Cracking the Nut® Health

The Role of Communities in Building Resilient Health Systems | Lessons from the 2016 Conference

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Acronyms

AEF	Afya Elimu Fund
AMP	Aspen Management Partnership
ASHA	Accredited Social Health Activist
COMPASS	Community Participation for Action in the Social Sector
CHIS	Community Health Information System
CRS	Catholic Relief Services
DHSI	Decentralized Health Service Index
DR-TB	Drug Resistant Tuberculosis
eLMIS	electronic Logistics Management Information System
FHWC	Frontline Health Workers Coalition
HEP+	Health and Education Plus
HEW	Health Extension Worker
HIS	Health Information System
HSR	Health Sector Resiliency
HSS	Health Systems Strengthening
HMIS	Health Management Information System
JSI	John Snow Incorporated
MNCH/FP/N	Maternal, Newborn and Child Health/Family Planning/Nutrition
MOHFW	Ministry of Health and Family Welfare
MSH	Management Sciences for Health
NAC	National Advisory Committee
NGO	Non-Governmental Organization
NIAD	National Institute of Allergy and Infectious Diseases
NIH	National Institutes of Health
NTD	Neglected Tropical Disease
OpenHIE	Open Health Information Exchange
PDQ-Y	Partnership Defined Quality for Youth
PLAN-Health	Program to Build Leadership and Accountability in Nigeria's Health System
PRISM	Performance of Routine Information System Management
USAID	United States Agency for International Development

Foreword

Dear Fellow Nutcrackers,

Reflecting on the seventh *Cracking the Nut* conference, I am pleased to see that Connexus' approach to participatory knowledge sharing was equally beneficial to participants in the area of health sector strengthening as it has been in its traditional realm of rural and agricultural development. With nearly 200 people from 25 countries, participants gave the overall conference a rating of 4.3 on average on a scale of 1 (bad) to 5 (excellent). Through the evaluations, multiple participants expressed their appreciation for the new insights and contacts gained at *Cracking the Nut Health*, which they plan to integrate in their own work in building resilient health systems.

The recent Ebola outbreak in West Africa shed light on the lack of infrastructure and resilience in health systems in low-income countries and the limitations inherent in trying to improve these systems with funding silos focused on specific disease control programs, rather than holistic approaches to improving health system performance. With the Zika virus now spreading rapidly, health practitioners are increasingly aware of the vulnerabilities infectious disease outbreaks create for inhabitants of all countries regardless of income status. To improve health system resilience, this conference emphasized the important role of governance and the necessary participation of a diverse range of stakeholders, beginning with local community members, in ensuring a flow of information up and down the health system's chain of decision-making. The conference highlighted the necessity of working with the private sector and civil society to fill in the gaps left from the public sector; a wide range of partnerships is needed to create resilient health systems. While new technologies offer many interesting opportunities to improve health care and its delivery, we were reminded of the importance of focusing on the need and the end-user to drive innovative solutions. Financing health is one of the areas that we need to explore further to catalyze and sustain access to quality health services for the growing populations across the globe.

We are grateful to the many contributions made to this body of knowledge and we are confident that together we can generate the sparks, synergies and innovations needed to support and grow resilient health systems in communities around the world.

Sincerely,

Anita Campion
President and CEO

Executive Summary

The learning event, *Cracking the Nut Health: The Role of Communities in Building Resilient Health Systems* took place July 18-19, 2016 in Washington, D.C., which focused on the three core themes:

- Using Measurement and Analytics to Improve Accountability
- Leveraging Partnerships to Promote Resilience; and
- Scaling Technology and Innovation to Increase Impact.

The conference began with a presentation by Michael Myers of The Rockefeller Foundation, who introduced the three themes and highlighted five characteristics of resilient health systems; notably, that they should be aware, diverse, self-regulating, integrated and adaptive. The conference generated the following lessons, which are categorized according to the themes.

Using Measurement and Analytics to Improve Accountability

This theme emphasized the importance of capturing and analyzing health information to make better decisions and improve resiliency of health systems from the community up.

Lesson 1: Decentralized planning is essential for tailoring appropriate interventions to address epidemiological variations across geographic areas. Decentralized planning is particularly useful in identifying low performing areas and underserved populations so that local governments can bring services closer to people who need them most.

