPrep Journal:
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J. Michael Barrett, Director of the Center for Homeland Security & Resilience
Laura Biesiadecki, Senior Director for Preparedness, Response, and Recovery, NACCHO
Darrin Donato, Resilience Policy Coordinator, DHHS ASPR
Kathleen E. Goodwin, Special Assistant to the Commissioner, Baltimore City Health Department
Natalie N. Grant, Program Analyst, U.S. DHHS/ASPR/OEM/Recovery
Regina Hawkins, Intern, NACCHO
Jack Herrmann, Senior Program Officer, National Academies of Sciences, Engineering, and Medicine
Robert C. Hutchinson, Deputy Special Agent in Charge, U.S. Department of Homeland Security, U.S. Immigration and Customs Enforcement's Homeland Security Investigations
James J. James, M.D., Dr.P.H., M.H.A., Executive Director Society for Disaster Medicine and Public Health
Thomas Lockwood, Former Member of U.S. Department of Homeland Security's Senior Leadership Team
Emily Lord, Executive Director, Healthcare Ready
Nicolette Louissaint, Director of Programming, Healthcare Ready
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Catherine Feinman joined Team DomPrep in January 2010. As the editor-in-chief, she works with subject matter experts, advisors, and other contributors to build and create relevant content. With more than 25 years of experience in publishing, she heads the DomPrep Advisory Committee to facilitate new and unique content for today's emergency preparedness and resilience professionals. She also holds various volunteer positions, including emergency medical technician, firefighter, and member of the Media Advisory Panel of EMP SIG (InfraGard National Members Alliance).

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Bringing Public Health Preparedness Into the 21st Century

By Emily Lord

The probability of certain public health threats, the costs and funding related to such threats, and the "silo" effect of the public health sector all contribute to the preparedness gap between public health and other sectors. It is time to bridge this gap and update preparedness efforts to better prepare for 21st Century threats.

The U.S. disaster and disease health preparedness infrastructure has historically focused on a few key pillars including:

- Strong national public health presence from the Department of Health and Human Services (HHS) Assistant Secretary for Preparedness and Response (ASPR), and from the Centers for Disease Control (CDC);
- Community-level preparedness by state and local public health departments; hospital system preparedness and healthcare coalitions; and
- Varying levels of engagement and support from emergency management.

Although these pillars have prepared the United States better than ever before, it is not enough to meet the evolving threats that are now facing the nation.

Reasons Behind the Public Health Preparedness Gap

First, "disaster dissonance" widens the gap. Health preparedness has historically focused on readiness for catastrophic events. The challenge is that many people do not think they will ever be affected by a catastrophic event. The likelihood of a low-probability, high-impact hurricane like Katrina or Sandy seems small, so the level of preparedness needed for these events may not feel necessary. Thus, people recognize there is a threat, but many choose not to prepare.

Second, health preparedness is expensive and time-consuming, and funding is being continually reduced. The Public Health Emergency Preparedness (PHEP) cooperative agreement is the only major source of funding for state and local health departments, and it has significantly declined over the past 10 years. As a result, when unforeseen threats like Zika occur, funding is shifted from existing priorities, and there is not enough political will to raise the money to bolster capabilities, which leaves the nation's long-term preparedness weaker.

Third, health preparedness, like many fields, is siloed. Healthcare coalitions are an ideal example. Federal funding from ASPR's Hospital Preparedness Program (HPP) is meant to create a noncompetitive space for different parts of healthcare to plan, exercise, and coordinate for public health emergencies. Unfortunately, coalitions have struggled to breach the siloes within healthcare and bring more than just hospital systems to the table. This failure

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restricts the ability to assist patients with chronic care needs that would be best served in an outpatient setting like a pharmacy or a dialysis center. Ultimately, this harms the whole community because these other parts of healthcare tend to be less resilient, take longer to recover, or never reopen, which dampens economic recovery.

Moving Toward 21st Century Preparedness

Whether it is the term used or not, resilience – not response – should be the major focus going forward. Resilience looks much more broadly at how to create strong, cohesive communities with the goal that the stronger communities are, the better they will bounce back when faced with trauma. Although resilience is built by many different programs, a key component and first step forward should focus on incorporating the changes happening in healthcare such as: expanded coverage options; value-based medicine; Accountable Care Organizations (ACOs); and the development of electronic health records.

U.S. healthcare reform has led to highest number of insured American's ever. Access to insurance supports and coincides with the growth of traditional provider networks and the development of new modalities such as convenient care clinics in pharmacies and the ability of pharmacists to provide immunizations. By their very nature, these new care delivery centers spread care away from a centralize location and increase resilience. Most importantly, there is a shift toward value-based medicine, which changes how healthcare systems approach patient engagement. Previously, revenue was directly connected to the amount of services provided; now it is shifting to how successful these services are. This is the goal of the newly created ACOs, which coordinate patient care to enhance wellness, avoid duplication of services, and better manage chronic illnesses. ACOs are resilience in action. They project into the community because they are designed to be concerned with patients' health outside the hospital's walls or a doctor's waiting room.

ACOs also help to answer a critically unanswered question in preparedness, "Who is responsible for a patient?" Traditionally, when an outbreak or disaster occurs, if a patient with chronic illness is not hospitalized or in a healthcare facility, there is no one responsible for ensuring that he or she has the life-sustaining healthcare required. Whether medicine, oxygen, or supportive care, patients are left to try to fill the gaps themselves or call emergency services. Efforts like ASPR's emPOWER map, which identifies vulnerable Medicare patients who use electric powered medical equipment, are extremely helpful to identify and assist these patients after an event occurs, but need to be better incorporated into day-to-day care. If the healthcare preparedness community begins to increase focus on collaborating with ACOs and other community-based organizations, it will significantly increase the resilience of communities.

Likewise, the adoption of electronic health records and the expansion of Health Information Exchanges are vital tools for ensuring resilience. With their use, patients can continue to receive the correct care they need by any provider in any region that can access the patient's records. Working to make these systems interoperable and protected by backups in other locations directly influences the level of care patients receive. None of this is easy, but it is critical for protecting patients.

Lastly, because healthcare in the United States is owned mostly by companies, it requires a type of partnership that can feel uncomfortable at first, but public/private partnerships is

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critical to protect patients. The first step to encourage public health to collaborate with other organizations is by thinking like a business to understand the motivations and limitations of what private healthcare can do. If traditional public health worked to understand these motivations and to prioritize lifting restrictions and assisting healthcare to continue its operations, private sector healthcare companies would be more receptive to working alongside its public partners. The result would be more resilient communities thanks to joint private and public resources being deployed effectively.

Protecting and building the resilience of communities' health is a long-term and incredibly difficult endeavor. It requires agility and the ability to capitalize on rapidly changing healthcare landscape, but it is possible if traditional views on what it takes to be ready can adapt and if funding has sufficient flexibility.

Emily Lord serves as the executive director of Healthcare Ready, a nonprofit set up in the wake of Hurricane Katrina to ensure that the catastrophic breakdowns in patient access to healthcare would never happen again. As the ten-year anniversary of Katrina approached, she led the expansion of Healthcare Ready's mission to address healthcare supply chain-wide resiliency and response by focusing on public policy and advocating for the adoption of best and promising disaster preparedness and response practices by government and industry. She has also led Healthcare Ready's response to multiple natural disasters including Hurricane Sandy, during which the organization coordinates and works to solve barriers to patient access to healthcare. She holds a Master of Public Administration from The George Washington University and a B.A. from the University of Wisconsin-Madison.

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Threats Evolving Faster Than Preparedness

By Robert C. Hutchinson

With the current amount of discussion and media coverage regarding the spreading Zika virus and the mounting concerns over antibiotic drug resistance, public health remains a critical homeland security and emergency preparedness priority. Unfortunately, it is often a fluctuating priority that does not receive consistent attention, action, and funding to prepare for future known and unknown public health threats.

The May 2016 birth of a child in the continental United States reportedly with microcephaly from the Zika virus has once again pushed the subject of preparedness and funding for public health into the op-ed pages and 24-hour news cycle. As Ebola receded in Africa and faded from discourse in the United States, Zika erupted due to its reported grave effects on pregnant women and their developing fetuses. As a result, the public health emergency fund in the United States and its level of funding were once again a topic of intense discussion and political squabbling.

Beyond these current public health challenges and funding questions, another question arises about whether cross-sector planning and preparedness priorities are being properly addressed for the whole of community requirements to prepare for, respond to, and recover from a severe public health threat. Previous research, observations, and experience may not provide the highest level of confidence for a unified response to rapidly emerging and evolving pathogenic threats.

