From Fragile to Resilient Health Systems:
A Journey to Self-Reliance

Meeting Report
March 27, 2019

USAID
FROM THE AMERICAN PEOPLE

MEASURE Evaluation

From Fragile to Resilient Health Systems:
A Journey to Self-Reliance

Meeting Report

March 27, 2019
Washington, DC

July 2019

MEASURE Evaluation
University of North Carolina at Chapel Hill
123 West Franklin Street
Chapel Hill, NC 27516 USA
Phone: +1 919-445-9350
measure@unc.edu
www.measureevaluation.org

This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of MEASURE Evaluation cooperative agreement AID-OAA-L-14-00004. MEASURE Evaluation is implemented by the Carolina Population Center, University of North Carolina at Chapel Hill in partnership with ICF International; John Snow, Inc.; Management Sciences for Health; Palladium; and Tulane University. Views expressed are not necessarily those of USAID or the United States government.
TR-19-362

USAID
FROM THE AMERICAN PEOPLE

MEASURE
Evaluation

Acknowledgments

We would like to acknowledge Anwer Aqil, Elizabeth Lugten, and Aimee Desrochers of the Office of Health Systems (OHS) at the United States Agency for International Development (USAID) for their diligence and commitment in the planning of the meeting. We appreciate the excellent work by the moderators (Rhea Bright, Elisa Adelman, Nazo Kureshy, Caroline Ly, and Anwer Aqil) to highlight varying perspectives and voices. Special thanks to all the panelists from esteemed organizations who shared their experiences and thoughts in this conversation on health system resilience.

We appreciate Joni Bowling, Melissa Lam-McCarthy, and Victoria Fleming for their logistical support in organizing and working around the clock to ensure that all pieces were in place for a successful conversation. Victoria Fleming drafted this report. Special thanks to Stephanie Watson-Grant for technical guidance provided during the drafting process and to Tobey Busch, technical advisor in pharmaceutical system strengthening with USAID, for her graphic representations of sessions (found on pages 9, 22, and 23).

Video recordings from this meeting are available on MEASURE Evaluation's YouTube page:
https://www.youtube.com/user/measureevaluation

Table of Contents

Abbreviations

CDC	U.S. Centers for Disease Control and Prevention
DRC	Democratic Republic of the Congo
FBOs	faith-based organizations
HIS	health information system
IHR	International Health Regulations
LMICs	low- and middle-income countries
OHS	USAID Office of Health Systems
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
SOCI	Stages of Continuous Improvement tool
USAID	United States Agency for International Development
WHO	World Health Organization

Foreword

What is resilience? How do you measure it? How do you develop it? Is it something that's intrinsic or something we can impart? I think those are some of the questions we will be dealing with today. I love the list of panelists and discussions and I look forward to hearing more about how the whole day goes, even though I cannot be here the whole time.

Resilience is defined as tending to recover from or adjust to shock or change. For health systems we need to be looking at what that means with a multisectoral methodology. As countries become more self-reliant through their workforce, through their governance, through their communities, we recognize that these populations, if they're healthy, can be much more productive as well. Consequently, we need a true collaboration—from the community level, to the national level, to the international donor level. We need to be able to see countries commit both philosophically and financially to what they're doing.

This means we need to build a partnership that goes multisectoral. One of the things that we've recognized is that some of the stronger health systems have a comfortable link between many different areas. Some may have a health system that is too dependent on one mechanism or another, let's say public versus private. We need to be able to help our countries recognize where the strengths are for the private, for the faith-based, for the public, and help countries recognize how to improve all of them, so all of them are strengthened.

Self-reliance is where we are going in USAID. We call it "the journey to self-reliance," but self-reliance is not going to be effective if we don't have resilience. This is critical to where we go next. We need to recognize that many of the community health approaches are outside of the health system. All of us are aware that many of the predictors of actual population care—nutrition, safe water, environmental and air quality, community standards, family support structure and stability, religious beliefs, and practices—are outside of the healthcare system in a formal sense, but we know many of them impact things greatly.

You really are some of the folks that are going to make a big difference in what happens in the world in terms of health systems. I want to encourage all of us to look not only at how we address the issues related to regulations—which are so important to healthcare training, which is so vital to assessing needs—we can't target what we're doing if we don't do that, and to assuring quality of care. All of these are critical to what we do today, and I think they are all going to be covered in such wonderful ways throughout the day. The bottom line is, to a certain extent, resilient health systems are going to be dependent on the resilient people who are in this room and that those whom we interact with at the community level, like those wonderful community health workers we have all seen around the world—the doctors and the determined and thoughtful leaders of healthcare around the world. Resilience is essential on many levels and I applaud your work on this today.

Dr. Alma Crum Golden

Senior Deputy Assistant Administrator[1]
United States Agency for International Development (USAID)

[1] *Dr. Alma Golden's title is currently Executive Director of the Global Development Lab, and Nominee, Assistant Administrator of the Bureau for Global Health.*

Background. Resilient health systems

In 1997, the first cases of Avian influenza in Hong Kong focused global attention on the lack of preparedness for emerging infectious diseases. Ebola, which infected more than 28,000 people and caused 11,000 deaths primarily across Liberia, Sierra Leone, and Guinea in 2013, revealed the fragility of health systems, exposing their inabilities to deal with such a public health emergency.

Health system resilience is the ability to maintain optimal system performance in times of adversity/crises. However, achieving resilience requires constant balancing of alignment, collaboration, adaptation and transformation of supply, demand, and contextual factors within and outside of the system.

While significant progress has been made in global health, in 2017, 5.4 million children under five years of age died from largely preventable causes; 75 percent of those deaths occurred within the first year of life. Every day, approximately 830 women die from preventable causes related to pregnancy and childbirth. Progress is also being challenged by increases in the number and scale of extreme weather-related disasters due to urbanization, environmental degradation, and climate change (UNISDR, 2016); as well as increasing incidence of violent extremism and other disruptions to weak health systems. Currently, more than 2.5 billion people in 51 low- and middle-income countries (LMICs) live in high to very risky situations. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) predicted in 2018 that approximately 134 million people would require humanitarian assistance worldwide. The World Bank has calculated that the disasters' real cost to the global economy is a staggering US$520 billion per annum and is pushing 26 million people into poverty every year. Shrinking donor investments, stagnant country health budgets, population pressures, and the growing number and complexity of emergencies challenge the world's ability to achieve the Sustainable Development Goals.

These overwhelming costs, both economically and through the loss of human life associated with fragile health systems have led to a focus on building health system resilience. Any change in the norm, whether it is expected or unexpected, places stress on a health system's ability to provide routine or emergency care to the population it serves. These shocks can be large and complex, such as infectious diseases, natural disasters, and refugee influx, or can be slower onset, such as shifting demographics, droughts, urbanization, and migration. The fragility of a health system also results from supply- and demand-side factors. The supply factors include weak management of or poor planning for availability of medicines or supplies, or poor distribution of human and financial resources to match population health needs. Demand factors imply that people perceive the utility of services and trust them to change their health-seeking behaviors. In addition, community mobilization, participation, and advocacy help in making a health system accountable to address target population health needs.

Health systems do not exist in a vacuum. Socioeconomic, demographic, political, and physical context determines the types and distribution of health outcomes as well as the financing and governance of a health system. It also cannot thrive without the support of other sectors. Providing high-quality services requires financial support, infrastructure (such as safely constructed buildings, roads, water and sanitation, and electricity), and education for health professionals. A health system must also function at multiple levels—individual, community, national, subnational—and with private sector, including civil society organizations.

Paradigm shift in fostering health system resilience

Understanding supply, demand, and contextual factors contributing to health system resilience requires a paradigm shift. First, health systems in LMICs are fragile due to internal weaknesses in supply, demand or contextual factors. Second, any expected or unexpected shock will further deteriorate the

existing performance. Therefore, health system resilience should be fostered by paying continuous attention to supply, demand, and contextual factors and their interdependencies and linkages.

Implementing this paradigm shift in resilience requires:

- Moving away from a narrow conception of resilience as a collection of capacities that are needed to keep systems' performance at its routine level during sporadic emergencies
- Recognizing that resilience is inherent in how the system is organized to perform through alignment and collaboration among the supply, demand, and contextual factors and emerges to maintain its performance when systems are hit by expected or unexpected crises
- Acknowledging that fostering resilience requires programs to emphasize better collaboration and alignment among supply, demand, and contextual factors.

Evidence demanding a paradigm shift in fostering health system resilience

There is mounting evidence suggesting the need for this shift away from focusing on acute, sudden onset shocks toward building capacity to address regular disruptions: disruptions caused by supply side weaknesses such as inability to scale up cost-effective interventions due to the inadequate availability of trained health professionals (evidenced by the projected global gap of 19 million health workers required to meet growing health needs); disincentives to seek care due to high out-of-pocket expenditures and the lack of financial risk protection schemes, or available care being unacceptable because of poor quality and mistreatment of patients; incomplete and untimely availability of information for monitoring progress, planning, and managing resources, and limited transparency and accountability contributing to poor health governance.

The availability of high-quality, affordable health services alone does not assure their use unless people believe in their utility and trust them; thus, a lack of robust community involvement in health systems also contributes to their fragility. A lack of trust leads to misconceptions and fears regarding a range of healthcare services and requires incentivizing demand to improve health-seeking behaviors and change social norms. Community involvement in planning, management, and monitoring of health system outcomes in addition to mobilization and advocacy can strengthen accountability to address population needs.

While deliberate attention to both supply and demand factors and building a system-level response to each can lead to better system performance, contextual factors continue to undermine the emergence of resilience. Without safe water and sanitation services or adequate physical infrastructure like roads, transport, electricity, and telecommunications to operate and improve access to health services, improvements in system performance through other efforts will be limited. Additionally, first responders and law enforcement agencies help create safe, secure, and stable environments to work in. Without the collaboration of multiple stakeholders across different sectors, issues such as low investments in the health sector and health disparities due to income, gender, geography, minority status, and food insecurity are likely to endure.

Moving forward

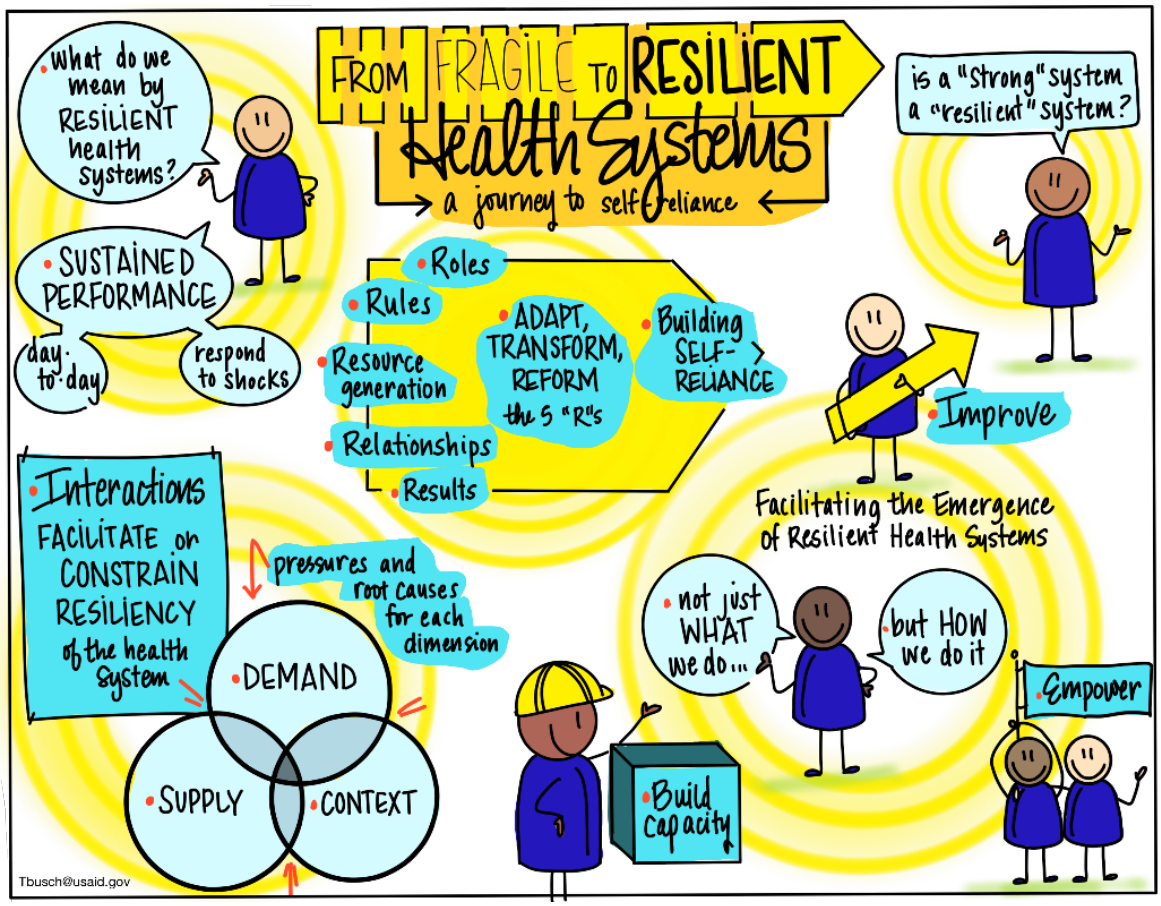
Coordination between health development programs and development programs in sectors that impact social determinants of health is required to successfully address both expected and unexpected shocks. The health systems alone cannot address these crises. Development actors should seek to bring about this paradigm shift from working in isolated, sector-based silos to comprehensive system-wide, multiscale and multisectoral approaches whenever possible. Evidence and case studies from LMICs on fostering resilient health systems support this approach (Appendix A). Country progress from fragile to resilient health systems reflects improved commitment and capacity and supports countries to foster self-reliance.

USAID's Office of Health Systems organized a consultative meeting to bring together health systems and public health policymakers, managers, researchers, multilateral agencies, and donors to share experiences, innovative practices, successes, challenges, and methods to track the changes from a fragile to resilient health system. The consultative meeting report is based on multiple sessions and steps for moving forward.

Setting the stage: Remarks by Kelly Saldana, director, Office of Health Systems, USAID

Framing questions for the day's discussions:

- What do we mean by resilient health systems?
- What does it take to make health systems resilient?
- What unexpected crises influence policy and programming to build health systems and how can we learn from that to regularly strengthen health systems to be more resilient?
- What should be the roles for donors in setting the agenda for resilient health systems and how can we help resilience to emerge from our efforts to strengthen health systems?
- What strategies can we use to build and strengthen links between communities, health systems, and other sectors?
- What methods and approaches for assessing and monitoring health system resilience do you use?
- How can we learn from each other and adapt those learnings for our work?