Lesson 2: Collection and analysis of data must be continuous to inform key processes, such as planning, implementation, management and monitoring. There has been an inadequate availability and use of data to inform planning processes that guide effective decision making and lead to improved health sector performance. Health system planning and management that is based on verifiable data is needed to improve the use of health services.

Lesson 3: Good governance is essential to leveraging support from policymakers to back data collection. By establishing a transparent governance framework that regulates institutional participation and sets clear standards for data exchange and quality, governments can create an effective system for measuring and monitoring health sector impacts with information that is accessible to the public.

Lesson 4: Real-time data can be used in adaptive management for quicker response to commodity supply gaps. By using health information systems with real time data, informed decisions can be made faster, public health commodities can be better managed and medical supply stock-outs can be minimized, thereby improving the resiliency of local health systems.

Lesson 5: Building off of existing technology can create more efficient data handling and management systems to enhance data usability. For example, cStock, an open-source RapidSMS information system is now being scaled up in Malawi to monitor and manage the supply of medications at community levels.

Leveraging Partnerships to Promote Resilience

This theme emphasized the broad range of partnership types and how collaboration can create more impactful, lasting and resilient results.

Lesson 6: Barriers to reaching youth with needed health services can be overcome by engaging them in true partnerships with the health sector. True partnership implies effective ways for health professionals to be understanding of the particular concerns of youth, such as privacy, confidentiality, wait times, hours of operation and to offer non-judgmental counseling services.

Lesson 7: Resilient health systems are made up of resilient health workers who have the competencies and resources to meet the health needs of under-served communities. There is a large demand for trained frontline health workers especially in remote, under-served communities. Young people interested in becoming health workers, especially those living in the most vulnerable communities, often face financial barriers to obtaining the education and training they need to become health workers and ultimately serve their communities.

Lesson 8: Partnerships that are flexible, adaptable and based on mutual trust can be more resilient and leveraged in unique ways to strengthen health systems. Although not a humanitarian relief-focused advocacy alliance, for example, members of the Frontline Community Health Workers quickly mobilized to highlight and reinforce the extraordinary care being provided by local frontline health workers amid the recent Ebola crisis in West Africa.

Lesson 9: Diverse partnerships have driven attention and resources toward innovative community health models that are showing positive impacts on health systems. USAID has undertaken a range of partnerships that are creating positive results at the community level, whether it is ending preventable maternal and child deaths, creating an AIDS-free generation or protecting communities from infectious diseases**.**

Lesson 10: Private entrepreneurs can be a powerful force for extending healthcare products and services to a large number of people. Examples from MicroEnsure, ClickMedex and others demonstrated how private entrepreneurs are able to reach a large number of under-served clients, however, reaching the poorest of the poor remains a challenge.

Scaling Technology and Innovation to Increase Impact

This theme explored how new technologies and other innovations can facilitate knowledge and access to resilient health services all the way to the community level.

Lesson 11: Demonstrating the value of technology is key to government adoption, ownership and use. To be effective, technology interventions should not only allow for improved connectivity and results, but also offer a return on investment that governments can support and sustain over the long-term.

Lesson 12: To ensure a new technology or innovation will have an impact, design the intervention plan and budget with the final vision and scale in mind. Prior to using its mHealth tool, CommCare, which is a mobile application to support frontline workers as they provide community health care, Dimagi encourages projects to start by defining the intended maturity the system will have and the desired impact. With these goals in mind, practitioners can monitor and evaluate their implementation more effectively.

Lesson 13: Building clinical research tools that can be used across different country contexts allows researchers to leverage existing data to make scientific advances. For example, a portal to compile and analyze data collected from tuberculosis patients from multiple countries now provides information and insights to clinicians and researchers across the globe.

Lesson 14: Collecting data is not enough, results need to be critically analyzed to understand and assess impact. CRS presented a case from India demonstrating how certain indicators can suggest improvement in demand for health services without resulting in true impact in terms of improved health service utilization.

Caption: Michael Myers, Director of The Rockefeller Foundation, gives the Keynote Address

Caption: Dr. Aidee DeGregorio leads a discussion during a break out session on PDQ

Lesson 15: By connecting data information silos, systems for analysis and decision-making become more powerful. The Open Health Information Exchange is a community of practice working to develop standards and architecture to improve the interoperability of these siloed systems across national and regional boundaries.