Changing Focus From Ebola to Zika

The international priorities and focus continue to transition from the diminishing Ebola virus to the expanding Zika virus and other re-emerging public health concerns such as yellow fever. Director General of the World Health Organization Dr. Margaret Chan identified numerous international public health and policy issues for the world during her address to the 69th World Health Assembly in May 2016, which included the following statements:

- "Drug-resistant pathogens, including the growing number of 'superbugs,' travel well internationally in people, animals, and food."
- "The Ebola outbreak in three small countries paralyzed the world with fear and travel constraints."
- "For Ebola, it was the absence of even the most basic infrastructures and capacities for surveillance, diagnosis, infection control, and clinical care, unaided by any vaccines or specific treatments."
- "The rapidly evolving outbreak of Zika warns us that an old disease that slumbered for six decades in Africa and Asia can suddenly wake up on a new continent to cause a global health emergency."

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- "For Zika, we are again taken by surprise, with no vaccines and no reliable and widely available diagnostic tests."
- "Few health threats are local anymore. And few health threats can be managed by the health sector acting alone."
- "Medicines for treating chronic conditions are more profitable than a short course of antibiotics."
- "For infectious diseases, you cannot trust the past when planning for the future."

The Zika virus is not new, but expanding to new locations beyond Africa and Asia largely due to international trade and travel. The virus was originally isolated and identified in a sentinel rhesus monkey in the Zika Forest near Entebbe, Uganda, in 1947. Although unknown how and when Zika arrived in Brazil, it has been theorized that the virus may have been introduced during a sporting event in August 2014 with numerous competitors from four Pacific nations where the virus was present. This theory compounds concerns regarding the upcoming Olympic Games and several recently completed international events in Brazil.

Unfortunately, confusion may exist regarding the definite source of an illness and the most appropriate medical treatments. As with Zika and other viruses, the effectiveness and usefulness of broad antibiotic use for an unconfirmed illness, which may be viral, can have significant consequences for the whole society – especially with the explosion of antibiotic-resistant superbugs.

Expanding Resistance to Antibiotics

In May 2016, The *Review on Antimicrobial Resistance* issued, "Tackling Drug-Resistant Infections Globally: Final Report and Recommendations." The report, sponsored by the United Kingdom and Wellcome Trust, estimated that 10 million lives per year would be at risk by 2050 due to the rise of drug-resistant infections. These antimicrobial drugs include antibiotics, antivirals, antifungals, and antimalarials. According to the study, less than five percent of venture capital investments in pharmaceutical research and development between 2003 and 2013 were for antimicrobial development. The report identified 10 interventions or fronts to reduce the demand for antimicrobials, including better incentives to promote investments for new drugs and improvements of existing ones.

The recent finding that an E. coli bacterium superbug, with the mcr-1 gene, was resistant to the last-resort antibiotic colistin only added to the concerns about resistance and the nation's future capabilities. According to the Centers for Disease Control and Prevention, the mcr-1 gene exists on a plasmid, a small piece of DNA that is capable of moving from one bacterium to another, spreading antibiotic resistance among bacterial species. Colistin was reportedly seldom used in humans due to its toxicity, but it has reportedly been utilized in the agriculture environment for decades.

Due to the enormous costs of developing new medicines and treatments, the amount of new antibiotics in the research pipeline appears rather small compared to other drugs. There are reportedly stronger financial incentives to invest in drugs for chronic diseases to recoup

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research investments over a long period of time. A May 2016 analysis by *The Economist* magazine revealed the limited cumulative profits from antibiotic research from pre-clinical research to off-patent sales.

In May 2016, the World Health Organization issued a research and development blueprint for actions to prevent epidemics. The global strategy and preparedness plan was created to reduce the amount of time required to deliver tests, vaccines, and medicines, and to strengthen emergency response during epidemics and pandemics.

Epidemic & Pandemic Preparedness

It has been estimated that as many as 100 million people died during the Spanish Flu pandemic outbreak in 1918. It is projected that a similar pandemic outbreak today could result in the death of 360 million people around the world despite the availability of vaccines and antimicrobials. In addition to the world population growth, the pace of urbanization, globalization, and travel only expands the genuine concern for the rapid spread of epidemics and pandemics.

"It has been estimated that as many as 100 million people died during the Spanish Flu pandemic outbreak in 1918. It is projected that a similar pandemic outbreak today could result in the death of 360 million people around the world despite the availability of vaccines and antimicrobials."

In the November 2013 DomPrep Bio-Training edition, the subject of preparing for Black Swan pandemic and biological threats asked important questions regarding preparedness for a vast array of public health threats. Sadly, many of the same critical questions remain unanswered today, such as, "Have the many lessons from SARS, H5N1, H1N1, MERS, and Ebola truly been learned and implemented?"

Unfortunately, too many still view a pandemic-prone pathogen as the primary responsibility of the public health and medical services organizations. Law enforcement, military, and numerous other public and private sector organizations have critical responsibilities to execute during a serious public health event – usually in close coordination and collaboration with the other agencies involved for support and response.

As is true of many significant incidents and disasters, there is usually very little if any time to plan and prepare when a new threat suddenly appears, rapidly expands, and eventually overwhelms medical services and public health officials. In addition, quarantine, isolation, and medical countermeasure dispensing procedures may be required to contain a new disease outbreak or biological agent attack and, in some situations, any subsequent public unrest. The experience with Ebola in 2014 in the United States and other recent outbreaks does not indicate a significant level of readiness and coordination. Many of the most controversial and difficult issues have been ignored since the Ebola outbreak.

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Need to Prepare & Respond

Ebola and Zika were not new public health threats, but viruses that were isolated to rather limited areas due to emergence, transmission, and travel limitations. The geographic isolation and infrequent outbreaks may have led to international complacency. Globalization has provided many benefits for the world, but unfortunately there are also grim consequences such as the rapid spreading of novel and re-emerging pathogens.

The prospect of a very serious novel virus with sustained human-to-human transmission could make previous Ebola or Zika outbreaks appear as rather manageable challenges in a globalized world. This concern was well established in journalist David Quammen's 2012 book, "Spillover: Animal Infections and the Next Human Pandemic." He characterized spillover as the moment when a pathogen passes from one species to another. This subject is very important since, in 2005, reportedly three-quarters of emergent pathogens were zoonotic spillovers. It is necessary to be cognizant of spillover public health threats that are both highly infectious and highly contagious, which could greatly threaten global health security.

As concluded by the Council on Foreign Relations in May 2016 regarding the future of global health security:

> *"Creating a sustainable and coordinated environment for supporting innovation is key to advancing the goal of improved global health security. This is true whether it is investing in 'just-in-case' preparedness or a 'just-in-time' response to an outbreak. Implementing the hard-learned lessons from the last decade in global health can help achieve this goal while ensuring that the assets, resources, and commitments of partners across various sectors all fully contribute to enhancing global security."*

These public health challenges and threats linger and evolve with little notice and many cascading consequences. The question remains about whether planning and preparedness will get ahead of these current public health threats and the ones on the horizon, or the nation will continue to respond the best way that it can and only add Ebola and Zika to the list with SARS, H5N1, H1N1, MERS, and many others pathogens – with lessons not truly learned. It is necessary to evolve faster than these public health threats – a difficult but critical necessity for global health security.

The opinions expressed herein are solely those of the author in his individual capacity, and do not necessarily represent the views of his agency, department or the United States government.

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Social Impact Bonds & Sustainable Disaster Risk Reduction

By Justin Snair & Megan Reeve Snair

National policy and practice tend to focus efforts and resources on disaster response and recovery, rather than on disaster risk reduction. Understanding disaster risks and incentivizing sustainable risk reduction efforts could help reduce overall disaster costs and even save lives.

Disasters are about lives. Those lost. Those put on hold. Those scattered to pieces. All of these lives should be at the center of policy discussions. Although the effect of disasters is difficult to witness, their impact is easily noticeable. Readily found online among the thousands of images of people, property, livelihoods, dreams, and a collective sense of security buried under rubble, torn apart, washed downstream, or blown away by disasters are also scenes of rescue, bravery, rebuilding, and recovery. Evidenced by the recent events in West Virginia, Texas, and Florida, the United States has a remarkable capacity for responding to disasters. Watching communities come together in the aftermath of tragic events to support one another – with examples like Joplin, Missouri's resilience efforts after the 2011 tornado destruction and "Boston Strong" following the 2013 bombings – the capacity for recovery and rebuilding is clear. Yet, with nearly as many deaths from billion-dollar disasters as from U.S. military fatalities in the Iraq and Afghanistan Wars (6,756) and domestic terror attacks (3,158) combined, the capacity for disaster risk reduction is not as apparent.

In light of the almost 9,500 deaths that have occurred just in disasters costing a billion dollars or more in damage since 1980, there is no need to wait for something terrible to happen. Mark Keim, founder of DisasterDoc LLC and a disaster medicine expert, has remarked that the goal should be to save every single life from natural disasters. Some would even say that there is no such thing as a "natural" disaster and many of the associated deaths and damage costs are not inevitable. Perhaps holistic approaches could manage the causal factors of disasters, reduce exposure to hazards, lessen vulnerabilities of people and property, and better manage the land and environment – overall improving preparedness for adverse events. Perhaps social impact bonds – an emerging "pay for success" financing model for programs with social benefits – could be used to fund approaches that could save lives and decrease the economic damage of disasters. Perhaps public health could be the connective tissue across it all, because the profession is already experienced with these approaches. These concepts may be too good to be true, but they are certainly worth consideration.