The shifting paradigm on health systems resilience—expected and unexpected crisis

The stages related to resilience in literature are preparing, detecting, absorbing, responding, recovering, adapting, and transforming. From a systems perspective, the ultimate goal is to sustain the performance of a health system when there is a shock or a major event. Of course, sustaining health system performance is difficult, even in stable conditions. A lot of factors affect performance. The interactions of these factors, grouped by supply, demand, and contextual factors, facilitate or impede a health system's ability to perform at an optimal level and sustain that performance. Variations in performance could be due to any of these factors or something else entirely. Let's take the example of Nigeria. In the north, the supply of and demand for health services are weak due to certain cultural practices. These factors are compounded by poverty, weak infrastructure, etc., so the overall health system performance is relatively low compared to south, where opposite conditions exist.

The Nigeria example illustrates that health system resilience is not built by addressing specific capacities. It must be nurtured through improvements across supply, demand, and contextual factors as well as within their interactions. It is important that we acknowledge and consider these factors when we talk about health systems and resilience. Examples from Nigeria and other countries help us to make the mental shift from focusing on specific capacities to strengthening supply, demand, and contextual factors and their interactions to foster sustainable and optimal health system performance that will facilitate resilience in times of crises. Weakness of any factor could nullify improvements in other factors. In other words, alignment and collaboration among these factors is a precondition for a resilient health system that can withstand shock but maintain its performance to serve target communities.

What we want to do in an unexpected crisis is similar to what we want to do each day. A health system cannot be resilient if it is not strong, but a strong health system is not necessarily resilient. Empowering individuals, enabling processes and practices, and establishing rules and regulations that allow for adaptation and change are all ways in which a health system can respond to changing conditions and begin to promote the emergence of resilience.

The USAID OHS is using systems thinking to move beyond the building blocks and talk about the interactions among those building blocks that work to create strong health systems. To understand the resilience context, one must also understand the interactions between demand, supply, and pressures within a country and how these affect building resilient health systems.

Resilient health systems contributing to the journey to self-reliance:
Themes from the meeting

This meeting explored system resilience as an emergent characteristic arising from the interactions of supply, demand, and contextual factors of health systems. It contributed to USAID's Journey to Self-Reliance by focusing attention on the need to strengthen processes of supply, demand, and context within country health systems to indirectly increase government capacity and commitment. Specifically, promoting health system resilience will increase government commitment through inclusive government that includes multisectoral, private sector, civil society and community collaboration, and improving gender equity and social cohesion among different ethnic groups in times crises. Government capacity will be enhanced through improvements in government effectiveness, as measured by improved government capacity to respond to citizens' health needs; citizen capacity, as assessed by improved public and child health, International Health Regulations (IHR) capacity health, and reduced poverty due to reducing impact of crisis; capacity of civil society groups by integrating them in service delivery and advocacy; and economic capacity by promoting increased use of innovative information and communication technology.

> Foundations and donors like USAID may work in all the pieces needed for resilience individually, but we acknowledge that it can be challenging to approach the system holistically when there are competing outcome priorities that are associated with element-specific funding. Today's meeting has brought these pieces together through a systems lens.
>
> — Kerry Pelzman, director, Office of Health Systems

Themes

Several themes emerged from the meeting's panels and discussions, but the main one that appeared consistently was that system resilience cannot be achieved in silos. It must be a multisectoral approach that encourages engagement of the public and private sectors and civil society. Other themes were as follows:

- Government capacity to deal with health system supply, demand, and contextual factors to promote better health system performance and resilient health systems
- Trust in the health system as an important part of successful response, especially if outbreaks occur where systems are weak or conflict exists
- Planning for shocks should be incorporated into activities now—because shocks will happen
- A system's ability to adapt to political and social contexts, the local disease profile, and other pressures is vital for stability, security, and resilience
- Evaluations of health system resilience should include the intersection of pressures on supply and demand, and unique country contexts
- A national level examination of resilience is not sufficient; regional and, most importantly, local resilience should be considered
- Communities need to engage with the health system continuously, not just in times of crisis
- Community health isn't just what community health workers do, it includes behavior change, understanding cultural norms, and empowering citizens to make good health decisions.
- Building resilient health systems requires multisectoral approaches that include the public sector, civil society, and the private sector—plus working with non-health sectors, such as agriculture, environment, education, and security
- Examine the comparative advantage of the private sector and non-health sectors and integrate those strengths into approaches for strengthening health systems.
- Tracking and measuring of resilience is for generating evidence and better program design

Panel: Shocks/crises that stress health system performance

- Health development outcomes are threatened by emerging infectious diseases, increased frequency of natural and man-made disasters and armed conflicts.
- Fostering health system resilience prevents unnecessary deaths, injuries, and disabilities caused by crises, and can improve quality of life, safety, and security.
- Every crisis creates opportunities to bring stakeholders together to reform the health system to increase resilience.
- Having a sophisticated health system does not guarantee it will be resilient to shocks.
- Resilience of all systems, including health systems, should be addressed at the national, regional, and local levels (including community and family).
- A strong and resilient health system must start by building trust with the population in that system.

In this session the panelists hypothesized how to develop stronger health systems that would have the capacity to respond to and resist shocks. Discussants agreed that assigning roles for coordination during a crisis would lead to stronger, more resilient systems.

> I want to emphasize here that a resilient health system does not automatically mean the system can resist the shock. Even a good health system can collapse in the event of an emergency.
>
> — Sohel Saikat, programme officer, Quality Systems and Resilience Unit at WHO

Sohel Saikat, program officer, Quality Systems and Resilience Unit at the World Health Organization (WHO), listed four performance objectives for health systems strengthening: health services are maintained in all contexts; the system is able to provide emergency services; the health system plays a central role during any health event; and the health system can adapt to changes in demographics, disease profile, and political context. A resilient health system does not automatically mean that it can resist shock. Even a strong health system can collapse in an emergency.

Oliver Wilcox, director of the Office of Countering Violent Extremism, U.S. Department of State, spoke about how resilience applies in countering violent extremism. Part of resistance to extremism is a prevention focus on building the resilience of individuals and populations where radicalization may take place (e.g., universities, prisons). This approach addresses resilience at the national, regional, and local levels. Research shows that psychosocial factors, not poverty, are the drivers for radicalism. Research also shows that radicalization is a highly individual phenomenon, suggesting that building youth resilience should be the main objective and that this often requires working with existing community-based intervention programs.

LSNichols @ls_nichols tweeted

Dr. Mayala @USAID DRC. Trust of the population in the health system is an important part of successful responsiveness to Ebola in a decentralized environment. #HealthSystemResilience #resilience #healthsystems @USAIDGH @abtassociates

Godefroid Mayala, reproductive health and HSS specialist, USAID/Democratic Republic of the Congo (DRC), offered the current example of the ongoing Ebola outbreak in the DRC. With more than 1,000 cases reported by the DRC ministry of health and the death toll around 600 (60%) at the time of the meeting March 27, 2019, Mayala said that one of the biggest challenges facing his country was the geography of the disease, including its remote distance from the capital city and the fear that the outbreak could cross provincial and national borders. Mayala suggested that all organizations seeking to strengthen response should focus on ensuring that people can trust the system, empowering the community, and assuring the system is flexible. These efforts would be especially important in environments of conflict or weak governance

Panel: Health system response to crises

- Implementing the global health security agenda and international health regulations has fostered health system resilience against infectious diseases.
- Cultural shifts are needed so that people throughout an organization take ownership to make changes and respond to unexpected and routine work crises to cultivate health system resilience.
- Increasing community engagement and trust, use of innovative digital technologies, and multisectoral collaboration must occur before, during, and after a shock.
- Countries have become more willing to share information across borders and have a greater ability to diagnose diseases.

This panel explored the challenges health systems currently face in adapting and responding to crises and how we can improve response. Even health systems with all the "essential" functions have no guarantee of resisting shocks, but those that are flexible in operations and management stand a better chance. To build systems that can resist shocks, this panel argued that it is critical to engage citizens to better understand the cultural context of the health system and to adapt communications to the community context.

Dana Hovig, director of integrated delivery at the Bill & Melinda Gates Foundation, spoke to a newly released World Bank working paper, "What is State Capacity?" which argues that expectations and behavior norms that highlight underperformance will, in turn, cause a health system to underperform. Hovig emphasized that building state capacity entails technical capacity and organizational culture. One challenge in health systems response to crises is to respond at scale. Hovig argued that one way to meet that challenge is to build government capacity around contracting, strategic purchasing, billing, and buying services. Countries are increasingly interested in strengthening these functions.

Karima Saleh, senior economist at the World Bank, said a crisis often leads to a loss in health financing and health services use, along with a rise in possible epidemic and endemic diseases. In those situations, primary healthcare is greatly affected. In crisis, Saleh said, disease surveillance and mobile technology are critical. Community engagement is also essential because people should have a voice and could be advocates of the health system. Saleh stated that stakeholders, in partnership with companies, organizations, and communities, should be an essential component of the national agenda for successful crisis response.

> Resilience requires multisector approaches, including defense and security, to address global health security threats, linking sectors so real-time data and info is shared.
>
> — Richard Greene, senior infectious disease strategy advisor, USAID

Richard Greene, senior infectious disease strategy advisor, USAID, discussed what is needed for a health system to become more resilient at the national, community, and family levels. At the national level, a country needs port of entry screening capability, national laboratory systems, and response teams. Communities must have active community-based surveillance systems to collect rapid evidence. Greene also said that countries must build families' trust in the health system and in health facilities. Trust, he said, will mean people are willing to go to facilities during an outbreak instead of going to traditional healers first and delaying facility-based care, while possibly transmitting the disease to others. Greene suggested that one way to build people's trust in facilities is to have community co-management of facilities throughout the year, not just during a crisis.

The panel was also asked to highlight tools and approaches needed for health system response to crises. They responded:

- A survey of the health system that looks at where things are and how they have improved
- Simple communication tools (e.g., outlines) that are relevant to community contexts
- Better service design

Panel: Integrating communities, civil society and the private sector

- The public sector, the private sector, and civil society are all essential players in health system resilience and accountability.
- Nongovernmental organizations and the private sector have experience and expertise in providing basic services during shocks, but it is important to cultivate linkages between the public and private sectors.
- Community demand for health services can encourage a health system to align its resources according to community health needs, thereby promoting resilience.
- Better linking health systems to civil society organizations and the private sector can enable these organizations to act as buffers to prevent conflict situations, gain trust, and reduce the impact of crises.

This session focused on perspectives from individuals on the front line of response and community members. It addressed resilience at various scales and highlighted the theme that redundancies within health systems should be deliberate.

Luwei Pearson, deputy director/health, UNICEF, stressed the importance of a multisectoral and horizontal approach to building health systems. She emphasized that donors, implementing partners, and other stakeholders must remember to be patient and allow systems the time needed to achieve defined priorities for health, and that constant shifting of priorities will make that more difficult. Drawing on her experience growing up in China, Pearson made the point that there, even in the poorest settings, a national value was to be self-reliant. Countries that want to be self-reliant, she said, must make individual self-reliance part of their national vision.

Robert Clay, senior vice president of global health, Save the Children, said two retrospective case studies Save the Children is conducting in South Sudan and Pakistan are focused on emergency health and nutrition programs. These studies have demonstrated that health workers and community engagement are critically important for successful health systems. Clay listed four ways to address the issues raised in the meeting: always prioritize service delivery in an emergency; evaluating our work and fostering a stronger information system are important parts of response; involve staff in emergency programming; and improving advocacy for system change is necessary.

> “Community health workers who are trained and mobilized during stable times can provide a critical link, especially in disease surveillance and early warning systems, when disaster hits.”
>
> — Ann Claxton, senior director for program quality and resource, sustainable health, World Vision

Ann Claxton, senior director for program quality and resource, sustainable health, World Vision, pointed to the important role faith-based organizations play in health system response to crises. Faith-based organizations and community health workers are vital to help build community trust and the willingness of families and individuals to support the epidemic response. Claxton used the Citizens Voice and Action Project as an example of how shared responsibility among communities, implementers, and elected and unelected officials is a driver for government accountability and response. All civil society, community, and nongovernmental organization actors are often capable of agility and responsiveness in crises, but we may turn too quickly to nonsustainable, outside solutions to maintain service delivery—essentially abandoning our principles of country ownership for health systems strengthening.

Ashley Wolfington, senior technical advisor for reproductive health, International Rescue Committee, said that in the global space where all are responding to crisis, often a patchwork of humanitarian and development efforts exist that do not always work together. Wolfington said local civil societies can play a direct role in the humanitarian response—through sub-awards to local organizations for some of the work we might traditionally do—but also have a role to influence the government and hold it accountable, and to elevate community voices speaking about how humanitarian response is provided.

Mei Li, director, global community impact, Johnson & Johnson, stated that private sector companies, such as Johnson & Johnson and GlaxoSmithKline, often serve as the conveners or catalysts to support building domestic organizational capacity of national and subnational governments. She emphasized that healthcare systems cannot be resilient if healthcare workers are not resilient. She said the ultimate goal should be to have a clear exit plan and we should know what has to be in place, so countries continue improving their health systems and manage them well enough that they do not collapse. She also noted that the answer cannot be yet another donor.

Shira Kilcoyne, head of government affairs, Washington, GlaxoSmithKline, explained that while the private-sector organizations are not the experts on the ground for implementation, they are the supporters of implementation and have a huge role to play in advocacy. Kilcoyne asserted that one of the biggest challenges—private, public, developmental, or humanitarian—to overcome together is building trust among all of the actors. Many private companies, like Johnson & Johnson and GlaxoSmithKline, have complimentary agendas for building health systems and resilience. We need to work together to find each other's strengths to make a bigger impact.

Panel: Taking a multisectoral approach

- Poor and vulnerable populations have less resources and require additional support during a shock.
- It is critical to think expansively about the meaning of "system" when considering health system resilience.
- A whole of society approach is necessary to ensure health systems resilience.
- Building health system resilience requires cross-sector collaboration and interdependence.