Moving Forward. Given the many lessons gleaned from participants of *Cracking the Nut Health 2016*, it became clear that we have more work to do to break down silos and communication barriers, to improve interconnectivity and to improve health sector resiliency. Here are a few of next steps that emerged, which could form the basis for *Cracking the Nut Health 2017*, including the need to:

- Encourage governments and their partners/funders to share public health data online and facilitate its use;
- Explore the role of governance (formal and informal) in health system reform; building capacity of local communities to communicate their needs to government through transparent channels;
- Support large-scale, sustainable finance models to inclusively serve the rural poor and other marginalized populations; and
- Ensure that women and youth have access to services, as we move toward advanced eco-systems in building resilient health systems.

I. Introduction

The focus for the *Cracking the Nut Health 2016* conference was "The Role of Communities in Building Resilient Health Systems." As a community of international development practitioners, health sector specialists, donors and private sector stakeholders, conference participants are committed to making the world a better place, where people have access to quality, affordable health care, based on people and systems that are resilient in times of crisis, as well as times of calm.

In his keynote address, Mr. Michael Myers, Managing Director of The Rockefeller Foundation opened the conference with a discussion on resiliency and offered a formal definition (see Box 1), which he simplified as "the ability to bounce back." As one participant stated, "We are all standing on sand" as everything is changing all the time; and for all the planning governments do, "mosquitos do not respect national borders." Both of these comments highlight the need for resilient health systems.

Box 1. Definition of Resilient Health System:

- Capacity of health actors, institutions, and populations to prepare for and effectively respond to crises.
- Ability to maintain core functions when a crisis hits; and, informed by lessons learned during the crisis, reorganize if conditions require it.
- Ability to protect human life and produce good health outcomes for all during a crisis and in its aftermath. Resilient health systems can also deliver everyday benefits and positive health outcomes.

Mr. Myers demonstrated the importance of building resilient health systems, using the example of Liberia. After two decades of civil war, Liberia was the first developing country in sub-Saharan Africa to achieve Millennium Development Goal #4 reduced child mortality, for which Chief Medical Offer Bernice Dahn, who later became Health Minister, was publicly acknowledged on July 25, 2013. Just one year later, on Sept. 17, 2014, the Ebola epidemic hit the news with 1,578 deaths linked to this highly contagious disease in less than 6 months. Liberia's health systems collapsed, as the "lack of connective tissues" caused its silos of excellence to fail in its greatest time of need. Since then The Rockefeller Foundation has been working in partnership with a local non-governmental organization (NGO) on Liberia's Plan for Community Health, reinforcing those connective tissues starting at the village level. Once the plan was finalized, training began for new Community Health Associates and they were connected more directly to the health system than before the Ebola crisis. For example, recently, a Community Health Associate working just 5 miles away from Ebola's ground zero (where the first child was diagnosed) examined an 8-year old boy with a strange cough. By connecting to a nurse, samples were taken, resulting in the diagnosis of pertussis (whooping cough) for the boy and more than 50 other children in the village, thereby avoiding a major epidemic in the area. By being located at the community level, these Community Health Associates are able to watch for such health abnormalities or anomalies on a real-time basis. And by being better connected to the health system, they play an important role in raising alerts, making the community and the overall health system more resilient to changing health needs.

From its work in multiple sectors, The Rockefeller Foundation has identified the five characteristics of resilience that also apply to building resilient health systems at the community level.

1. **Aware** – Communities are at the front line; they must be able to identify possible threats, sound alarm and be heard by proper authorities, who can respond. Communities must also be aware of the strengths and weaknesses of their capacities.
2. **Diverse** – Communities can respond to a variety of different pressures and needs; providing diverse primary care as possible as well as public health needs.
3. **Self-regulating** – The system must have the authority and capacity to change and evolve as needed from community levels up to national levels. Pre-crisis partnerships and agreements can facilitate decision making and enhance response times amid crisis.

4. **Integrated** – Community level health care must be connected and integrated with the broader national or regional health system. Also, as health work is becoming more multi-sectoral, including actors from public, private and civil society, all systems must work effectively together, with relationships built on trust and social capital that can be tapped in times of urgent need. It is much harder to try to "cobble together" partnerships amid crisis.
5. **Adaptive** – Communities and health systems must be able to adjust in times of crisis and strengthen in times of calm, adjusting for slower stresses, such as climate change and demographics, as well as to acute shocks, such as epidemics.