The Nature of Disasters & Risk

Natural hazards and resulting disasters are not a new phenomenon, but they are becoming more frequent and increasingly severe, continuing to result in loss of human life and significant economic damage. According to the National Centers for Environmental Information (NCEI), from 1980 to 2014, the United States experienced 178 disasters with damage of $1 billion or more per event, with an average of about five events per year. Between 2009 and 2014 alone, there were 56 disasters costing more than $1 billion each, with an average of nine events per

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year. These hazards are almost impossible to prevent, but the destruction that occurs – often perceived as inevitable and expected – can be.

A state of *disaster* only occurs when the *hazard* exceeds the coping capacity (i.e., the ability of people, organizations, and systems using available skills and resources to face and manage adverse conditions, emergencies, or disasters) of an individual or community. Three feet of snow in Buffalo, New York, is just another Tuesday in January for them. But even the prediction of one foot of snow in the nation's capital would cause a total shutdown, complete with terms like "snowpacolypse" and "snowmageddon" and disappearance of all bread products from grocery stores. Although the result is relative, it is not mysterious. Knowing how to determine risk means that it should be possible to reduce the occurrence of disasters.

To determine an individual's or community's level of risk for disaster (i.e., potential loss of lives, health, livelihood, assets, services, infrastructure), three factors collectively determine disaster risk:

- *Vulnerability* – the physical, social, economic, and environmental circumstances that make it susceptible to the damaging effects of a hazard;
- *Coping capacity* – the ability to use existing assets to manage adversity; and
- *Specific hazard exposure* – the characteristics of the phenomenon, substance, human activity, or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Examining these factors, disaster risk can be reduced by decreasing a community's vulnerabilities, mitigating its exposure to hazards, or increasing its coping capacity through building resilience. Collectively, this approach is known as disaster risk reduction (DRR). Globally, this concept has taken root. The signing of the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) – a 15-year voluntary, nonbinding agreement that maps a broad, people-centered approach to disaster risk reduction – renewed an international commitment from 2005 and focuses on holistic approaches to DRR, now with health included.

However, U.S. disaster policy still lags, with response and recovery efforts after a disaster largely the focus. In addition to the need for response and recovery is the need to consider community vulnerabilities and assets in developing "upstream" policy, systems, and environmental interventions to reduce disaster risk. This risk reduction perspective is common in domestic public health strategies, which positions the profession well for rethinking how to approach disasters and shift some of the focus to before a disaster.

Public Health Approaches

The aim of public health is for every person to have a chance at a secure, productive, and healthy life. A large part of this involves reducing or eliminating mortality and morbidity associated with a host of "hazards," which include chronic disease, community violence, or even car crashes. Public health approaches most hazards with consideration of exposure and behavior, underlying vulnerabilities, and a capacity to cope or bounce back. This same approach should be taken with disasters.

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For the most part, though, U.S. public health preparedness and emergency management practitioners have largely focused on the acute response immediately following a disaster and in helping those that survive. Yet, most disaster-related deaths occur during the impact, before response teams can even deploy. These deaths do not need to be accepted as inevitable. With prevention as a key aspect, public health's goal should be to think more creatively about how to stop these deaths from occurring at all. Of course, how to pay for this is the next question. The answer gets a bit complicated and, like many things, politics and power influence the options. It is important, however, to understand the context these forces create before looking for the "how."

Policy, Spending, & (Dis)Incentives

U.S. national disaster policies, incentives, and financing tend to be reactive, focused heavily on response and recovery actions following disasters. Although private commercial, insurance, and reinsurance entities certainly share the burden of disaster costs, the cost for response and recovery has fallen increasingly on government, and thus the public. And the public, with perhaps a psychologically rooted inclination to not see the worst-case scenario, tend to support elected officials in this behavior, even though investing in prevention and preparedness has been shown to produce large social and cost-effective benefits. Numerous studies estimate that, for every $1 spent in preparedness activities, as much as $15 in disaster damage is prevented.

Making matters worse, local, state, and volunteer organizations often encounter gaps in financial resources for disaster response and recovery. This can lead to delayed reconstruction, eventually shifting development trajectories and hampering long-term economic growth. The Stafford Disaster Relief and Emergency Assistance Act gives the federal government the authority to supplement the efforts and available resources of state and local governments to respond to and recover from disasters, even though the federal government is not meant to be the first-line provider of emergency assistance and disaster response and recovery. The federal government will provide assistance, though, when the disaster exceeds the coping capacity of state and local governments, but often at a very high cost.

It could be far less costly to invest in disaster risk reduction measures. However, politically speaking – and aside from the inherent partisanship – it is easier for all levels of government to appropriate and spend money reactively, only after a disaster and when the damage and need is visible. Since predicting natural hazards and forecasting disasters remains extremely difficult and imprecise, politicians often do not risk investing in strategies to mitigate disasters that might not occur because their constituents tend to see this spending as a waste – especially when the strategies are not evidence-based.

This is also a common problem for public health. Often, successes are the absence of adverse outcomes and thus difficult to visualize. This lack of a tangible, and marketable, success presents a strong disincentive for risk reduction practices. Additionally, tacking on another separately funded program to already burdened public health and emergency management offices throughout the country is not practical given existing competition for scarce resources.

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Rather than continuing on this reactive, politically motivated, response-based course, the national disaster approach must be reformed to sustainably fund pre-disaster planning and DRR programs. Alternative financing programs aimed at preventative and risk reduction measures, which are not a condition of political will and voter support, are needed. One way to do this is to incentivize private investors to generate alternative financing and shift the burden away from the public sector and shortsighted political will.

Financing Disaster Risk Reduction & Preparedness

A type of alternative financing is social impact bonds (SIBs), which are already gaining traction both internationally and domestically for other types of programs. SIBs are a type of pay-for-success (PFS) financing mechanism used to raise upfront funding for social and public interventions from philanthropic and private investors. Payers – typically governments – leverage the anticipated savings due to prevention of an adverse outcome as a source of financial rewards for the investors. Rewards are due if and only if the intervention succeeds in reaching predetermined benchmarks, thereby shifting the financial burden of success to investors.

If successful, SIB programs have a policy trifecta benefit: the government saves money; the private sector makes money; and populations (often vulnerable ones) have better outcomes and services. Not surprisingly, lawmakers are increasingly interested in SIBs. As of 2015, nine states had laws relating to PFS or SIB programs and 19 states have PFS or SIB laws. The 113th and 114th Congresses saw numerous bipartisan PFS legislations proposed, and $300 million was allotted for PFS in the president's FY2016 budget proposal.

SIBs can be and are already used to fund complicated programs throughout the United States and abroad, such as the California Endowment's SIB program to fund delivery of outcome-based social services in the areas of juvenile restorative justice and foster care, as well as other programs aimed at improving homelessness, juvenile recidivism, asthma, diabetes, and elderly service outcomes. SIBs are also being considered a viable option for financing global pandemic preparedness. During the Global Health Risk Framework: Pandemic Financing workshop convened by the National Academies in 2015, Adam Bornstein of the Global Fund said that "private-sector investors are happy when their money goes out and is put to work." He further stated that, "as long as they are compensated for the lending, the rate of return need not be particularly high. Provided there are course-correction measures in place to ensure the money is being spent properly and efficiently, finding investors should not be difficult."

SIBs could possibly be used for funding disaster prevention and risk reduction programs. A SIB creates a mutually beneficial alliance between private and public sectors, something that has often escaped in preparedness planning, and could create a strong political incentive for support and action. An inherent strength of the private sector is to identify and employ successful and cost-effective services and products – as their *financial* profit motive incentivizes such behavior. Alternatively, the public sector is incentivized by a *social* profit motive, but is not always successful in using evidence-based and cost-effective approaches. SIBs have been demonstrated to align these respective motives to solve complicated social

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problems, while leveraging strengths and mitigating weaknesses within the sectors. Because of this, SIBs could be effective for financing disaster risk reduction and preparedness and should be explored further. An obvious argument against private sector investment might be the sentiment that no one should profit from disasters. In this case, though, the private sector would actually be profiting from the opposite, a reduction in disaster losses – a worthwhile endeavor by most accounts.

How SIBs for DRR Might Work

Use of SIBs to support disaster risk reduction programs requires three important design conditions, as noted in a related 2013 white paper on alternative financing mechanisms commissioned by the National Academies' Forum on Medical and Public Health Preparedness for Catastrophic Events. First, there must be evidence that the proposed interventions are effective at producing the desired outcome. Second, there must be an accurate assessment of potential loss. Third, public attitude – and the accompanying political will it often engenders – needs to support risk reduction rather than reactive approaches to disasters.