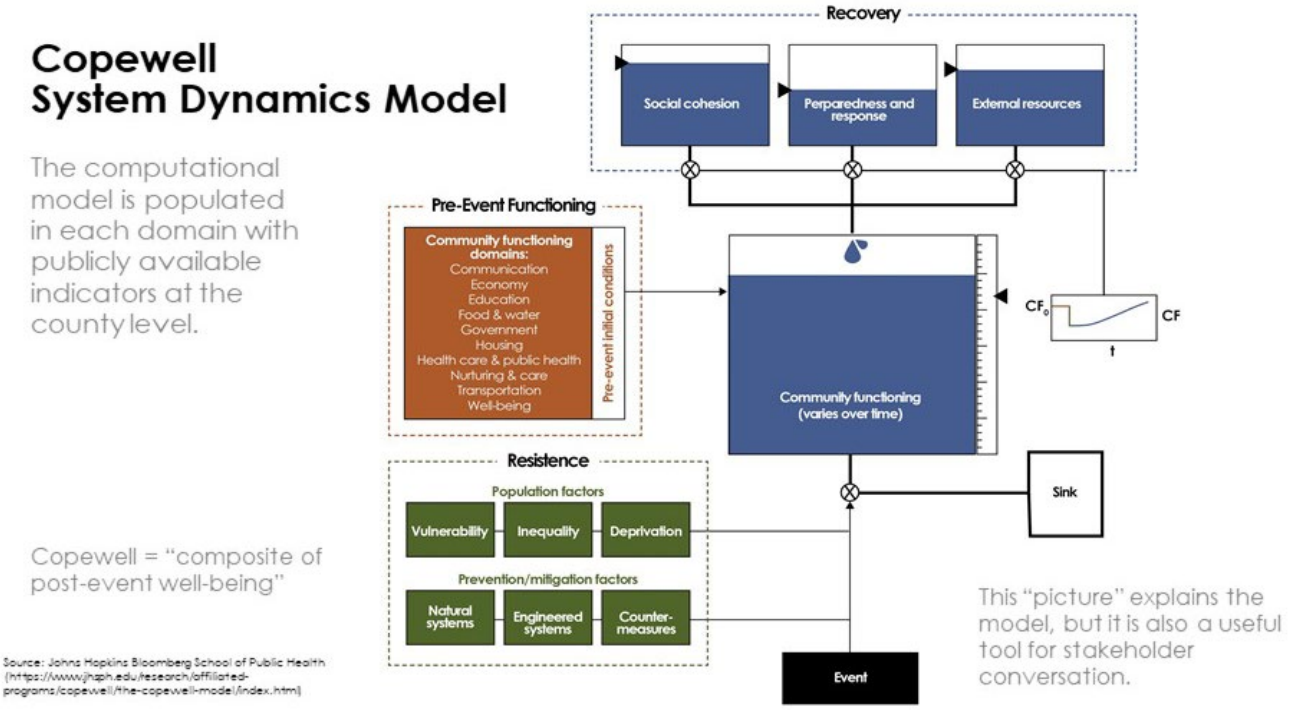
To supplement the limitations of a health system, resilience needs a multisectoral approach. We must be deliberate in how we work across sectors, layering our approaches and ensuring means exist to coordinate across all systems in the face of major shocks.

Christine Gottschalk, director, Center for Resilience, USAID Bureau for Food Security and Resilience, cited USAID's approach in Ethiopia as evidence that health system resilience plays a role in reducing vulnerability and enhancing household and community capacity. In Ethiopia, USAID and the Ethiopian government intentionally layered livelihoods programs, productive social safety net programs, and community-based health insurance. Gottschalk emphasized that the multisectoral approach at USAID is focused on assembling cross-sectoral capacities to influence program design.

> "As a donor, we work in a very earmarked world, but it is quite powerful when we bring people around a problem … when we are looking at things that transcend the sectors and bring a multisectoral approach to the problem itself, we have greater, longer- lasting development outcomes."
>
> — Christine Gottschalk, director, Center for Resilience, USAID's Bureau for Food Security and Resilience

Jonathan Links, vice provost and professor, John Hopkins University, discussed the COPEWELL model, a conceptual and corresponding computational model of community functioning and resilience (see Figure 1) developed with the U.S. Centers for Disease Control and Prevention (CDC). This model explicitly distinguishes between community functioning and resilience, identifies the key constructs or domains of each, populates the computational model with pre-event indicators at the county level (for every county in the United States), and predicts the time course of community functioning (from which resilience metrics can be derived) via system dynamics modeling. An analogous model could be built for health systems resilience. Links also said that an illustrated representation of any system should be complex, with many pieces, and a health system in particular would have many pieces because of its complex, multisectoral nature. All health system stakeholders should see themselves in the illustration. He emphasized that health system resilience must also rely on other sectors and, for that reason, it is inherently interdependent. Links suggested taking an expansive view of the health system and that there are no outliers because everything is within the system. No one sector can individually build a system's resilience, but all sectors collaborating together can.

Figure 1 The COPEWELL (Composite of Post-Event Well-being) model



Outi Kivasniemi, JEE Alliance, deputy director for international affairs, Ministry of Social Affairs and Health, Finland, looks at resilience through the lens of pandemic preparedness that helps with an all-hazards approach to respond to health threats. Kivasnimei said Sierra Leone established a national action plan that takes a multisectoral view, put in place legislation for the implementation of the action plan, and set up a multisectoral reference group that reinforces the links between universal health coverage and health security through ongoing meetings with multiple stakeholders.

Amanda Quintana @aquintanamph tweeted

At the #HealthSystemResilience Event today organized by @USAIDGH. Loved this quote "you don't know the measure of resilience until there is a crisis" by Jonathan Links at @JohnsHopkinsSPH

Amani M'Bale, digital financial services fellow, OHS, USAID, focused on an election crisis in Kenya in 2007. People were afraid to leave their communities because of the violence. A mobile money platform helped some families access money from friends and family when they were unable to go to work, for example. She also mentioned Venezuela, where hyperinflation exists and a digital economy is emerging. Both examples illustrate that digital financial resources can help people withstand shocks and may help countries bounce back from crisis. M'Bale also said it is important to look at the health system broadly because it is interdependent on many factors. In addition to health facilities, other entities—such as the private sector, banking, and transportation systems—support and rely on the health system.

Panel: Tracking and measuring resilience

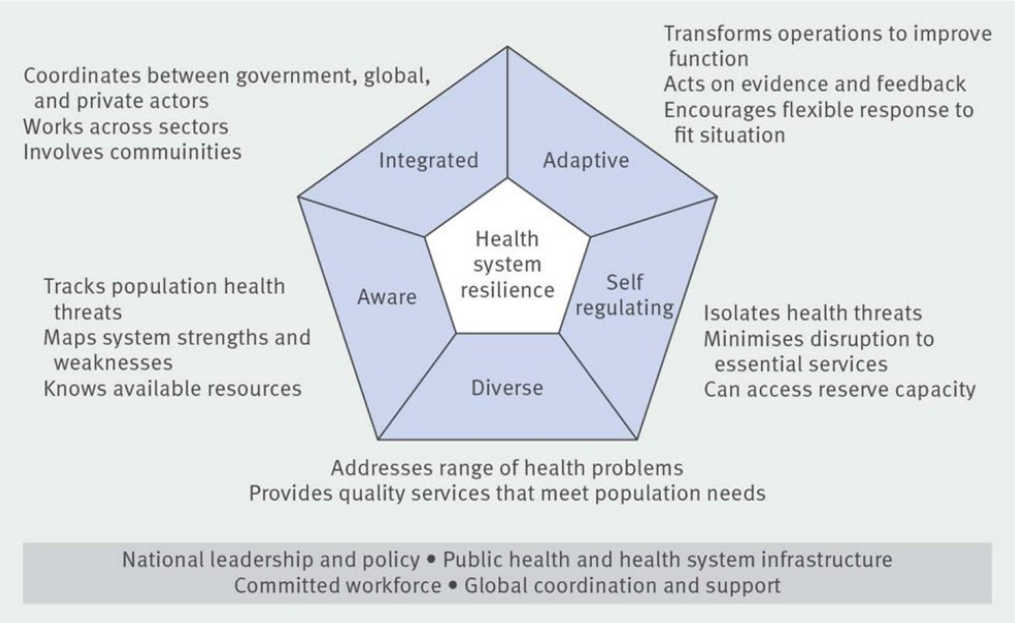
- Multiple frameworks for measuring health system resilience exist. There is a need for better multidisciplinary approaches.
- Health system resilience should be tracked before, during, and after crises because it has different implications for types of interventions.
- Accurate, timely, and interoperable health information systems can create a holistic picture of supply, demand, and contextual factors to track the emergence of health system resilience.
- Strong health information systems can contribute to resilient health systems. There is a need to use existing tools to measure health system resilience.

This panel discussed the available tools for measuring health system resilience and the applications and challenges for those tools.

Margaret Kruk, associate professor, Harvard University, suggested that resilience is key attribute of a high-quality health system—intrinsic to the idea of measuring health systems. A health system is focused on people and optimizing health, with three important features: consistently delivering high-quality services, trust, and "bendability" to respond immediately to crises and changing needs. Kruck pointed out that the word "trust" was one of the most used words of the day. She cited an example of survey results from Liberia in 2008 that showed the poorest and most traumatized people in the larger population had the least trust in the health system. She added that trust cannot be demanded from people in times of crisis, but rather is something that should be built when things are calm. In coordination with government and academic colleagues in Liberia, a model was developed that defines five essential components of a resilient health system (see Figure 2).

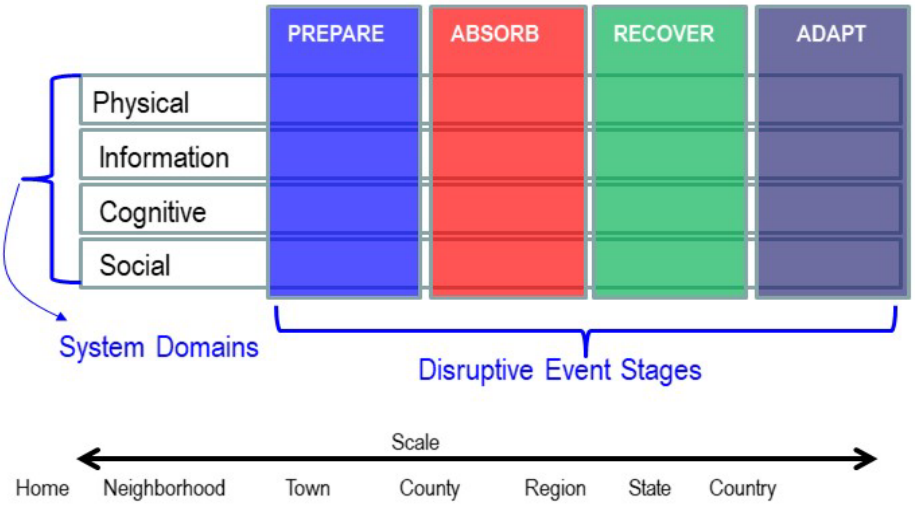
> *Health systems are essentially a social contract and those contracts are null and void if the populations do not trust.*
>
> — Margaret Kruck, associate professor, Harvard University

Figure 2 Resilient health system framework created by Kruk and others based on lessons from Ebola



Igor Linkov, of the Society for Risk Analysis, Carnegie Mellon University, explored health system resilience by examining the plague outbreak in Venice in the 17th century. He outlined how Venetians were able to disrupt disease transmission by having several structures available to isolate people who were sick. The point, he said, is that resilience should be built into the health system to—it is hoped—prevent a crisis and to respond if needed. Network science, applied to how networks operate in disease outbreaks, can reveal how to disrupt them as a response to outbreaks. Resilience starts with failure, when critical functions of the system are down. Linkov also presented a resilience matrix across a timeline of crisis preparedness and response (from preparation to adaptation; see Figure 3). Planners could define metrics for each cell to describe how to measure whether the system elements were coping with a crisis. Linkov also said measurement and assessment of resilience should evolve as multiple disciplines collaborate.

Figure 3 A resilience matrix created by Linkov and colleagues that captures the capacity of a system across a timeline of events



> *Coordination mechanisms are not the sexy part of our work but pulling people together to have these very important and useful conversations is an important part. When we are talking about pulling together three or four ministries of health that don't traditionally work together, these platforms and coordinating mechanisms are absolutely invaluable.*
>
> — Stephanie Watson-Grant, director, field operations, MEASURE Evaluation

Stephanie Watson-Grant, director, field operations, MEASURE Evaluation, described how MEASURE Evaluation looks at health systems and uses a data lens to examine a Health Information System (HIS) Strengthening Model (see Figure 4). The components of a health system are the enabling environment, information generation, HIS performance (marked by data quality and data use), the human element that underpins all other components, and contextual factors. Watson-Grant stressed that a strong HIS is one that generates useful health data. An HIS should be well defined, comprehensive, integrated, interoperable, functional, adaptable, scalable, and resilient. To measure whether an HIS is strong or progressing toward strength, Watson-Grant introduced the Stages of Continuous Improvement (SOCI) tool developed by MEASURE Evaluation (see Figure 5). The SOCIE tool measures a HIS through five stages (1, emerged/ad hoc; 2, repeatable; 3, defined; 4, managed; and 5, optimized) and is broad enough to address all of the possible HIS strengthening needs. Countries can adapt the tool to fit their own contexts.