Using this framework, Mr. Myers linked the overarching topic of "The Role of Communities in Building Resilient Health Systems" to the conference's three sub-themes, as follows:

Theme 1: Using Measurement and Analytics to Improve Accountability

The Ebola crisis showed us just how important communities are to the foundation of a resilient health system, as some of the best solutions to manage the crisis were identified at the community level. The Ebola crisis also highlighted how the lack of health sector infrastructure in developing countries created vulnerabilities in developed countries. Part of the missing infrastructure relates to national health sector databases, which have to start at the community level, "where the rubber meets the road." In retrospect, early warning systems and indicators to track and monitor health sector resiliency were largely missing in countries that experienced Ebola. The Rockefeller Foundation has been working with the Harvard School of Public Health, the World Bank, various countries and other actors to develop a set of indicators to measure health system resiliency, including many that are applicable to community resilience.

Theme 2: Leveraging Partnerships to Promote Resilience

As we develop partnerships and agreements to improve health sector resiliency, we must keep in mind that the community should be at the center. Given the strong role of the public sector in health systems, government actors will inevitably be involved, but we should focus primarily on the needs of the people and on building relationships of trust including with civil society leaders and the private sector

Theme 3: Scaling Technology and Innovation to Increase Impact

As we develop new technologies and innovations for the health sector, we need to use client-centered approaches and actively involve end users in the design of solutions. Mobile health (mHealth) technologies, such as cellphones, can be excellent resources for strengthening health at the community level, as they can link to health system partners and to communicate with the general population. When banking systems collapsed amid the pressures of the Ebola crisis, cellphones were used to pay local health workers, while simultaneously improving transparency and reducing corruption. The world is experiencing a vast explosion in technological innovations, including health apps, tablets, patches, telemedicine, and remote diagnoses, but as development professionals we must work to make sure that low-income populations benefit from these new technologies and innovations.

II. Using Measurement and Analytics to Improve Accountability

An oft repeated quote is attributed to business management expert Peter Drucker, "What gets measured, gets managed." This is the basis for this particular theme of the *Cracking the Nut Health* conference, as we assume that strategic use of measurement and analytics can improve accountability and the management of health care services. This chapter showcases the importance of good governance, decentralized planning and the participation of diverse stakeholders to ensure that health information systems are designed to be resilient amid ever changing circumstances, and extracts some of the core lessons from leading health sector implementers.

Lesson 1: Decentralized planning is essential for tailoring appropriate interventions to address epidemiological variations across geographic areas.

Decentralized planning is useful in identifying low performing areas and underserved populations so that local governments are able to bring services closer to people who need them most. Moreover, decentralization allows focus to be directed toward the most critical interventions a community needs and to accelerate implementation of these services. It also enables the establishment of realistic and achievable performance targets, which can be more closely monitored and evaluated.

A good illustration of how decentralization can improve health system performance is the Decentralized Health Services Index (DHSI) in Honduras. The DHSI was developed as a pilot under the Transparent Local Governance & Improved Service Delivery Project in Honduras. The index is an Excel-based tool, whose variables provide a snapshot of the decentralized health services condition in a given municipality. See Box 2.1 for a description of the DHSI in Honduras.

Box 2.1 The Decentralized Health Services Index in Honduras

The index quantifies the level of decentralization of health services and their impact within municipalities across three variables: supply side (institutional variables) 30%; technical (quality variables) 30%; demand driven (social variables) 40% weighting.

In the pilot study, the Decentralized Health Services Index showed an overall improvement in health service delivery in Honduras between 2012 and 2015 by up to 27%. This can be attributed to improved prioritization of services identified by target communities.

The index is used to merge pressure points between supply and demand for health services "eco-system" to identify bottlenecks in health services industry and inform decision makers on overcoming specific health delivery challenges.

The DHSI in Honduras demonstrates that:

- It is important for local governments to provide a mechanism through which civil society can engage in influencing the health system. If governments enable citizen participation and seek feedback, there will likely be an improvement and overall increase in satisfaction with service delivery.
- Decentralization is the most effective way to gain insights from marginalized groups or citizens that are politically or economically excluded from the rest of the community.