Meeting these conditions might present the greatest barriers to implementing SIBs for disaster risk reduction. Unfortunately, there is little empirical work in understanding how risk reduction investments affect an individual's or a community's overall vulnerability and coping capacity. Without this data, it can be difficult to measure success. Much of the investments into preparedness by the government and public sector over the past few decades have not been toward evidence-based programs. Therefore, it is necessary to pilot test and assess the successfulness of interventions before there can be wide-scale implementation through SIB investment.

"Between 2009 and 2014 alone, there were 56 disasters costing more than $1 billion each, with an average of nine events per year... . Numerous studies estimate that, for every $1 spent in preparedness activities, as much as $15 in disaster damage is prevented." Yet, the nation continues to largely focus on response and recovery efforts.

SIB investment would primarily make sense in areas with a history of disasters because more-predictable assessments of expected losses would be possible. In the private insurance markets, estimates of expected losses/costs are routinely used to determine insurance premiums to cover against many sources of accident or injury. In short, it is easier to determine how much was saved during a performance period through intervention programs because data on many past events and corresponding losses can be examined.

Public attitude can sway political behavior. Ideally, people and policy makers would focus on DRR, supporting systemic, evidence-based interventions. In reality, people tend to focus on risks that are immediate or memorable and that incentivizes politicians to support funding reactive interventions. Funding SIBs would require support of a paradigm shift by

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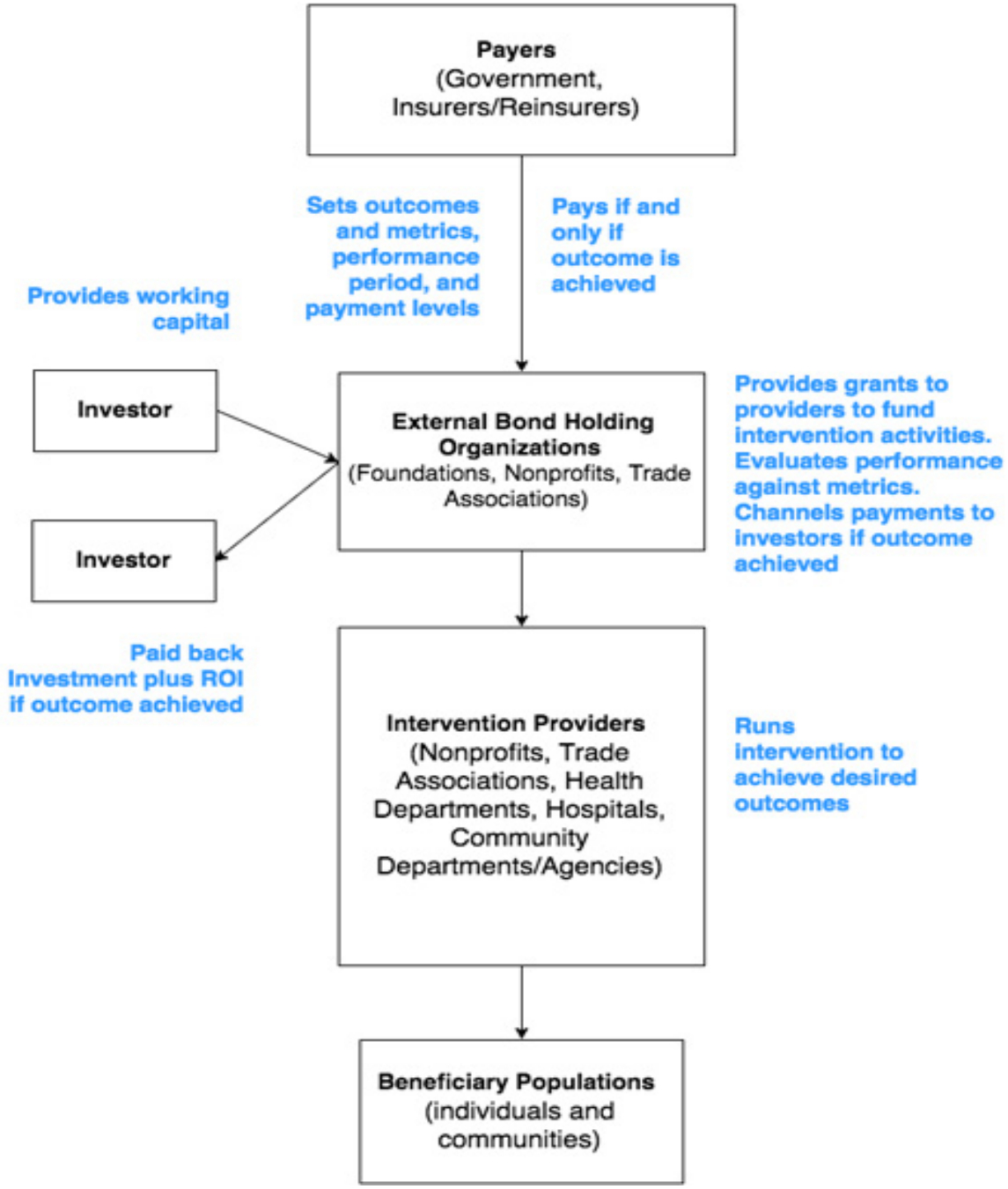

Fig. 1. A framework for social impact bond for disaster risk reduction financing.

practitioners, policy makers, and the public. Without this support, SIBs for disaster risk reduction are very unlikely.

With these three conditions in mind, the applicability of SIBs can be explored through a hypothetical scenario using 2009-2014 U.S. disaster loss cost data, which totaled about $148 billion. Following the framework in Figure 1, in early 2000, payers (government, insurers, and reinsurers) would establish the desired outcomes and success metrics. Since it is not likely that a total elimination of disasters and related losses is possible, this scenario assumes

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that the desired outcome would be a 20-percent reduction in the costs from disaster losses – a reduction of about $30 billion. Next, payers would seek investors such as the private sector and banks to front about $2 billion (one-fifteenth of the anticipated savings). A return on investment (ROI) would be set – this example assumes 5 percent, but it could be higher or lower depending on the negotiated payout rate.

Once an investment agreement is settled, private funding would be channeled to an external bond holding organization (e.g., foundations, nonprofits, trade associations) that would issue the bonds and administer a grant process to service providers (e.g., local and state government, nonprofits, health departments, hospitals, community organizations). Service providers would use these grants to implement evidence-based risk reduction and intervention programs aimed at the aforementioned risk factors in areas of the country with predictable disaster risk and known history damage losses and costs. Intervention programs would be measured for success at reducing the cost, damage, or losses associated with disasters over the performance period, which in this scenario is 2009-2014.

If success were found, the payers would channel a portion of their savings to the external organization for payment to the investors. In this scenario, investors would receive the initial amount of $2 billion plus $100 million in ROI if successful. If an intervention were not successful – for example, disaster-related losses were typical or increased during the performance period – the investor would not be reimbursed or gain a ROI. As such, the payers could have saved $27.9 billion. This example is an oversimplification, and investment amounts can be much lower or even higher, but it illustrates the possibility of savings for payers, incentives for investors, and benefits for individuals and communities.

A Future of Sustainable Disaster Risk Reduction

Given the growing detriment of climate change, social and structural inequities, population density, and aging infrastructure in hazard-prone areas, communities cannot continue to merely react to disasters. There must always be a capacity to respond to disaster, but there should also be a focus on reducing risk and preventing disaster. SIB models offer an alternative financing solution for an already stressed and under-resourced public system. However, even with three well-defined conditions, changing "the way we do business" is no easy task.

There are, however, viable lessons from the international community on DRR strategies, and a growing commitment from the U.S. government and other domestic partners to implement the Sendai Framework over the next 15 years. The public health sector should capitalize on these opportunities to investigate potential evidence-based strategies, educate policymakers and their constituents about the benefits of proactive, risk-reducing approaches, and perhaps even sway their behavior and affect necessary change. In doing so, communities could save money, avoid devastating damage, and maybe even prevent deaths.

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Public Health: A Whole Community Approach Partner

By Thomas Russo

Public health practice parallels the whole community approach advocated by 21st century emergency management practitioners. Therefore, public health's emergency preparedness actions integrate nicely with contemporary emergency management practice. Several methodologies of public health practice lend themselves to collaboration with other planning and response disciplines. By examining these methods, public health can extend and maximize its role in community-based emergency planning, response, and recovery.

The public health sector examines an entire community, demographic, cultural, health, and/or environmental status before proceeding with a strategy to affect shortcomings. Through community analysis, it identifies weaknesses or disparities in the population and then brings stakeholders together to plan strategies that will improve community health status and thus build community health resilience. Health status is one factor addressed from within the framework of the whole community approach.