Figure 4 MEASURE Evaluation's Health Information System Strengthening Model

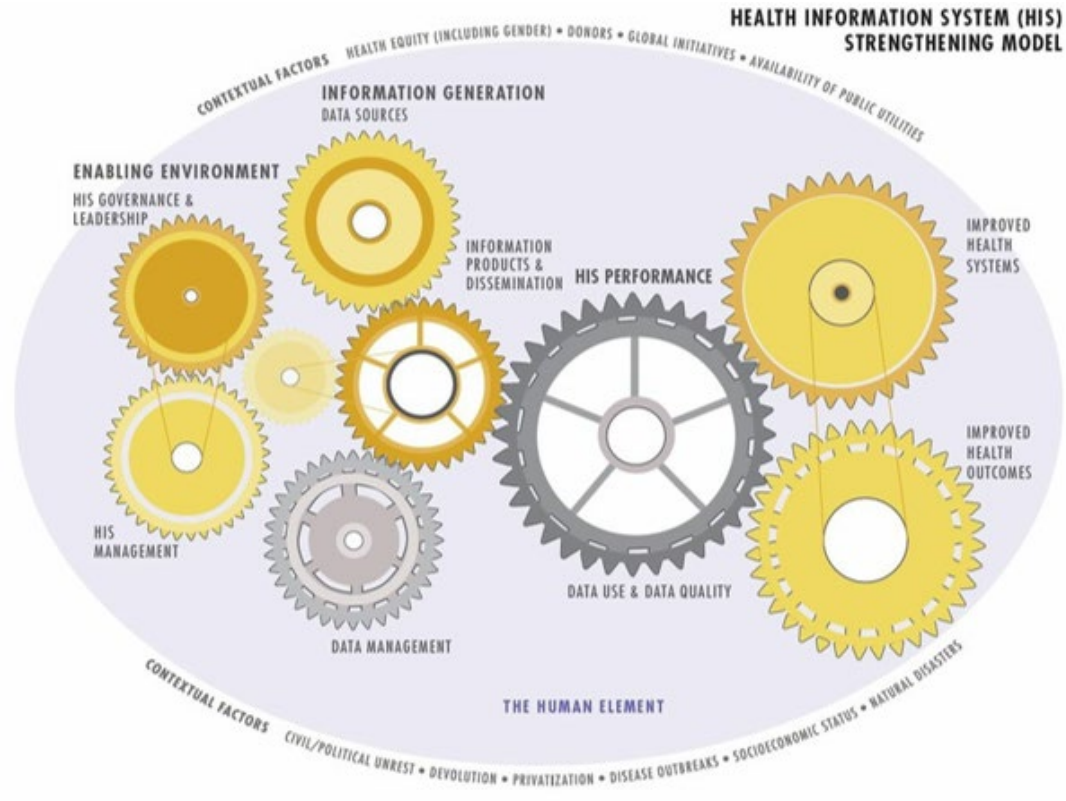
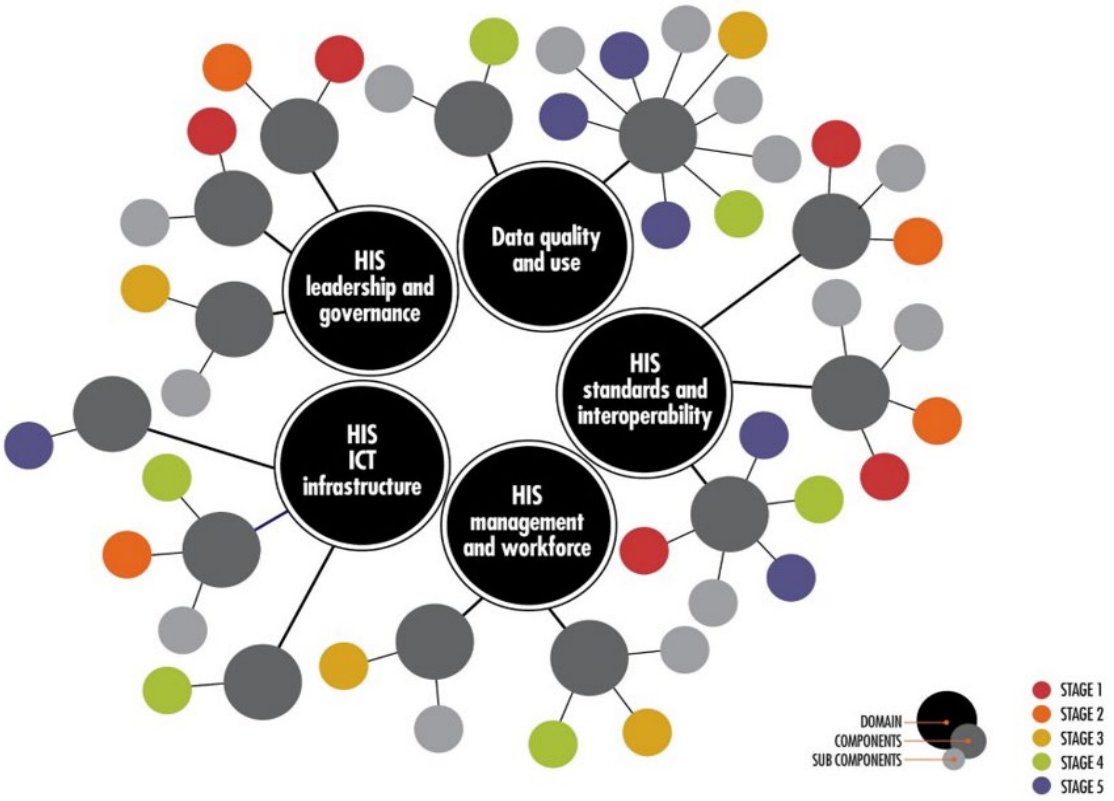
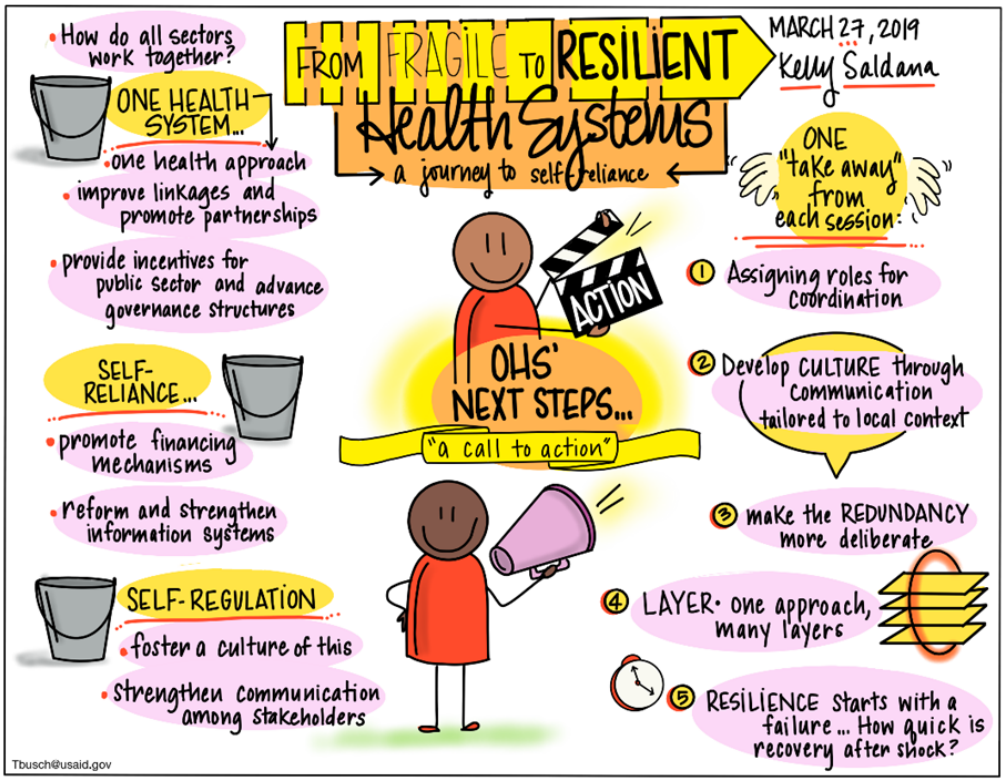


Figure 5 The HIS SOCI Toolkit jointly developed by CDC, the Health Data Collaborative digital health and interoperability working group, and the USAID-funded MEASURE Evaluation project



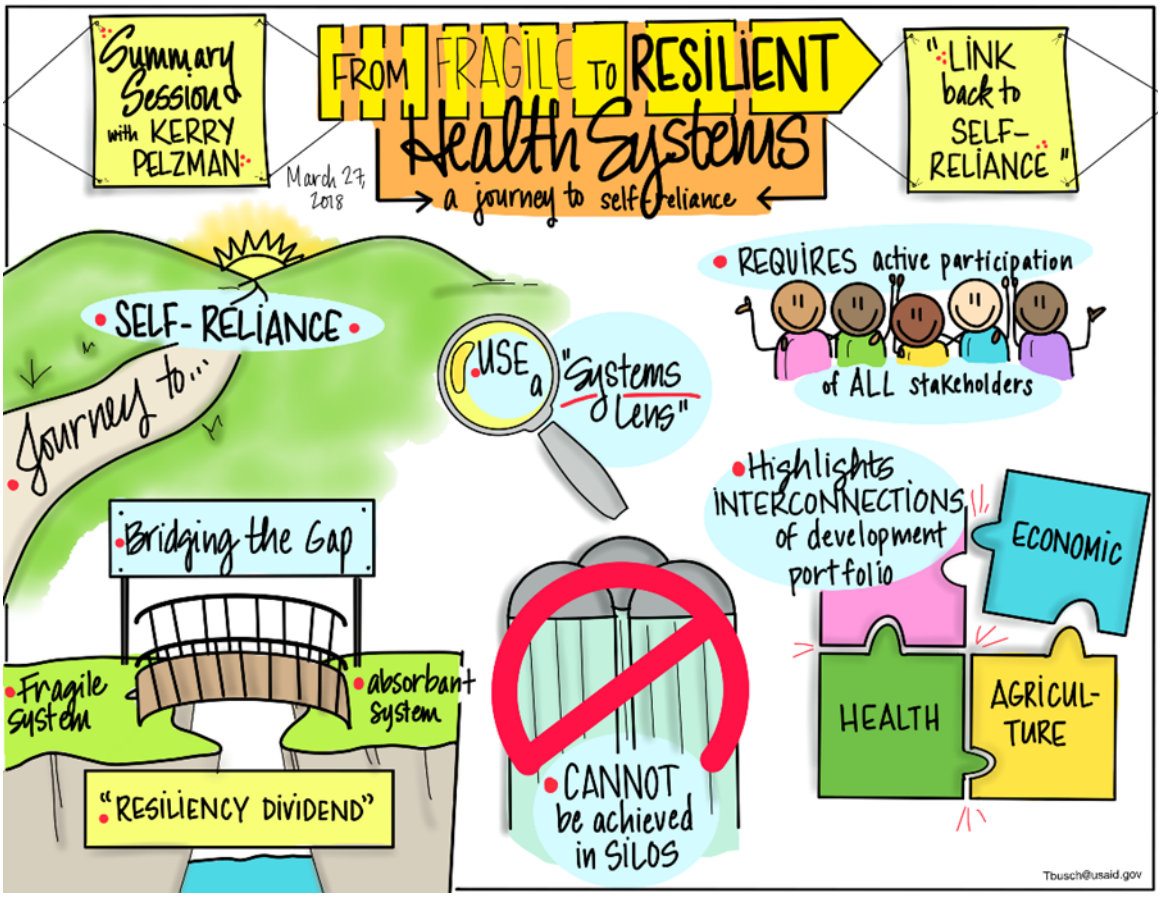


Transforming for self-reliance

The meeting's exploration of health system resilience is an important aspect of helping countries achieve progress in their journey to self-reliance.

The effort will require work and cooperation from the public and private sectors, civil society, communities, and faith-based organizations. "Business as usual" is not an option for population health security or for global health security. We must establish strong systems that can absorb and respond to shocks at any scale.

The themes that emerged from the meeting cluster around cooperation among sectors and trust built among the people that health systems are meant to serve. Reacting to shocks is not enough; the possibility, even probability, of shocks must be planned for.



The day's discussion ended with group thinking on action steps that we can take now and report back to our organizations:

- Find alternative ways to achieve HIS essential functions.
- Plan for shocks to the system before they occur.
- Look at data in countries where we work to find patterns and identify everyday shocks we should be thinking about and planning for.
- Build in intentional redundancy to create a responsive, resilient system.
- Take a multisectoral approach from the community's perspective.
- Have an evaluation lens on systems that's larger than our project. The HSS MEL Guide is a resource to help implement this.
- Consider how we can be more deliberate in implementing climate risk management.
- We need to make sure we provide practical guidelines to our country offices, govt counterparts and other organizations that fit their contexts.
- Educating the government and building the capacity of the public sector to embrace the private sector will help us work as partners to build resilient health systems.
- Think about community health spaces as the entry point to health systems and begin strengthening trust.
- Strive for multidirectional learning

Appendixes

Appendix A: Meeting agenda

From Fragile to Resilient Health Systems - A Journey to Self-Reliance

Since 2000, there has been tremendous progress toward achieving global health goals. Health outcome gains aren't sustainable if the health system itself is fragile. In many countries, health systems remain weak and unprepared to deal with stressors from population changes, increased incidence of conflict, or other shocks such as natural disasters and disease outbreaks. More than 2.5 billion people in 51 countries live in areas of high risk for an event such as a natural or humanitarian disaster that could overwhelm a country's national response capacity. Such disasters cost an estimated $520 billion USD per year.[2] Development assistance for health is no longer an expanding resource for country health budgets. Projected shortfalls in health spending and an increase in the number of unexpected shocks, particularly in countries with the most complex disease burdens, threaten the achievement of health targets.[3] System failures—lack of supplies, lack of health staff, or poor facility infrastructure, for example—can cause public and private health systems to halt good-quality routine care. The consequences—prolonged illness, preventable deaths, and the spread of diseases—lead to lack of trust in the health system. Unfortunately, the deterioration of a health system adversely affects the health of the most disadvantaged and vulnerable groups, such as women and children, and can cause the health gains a country has made to backslide.

A resilient health system can reduce vulnerability, prevent deterioration of health, and mitigate increased poverty. Absent a shock to test this definition, how do we know if health systems are able to prepare for challenges and respond and adapt to meet them? During stable times, what health system policies and processes need to be in place to ensure uninterrupted, good-quality services? What can be done at the systems level to enhance individual and community capacity to deal with disasters? How can a health system coordinate with non-health sectors to be better prepared for future shocks? And what is needed to shift a health system from fragility to resilience?

USAID's Office of Health Systems is hosting a consultative meeting on March 27, 2019 to discuss these questions and propose solutions to make health systems more resilient. The meeting will bring together health system and resilience leaders, policymakers, and development experts to share experiences, innovative practices, successes, and challenges in shifting fragile health systems to resilient ones.