Decentralized planning creates more transparency and improves accountability as local governments have stronger capacity to oversee decentralized services. It increases the national government's and institutions' capacity to implement policies and regulations.

Lesson 2: Collection and analysis of data must be continuous to inform key processes, such as planning, implementation, management and monitoring.

Decisions taken to strengthen health systems should be backed by verifiable data. Inadequate use of data to inform planning processes was cited as a major challenge in building stronger health systems throughout the Cracking the Nut Health conference.

The MaMoni Health Systems Strengthening (HSS) Project in Bangladesh presented examples of how a data driven planning process had been successfully used to improve the utilization of maternal, newborn and child health, family planning and nutrition (MNCH/FP/N) services in underserved rural areas of Bangladesh.

In her presentation, Dr. Afsana discussed how the project used evidence-based practices to inform planning and management in a scaled-up approach that started at the peripheral level, called Unions. See Box 2.2 for a description of the MaMoni Health Systems Strengthening Project.

Box 2.2 The MaMoni Health Systems Strengthening Project

The MaMoni Health Systems Strengthening Project is a four-year project funded by USAID that began in September 2013. It supports the Ministry of Health and Family Welfare (MOHFW) in Bangladesh to increase the availability and quality of high-impact interventions, with the aim of reducing maternal, newborn and child mortality in six underserved districts.

The MaMoni HSS Project has promoted a data-driven joint comprehensive plan for maternal, newborn and child health, family planning and nutrition (MNCH/FP/N) and set up joint review systems to monitor progress. The project's approach focuses on local decision making, identifying barriers and mobilizing local resources to support MNCH/FP/N services in rural areas of Bangladesh. The project's approach focuses on local decision making, identifying barriers and mobilizing local resources to support MNCH/FP/N services in rural areas of Bangladesh.

The project engages with local government and nongovernmental organizations to improve the delivery of health services. At the national level, MaMoni HSS works to build consensus around policies and standards that positively drive evidence-based decisions and interventions at all levels of care.

The community mobilization model of MaMoni HSS provides volunteers, selected by the community, to work as an extension of the MOHFW front line workers in reaching the mothers with critical information. Community microplanning creates a platform for interfacing of the community with MOHFW service providers to promote locally driven planning.

MaMoni HSS builds on existing resources of MOHFW to mobilize local resources and provide inputs to fill the gaps. The project has also supported the roll out of the drug, Misoprostol, to address postpartum hemorrhage, improved logistics handling of lifesaving commodities at health centers and enhanced referral networks by linking smaller centers to higher facilities to manage complications.

Some key observations that arose from the MaMoni HSS Project are:

1. Planning, management and monitoring are continuous processes which rely on ongoing collection and routine analysis of data.
2. Improved integration of services increases access and utilization of services by the community. Integration of services also enhances the planning, management and monitoring process promoting higher efficiency. Existence of parallel planning systems by different units of the Ministry of Health and Family Welfare was observed to present setbacks in the local level planning.
3. Delegation of financial authority to districts and sub-districts improves resource allocation and enables their health systems to plan and perform better. This should be linked to a strong monitoring system to promote accountability.

Lesson 3: Good governance is essential to leveraging support from policymakers to back data collection.

Establishing a governance framework to regulate institutional participation, as well as defining clear standards for data exchange and data quality, are important to creating an effective system for monitoring and measuring health sector impacts. Guatemala offers an excellent example of how top-level government commitment to transparency and accountability can yield significant benefits in terms of improving the resiliency and responsiveness of a health system to changing realities. See Box 2.3 for a description of Guatemala's Health Indicators System, which was designed with technical assistance from Palladium Group's Health and Education Plus (HEP+) project. Some of the factors that contributed to the success of Guatemala's information systems include:

- An early commitment to designing a user-friendly interface, strongly based on visualization, so as to minimize the need for end-user training;
- A decision to encourage "openness," including use of open source applications, architecture and access, which also reduced cost and thereby improved long-term sustainability of the system; and,
- Documentation and systematization that allowed the information system to be easily replicated and adapted for other government uses.

These factors contributed to the development of a successful database that is helping frontline health workers save lives.