One example is mass vaccination, which was very effective in historically eliminating childhood diseases. In recent years, communities have experienced resurgence, but the premise is what epidemiologists (disease investigators) call "herd immunity" – vaccinate an estimated 80 percent of the population, protect an entire community, and avert a public health crisis. Resurgence results from several factors, one of which is the cessation of vaccination among age groups that are most vulnerable to childhood disease.

Building a Resilience Toolbox

The Community & Regional Resilience Institute (CARRI) was established in 2010 to promote community resilience to the vulnerabilities communities confront. CARRI describes a community's resilience as being "measured by its sustained ability to prepare for, respond to, and fully bounce back from a variety of crises." Mass vaccination, such as the annual flu vaccination campaign is just one strategy that public health officials advocate to support community health resilience, which is the premise and goal of the whole community approach. However, emergency preparedness adds an entire layer of community complexity and "resets" the basis for study and planning when an all-hazards threat analysis is the basis for a community-wide comprehensive emergency planning effort.

The whole community approach is similar to traditional public health methods that remain in the toolbox today as communities confront ever-emerging infectious diseases as well as bioterrorist threats. The Federal Emergency Management Agency (FEMA) recognized the tendency for various sectors to rely on the government for planning, response, and recovery for threats that communities confront throughout the nation. FEMA learned from communities confronted with disaster that what works best is when all community stakeholders share the

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responsibility for preparedness and recovery. This is achieved through unique community structures – whether the business sector, nonprofit organizations, or faith-based or citizen groups. What emerged is FEMA's whole community approach, with strength coming from the integration of government and other sectors, including residents. In November 2011, FEMA shared the following definition in A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways to Action:

> *"As a concept, Whole Community is a means by which residents, emergency management practitioners, organizational and community leaders, and government officials can collectively understand and assess the needs of their respective communities and determine the best ways to organize and strengthen their assets, capacities, and interests. By doing so, a more effective path to societal security and resilience is built. In a sense, Whole Community is a philosophical approach on how to think about conducting emergency management."*

A few examples illustrate the application of public health methods and include multidisciplinary, multijurisdictional approaches, coalition building, situational awareness, and resilience building. As a result, the practice of public health emergency management integrates emergency preparedness efforts with first responders, healthcare sector, and emergency operation centers (EOC) – both public and private EOCs.

Examples of Collaborative Efforts

A critical function that public health provides to members of the traditional emergency planning community is that of situational awareness, used during recent emerging infectious disease threats and described in the February 2016 issue of the *DomPrep Journal* by Raphael Barishansky and Seth Komansky. This role played out during the Ebola dust-up in 2014, when public health biostatisticians produced graphics that targeted outbreaks while also providing extensive but detailed guidance on actions to take. Much of this built on pandemic preparedness plans that were developed, exercised, and executed during the 2009 H1N1 pandemic. This plays out once again with the Zika virus.

Communities witnessed another example of public health's ability to leverage a range of associations during the 2009 H1N1 pandemic, when it collaborated with the private sector to extend manpower for a mass vaccination campaign. Private sector medical practices joined numerous public sector clinics, but pharmacies – both independently owned and franchise operations – were recruited to join the campaign. These associations were pre-existing through the regulatory function assigned to public health in most states. As a result, established relationships were leveraged to tap private sector entities whose corporate missions include the responsibility of ensuring community health.

Public health also represents a composite of several but distinct health and safety disciplines whose natural orientation is regulation, safety, and preparedness. These disciplines stand ready to fulfill staffing functions for the emergency support function structure when emergency operation centers are activated. The reach of these disciplines extends well into the everyday lives of citizens for issues such as food safety, clean drinking water, fresh air,

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waste treatment, nuclear power, dam safety, and regulation and certification of healthcare workers and healthcare facilities. The integration of these public health disciplines into an emergency operation center structure adds technical assistance with subject matter experts to solve complex health, safety, and environmental infrastructure breakdowns during emergency operations.

Another example, the driving force behind the Hospital Preparedness Program is the healthcare coalition, a stakeholder group that would be affected when an emergency escalates to a community-wide mass casualty or mass fatality incident. The coalition makeup consists of regional hospitals as well as emergency medical services, emergency management, public health, and other partners that could be involved in any number of high-priority planning efforts.

"The whole community approach is similar to traditional public health methods that remain in the toolbox today as communities confront ever-emerging infectious diseases as well as bioterrorist threats."

A healthcare coalition serves as a vehicle to identify both threats and weaknesses in regional capabilities and to improve response by ensuring that all stakeholders are present. For example, initial preparedness activities for terrorism, chemical, and biological events, used a multidisciplinary approach for planning, training, and exercise scenarios. A gap was identified that medical examiners/coroners (ME/Cs) had a critical role in the planning and resolution of such events and that multidisciplinary teams should include ME/Cs. It was also recognized that these planning teams be trained in postmortem operations and essential services needed in a mass fatality incident. Public health has a responsibility through Emergency Support Function 8: Health and Medical, which places it in a lead role to form and nurture multidisciplinary, multijurisdictional preparedness initiatives. In a scenario such as this, the coalition must expand to not only include ME/Cs, but other agencies and organizations that may be involved in a mass fatality – such as family assistance services, which requires not only spiritual and emotional support services, but also support services such as housing, insurance, and legal assistance.

A mass fatality incident is dependent on these community services and, in many communities, agencies coordinate through Volunteer Organizations Active in Disasters (VOAD), which includes local chapters of the American Red Cross and member agencies such as the Salvation Army and the Southern Baptist Disaster Relief. Although VOAD members provide a full range of support services, another critical sector to incorporate into region-wide planning are federal technical agencies such as the Disaster Mortuary Operation Response Team (DMORT), the DMORT Family Assistance Team, or the National Transportation Safety Board's Victim Assistance team. In the planning for emergency scenarios, the role of public health is to work closely with ME/Cs and integrate – both vertically and horizontally – the local, state, and federal partners that may be on the ground in the event of an emergency

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turned disaster. In many state and local jurisdictions, ME/Cs take lead roles in mass fatality incidents. In others, law enforcement may take the lead role.

Unity Through Complexity

Complexity exists in emergency planning when high-risk threats – such as hurricanes, tornadoes, terrorism, snow and ice storms, or historic rainfalls – are studied and solutions to preparedness, response, and recovery sought. Planning cannot be limited to public health, emergency management, or other government-related structures, but must incorporate all sectors of the community including state and federal agencies, which also have a stake in response and recovery. Another example underscores the importance of community health resilience and illustrates an understanding of this complexity at the federal level.

The Centers for Disease Control and Prevention (CDC) has joined with FEMA in promoting the whole community approach. Through its foundation, CDC funds community-based projects that encompass the whole community approach through its Building a Learning Community & Body of Knowledge: Implementing a Whole Community Approach to Emergency Management project report. In collaboration with community partners, public health emergency management practitioners should study CDC whole community projects for not only their community resilience lessons learned but equally as models to strengthen health security. CDC's Office of Public Health Preparedness and Response Learning Office works to identify promising examples of existing community efforts that reflect the whole community approach. This mix of training, knowledge, and resources place practitioners in a unique position to synchronize these complex vertical and horizontal relationships, recognizing that the outcome is improved community resilience.

An outcome of these collaborations is social connectivity among stakeholder groups before a crisis. Community resilience is realized when established community connections are tested and the result is a spirit of cooperation to overcome challenges. However, this cooperation is also seen at the federal level. Through a collaborative partnership, FEMA and CDC have positioned themselves to encourage, support, and build community resilience via social connectivity while encouraging collective action after an adverse event. Public health's role at the local level, with its tradition of whole community, is a vital partner in this process with the skill set, technical expertise, and mission to improve health status, which maintains resilience while fulfilling the goal of the whole community approach.

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The "Glue" for Incident Management

By George A. Morgan

"Forms, we don't need no stinking forms to handle an all hazard emergency response in our _____ (fill in the blank: town, city, county, parish, tribal territory, region, state)," was no doubt echoed by many of the leaders of the numerous alphabet agencies attending mandatory National Incident Management System (NIMS) training some 15 years ago.

What accelerated the immediate need for NIMS was Homeland Security Presidential Directive 5 (2003), which directed the establishment of a single, comprehensive national incident management system shortly after the World Trade Center terrorist attack. Reflecting on that period of time, with potential manmade catastrophes specifically maritime, aviation and rail disasters, fires and explosions, and terrorism and social unrest on the rise and a significant increase in nationwide weather disasters, the limited resistance to a federally mandated program is understandable. However, as time moved on, the mandated compliance effort had the potential to eliminate federal grants eligibility if an agency was not 100-percent NIMS compliant. This action was seen as a negative deterrent for the required NIMS audience.