Goal

Strengthening commitment and capacity for resilient health systems: A step in the journey to self-reliance

Objectives

- Analyze innovations and approaches to shift a health system from fragile to resilient
- Illustrate needs, successes, and challenges of applying multisectoral and multilevel approaches to increase health systems resilience
- Understand application of major innovative frameworks, tools, and methods for measuring health systems resilience

[2] http://www.worldbank.org/en/news/press-release/2016/11/14/natural-disasters-force-26-million-people-into-poverty-and- cost-520bn-in-losses-every-year-new-world-bank-analysis-finds

[3] https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)30873-5/fulltext

March 27, 2019
FHI 360 ● 1825 Connecticut Ave NW ● Washington, DC 20009
Academy Hall, 8th floor

8:00–8:30	**Registration** Academy Hall Foyer
8:30–9:00	**Welcome address** **Alma Golden** Senior Deputy Assistant Administrator USAID Bureau of Global Health
9:00–9:30	**Framing dialogue around resilience: why and why now?** **Kelly Saldana** Director, Office of Health Systems USAID
9:30–10:30	**Shocks to the system** To what extent do natural and man-made disasters stress a health system's capacity to deliver health services? This session will discuss evidence of the need for resilient health systems and the effects weak systems could have at a country level. Moderator: **Rhea Bright** Panelists: **Sohel Saikat** Programme Officer, Quality Systems and Resilience Unit World Health Organization **Oliver Wilcox** Deputy Director, Office of Countering Violent Extremism U.S. Department of State **Godefroid Mayala** Reproductive Health and Health Systems Strengthening Specialist USAID/Democratic Republic of the Congo
10:30–10:45	Tea in the foyer
10:45–11:45	**Health systems response** Are system functions performing optimally to meet crisis situations? Moderator: **Elisa Adelman** Panelists: **Dana Hovig** Director, Integrated Delivery Bill & Melinda Gates Foundation **Karima Saleh** Senior Economist World Bank **Richard Greene** Senior Infectious Disease Strategy Advisor USAID

11:45–1:00	**Supporting Actors: Integrating communities and the private sector** Resilience takes place at the individual, household, community, and institutional levels. This session will focus on resilience at various scales and how the private sector plays a role in health systems resilience. Moderator: **Nazo Kureshy** Panelists: **Luwei Pearson** Deputy Director, Health UNICEF **Robert Clay** Senior Vice President of Global Health Save the Children **Ann Claxton** Senior Director for Program Quality and Resource, Sustainable Health World Vision **Ashley Wolfington** Senior Technical Advisor for Reproductive Health International Rescue Committee **Mei Li** Director, Global Community Impact Johnson & Johnson **Shira Kilcoyne** Head of Government Affairs, Washington GlaxoSmithKline
1:00–1:45	Lunch in the foyer
1:45–2:45	**Taking a multisectoral approach** Natural and man-made disasters are not sector-agnostic and affect different aspects of public life, so they require a multisectoral approach to supplement a health system's limitations. Are processes in place to assure coordination and collaboration among different actors? Moderator: **Caroline Ly** Panelists: **Christine Gottschalk** Director, Center for Resilience USAID's Bureau for Food Security and Resilience **Jonathan Links** Vice Provost and Professor Johns Hopkins University **Outi Kuivasniemi** JEE Alliance Deputy Director for International Affairs Ministry of Social Affairs and Health, Finland **Amani M'Bale** Digital Financial Services Fellow, Office of Health Systems USAID
2:45-3:00	Tea in the foyer

3:00-4:00	**Tracking and measuring resilience** Provide an overview of resilience measurement frameworks. Moderator: **Anwer Aqil** Panelists: **Margaret Kruk** Associate Professor Harvard University **Igor Linkov** Society for Risk Analysis Carnegie Mellon University **Stephanie Watson-Grant** Director, Field Operations MEASURE Evaluation
4:00-4:30	**Link back to self-reliance** This session will summarize the meeting's outputs and discuss how health system processes in different functions can be strengthened and adapted and how incorporating multisectoral and multilevel approaches can transform a system's ability to respond to shocks. **Kerry Pelzman** Deputy Assistant Administrator Bureau for Global Health USAID
4:30-5:00	**Next Steps** **Kelly Saldana** Director, Office of Health Systems USAID

Appendix B: Resource materials

Papers and documents with an asterisk (*) note an author who participated in the meeting as a panelist or speaker.

Health System Resilience Frameworks

1. Blanchet, K., Nam, S.L., Ramalingam, B., Pozo-Martin, F. (2017, April) Governance and capacity to manage resilience of health systems: towards a new conceptual framework. *International Journal on Health Policy Management,* 6(8), 431-435. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/28812842.
2. Hanefeld, J., Mayhew, S., Legido-Quigley, H., Martineau, F., Karanikolos, M., Blanchet, K., … Balabanova, D. (2018). Towards an understanding of resilience: responding to health systems shocks. *Health Policy Planning*. 33(3), 355-367. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/29325025.
3. Ho, K., Al-Shorjabji, N., Brown, E., Zelmer, J., Gabor, N., Maeder, A., Marcelo, A., … Doyle, T. (2016) Applying the resilient health system framework for universal health coverage. In Maeder, A., Ho, K., Marcelo, A., Warren, J. (Eds.), *The Promise of New Technologies in an Age of New Health Challenges* (pp. 54– 62). Amsterdam, Netherlands: IOS Press BV. Retrieved from http://ebooks.iospress.nl/volume/the-promise-of-new-technologies-in-an-age-of-new-health-challenges-selected-papers-from-global-telehealth-2016.
4. Khan, Y. O'Sullivan, T., Brown, A., Tracey, S., Gibson, J., Généreux, M., … Schwartz, B. (2018) Public health emergency preparedness: a framework to promote resilience. *BMC Public Health* (18)1344. Retrieved from https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-6250-7.
5. * Kruk, M., Myers, M., Varpilah, S.T., Dahn, B.T. (2015, May). What is a resilient health system? Lessons from Ebola. *The Lancet Viewpoint*. 385(9980), 1910-1912. Retrieved from https://www.thelancet.com/action/showPdf?pii=S0140-6736%2815%2960755-3.
6. * Links, J., Schwartz, B.S., Lin, S., Kanarek, N., Mitrani-Reiser, J., Sell, T.K., … Kendra J.M. (2017) COPEWELL: A Conceptual Framework and System Dynamics Model for Predicting Community Functioning and Resilience After Disasters. Disaster Medicine and Public Health Preparedness 12(1):127-137. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/28633681.
7. MEASURE Evaluation. (2017, March 15). Country Ownership of HIV M&E Systems Tool. Retrieved from https://www.measureevaluation.org/resources/files/country-ownership-of-hiv-m-e-systems-tool.
8. MEASURE Evaluation. (2018, October). *What are the characteristics of a strong health information system?* [Fact Sheet]. https://www.measureevaluation.org/resources/publications/fs-18-294.
9. Mills, A. (2017, November) Resilient and responsive health systems in a changing world. *Health Policy and Planning*, Volume 32 (suppl_3), iii1–iii2. Retrieved from https://academic.oup.com/heapol/article/32/suppl_3/iii1/4621481.
10. Nicholson, A., Reve, M.S., Herrmann, J. (2016). National Academies of Sciences, Engineering, and Medicine. *Global Health Risk Framework: Resilient and Sustainable Health Systems to Respond to Global Infectious Disease Outbreaks: Workshop Summary*. Washington, DC: The National Academies Press. Retrieved from https://www.nap.edu/catalog/21856/global-health-risk-framework-resilient-and-sustainable-health-systems-to.
11. Olu, O. (2017.) Resilient Health System As Conceptual Framework for Strengthening Public Health Disaster Risk Management: An African Viewpoint. *Frontiers in Public Health*. 5(263). Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5625001/.
12. Shumake-Guillemot, J., Fernandez-Montoya, L. (Eds.), (2016). *Climate Services for Health: Improving public health decision-making in a new climate*. Eds. J. Shumake-Guillemot and L. Fernandez-Montoya. Geneva: World Health Organization/World Meteorological Organization. Retrieved from https://public.wmo.int/en/media/news/climate-services-health.
13. Thomas, J.C. (2016, July 14). Resilience: More than a quick fix [Blog post]. *Investing in Health*, World Bank blog. Retrieved from http://blogs.worldbank.org/health/resilience-more-quick-fix.
14. Thomas, S., Keegan, C., Barry, S., Layte, R., Jowett, M., Normand, C. (2013). A framework for assessing health system resilience in an economic crisis: Ireland as a test case. *BMC Health Services Research*. 13(450). Retrieved from https://bmchealthservres.biomedcentral.com/articles/10.1186/1472-6963-13-450.

15. United Nations Development Program. (2014). *Community-Based Resilience Analysis (CoBRA) Conceptual Framework and Methodology*. Commissioned by UNDP Drylands Development Centre. Retrieved from https://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/sustainable%20land%20management/CoBRA/CoBRRA_Conceptual_Framework.pdf.
16. *Watson-Grant, S., Xiong, K., Thomas, J.C. (2017). Achieving sustainability in health information systems: a field tested measure of country ownership. *Globalization and Health*. 13(36). Retrieved from https://globalizationandhealth.biomedcentral.com/articles/10.1186/s12992-017-0258-0.
17. *Watson-Grant, S., Xiong, K., Thomas, J.C. (2016, May) *Country Ownership in International Development: Toward a Working Definition.* MEASURE Evaluation. Retrieved from https://www.measureevaluation.org/resources/publications/wp-16-164.
18. World Health Organization. (2017). *Strengthening resilience: a priority shared by Health 2020 and the Sustainable Development Goals*. Italy: Areagraphica SNC Di Trevisan Giancarolo & Figli. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0005/351284/resilience-report-20171004-h1635.pdf.
19. Wulff, K., Donato, D., Lurie, N., (2015, March). Katharine Wulff, Darrin Donato, and Nicole Lurie (2015) What Is Health Resilience and How Can We Build It? *Annual Review of Public* Health. 36(361-374). Retrieved from https://www.annualreviews.org/doi/full/10.1146/annurev-publhealth-031914-122829?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed.

Everyday Health Systems Resilience

20. Barasa, E.W., Cloete, K., Gilson, L., (2017, November) From bouncing back, to nurturing emergence: reframing the concept of resilience in health systems strengthening. *Health Policy and Planning.* 32(suppl_3), iii91–iii94. Retrieved from https://academic.oup.com/heapol/article-lookup/doi/10.1093/heapol/czx118.
21. Braithwaite, J., Wears, R.L., Hollnagel, E., (2015, October) Resilient health care: turning patient safety on its head. *International Journal for Quality in Health Care*. 27(5), 418-420. Retrieved from https://academic.oup.com/intqhc/article-lookup/doi/10.1093/intqhc/mzv063.
22. Department of International Development UK (2011, November). Defining Disaster Resilience: A DFID Approach Paper. London: DIFID. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/186874/defining-disaster-resilience-approach-paper.pdf.
23. Gilson, L., Barasa, E., Nonhlanhla, N., Cleary, S., Goudge, J. Molyneux, S., … Lehmann, U., (2017, June) Everyday resilience in district health systems: emerging insights from the front lines in Kenya and South Africa. *BMJ Glob Health*. 2(e000224). Retrieved from https://gh.bmj.com/content/2/2/e000224.
24. * Nemeth, C., Wears, R., Woods, D., Hollnagel, E., Cook, R., (2008, August). Minding the Gaps: Creating Resilience in Health Care. In Henriksen, K., Battles, J., Keyes, M., Grady, M. (Eds.), *Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools)*. Rockville, Maryland: Agency for Healthcare Research and Quality. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK43670/
25. Resilient and Responsive Health Systems (RESYST), London School of Hygiene and Tropical Medicine. (2018, August). What is everyday health system resilience and how might it be nurtured. *RESYST key findings sheet*. Retrieved from https://resyst.lshtm.ac.uk/sites/resyst/files/content/attachments/2018-08-22/Everyday%20resilience%20key%20findings.pdf.
26. * Toner, E., Shearer, M., Sell, T.K., Meyer, D., Chandler, H., Schoch-Spana, M., Echols, E.T., … Carbone, E., (2017). Health Sector Resilience Checklist for High-Consequence Infectious Diseases—Informed by the Domestic US Ebola Response.; Baltimore, Maryland: Johns Hopkins Center for Health Security and US Centers for Disease Control and Prevention. Retrieved from http://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2017/HCID_Final_Report_05.23.2017.pdf
27. Thomas, J.C. (2016) Getting from "Wow" to Sustainability [blog]. Global Digital Health Network on the Knowledge Gateway (reprinted on the MEASURE Evaluation blog page). Retrieved from https://www.measureevaluation.org/resources/newsroom/blogs/getting-from-2018wow2019-to-sustainability.

Health System Resilience Measurement

28. * Bakkensen, L.A., Fox-Lent, C., Read, L., Linkov, I. (2016, August) Validating Resilience and Vulnerability Indices in the Context of Natural Disasters. *Risk Analysis*. 37(5). Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/risa.12677.
29. Bayntun, C., Rockenschaub, G., Murray, V. (2012, August). Developing a health system approach to disaster management: A qualitative analysis of the core literature to complement the WHO Toolkit for assessing health-system capacity for crisis management. *PLOS Currents Disasters*. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23066520.
30. Berg, S.H., Akerjordet, K., Ekstedt, M., Aase, K. (2018, December) Methodological strategies in resilient health care studies: An integrative review. *Safety Science*. 110(Part A), 300–312. Retrieved from https://www.sciencedirect.com/science/article/pii/S0925753516303253.
31. * Ganin, A.A., Massaro, E., Gutfraind, A., Steen, N., Keisler, J., Kott, A., Mangoubi, R., Linkov, I. (2016, January) Operational resilience: concepts, design and analysis. *Nature: Scientific Reports*, 6(19540). Retrieved from https://www.nature.com/articles/srep19540.
32. * Kruk, M., Ling, E.J., Bitton, A., Cammett, M., Cavanaugh, K., Chopra, M., … Warnken, H. (2017). Analysis: Building resilient health systems: a proposal for a resilience index. *BMJ*. 357(j2323). Retrieved from https://www.bmj.com/content/357/bmj.j2323.long.
33. * Linkov, I., Fox-Lent, C., Read, L., Allen, C., Arnott, J., ... Woods, D. (2018, April) Perspective: Tiered Approach to Resilience Assessment; Risk Analysis. *Risk Analysis*. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/risa.12991.
34. * Linkov, I., Bridges, T., Creutzig, F., Decker, J., Fox-Lent, C., Kroger, W., … Thiel-Clemen, T. (2014, May). Commentary: Changing the resilience paradigm. *Nature Climate Change*. Retrieved from https://www.nature.com/articles/nclimate2227.
35. * Linkov, I., Eisenberg, D., Bates, M., Chang, D., Convertino, M., Allen, J.H., … Seager, T. (2013, September). Measurable Resilience for Actionable Policy. *Environmental Science and Technology*. 47(18), 10108−10110. Retrieved from https://pubs.acs.org/doi/abs/10.1021/es403443n.
36. Organisation for Economic Co-operation and Development (OECD). (2014). *Guidelines for resilience systems analysis: how to analyse risk and build a roadmap to resilience*. OECD Publishing. Retrieved from https://www.oecd.org/dac/Resilience%20Systems%20Analysis%20FINAL.pdf.
37. South, J., Jones, R., Stansfield, J., Bagnall, A.M. (2018). What quantitative and qualitative methods have been developed to measure health-related community resilience at a national and local level? *Health Evidence Network (HEN) synthesis report 60*. Copenhagen: WHO Regional Office for Europe. Retrieved from http://www.euro.who.int/en/publications/abstracts/what-quantitative-and-qualitative-methods-have-been-developed-to-measure-health-related-community-resilience-at-a-national-and-local-level-2018.
38. * US Army Corps of Engineer. (2016, August 22). Risk and Decision Science. Retrieved from https://www.erdc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/920870/risk-and-decision-science/.
39. WHO. (2015). Operational framework for building climate resilient health systems. Geneva, Switzerland: WHO. Retrieved from https://www.who.int/globalchange/publications/building-climate-resilient-health-systems/en/.