Box 2.3 Guatemala's Transparent Health Indicators System

Guatemala's Health Indicators System was developed as part of a larger government effort, its National Social Indicators System or *Sistema Nacional de Informacion Social*, which aims to improve transparency and access to data for 16 ministries and government organizations. Guatemala made the bold commitment to mandate the use and maintenance of this system, with clear standards for information to ensure consistency and to inform decision-making. The knowledge management portal provides information related to health outbreaks, such as Dengue, diarrhea and malaria, and predicts chances of outbreaks for surrounding communities. In addition, the portal provides information on budgets and expenses, as well as availability of provisional supplies and medicines by location. Recently, the portal has been used to track the Zika virus, highlighting emergency alerts in southern Guatemala where there have been four deaths as of July 2016. The Ministry of Health closely monitors this information, which is updated daily. The portal shows that the Chiquimula community has experienced higher incidence of Zika than other communities, which affected more women than men, probably because women are more likely to stay in the community. Not only is the portal accessible to all public health workers in Guatemala, it is accessible to the general public. According to Google Analytics, the site has 60,000 active users and receives an average of 500 visits per day.

Box 2.3 continued

To further encourage use of the data, Palladium's HEP+ project recently developed a smartphone app, Saludinfo GT, which does not require connectivity once the database is downloaded for that day, making it especially useful for rural health workers. With links to social media, information and graphics can rapidly be shared with the public to inform them of changing health risks.

Lesson 4: Real-time data can be used in adaptive management for quicker response to commodity supply gaps.

The use of real time data learning systems in health system strengthening is helpful in adaptive management when addressing public health commodity challenges and integrating supply chain data in meeting community health needs. Tanzania offers an excellent example of how real-time data is used in adaptive management to verify adequate quality and quantities of health commodities compared to health services provided. See Box 2.4 for a description of the electronic Logistics Management Information System (eLMIS) in Tanzania, which was designed with technical assistance from John Snow, Inc. (JSI) funded by the USAID | DELIVER PROJECT. Factors that contributed to the success of Tanzania's electronic Logistics Management Information System (eLMIS) include:

- The availability of accurate, timely and routine consumption data leads to better and impactful decision making;
- Enhancing public health commodity information collection and visibility with the eLMIS, combined with increasing data use—especially with the development of the Logistics Management Unit (LMU) in Tanzania— leads to increased efficiency of supply chains;
- The flow of information on stock levels and stock outs reduced the occurrence and duration of stockouts;
- Improved reporting rates and timeliness of stock data facilitated redistribution decisions
- The integration of real-time dashboards gives management an additional tool for identifying and correcting anomalies to minimize negative health outcomes and loss of resources.
- In addition to building systems, local capacity and culture were reinforced to produce and act on data, to identify gaps, and develop and implement improvements

Box 2.4 Tanzania's electronic Logistics Management Information System (eLMIS)

The electronic Logistic Management Information System (eLMIS) in Tanzania was developed to address many of the challenges with the paper-based LMIS used by employees in the public health supply chain throughout the country. The eLMIS was created and went live in 2014 with end-to-end visibility across more than 5,000 health facilities, while streamlining business processes in the public health supply chain. The real-time availability of data enables adaptive management for a quicker policy response to commodity security challenges, reducing lead time and allowing for rapid, impactful decision making. Integrating the supply chain data from eLMIS with service data from the health information management system has made data available through a reproductive maternal, nutrition and child health (RMNCH) dashboard, giving visibility into how decisions impact commodity flow and service delivery.

In conjunction with the creation of the eLMIS, JSI assisted the Tanzanian Government to create and build capacity of the Logistics Management Unit (LMU). The LMU is responsible for organizing, monitoring, and supporting all supply chain activities of all programs within the public health supply chain in the country.

Lesson 5: Building off of existing technology can create more efficient data handling and management systems to enhance data usability.

Resilient health systems need timely and complete data from all levels of the community to be able to respond effectively and drive improvements in service delivery. A major challenge to data collection and utilization for many countries is the existence of parallel reporting systems that are often paper driven. This leaves managers with an overwhelmingly large quantity of data that is cumbersome to analyze and difficult to share and use.

E-health approaches are promising in providing a solution to this, but are difficult to implement in many areas due to a lack of appropriate systems and infrastructure to support technology-driven interventions. Major challenges to technology-based data management innovations include: poor connectivity to the internet, frequent power outages, lack of computers, and no budgetary allocation to train personnel on operating and managing digital health information systems. It is also important to note that technological interventions are rarely one-time investments and require ongoing maintenance, supervision, and support from system developers, which further drives up the cost and resource burden.