Wanting to take immediate positive proactive action to stop a threat, incident commanders might have found it foreign to initiate the NIMS model on every response regardless of the size and duration of the emergency. Unfortunately, some agencies directed that NIMS would be implemented for every incident. NIMS is designed to prepare for (mitigate), prevent, and manage response to emergency and disaster situations, and to coordinate all disaster responder agencies on the local, state, and federal levels – inclusive of the agency on scene first (emergency responders who deploy and function using the ICS model). This was not a consequence of the NIMS directives but instead more of a misunderstanding in the initial training efforts and in the integration of the Incident Command System that were already being used at the local level. NIMS is the overarching framework through which disaster management is coordinated, whereas ICS manages personnel as a subset within the NIMS model. As the event escalates either in seriousness or in resilience efforts after action requiring more resources, this complementary cohesiveness model defines a more successful outcome.

Compliance at All Levels

With respect to the mandated training compliance concerns, beginning in federal fiscal year 2008, the Department of Homeland Security required that all jurisdictions report NIMS compliance through the NIMS Compliance Assistance Support Tool (NIMSCAST) system. Employees designated as having a primary or supporting role during an emergency are required to complete the following online courses available on the Federal Emergency Management Agency (FEMA) website:

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- IS-100.b, Introduction to Incident Command System
- IS-700.a, National Incident Management System, An Introduction

First line supervisors – including any employee who may be required to temporarily serve in this capacity – who are or may become involved in emergency planning or response activities must also complete IS-200, Basic Incident Command System.

Positions designated as "middle management" – that is, any employee who may be required to manage first line supervisors – or any person designated to support an activation of the agency's emergency operations center must complete: ICS-300, which is an intermediate Incident Command System course; and IS-800.b, National Response Framework. ICS-300 training is conducted in a traditional classroom setting, as is ICS-400, which focuses on large single-agency and complex multiagency/multijurisdictional incident responses.

Finding Synergy

FEMA now clearly describes NIMS as a set of principles that provides a systematic, proactive approach to guiding government agencies at all levels, nongovernment organizations, and the private sector to work seamlessly to prevent, protect against, respond to, recover from, and mitigate the effects of incidents – regardless of cause, size, location, or complexity – in order to reduce the loss of or harm to life, property, or the environment. FEMA further addresses how NIMS supports this principle-driven response through the following elements of unified command (ICS):

- Developing a single set of objectives;
- Using a collective, strategic approach;
- Improving information flow and coordination;
- Creating a common understanding of joint priorities and restrictions;
- Ensuring that no agency's legal authorities are compromised or neglected; and
- Optimizing the combined efforts of all agencies under a single plan.

Peter Senge is an American systems scientist and lecturer at the Massachusetts Institute of Technology who wrote, "The Fifth Discipline: The Art and Practice of the Learning Organization" (published in 1999). Senge shared many ways to think of and define a system. For example, he stated that a system:

- Is composed of parts that must be related (directly or indirectly)
- Has a boundary that is determined by an observer or a group of observers
- Can be nested inside or overlap another system
- Is bounded in time, but may be intermittently operational
- Is bounded in space, though the parts are not necessarily co-located
- Receives input from, and sends output into, the broader environment

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- Consists of processes that transform inputs into outputs
- Is autonomous in fulfilling its purpose – for example, a car *with* a driver is a system

Essentially Senge's system concept components are similarly defined and well integrated within the NIMS principles.

The required five tenets identified in the 2011 FEMA Incident Management and Support Keystone doctrine for successful disaster response, recovery, mitigation, and logistics are:

- Engage the whole community
- Empower managers regardless of rank, to make decisions and take coordinated action
- Respond quickly with decisive actions
- Use outcome-based objectives
- Develop creative solutions and atypical resources

Building Trust & Collaboration

Most successful management systems are achieved by establishing trust and encouraging people to cooperate. Trustworthiness is the unspoken glue that promotes management system success, and NIMS operational success is no different. In fact, the definition of trust as described by the International Association of Business Communicators is based on an organization's willingness to be open and honest and to believe that another organization is also competent, open, honest, concerned, and reliable, and has common goals, norms, and values. Good communication and common vision help achieve enduring and trust-based relationships.

In his presentation entitled, "Last Lecture: Really Achieving Your Childhood Dreams" (at Carnegie Mellon University on 18 September 2007), Professor Randy Pausch refered extensively to "head fakes." For example, he described how parents may tell their children to play sports not because they really want them to become sports stars, but to help them develop collaboration and socializing skills. Similarly, as much as some people may dislike NIMS forms, such forms could serve as a catalyst to find common ground among participants – and develop collaboration and socializing skills – in the shortest timeframe.

Chief George A. Morgan's experience in fire and rescue service spans more than 40 years. He has served as a company officer, command level officer, and deputy/assistant fire chief in several Mid-Atlantic Fire Departments including: Howard County Maryland, the City of Hampton Virginia, Navel District of Washington, and Anne Arundel County Maryland. Chief Morgan's educational accomplishments include a Bachelor of Science Degree in Fire Administration from the University of Maryland, two Master of Arts degrees from the University of Phoenix, one in Organizational Management and a second one in Adult Education and Distance Learning. Chief Morgan is an active Chief Fire Officer Designation (CFOD) presented by the Center for Public Safety Excellence. Additionally he is a National Registry EMT-Paramedic and an NFPA Certified Fire Protection Specialist.

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Recovery – Uniting Efforts in a Complex Process

By Natalie N. Grant

Many communities – large and small – have recovered from disasters. Some have been successful, while others struggle to return. Disasters affect hundreds of communities nationwide every year and – at some point in time – each is confronted with the hard reality of recovering from a disaster. When the national attention and bright lights of the media fade, communities need to be prepared to recover.

Disaster recovery is a nonlinear process. Competing timelines, conflicting priorities, calls for swift and aggressive action, and the pressure to "return to normal" all present opportunities for missteps and misdirection. These stressors – and the difficulties addressing them – are not new. In fact, as identified by the 2016 National Preparedness Report (NPR), "states and territories continue to be more prepared to achieve their targets for Response core capabilities, while they are least prepared to meet their targets in the Recovery mission area." Although national proficiency has proved elusive thus far, the strategies and individual skills required to facilitate a recovery operation were also flagged as gaps. Specifically, page 83 of the NPR states that, "core capabilities associated with recovery from disaster have consistently scored very low in proficiency for states and territories since 2012."

Tackling community-level recovery planning following a disaster can prove daunting if attempted in isolation. As detailed in the National Disaster Recovery Framework, disaster recovery – as a planning process – must involve *whole community* engagement while maintaining *unity of effort* in defining and achieving desired outcomes. To implement these concepts, communication and translation are important to determine how and in what way the affected residents, businesses, and community members repair the destruction and collectively work to create a *healthy*, *resilient*, and *sustainable* future.

Disaster recovery is not simply a reconstitution of the buildings and thoroughfares that connect communities through infrastructure and commerce. Recovery is broader than that. It includes processes that support appropriate assessment or recalculation of risk, equitable and sustainable redevelopment, and an overall focus on supporting concepts contributing to positive community health outcomes.

As with preparedness and response, *collaboration* through a constellation of *engaged partners* to identify a *common vision* and establish *ongoing communications* is critical. An engaged partner is actively involved in the discussion and has a stake in the community outcome of a particular project or the overall recovery vision. This ability to find common ground among a diverse network is essential to equitable community recovery. In this process of engagement, identifying and demonstrating the value of collaboration to various partner groups is a necessary challenge to ensure commitment over a potentially extended time horizon.

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How & Where to Start

Often, the perception about recovery is that these plans only exist or are only needed following a catastrophic emergency incident. In truth, elements of pre-disaster planning are connected to existing strategic visioning plans. A "Healthy Community 2020," Community Comprehensive land-use plan and the like are pre-approved, senior leadership visioning documents that can provide a helpful foundation for the engagement of various partners. The Federal Emergency Management Agency (FEMA) has developed a toolkit resource to facilitate recovery-planning processes for the emergency management audience. In partnership with FEMA, the American Planning Association has similarly developed a comprehensive guide from the community planning perspective. The National Academies has also published an assessment report detailing the intersections of disaster recovery management, community planning, and health and social service systems. While this report is targeted at the health and service communities, there is value for planners and emergency managers in understanding methods, considerations, and opportunities for engaging these interconnected networks.

Each document targets a specific audience and presents a particular perspective, however, the overall themes, cross-referenced sources, and similar approaches among them demonstrate the connectivity between disciplines in supporting community recovery.

Recovery Partners

The set of partners engaged in the recovery process are necessarily different than those engaged in response. In reconstituting a community fabric, many different stakeholders will be consulted – program officers, engineers, community planners, community advocates, social service and healthcare organizations, to name a few. The inclusiveness sought during these planning meetings can borrow from the process utilized by Environmental Protection Agency for Superfund activities to support collective engagement and decision-making. Similar approaches in the FEMA Hazard Mitigation Grant Program demonstrate the importance of forming a multidisciplinary coalition.