Country Experiences/Lessons Learned on health system resilience

40. Ammar, W., Kdouh, O., Hammoud, R., Hamadeh, R., Harb, H., Ammar, Z., … Zalloua, P.A. (2016, December) Health system resilience: Lebanon and the Syrian refugee crisis. *The Journal of Global Health*. 6(2). Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5234495/.
41. Cancedda, C., Davis, S.M., Dierberg, K.L., Lascher, J., Barrie, M.B., Koroma, A.P., … Farmer, P.E. (2016, October) Strengthening Health Systems While Responding to a Health Crisis: Lessons Learned by a Nongovernmental Organization During the Ebola Virus Disease Epidemic in Sierra Leone. *The Journal of Infectious Diseases*. 214(Suppl 3), 153-163. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/27688219.
42. Fitter, D.L., Delson, D.B., Guillaume, F.D., Schaad, A.W., Moffett, D.B., Poncelet, J.L., … Gelting, R. (2017, October). Applying a New Framework for Public Health Systems Recovery following Emergencies and Disasters: The Example of Haiti following a Major Earthquake and Cholera Outbreak. *The American Journal of Tropical Medicine and Hygiene*.

97(Suppl 4), 4–11. Retrieved from http://www.ajtmh.org/docserver/fulltext/14761645/97/4_Suppl/tpmd160862.pdf?expires=1558125711&id=id&accname=guest&checksum=5EC543DEECB30A681BBB758868C30E45.
43. Hoddinott, J.F. *Understanding resilience for food and nutrition security*. Presented at the 2020 International Food Policy Research Institute (IFPRI) Conference, Addis Ababa, Ethiopia, May 17-19, 2014. Retrieved from http://www.ifpri.org/publication/understanding-resilience-food-and-nutrition-security.
44. Kieny, M.P., Dovlo, D. (2015, January) Beyond Ebola: a new agenda for resilient health systems. *The Lancet*. 385(9963), 91-92. Retrieved from https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)62479-X/fulltext.
45. Kieny, M.P., Evans, D.B., Schmets, G., Kadandale, S. (2014, December) Health-system resilience: reflections on the Ebola crisis in western Africa. *Bulletin of the World Health Organization*. 92(12), 850. Retrieved from https://apps.who.int/iris/handle/10665/271627.
46. Kutzin, J., Sparkes, S.P. (2016, January). Health systems strengthening, universal health coverage, health security and resilience. *Bulletin of the World Health Organization*. 94(2). Retrieved from https://www.who.int/bulletin/volumes/94/1/15-165050/en/.
47. Martineau, F.P. (2016, September). People-centered health systems: building more resilient health systems in the wake of the Ebola crisis. *International Health*. 8(5), 307-309. Retrieved from https://academic.oup.com/inthealth/article/8/5/307/2387877.
48. MEASURE Evaluation. (2018, June). *Guinea's Readiness Response to Ebola: Strengthening Data Availability and Use*. Retrieved from https://www.measureevaluation.org/resources/publications/tr-18-265.
49. Naimoli, J.F., Saxena, S., (2018, December) Realizing their potential to become learning organizations to foster health system resilience: opportunities and challenges for health ministries in low- and middle-income countries. *Health Policy and Planning*. 33(10). 1083-1095. Retrieved from https://academic.oup.com/heapol/article/33/10/1083/5248190.
50. Saltzman, W.R., Lester, P., Milburn, N., Woodward, K., Stein, J. (2016, December) Pathways of Risk and Resilience: Impact of a Family Resilience Program on Active-Duty Military Parents. *Family Process*. 55(4), 633-646. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/famp.12238.
51. Sheaff, R., Benson, L., Farbus, L., Schofield, J., Mannion, R., Reeves, D. (2010, March). Network resilience in the face of health system reform. *Social Science & Medicine*. 70(5), 779–786. Retrieved from https://www.sciencedirect.com/science/article/pii/S0277953609008065?via%3Dihub.
52. Woodward, G., Bonada, N., Feeley, H.B., Giller, P.S. (2015, May). Resilience of a stream community to extreme climatic events and long-term recovery from a catastrophic flood. *Freshwater Biology, Special Issue*. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.12592.

Global Health Security Agenda

53. Bouley, T., Roschnik, S., Karliner, J., Wilburn, S., Slotterback, S., Guenther, R., … Torgeson, K. (2017, January). Climate-smart healthcare: low-carbon and resilience strategies for the health sector (English). Investing in climate change and health series. Washington, D.C.: *World Bank Group*. Retrieved from http://documents.worldbank.org/curated/en/322251495434571418/Climate-smart-healthcare-low-carbon-and-resilience-strategies-for-the-health-sector.
54. Commission on a Global Health Risk Framework for the Future. (2016). The neglected dimension of global security: A framework to counter infectious disease crises. Retrieved from https://nam.edu/wp-content/uploads/2016/01/Neglected-Dimension-of-Global-Security.pdf.
55. Global Health Security Agenda. (2016, October 21). Retrieved from https://www.usaid.gov/ghsagenda.
56. International Health Regulations (IHR). (2013, April). International Health Regulations 2005- IHR Core Capacity Monitoring Framework: Checklist and Indicators for Monitoring Progress in the Development of IHR Core Capacities in States Parties. WHO. Retrieved from https://www.who.int/ihr/checklist/en/.
57. Joint External Evaluations. (2018, July 19). WHO. Retrieved from https://www.who.int/ihr/procedures/joint-external-evaluations/en/.
58. Lancet editorial. (2014, October). Ebola: What lessons for the International Health Regulations? *The Lancet*. 384(9951), 1321. Retrieved from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)61697-4/fulltext.

59. USAID. (2013, June). The Resilience Agenda: Measuring Resilience in USAID. Retrieved from https://www.usaid.gov/sites/default/files/documents/1866/Technical%20Note_Measuring%20Resilience%20in%20USAID_June%202013.pdf.
60. WHO. *International health regulations (2005)*. (2016). Geneva: World Health Organization. Retrieved from https://www.who.int/ihr/publications/9789241580496/en/ .

Resilience Literature Outside of the Health System

61. Arup. (2015). *City resilience index*. New York: The Rockefeller Foundation. Retrieved from https://www.arup.com/perspectives/publications/research/section/city-resilience-index.
62. Arup. (2015, December). *City Resilience Framework*. New York: The Rockefeller Foundation. Retrieved from https://www.rockefellerfoundation.org/report/city-resilience-framework/.
63. Folke, C. (2006, August) Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*. 16 (3), 253–267. Retrieved from https://www.sciencedirect.com/science/article/pii/S0959378006000379.
64. Frankenberger, T., Mueller, M., Spangler, T., Alexander, S. (2013, October). Community resilience: Conceptual framework and measurement. Feed the Future Learning Agenda. Report for USAID. Rockville, MD: Westat. Retrieved from https://www.agrilinks.org/sites/default/files/resource/files/FTF%20Learning_Agenda_Community_Resilience_Oct%202013.pdf.
65. Holdaway, L., Simpson, R. (2018, May). Improving the impact of preventing violent extremism programming: A toolkit for design, monitoring and evaluation. Oslo, Norway: UNDP. Retrieved from https://www.undp.org/content/undp/en/home/librarypage/democratic-governance/oslo_governance_centre/improving-the-impact-of-preventing-violent-extremism-programming.html.
66. Keim, M. (2008, November). Building Human Resilience, The Role of Public Health Preparedness and Response as an Adaptation to Climate Change. *American Journal of Preventive Medicine*. 35(5), 508–516. Retrieved from https://www.sciencedirect.com/science/article/pii/S0749379708006879.
67. National Academies of Sciences, Engineering, and Medicine. (2018). *Engaging the private-sector health care system in building capacity to respond to threats to the public's health and national security: Proceedings of a workshop*. Washington, DC: The National Academies Press. Retrieved from https://www.nap.edu/catalog/25203/engaging-the-private-sector-health-care-system-in-building-capacity-to-respond-to-threats-to-the-publics-health-and-national-security.
68. Nemeth, C. P., & Hollnagel, E. (Eds.). (2014). *Resilience Engineering in Practice: Volume 2: Becoming Resilient*. Farnham: Ashgate.
69. Plough, A., Fielding J.E., Chandra, A., Williams, M., Eiseman, D., Wells, K.B., … Magana, A. (2013, July). Building Community Disaster Resilience: Perspectives from a Large Urban County Department of Public Health. *American Journal of Public Health*. 103(7): 1190-1197. Retrieved from https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2013.301268?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed&.
70. Ridde, V., Benmarhnia, T., Bonnet, E., Bottger, C., Cloos, P., Dagenais, C., … Sarker, M. (revised 2019, April). Climate change, migration and health systems resilience: Need for interdisciplinary research *F1000Research*. 8(22). Retrieved from https://f1000research.com/articles/8-22/v2.
71. Taylor, R. M., & Christian, J. (2016). *The role of public-private partnerships in health systems strengthening: Workshop summary*. Washington, DC: The National Academies Press. Retrieved from https://www.nap.edu/catalog/21861/the-role-of-public-private-partnerships-in-health-systems-strengthening.
72. Ungar, M. (2003, March) Qualitative Contributions to Resilience Research**.** *Qualitative Social* Work. 2(1), 85-102. Retrieved from https://journals.sagepub.com/doi/pdf/10.1177/1473325003002001123.
73. Ungar, M. (2018). Systemic resilience: principles and processes for a science of change in contexts of adversity. *Ecology and* Society. 23(4):34. Retrieved from https://www.ecologyandsociety.org/vol23/iss4/art34/.
74. Ungar, M. Ed. (2012) *The Social Ecology of Resilience, A Handbook of Theory and Practice*. Springer: New York. Retrieved from: https://link.springer.com/book/10.1007%2F978-1-4614-0586-3#about.
75. Hallegate, S., Rentschler, J., Rozenberg, J. (2019) *Lifelines: The Resilient Infrastructure Opportunity. Sustainable Infrastructure*. Washington, D.C.: World Bank. Retrieved from: https://openknowledge.worldbank.org/handle/10986/31805.

Appendix C: Presenters' bios

Dr. Alma Crumm Golden is senior deputy assistant administrator in USAID's Bureau for Global Health. A pediatrician by training, Dr. Golden has worked in private pediatrics, indigent health services, academic medicine, public health, healthcare administration, and health policy. A graduate of the University of Texas Medical Branch (UTMB), Dr. Golden later became the director of pediatric services for UTMB's Maternal and Child Health Program, establishing and managing 16 clinics in south and east Texas serving unfunded, Title V, and Medicaid children and families. During her career, Dr. Golden has served as faculty at both the University of Texas Medical Branch and Texas A&M Health Science Center. She also served as a Presidential Appointee from 2002 to 2006 as Deputy Assistant Secretary for the Office of Population Affairs in the U.S. Department of Health and Human Services, which included Family Planning, Teen Pregnancy Prevention, Embryo Adoption, and Abstinence Education.

Kelly Saldaña is the Director of the Office of Health Systems for USAID's Bureau for Global Health. She has more than 15 years of experience in public health administration and international development, having served in a variety of roles within USAID, most recently as the Deputy Director for the Office of Infectious Disease, and previously with the Bureau for Latin America and the Caribbean. She has led a wide array of health programs throughout her career, including the Haiti earthquake response, and more recently USAID's Zika response. She also developed the agency's approach for "Acting on the Call," through a report published annually the past four years to demonstrate the work being done by USAID and its partners to end preventable child and maternal deaths. Ms. Saldaña holds an MPH and an MPIA from the University of Pittsburgh.

Dr. Sohel Saikat has 20 years of experience in public health in academic, research, national, and international public sectors. His expertise includes health emergency planning, emergency response and preparedness; and International Health Regulations (2005) implementation in consideration of health systems strengthening. He has a proven track record for delivering results under pressure, multi-agency collaboration, and complex negotiation. He moved to the World Health Organization (WHO) in 2014 from the DH/Public Health England, United Kingdom, where he served in various capacities, including Principal Public Health Scientist and Global Health Strategist.

Dr. Mayala Mabasi Godefroid is the Reproductive Health and Health Systems Strengthening Specialist at USAID in DRC. He has 29 years of experience in public health within academic and national settings ranging from health financing and governance, reproductive health, and HIV/AIDS. Dr. Mayala is a member of the health donors group in DRC and has been working in technical groups related to human resources, health financing, and governance to ensure a coordinated and harmonized approach by government, donors, civil society, and the private sector. At both the central and provincial levels, Dr. Mayala is building capacity to implement health reforms to achieve universal health coverage goals. He is working with the World Bank to improve the use and quality of maternal and child health services through strategic purchasing and contributes to improving sectoral dialogue. He has a medical degree from the University of Kinshasa and degrees in reproductive health and health policy from the Institute of Tropical Medicine, Antwerp.

Oliver Wilcox is Deputy Director for Countering Violent Extremism (CVE), Bureau of Counterterrorism (CT), U.S. Department of State. Previously, he served as CT's CVE Unit Chief, and oversaw the development and implementation of tens of millions of dollars of pilot CVE programming. He led the elaboration of multiple sets of international Global Counterterrorism Forum CVE good practices, which have informed government and civil society CVE efforts. Mr. Wilcox spearheaded the U.S. design and implementation of international CVE initiatives – particularly Hedayah, the global CVE training center.

Mr. Wilcox taught political science at Trinity Washington University and the University of Virginia. He was an American Center for Oriental Studies Fellow in Jordan, where he researched the role of the parliament in political liberalization, and a Fulbright Scholar in Spain, where he studied contemporary North African immigration and Spanish-North African relations. Mr. Wilcox earned an M.A. in political science from the University of Virginia and

an M.A. with a distinction in Arab studies from Georgetown University. He received a B.A. with honors in political science and Spanish from Tufts University.

Dana Hovig works with the Global Development and Global Health divisions at the Bill & Melinda Gates Foundation to accelerate and improve the introduction and scale-up of life-saving and life-changing innovations. He has broad experience in healthcare delivery and has designed, launched, and managed successful health programs on five continents. Most recently, he was chief executive of Marie Stopes International, leading a global network of family health, reproductive health, and HIV/AIDS prevention programs operating in 40 countries. Prior to that, he was senior vice president of Population Services International (PSI). Mr. Hovig has spent nearly 10 years living and working in francophone West Africa and Pakistan.
Dana received his bachelor's degree in Economics from the University of Notre Dame, in Indiana, and his Master of Science in international political economy from the London School of Economics.