This is where building off of existing technology becomes a useful resource in communities where overcoming all the stated barriers would be too costly. Simple and accessible gadgets, such as mobile phones, are effective tools for handling, sharing and managing data.

John Snow Inc. (JSI) showcased cStock, an open-source RapidSMS information system piloted by SC4CCM in Malawi to monitor and manage the supply of medications at community levels. cStock has since been adopted by the Government of Malawi after being scaled up by local partners. (See Box 2.5 for a description of cSTOCK).

Applications like cSTOCK overcome the need to direct resources to train personnel on how to use new digital information systems as they build off of technology for which the majority of people are already familiar. There are also far fewer cost implications as there is no need to procure costly devices or develop supporting infrastructure for information systems. No money was spent on buying phones or training Health Surveillance Assistants on how to use cSTOCK.

Box 2.5 cStock: An innovative and scalable mHealth community supply chain solution

cStock was developed by JSI's Supply Chain for Community Case Management (SC4CCM) project (2009 to 2014), which was supported by the Bill & Melinda Gates Foundation. cStock is a simple mobile application with web interface designed to overcome supply chain constraints that prevent effective community-based treatment of common childhood diseases. It avails an effective reporting and resupply system that improves communication between the Health Surveillance Assistants (HSAs) in Malawi and their resupply points. cStock also provides visibility of real time HSA logistics data at district and central levels of the Ministry of Health, such as alerts, current stock status and stock out rates, enabling supply chain managers to respond in a timely way to issues.

cStock uses basic Global System for Mobile (GSM) communications phones already owned by HSAs to report data monthly via SMS on a toll free phone line. The system calculates resupply quantities for each HSA and sends the quantities directly via SMS to the health center to prepack products. Health centers advise HSAs when the stock is available for pick-up, significantly reducing unnecessary travel time for the HSAs to the Health Centers. A web-accessible dashboard with simple, easy-to-use reports, shows stock levels, reporting rates, and alerts for central and district level managers. Data is hosted on the Cloud, which is an inexpensive, reliable, and easy to manage option for a small scale system like cStock as it does not require recruiting/training IT support staff and procuring/maintaining a server.

Box 2.5 continued

The SC4CCM experience using cStock demonstrates that simple, easy-to-use interventions make it possible to remove supply chain constraints at the community level, transform practices to strengthen and improve supply chain performance and even significantly improve product availability at the community level when products are present in the overall system.

III. Leveraging Partnerships to Promote Resilience

In the second theme at the *Cracking the Nut Health* conference presenters explored the range of relationships and partnerships that contribute to the resiliency of health systems at the local level. From engaging youth to better tailor effective and customized health services, to leveraging relationships with faith-based entities to promote healthy lifestyles, this theme emphasized the need to seek out creative partnerships in order to crack the tough nuts involved in bolstering the resiliency of health systems. Remarking on the required cooperation between multiple private sector entities, one panelist said, "Motivations and expectations do not necessarily have to be the same for each partner, but they cannot be in conflict." These words can be applied even more broadly as a general undercurrent of the lessons that follow in this chapter. There are a broad range of players in any health system, so leveraging the partnerships that exist to the greatest extent possible can help to strengthen the resiliency of health systems for the future.

Lesson 6: Barriers to reaching youth with needed health services can be overcome by engaging them in true partnerships with the health sector.

Creating opportunities for young people and health professionals to work together to define, implement and monitor quality improvement processes can be a powerful approach to ensuring health services are youth-friendly, and used by young people. Health workers and youth often have very different perspectives regarding quality and service use. Health workers are sometimes uncomfortable serving youth, especially offering reproductive health counseling and services to unmarried young people. They also may feel their workloads prevent them from taking the time to offer the type of counseling and support youth require. Young people, on the other hand, are often reluctant or embarrassed to seek care because they are afraid that their needs will not be met. They are concerned with such issues as privacy, confidentiality, wait times, hours of operation, and what they perceive as the rudeness of health workers.