The Importance of Health

Since health is an integral part of life, work, study, and play, it necessarily has a connection to the built environment. As the National Institute for Standards and Technology (NIST) Community Resilience Planning Guide identifies, buildings and infrastructure systems play a role in "the health and vitality of the social and economic fabric of the community" and also "in assuring those social functions resume when needed after a hazard event." The National Academies report explains that poor pre-disaster community and individual health conditions may contribute to an elevated overall future social or economic expense to the community. The NPR also identifies on page 84 that states and territories "in their annual preparedness self-assessments . . . identified 'determining health and social needs' as their largest gap area in the Health and Social Services core capability, selecting the gap for 59 percent of responses."

The Role of Emergency Managers

Finally, the communities served and the leadership supported will continue to look to emergency managers for their knowledge and expertise to marshal appropriate resources to navigate the rough seas of a crisis. Once the acute threat has subsided, future uncertainty and resource availability could become a painful pressure point. Although emergency managers are often not in the lead recovery role, the subsequent supportive resources intended to

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mitigate future risk or reconstitute damaged infrastructure can serve a further coordination function for other government, nongovernment, and private sector actions. Communication, collaboration, flexibility, resilient planning, leadership, and unity are fundamental traits of an emergency manager and key to this process.

In closing, disaster recovery planning demonstrates the complexities and interrelated nature of various communities. No sector exists by itself. Navigating such an environment is a natural skill for the emergency management community. As such, tackling these challenges can and should be part of a collective pre-disaster planning process whereby partners across disciplines are engaged and committed to work toward a shared vision of creating a healthy, resilient, and sustainable community every day – especially after the worst day.

Natalie N. Grant works for the U.S. Department of Health and Human Services (HHS) Assistant Secretary for Preparedness and Response (ASPR) as a program analyst within the Division of Recovery. She has served as the health and social services recovery field coordinator for federal interagency coordination following Hurricane Sandy from 2012 to 2016 and other emergency incidents within HHS Regions 1, 2, 5, and 10. Prior to her federal role, she served as director of the Office of Public Health Preparedness at Boston Emergency Medical Services (BEMS). She was chief emergency planner for public health and medical matters, oversaw all programmatic activities associated with implementation of the Public Health Emergency Preparedness Cooperative Agreement (PHEP) and the Medical Reserve Corps (MRC), while collaborating closely with the Hospital Preparedness Program (HPP) through a partnership with the Conference of Boston Teaching Hospitals (COBTH) and the Massachusetts League of Community Health Centers. She also worked at the Miami-Dade County Office of Emergency Management and in close partnership with colleagues at Miami-Dade Fire Rescue, where she facilitated the Miami-Dade County ESF-8 response to natural hazards, utility failures, and civil disturbances. Originally from Homestead, Florida, she received her MPH in International Health from Boston University and AB in Biology from Harvard College.

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Integration of Public Health Into the Whole Community

By Kathleen E. Goodwin & Leana S. Wen

The Baltimore City Health Department (BCHD) is the oldest, continuously operating health department in the country – founded in 1793 to respond to a local yellow fever outbreak. BCHD is committed to the idea that health is critical to a community's ability to thrive and thus deserves to be incorporated in decision making in almost every sector.

Public health has never taken a back seat in Baltimore, Maryland. BCHD strives to engage with partners throughout the city, state, and nation to encourage prioritization of health and well-being. The aim is to focus on upstream prevention rather than reactionary responses.

Childhood Illnesses

BCHD functions as the citywide convener to set an agenda focused on collective health priorities by aligning goals and using evidence-based strategies. In 2009, Baltimore had one of the worst infant mortality rates in the United States. BCHD led a coalition of 150 public and private partners, including hospitals, clinics, foundations, sororities, and churches, to found a program called B'More for Healthy Babies. Within six years, Baltimore's infant mortality rate fell by 28 percent. The number of infants dying in their sleep was reduced by half. The disparity between black and white infant deaths dropped by 40 percent.

The guiding principle at BCHD is to go to where people are. Until April 2016, children were only getting eye screenings in their schools in pre-kindergarten, first, and eighth grades. Less than 20 percent of kids who screened positive were actually getting glasses, resulting in thousands of children struggling to reach their full potential because of being unable to see the boards in their classrooms. The straightforward intervention of glasses could mitigate a host of downstream problems. Together with partners at Johns Hopkins University and the support of local foundations, BCHD launched Vision for Baltimore, which provides eye screenings and glasses free of charge in schools – for every child in every grade, from kindergarten through eighth grade – so they do not have to miss class and their caregivers do not have to miss work.

Drug Addiction

BCHD has also been successful at changing legislation to save lives. Opioid addiction is an epidemic in Baltimore, as in the rest of the United States. Over 20,000 people in Baltimore use heroin. In 2015, more people died from overdoses than died from homicide, so the Health Commissioner declared overdose to be a public health crisis. BCHD worked to pass legislation so that, as of 1 October 2015, the Health Commissioner issued a blanket prescription for the opioid antidote, naloxone, to all 620,000 residents of Baltimore.

BCHD is committed to the belief that every resident has the ability to save a life, so has trained over 11,000 people on how to save a life and developed the first-of-its-kind online naloxone-training platform, DontDie.org. BCHD continues to partner with other city agencies,

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businesses, community groups, and faith leaders to provide trainings in markets, churches, senior housing, jails, bars and restaurants, even the Maryland Zoo. There are early signs of success. For example, in the first quarter of 2016, overdose deaths decreased by 8 percent in Baltimore, even as they continue to rise at unprecedented rates throughout the country.

Crime & Violence

BCHD's mandate is to protect the most vulnerable members of the community. In the unrest following Freddie Gray's death in April 2015, over a dozen pharmacies were burned, looted, or closed. Many seniors and other at-risk individuals did not have access to life-saving medications, so BCHD set up a 311 service request for assistance with prescription medication access and arranged for the delivery of urgently needed medications to residents' homes. BCHD also organized food distribution and set up a shuttle for seniors to get groceries. Efforts have continued, with virtual supermarkets to keep on delivering healthy food to people who do not have access to it, and a 24/7 phone hotline for individuals seeking addiction and mental health help.

Public Policy

All of BCHD's programs strive to incorporate health in all policies across the city and view any issue that decreases the safety and well-being of citizens to be a health issue. For example, BCHD continues to advocate for violence prevention to be a core tenet of public health. BCHD's Safe Streets program partners with community-based organizations to hire recently released citizens, many of whom are former gang members and drug dealers. In 2015, Safe Streets workers mediated nearly 700 conflicts, and the majority of these interactions were deemed to be likely, or very likely, to have reduced gun violence.

Baltimore is a unique city, but the problems the Baltimore City Health Department addresses on a daily basis – infant mortality, child health, the opioid epidemic, food and medication access, and violence – are issues that touch every city. This is the necessary role of local public health: to go to where people are, to unite communities, and to respond to needs with continuous innovation and unending dedication to serve.

Kathleen E. Goodwin is special assistant to the commissioner at the Baltimore City Health Department and a Baltimore Corps fellow. She graduated from Harvard University in 2013 with a B.A. in social studies, focusing on communal violence in South Asia. Following two years as a financial analyst at Credit Suisse, she enrolled in the Goucher College Post-Baccalaureate Premedical program and fulfilled the requirements to apply to medical school.

Leana S. Wen (pictured above), M.D. M.Sc. FAAEM, is the commissioner of health, Baltimore City. She leads the oldest, continuously operating health department in the United States, with over 1,000 employees. Her transformative approach to public health involves engaging hospitals and returning citizens in violence prevention and launching an ambitious opioid overdose prevention program that is training every resident to save lives. Following the civil unrest in April 2015, she directed Baltimore's medical access and trauma recovery efforts.

Significant contribution to this article was provided by:
Jennifer L. Martin, J.D. M.A., who is the director in the Office of Public Health Preparedness and Response (OPHPR) at the Baltimore City Health Department. As the director, she oversees and facilitates the emergency preparedness and response program within the agency, including biosurveillance and bioterrorism program activities, continuity of operations planning, and health and medical response planning. Additionally, the city's extreme heat and extreme cold planning efforts are led by BCHD under her direction. She also serves as BCHD's representative for issues and planning related to climate change at the state and local levels.

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Today's Decisions Drive Tomorrow's Power Grid

By J. Michael Barrett

For more than a century, the U.S. electrical power grid has dramatically improved the health, safety, and economic productivity of hundreds of millions of people. Although this grid stands as an ingenious accomplishment, experts fear that, as the 21st century progresses, the grid's ability to meet evolving U.S. energy needs may falter without dramatic modernization.

This U.S. power grid has grown to encompass some 5,800 major power plants and over 450,000 miles of high-voltage transmission lines delivering power to more than 144 million end-use customers. The cumulative value of the infrastructure and equipment it represents is a staggering $1 trillion, making energy the single most capital-intensive industry in the country.