Karima Saleh, PhD, is a Senior Economist (Health) at the World Bank. She has more than 20 years of global health experience (including fieldwork) in policy dialogue, business development, and project management. She has worked in more than 25 countries in South, Southeast, and Central Asia; Africa; the Middle East; and North Africa. With keen interest in health financing and health systems, she has been working in areas covering financial protection, social health insurance, strategic purchasing and payment mechanisms, public expenditure review, tracking, management and governance, and equity in resource allocations. Her PhD in health economics is from the Johns Hopkins University. She was part of the core team that developed the 1993 World Development Report, Investing in Health (Washington, DC: World Bank, 1993). Among her recent publications are Motivating Bureaucrats through Social Recognition: Evidence from Simultaneous Field Experiments (Policy Research Working Paper 8473, Development Research Group, Development Economics, World Bank, Washington, DC, 2018); Public Financial Management, Health Governance, and Health Systems: Marshalling the Evidence for Health Governance Thematic Working Group Report (USAID, Washington, DC, 2017); Making Fair Choices on the Path to Universal Health Coverage: Applying Principles to Difficult Cases (*Health Systems and Reform*, 3[4], 2017); Health care coverage decision-making in low- and middle-income countries: experiences from 25 coverage schemes (*Population Health Management*, New Rochelle, NY, 2015). She has situation analyses of several countries, including Ghana, and has an upcoming chapter on resource tracking in primary healthcare in selected states in Nigeria—findings from a prospective public expenditure tracking survey analysis, in a volume to be published in the World Scientific Publishers series Global Health Economics and Public Policy.

Richard Greene, MPH, MA, is the Senior Infectious Disease Strategy Advisor in the USAID Bureau for Global Health. Prior to retiring from the U.S. Foreign Service in 2015, he was the Senior Deputy Assistant Administrator for the USAID Bureau for Food Security (2013–2015) and, before that, the USAID Bangladesh Mission Director (2011–2013). From 2003–2011, Mr. Greene served as director of the Office of Health, Infectious Diseases and Nutrition in USAID's Bureau for Global Health. He previously served as a health development officer in Bangladesh, Cameroon, and Burkina Faso. Former USAID Administrator Rajiv Shah cited his "exceptional work on the design and launch of the President's Malaria Initiative, a lifesaving Initiative, which earned him the honor of being named the Federal Employee of the Year in 2008." Mr. Greene received a master's degree in history from the University of California at Los Angeles (UCLA) in 1976 and a master's degree in public health, with a specialty in epidemiology, from UCLA in 1982. From 1978 to 1980, he was a U.S. Peace Corps volunteer in Ivory Coast.

Luwei Pearson started her career with UNICEF in China in 1988. She served UNICEF in several duty stations: China, Pakistan, Nepal, and East and Southern Africa, based in Nairobi, Kenya, Ethiopia, and New York. Her expertise has been evolving, with a keen focus on maternal, newborn, and child health programs, especially for the most marginalized. Ms. Pearson is the Deputy Director of Health Programme at UNICEF headquarters.

Robert Clay joined Save the Children in 2014 as the Vice President for Global Health. He leads a team of 140+ staff locally and globally. He oversees teams in newborn health; nutrition; water, sanitation, and hygiene; child health; maternal and reproductive health; emergency health and nutrition; HIV/AIDS and TB; health systems;

innovation; and behavioral change communication. His department has a project portfolio of $821 million. He is also an Adjunct Professor at the George Washington University, Milken Institute School of Public Health. He has worked for 36 years in development at global and country levels.

Prior to joining Save the Children, Mr. Clay was Deputy Assistant Administrator, Bureau for Global Health, with USAID, in Washington, DC. He supervised the technical offices in the Global Health Bureau–HIV/AIDS; Population and Reproductive Health; Health, Infectious Disease and Nutrition; and Health Systems. He led USAID's implementation of the PEPFAR programs, overseeing 140 staff and a portfolio of $3.3 billion annually. He chaired the Saving Mothers, Giving Life Leadership Council, an innovative $200 million public-private partnership focused on maternal mortality, and represented the US Government on the GAVI Executive Board. He spent 10 years in Zambia and India, where he directed USAID's Population, Health and Nutrition programs. Robert obtained the rank of Minister Counselor in the Senior Foreign Service while at USAID and was honored with the Agency's Distinguished Career Service Award in 2013. He received the Lifetime Achievement Award, PEPFAR, in 2014.

Ann Claxton is the Senior Director for Sustainable Health Program Quality and Resource Development in World Vision International, where she provides strategic direction and support to ensure quality and innovation in programming and funding for maternal, newborn, child, and adolescent health; nutrition; water, sanitation, and hygiene; and infectious disease control. She has emphasized the integration of multisectoral program interventions at the community and primary healthcare level to improve access and equity. One of her main roles has been engagement with the Global Fund to Fight AIDS, TB and Malaria, with a focus on community systems and civil society strengthening in HIV/AIDS, tuberculosis, and malaria grants. She has been a delegate on the Developed Countries NGO Delegation to the Board of the Global Fund to Fight AIDS, Tuberculosis and Malaria.

Previously, Ann held numerous roles at World Vision since 1995, including Senior HIV/AIDS Program Advisor for the Africa Region (based in Nairobi), where she developed and oversaw a portfolio of HIV/AIDS programs in 16 countries that aimed to strengthen community capacity for prevention, care, and support, with a special emphasis on engagement of faith-based partners, social mobilization, and transformation of gender norms. As Director of International Program Development and Technical Team Leader in the WVUS International Programs Group, she initiated a number of public-private partnerships to expand World Vision's HIV/AIDS, child survival, and integrated food security programs. Prior to starting with World Vision, Ann worked in the area of food security, nutrition, natural resource conservation, humanitarian response, and resilience in a number of African countries, both as a consultant and for UNHCR, in Somalia, and the United Nations Association of the USA, in New York.

Shira Kilcoyne is responsible for designing and leading integrated public and government affairs programs to advance the corporate government affairs, global health, and global vaccines agenda of GlaxoSmithKline (GSK) in the United States. Her primary role is to develop partnerships that help achieve GSK's commitment to improve access to medicines; work with governments to find innovative solutions to provide the best treatments possible for patients; encourage fair, transparent, and pro-innovation regimes; and improve and/or accelerate market access opportunities for GSK products. Ms. Kilcoyne joined GSK in 2004 as Manager, Government Affairs, International. Before that, she served as Manager Asia Pacific Affairs for the Pharmaceutical Research Manufacturers of America (PhRMA). In her role at PhRMA, she worked with senior executives from the research-based pharmaceutical industry to create and defend policy that recognizes and awards innovative medicines.

Prior to joining PhRMA, Ms. Kilcoyne was the lead event coordinator for Investor Broadcast Network. In this capacity, she worked with investor relations departments of Fortune 500 companies to ensure that they were meeting their Securities Exchange Commission obligations. She earned her Bachelor of Arts in Business and Spanish at the University of Maryland, in 1998, and her Master of Business Administration at the University of Maryland, in 2005.

Mei Li is Director, Insights at Johnson & Johnson's Global Community Impact (GCI), the group that oversees Johnson & Johnson's social impact initiatives worldwide. Prior to joining GCI in 2007, she led child health initiatives in China for four years at Johnson & Johnson Pediatric Institute, LLC.

Ms. Li leads some of the company's global public health and development partnerships focused on improving the health of people on the frontlines of care, including health workers, caregivers, and mothers. Part of her role as Director, Insights is to provide technical expertise and insights for the entire GCI team and other parts of Johnson & Johnson on topics related to the health workforce and maternal and child health. Ms. Li has represented the company in several multisectoral partnerships, including Survive & Thrive Global Development Alliance, led by USAID, and Born On Time, a public-private partnership with the government of Canada, World Vision, Plan International Canada, and Save the Children to prevent preterm birth in Bangladesh, Ethiopia, and Mali.

Prior to this role, Ms. Li led the development of Johnson & Johnson's strategic giving priorities in Women and Children at Risk of Violence and Abuse, which resulted in the first partnership that empowers communities to abandon the practice of child marriage and female genital cutting. She has more than 10 years of diverse experience in global health, partnering with global collaboratives, national governments, academics, nongovernmental organizations, and communities.

Ashley Wolfington is a Senior Advisor for Reproductive Health at the IRC where she leads the organization's approach to health services for women and girls. She has extensive humanitarian and development experience in the delivery of health services in fragile contexts including Democratic Republic of Congo, Cote d'Ivoire, Pakistan, Chad, and Jordan. Her technical expertise is in family planning, HIV care and treatment, integration of reproductive health services, and building the capacity of health care workers. She has been involved in shaping policy around sexual and reproductive health in emergencies and protracted crises, including contributions to the recent revision of the Inter-agency Field Manual for Reproductive Health in Crises.

Jonathan M. Links, PhD., is a medical physicist, with a B.A. in Medical Physics from the University of California, Berkeley (1977) and a PhD. in Environmental Health Sciences from the Johns Hopkins University (1983). Dr. Links is a professor in the Johns Hopkins Bloomberg School of Public Health, with joint professorial appointments in the School of Medicine, the School of Education, the Whiting School of Engineering, and the Carey Business School.

Dr. Links directs the Center for Public Health Preparedness, a CDC-funded center focusing on disaster mental health and public health systems research, training, and professional practice. He is also Deputy Director of the Office of Critical Event Preparedness and Response, which is responsible for all disaster planning for both the university and the health system. Dr. Links is the university's Vice Provost and Chief Risk and Compliance Officer. In this role, he is responsible for the Institutional Risk Management program, which includes the compliance program; the crisis management program; the health, safety and environment program; and the insurance program.

Dr. Links is a member of the Delta Omega National Public Health Honor Society. He is a past president of the Society of Nuclear Medicine: a 16,000-member professional medical society that deals with the use of radioactivity and radiation in medicine. Dr. Links's interests include emergency management and disaster preparedness and response, medical imaging-based biomarkers, and radiation dosimetry and risk assessment. He has published more than 150 original scientific papers and one textbook.

Outi Kuivasniemi is Deputy Director for International Affairs at the Ministry of Social Affairs and Health in Finland. During her 20-year career at the Ministry, Ms. Kuivasniemi's focus has been on global and European Union (EU) health and social policies. She is a senior-level expert in global governance and financing. She was in charge of the planning and coordination of Finland's EU presidency, in 2006, at the Ministry of Social Affairs and Health.

Ms. Kuivasniemi has accrued wide understanding of issues around global health and multilateral collaboration. Finland joined the WHO Executive Board in May 2018 for a three-year term, and Ms. Kuivasniemi is the leading adviser to the Member, Permanent Secretary Dr. Päivi Sillanaukee. Ms. Kuivasniemi has served in many WHO, World Bank, and EU expert working groups, especially relating to global public goods, health security, financing, governance, and noncommunicable diseases. She acted as the Rapporteur at the 68th WHO Regional Committee for Europe. She was also the Chairperson of the Regional Evaluation Group, which oversaw the election process for the WHO EURO Regional Director in 2014.

Ms. Kuivasniemi has been actively working on improving global health security. She was Finland's focal point for the Global Health Security Agenda (GHSA), where Finland was the Chair of the Steering Group in 2015. She has also developed the concept for the JEE Alliance, now called Alliance for Health Security Cooperation, which is a global platform for facilitating multisectoral collaboration on health-security capacity building in countries. Finland is co-chairing the Alliance with Australia. In 2016 Ms. Kuivasniemi was decorated Knight of the Order of the White Rose of Finland. She was also named Health Systems Hero by Management Sciences for Health and No More Epidemics.

Amani M'Bale, MIA, MBA, is the Digital Financial Services Advisor for the Office of Health Systems in USAID's Bureau for Global Health. She is a financial inclusion and gender expert. She holds a Master of International Affairs from Columbia University, School of International Affairs, and a Master of Business Administration from the IE Business School, in Madrid. Amani is certified in Digital Money by the Digital Frontiers Institute/Tufts University and is fluent in French.
Amani has 18 years of international development experience. She served as a Chief Technical Advisor for Financial Inclusion with the United Nations Capital Development Fund (UNCDF) in Rwanda, Liberia, and Uganda. In Uganda, Amani launched the Mobile Money for the Poor Program, establishing partnerships in government and the private sector that led to digital financial services provision to rural communities. Preceding UNCDF, Amani worked with Catholic Relief Services, CARE International, and the International Rescue Committee. She has worked in multiple countries, including Benin, Zimbabwe, Mali, and Sierra Leone, and throughout East Africa.

Christine Gottschalk is the Director of the Center for Resilience in the Bureau for Food Security at the USAID. In this role, she oversees the agency's strategy and approach to building the resilience of vulnerable communities in areas subject to recurrent crisis. Ms. Gottschalk began her career with USAID in 2002, and in her tenure has supported emergency responses in Sudan, South Sudan, Syria, Afghanistan, Pakistan, and Yemen as well as responses to food insecurity in the Horn of Africa and Ebola in West Africa. Her technical expertise includes humanitarian assistance and crisis response, post-conflict peace-building and reconstruction, and food security. Ms. Gottschalk also served as the Director for Humanitarian Assistance on the National Security Council (NSC) from 2015–2016. She holds a master's degree in social work from the University of Michigan and a bachelor's in anthropology from George Mason University.

Stephanie Watson-Grant, DrPH, is the Director of Field Operations for MEASURE Evaluation. She has 17 years of experience in public health and development, 14 of them working with health ministries and organizations at the country level. She led a portfolio of sustainability activities that included an analysis of the weights and scoring of PEPFAR's Sustainability Index and Dashboard experience in systems thinking and using causal loop mapping to assess risks to task shifting from facilities to communities. She also has publications focused on measurement of country ownership in global health. She has detailed knowledge of and insights in the development, deployment, and improvement of integrated health information systems in more than 10 countries, with expertise in tracking and measuring the strengthening and improvement of these systems.

Dr. Margaret E. Kruk is Associate Professor of Global Health at the Harvard T.H. Chan School of Public Health. Dr. Kruk's research generates evidence on how health systems can improve health in low- and middle-income countries. She studies the links between health system quality and the demand for healthcare, population health, and confidence in the system. She uses novel implementation science methods to evaluate large-scale health

system reforms. She currently collaborates with colleagues in Tanzania, Ethiopia, Liberia, and India. Dr. Kruk is Chair of The Lancet Global Health Commission on High Quality Health Systems in the SDG Era (HQSS Commission), a global effort to redefine and measure quality in the health systems of lower-income countries. Previously, Dr. Kruk was Associate Professor of Health Policy and Management and Director of the Better Health Systems Initiative at Columbia University. She has held posts at the United Nations Development Program and McKinsey and Company and practiced medicine in northern Ontario, Canada. She holds an MD degree from McMaster University and an MPH from Harvard University.

Igor Linkov, PhD, is Risk and Decision Science Focus Area Lead with the U.S. Army Engineer of Research and Development Center and an Adjunct Professor of Engineering and Public Policy at Carnegie Mellon University. Dr. Linkov has managed multiple risk assessments and risk management projects in the areas of environmental health, climate change, homeland security, energy, infrastructure, emerging materials, cyber security, and systems vulnerability. He has published widely on environmental policy, environmental modeling, and risk analysis, including 13 books and more than 200 peer-reviewed papers and book chapters. Dr. Linkov has organized more than 20 national and international conferences and continuing education workshops.

Kerry Pelzman is a Senior Foreign Service Officer with 30 years of experience in public health, two-thirds of them with USAID. She has served in the USAID missions of South Africa, Afghanistan, India, Iraq, the Regional Mission for Central Asia, and Russia, where she covered health, education, and capacity development. Prior to joining USAID in 1998, Kerry was an international health consultant; worked to implement a family planning program in Togo; managed public health education programs for the New York City Department of Health and served as a U.S. Peace Corps volunteer in Mauritania.
She received a Bachelor of Arts degree from Yale University and a Master of Public Health degree from the University of Michigan's School of Public Health

Appendix D: List of participants

Gebeyehu Abelti
USAID/Ethiopia

Ojaswi Afhikari
Health Officer
USAID/GH

Diaa Ahmed
Utrecht University

Luara Alexander
Knowledge Management Specialist
USAID

Lydia Allen
Program Supervisor
NVFS

Soumya Alva
Senior Technical Advisor
JSI

Shelly Amieva
Technical Officer II
FHI 360

Rose Amolo
Director of International Programs
The Bizzell Group

Aqil Anwer
Senior HSS M&E Advisor
USAID, OHS

Muluken Aseresa
Senior Technical Advisor for TB and HIV- USA
MSH

Tesfaye Ashagari
Program Economist
USAID

Deb Ashner
Founder and Principal
Ashner Associates

Joy Atwine
Team Leader of Quality Improvement
MSH

Sawsan Baghdadi
Health Specialist
USAID

Lamine Bangoura
Malaria Program Specialist
USAID/Guinea

Elana Banin
Senior Policy and Advocacy Associate
PATH

Eric Baranick
Senior Zika Advisor, Contractor
USAID

Nicole Barcikowsi
Deputy Director
MSH

Matthew Barnes
Partner
AS6 Advisors

Cristina Bisson
HSS Director
RTI International

Cammi Blackman
Business Development Manager
World Vision

Vince Blaser
Director
Frontline Health Workers Collation, IntraHealth

Olivia Blomstrom
Student
American University

Bruno Bouchet
Director HSS
FHI 360

Jessica Brady
Associate Director
Save the Children

Leah Breen
Development Officer
ThinkWell

Kelly Bridges
Research Assistant
Global Water 2020

Rhea Bright
Senior Technical Advisor
USAID

Derick Brinkerhoff
Development Fellow
RTI

Erin Broekhuysen
KM Director
JSI

Tobey Busch
Technical Advisor
USAID

Nacy Caiola
Senior Program Advisor
Jhpiego

Ann Canavan
Managing Director
ThinkWell

Jodi Charles
Senior Health Science Specialist
USAID

Nora Charron
Associate
DAI Global Health

Rochika Chaudhry
Senior Advisor
USAID

Gersande Chavez
Vice President
USP

Dennis Cherian
Senior Director
World Vision

Thomas Chiang
Senior Tuberculosis Technical Advisor
USAID

Kendra Chittenden
Senior Infectious Disease Advisor
USAID

Aubrey Clark
Scientific Technical Writing Manager
USP

Robert Clay
Senior Vice President of Global Health
Save the Children

Ann Claxton
Senior Director for Program Quality and Resource, Sustainable Health
World Vision

Alison Collins
Health System Advisor
USAID/GH

Claudia Morrissey Conlon
Senior Advisor
USAID

Holly Connor
Family Planning Program Associate
EngenderHealth

Eliabeth Creel
Director APC
JSI

Laurette Cucua
Senior Youth and RH Advisor
USAID/CH/PRH/SDI

Pat Daly
Associate Vice President, Department of Global Health
Save the Children

Djenie Danjoint
Project Management Associate
Chemonics International

Susna De
Senior Program Advisor
BMGF

Aimee Desrochers
Program Assistant
USAID

Paul Dowling
Senior Technical Advisor
JSI

Jessi Drew
Research Assistant
NIH

Sambe Duale
Senior One Health Technical Advisor for the Preparedness and Response Project
DAI Global Health

Susan Duberstein
Technical Advisor for Health Systems Strengthening
FHI 360

Ricardo Echalar
Senior Public Health Advisor
USAID

Ruti Ejangue
Student
American University

Aaron Emmel
Director of Strategic Outreach
GHA

Cara Endyke Doran
Principal Technical Advisor, Health Programs Group
MSH

Melisa Esposti
Director of Government & NGO Relations
Project C.U.R.E.

Britany Evans
Advocacy Assistant, Global Policy
IntraHealth International

Nefra Faltas
Child Health Advisor
USAID

Robyn Fischer
Acting Director, Policy and Advocacy
WaterAid

Lisa Fleisher
Public Finance Advisor
USAID

Victoria Fleming
Executive Assistant
MEASURE Evaluation

Michelle Folsom
Global Health Consultant

Erin Fowler
Save the Children

Ciro Franco
Freelancer

Naomi Freeman
International Public Health Analyst
U.S Government, Department of Health & Human Services

Dominique Freire
Development Consultant

Jean-Jacque Freire
Senior Advisor, Governance
USAID

Bob Fryatt
Principal Associate, International Development
Abt Associates

Ashveena Gajeelee
Fellow
Harvard Law School

Kama Garrison
SBC Advisor
USAID

Ashley Gibbs
Manager, Health
The Palladium Group

Alma Golden
Deputy Assistant Administrator for Global Health
USAID

Sara Gopalan
Enterprise Monitoring and Evaluation Manager
USP

Christine Gottschalk
Director, Center for Resilience
USAID, Bureau for Food Security and Resilience

Ashley Grable
Senior New Business Development Officer
Project Concern International

Peter Graves
Vice President/New Business Development
Broadreach

Kate Greene
Abt Associates

Richard Greene
Senior Infectious Disease Strategy Advisor
USAID

Tiffany Griffin
Team Lead, Strategy and Impact
USAID, Center for Resilience

Rebecca Hamel
Founder, Co-Chair
Alliance for Food Security & Health

Neetu Hariharan
Technical Advisor
USAID

Carolyn Hart
Vice President
JSI

Danielle Heiberg
Senior Manager, Policy and Advocacy
Global Health Council

Jackie Hellen
Senior Health Associate
Palladium

Hany Helmy
Senior Manager, Advocacy and Communications
VillageReach

Graham Higgins
Special Assistant
USAID

Emily Hillman
Public Health Advisor
USAID

Rhonda Holloway
Business Development Manager
World Vision

Dana Hovig
Director, Integrated Delivery
Bill and Melinda Gates Foundation

Ishrat Husain
Senior Health Advisor
USAID

Ibe Ochiawun
Deputy Project Director
ICF

Jennifer Jackson
Senior Communications Advisor
USAID/OHS

Wanda Jaskiewicz
Project Director, HRH2030
Chemonics International

Zoe Jenkins
Manager
Chemonics International

Patricia Jodrey
Child Health Senior Advisor
USAID

Chris Johnson
Senior Business Development Specialist
CARE

Carolina Johnson
Policy Researcher
Population Council

Beverly Johnston
Division Chief
USAID

Melanie Joiner
Senior Technical Manger
IntraHealth

Inna Jurkevich
Program Director
AIHA

Lily Kak
Senior Country Advisor
USAID

Claire Karlsson
Child Health Team
USAID/MCHN/CHI

Sarah Kashef
Policy/Advocacy Associate
IntraHealth/THWC

Dyness Kasungami
Senior Child Health Advisor
JSI

Kay Amy
Senior Health Advisor
USAID, Middle East Bureau

Khalsa Saraswati
Senior Specialist
Save the Children

Ashima Khanna
Proposal Recruiter
IntraHealth

Shira Kilcoyne
Head of Government Affairs, Washington
GlaxoSmithKline

Rebecca Kohler
Chief Strategy Officer
IntraHealth

Margaret Kruk
Associate Professor
Harvard University

Outi Kivasniemi
Deputy Director for International Affairs
JEE Alliance, Ministry of Social Affairs and Health, Finland

Smita Kumar
Senior NB Advisor
USAID

Nazo Kureshy
Senior Community Health Systems Advisor
USAID, BGH, OHS

Bhavana Lall
Physician
Beth Israel Deaconess Medical Center

Melissa Lam-McCarthy
Executive Assistant
MEASURE Evaluation

Sascha Lamstein
HP+ Communications and KM Director
Palladium

Annmarie Leadman
Technical Director, Communications and Knowledge Management
Palladium

Scott LeFevre
Director of Health, Social Services, and Education
Catholic Relief Services

Charles Lerman
Health Development Officer
USAID

Chunmei Li
Director, Global Community Impact
Johnson and Johnson

Marcela Lievano-Marinez
Health Outreach Officer
The Kenjya-Trusant Group LLC

Amy Lin
Acting Deputy Director and Market Access Team Lead
USAID, Center for Accelerating Innovation and Impact

Igor Linkov
Risk and Decision Science Focus Area Lead, Adjunct Professor of Engineering and Public Policy
U.S. Army Engineer Research and Development Center, Carnegie Mellon University

Sara Lindsay
Global Advocacy Manager
Living Goods

Jonathan Links
Vice Provost and Professor
Johns Hopkins University

Anton Luchystsky
Senior Technical Advisor, Global Health Security
MSH

Lisa Ludeman
Senior Pharmaceutical Management Technical Advisor
USAID

Elizabeth Lugten
Program Analyst
USAID

Rachel Lyons
Student
American University

Beth MacNairn
Deputy Director of Health
Health Volunteers Overseas

Lisa Maniscalco
Health Information Systems and Evaluation Advisor
USAID, OHS

Rachel Marcus
Senior Health Systems Strengthening Advisor
USAID

Amrita Mathew
Program Manger
Jhpiego

Godefroid Mayala
Reproductive Health and Health Systems Strengthening Specialist
USAID, Democratic Republic of Congo

Amani M'Bale
Senior Digital Financial Services Advisor
USAID

Laura McGough
Senior Health Systems Strengthening Advisor
Pathfinder

Andrew Mershon
Resilience Advisor
USAID

Janet Meyers
Reproductive Health in Emergencies
Save the Children

Emily Myers
Senior Associate
Palladium

Edgar Necochea
Senior Director
Jhpiego

Megan Nelson
Director, Health Practice
Chemonics

Lisa Nichols
Principal Associate, International Development
Abt Associates

Maureen Norton
Technical Advisor, Family Planning/Reproductive Health
USAID

Holly O'Hara
Communications Specialist
Jhpiego/MCSP

Luara Olsen
Public Health Analyst
CDC

Nadia Olson
Senior Technical Advisor
JSI

Sadia Parveen
Senior Health Advisor
Palladium

Liz Pavlovich
Business Development Manager
Touch Foundation

Luwei Pearson
Deputy Director, Health
UNICEF

Kerry Pelzman
Deputy Assistant Administrator
USAID

Chris Penders
African Regional Lead
USAID

Taylor Price
Senior Business Development Officer
IMA World Health

Tina Quinby
Senior Program Manager
American Internation Health Alliance

Amanda Quntana
Program Analyst
USAID

Faiza Rab
Health Systems Impact Fellow and PhD Candidate
Canadian Red Cross and University of Western Ontario

Rochelle Rainey
Senior Technical Advisor
USAID Global Health Bureau

Sujata Ram
Lead MEL, IDDS Project
ICF

Mark Rasmuson
Senior Technical Manger
DAI

Rushna Ravji
Health Team Lead, Asia and Middle East
USAID

Barbara Rawlins
M&E Team Lead
Jhpiego/MCSP

Myat Htoo Razak
Director of the Division of Global Programs
HRSA, U.S. Department of Health and Human Services

Charlene Reynolds
Communications Team Lead
Jhpiego/MCSP

Jim Ricca
Learning and Implementation Science Team Lead
Jhpiego/MCSP

Samantha Rick
Advocacy & Policy Advisor
IntraHealth

Heather Ross
Senior Proposal Writer
IntraHealth

Jeanne Russell
Technical Writer
Save the Children

Sohel Saikat
Program Offcer
World Health Organization

Tiaji Salaam-Blyther
Global Health Specialist
Congressional Research Service

Kelly Saldana
Director, Office of Health Systems
USAID

Karima Saleh
Senior Economist
World Bank

Jeff Sanderson
Senior Technical Advisor
JSI

Linda Sanei
Director, Global Health Programs
FHI360

Eric Sarriot
Senior HSS Advisor
Save the Children

Fouzia Shafique
Senior Advisor-Health
UNICEF

Lindsey Shields
Surveillance Advisor
ICF/IDDS

Lucy Siegel
Director, New Programs Development
Jhpiego

Carly Smith
Program Assistant
USAID

Shelley Snyder
Technical Advisor, GH/PRH
USAID

Maura Sourcy Brown
Senior Technical Advisor
MSH

Pooja Sripad
Associate in the Reproductive Health Program
Population Council

Angela Stene
Senior Technical Advisor
Palladium

Agnieszka Sykes
Senior Country Advisor, Office of Country Support
USAID

Laura Tashjian
Program Manager
CORE Group

Patricia Taylor
Director of Country Programs
JSI/MCSP

Yosi Tesfaye
Business Development Manager
World Vision

Sara Tharakan
Analyst
Catholic Relief Services

Karen Tincknell
Assistant Vice President, Global Health
Save the Children

Ersin Topcuoglu
Senior Principal Technical Advisor
MSH

Kristen Wares
MEASURE Evaluation AOR/ Public Health Advisor OHA
USAID

Stephanie Watson-Grant
Director, Field Programs
MEASURE Evaluation

Oliver Wilcox
Deputy Director, Office of Countering Violent Extremism
U.S. Department of State

Taylor Williamson
Health Systems Manager
RTI

Lauri Winter
Independent Consultant

Ashley Wolfington
Senior Technical Advisor for Reproductive Health
International Rescue Committee

Jason Wright
Senior Director, External Engagement
MSH

Amanda Yourchuck
Nutrition and Health Advisor
Concern Worldwide

Linda Zackin
Health Program Director
Panagora Group

Trinity Zan
Technical Advisor
FHI 360

Danielle Zielinski
Sanitation Policy Project Officer
WaterAid

Alexandra Zuber
CEO
Ata Health Strategies

Nureyan Zunong
Emergency Health Advisor
Save the Children

Dominique Zwinkels
Executive Manager
UNICEF/People that Deliver Initiative

MEASURE Evaluation
University of North Carolina at Chapel Hill
123 West Franklin Street
Chapel Hill, NC 27516 USA
Phone: +1-919-445-9359
measure@unc.edu
www.measureevaluation.org

This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of MEASURE Evaluation cooperative agreement AID-OAA-L-14-00004. MEASURE Evaluation is implemented by the Carolina Population Center, University of North Carolina at Chapel Hill in partnership with ICF International; John Snow, Inc.; Management Sciences for Health; Palladium; and Tulane University. Views expressed are not necessarily those of USAID or the United States government. TR-19-362