However, in the face of changing user demands, manmade and natural threats, and potentially revolutionary technological solutions, there is serious reason to question if the current design of the grid will meet future demands. For example, the ability to effectively and efficiently incorporate novel technologies in a secure and optimal manner using the grid's decentralized, locally regulated, and arguably antiquated business operating model continues to generate concern among experts. In fact, it remains an open question as to whether or not the 100-year-old system – originally designed to incentivize power companies to connect new users to a largely non-electrified country using large, heavily regulated firms – is viable in the modern era. The majority of the population is already able to reach the grid and the concern now is not connecting more users, but rather balancing total cost, security, environmental concerns, and systemic resilience. Therefore, policymakers and technical experts would be right to conclude that the entire U.S. electrical grid is due for a major overhaul.

Investments, Innovations & Vulnerabilities

According to the International Energy Agency (IEA), the electrical power sector needs up to $2.1 trillion of new investment by 2035. As the government and industry continue to invest a massive amount of resources in a significant redesign of the grid, the looming massive investment period presents the opportunity for a de facto redesign of the grid – a period during which innumerable decisions will be made about trade-offs, cost optimization, reliability, environmental impact, continuity of operations, and responsibility for paying the associated costs. Specifically, as the grid's modernization continues, the new design, operating model, and core objectives of the power grid are all steeped in uncertainty due to: (a) emergent technologies; (b) changes to the climate and associated socially and politically mandated requirements; and (c) terrorism and other manmade threats.

Two innovations represent a particular opportunity to use targeted investment to dramatically improve the capacity of the power grid:

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- The "smart grid," comprising the collection of networked sensors located at the point of consumption, which enable two-way information flows for better management of both the supply and demand needs of the grid; and
- "Distributed energy" generation, which refers to rapid growth in localized power generation such as rooftop solar or wind farms. A related growing technological opportunity is that of the microgrid, which refers to a highly localized, self-contained power generation, transmission, and distribution model.

In fact, many observers agree that investments that harness the potential for near real-time monitoring and control of the power distribution network could usher in a revolution in terms of how energy is managed as well as who provides it. As Bloomberg New Energy Finance analyst Brian Warshay stated in a March/April 2015 article, this could result in "improved reliability, increased efficiency, and the seamless integration of renewable power – not to mention more stable prices and lower emissions."

However, there is also growing concern over the risks associated with connecting the grid ever more tightly to the vulnerable and inherently at-risk internet, which is plagued by malware, cyberterrorists, and other threats. In practical terms, due to the massive scale of investment required to build and maintain the power grid, each of the issues mentioned above significantly affects the business case supporting a variety of power grid investment decisions. Because much of the power grid's infrastructure is designed to last half a century or more, such decisions must be made very carefully. Without deliberate forethought and collective action, the resulting grid will be sub-optimal, one that fails to fully balance overall system cost, security, environmental impact, and surety of service.

Asking the Right Questions

With so much at stake, it is essential to appropriately define the parameters of the discussion about the grid's future – for absent such deliberate effort, the future of the grid will continue to be driven forward by technological advances and regulatory imperatives that foster somewhat disorganized growth. Making sound decisions will require asking several questions, for example:

- What could and should be the collective impact of such a large investment, and how will that align with the emergent policy, legal, financial, and technological changes over the coming years?
- To what degree will distributed generation and other emergent opportunities such as the "smart grid" be integrated throughout the entire power system, and how does that change the fundamental business case for various key industry participants as well as end-users?
- Will there be, for example, a shift from utilities focusing on growing the amount of power generated and charging per watt of electricity delivered to a more services-based model that focuses on efficiency, surety of service, and other systems-based value-added functions?
- Specifically, who is ensuring that the whole system is being made resilient against significant service interruptions?

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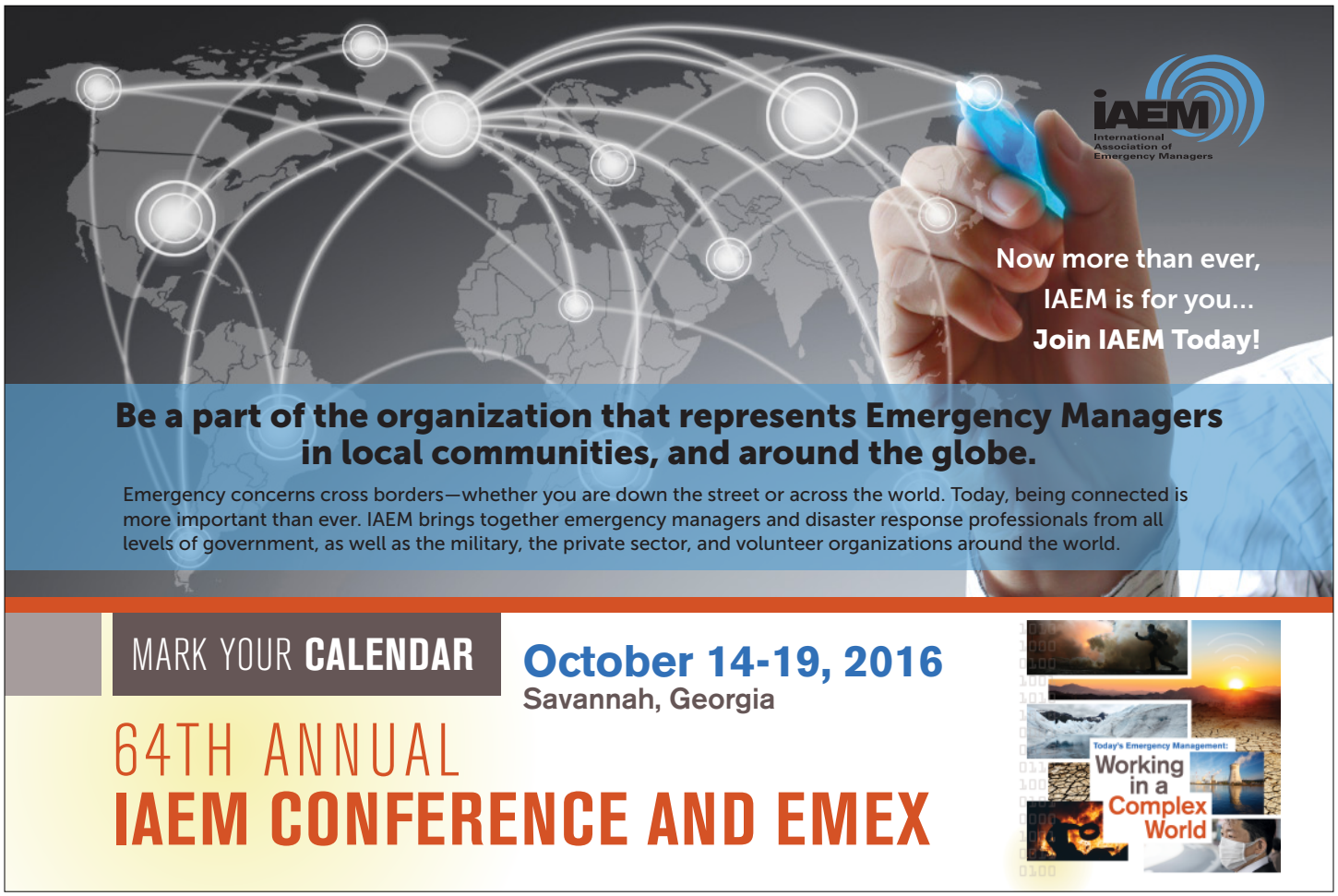
These and other important issues must be addressed in a deliberate, realistic manner in order to realize the potential benefits of the electrical grid's ongoing modernization, which has provided economic benefits for so long.

This article is drawn from the author's recent White Paper, "Challenges and Requirements for Tomorrow's Electrical Power Grid," published by the Lexington Institute and available at http://lexingtoninstitute.org/wp-content/uploads/2016/06/Tomorrows-Electrical-Power-Grid.pdf

J. Michael Barrett is director of the Center for Homeland Security & Resilience, an adjunct scholar with the Lexington Institute, and a former director of strategy for the White House Homeland Security Council. Serving as a Naval Intelligence Officer in the aftermath of the terrorist attacks of September 11, 2001, he worked on a variety of classified programs aimed at defeating terrorists overseas before transitioning to homeland security and developing core strategies and policies enabling a risk-based posture for federal, state, and local efforts. His current focus is on improving the systemic resilience of power grid, transportation, and communications networks by addressing both public and private sector gaps in terms of systemic survivability. A former Fulbright Scholar, author or co-author of two books and dozens of terrorism and homeland security articles, he also has been a frequent national security guest on television programs including ABC, Bloomberg, CNN, CNBC, Fox News, and Nightline. He can be reached at mbarrett@security-resilience.org



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