Save the Children has adapted its flagship Partnership Defined Quality for Youth (PDQ-Y) approach to meet youth needs (see Box 3.1). This approach seeks to improve quality of services by engaging community participation and ownership in the planning, implementation, monitoring and evaluation of service delivery at the health facility level. Diverse stakeholders come together to explore different perspectives on quality, identify action plans to address priority issues, and create quality improvement teams to address them. Working together to prioritize quality improvement actions, PDQ-Y has demonstrated that youth will participate in quality improvement committees with health workers to help make health facilities more youth-friendly. They also, when motivated, engage in monitoring client satisfaction and raising awareness and demand among their peers. At the same time, health facilities will reorganize their services (hours of operation, privacy) and health workers are willing to offer responsive youth-friendly services once they understand the concerns of young people and have the support from their management. Sustainability of such improvement efforts requires strong commitment from health sector authorities and they are most successful when quality improvement teams are institutionalized, and when young people have ongoing engagement in quality improvement committees.

Box 3.1 Save the Children Partnership Defined Quality for Youth

Save **the** Children has implemented the Partnership Defined Quality for Youth (PDQ-Y) approach in six countries. In each country, national and district ministries of health officials, health facility staff, youth groups, parents, and community leaders are active participants in the program. While these programs have yet to be fully evaluated, key learnings working across six countries include:

- Ministry of Health involvement is critical to implementing action plans and allocating resources.

Box 3.1 continued

- Youth lose interest easily if the process is not engaging or does not seem relevant.
- Different youth sub-groups have very different needs and expectations (age, gender, school attendance).
- Strong facilitation skills are needed to guide the process, so that all groups' voices are heard and validated, and that consensus is built.
- Power imbalances between health workers and youth can be a barrier and need to be taken into account in program design.

Lesson 7: Resilient health systems are made up of resilient health workers who have the competencies and resources to meet the health needs of underserved communities.

In Kenya, as in many countries, young people who aspire to become health workers are frequently unable to pursue their goals because they cannot afford training programs. Young people often do not begin higher education when they know they cannot afford school fees. In addition, many health professional students are unable to pay their annual tuition fees, leading to a high drop-out rate for those who do begin training programs. As described in Box 3.2, the Afya Elimu Fund, an innovative sustainable loan program for health professional students developed by IntraHealth International and its partners, is helping to make the dream of becoming a health worker a reality for thousands of young people in Kenya. The fund is beginning to prove that self-sustaining financing for health worker training is, indeed, feasible. The model also has the potential of being applied to those seeking higher education in other fields of work. Investing in individuals' ability to afford health worker training can increase their own resilience—and protection from financial hardship, leading to more resilient health systems, communities and countries.

Box 3.2 Making education affordable—and feasible—for Kenya's future health workers

The Afya Elimu Fund (AEF), established by IntraHealth International and its partners, provides affordable loans to health professional students in Kenya who need financial assistance to continue their education. Afya Elimu Fund loans are offered to students enrolled in accredited nursing, clinical medicine, laboratory sciences, nutrition, and health records information programs. Students apply for the loan to cover their tuition fees, and can receive a maximum of 70,000 Kenya Shillings (or about US$767) per year. The loans are intended to ensure that students continue their education without disruption, that they graduate, and that they are deployed to meet their country's health needs. AEF is a joint venture between IntraHealth's USAID-funded FUNZOKenya project, the Higher Education Loans Board, and the Kenya Healthcare Federation. Other partners include the Ministry of Health, the Ministry of Education, and the Ministry of Planning and Devolution, as well as local private-sector contributors. AEF provides a reliable source of funding for students. Interest, which is 4% (compared to an average of 12.5% for other loans) does not accrue while students remain in school. Graduates then receive a one-year grace period before they must make reimbursement payments, which revolve back into the fund to provide loans to additional health professional students. Because of the repayments, the program is self-sustaining unlike scholarship programs which require ongoing external funding. As of April 2016, more than 5,000 students—50% of them female—have benefitted from AEF loans at 85 participating training institutions.

Lesson 8: Partnerships that are flexible, adaptable, and based on mutual trust can be more resilient and leveraged in unique ways to strengthen health systems.

The Frontline Health Workers Coalition (FHWC) is a good example of a flexible and adaptable partnership. It was launched in 2012 to address a need for greater and more strategic focus on investment in health workers on the frontlines of health systems in low- and middle-income countries. In late 2014, the Ebola

epidemic in West Africa highlighted the need for greater attention to local frontline health workers. Although not a humanitarian relief-focused advocacy alliance, the FHCW membership quickly mobilized to spotlight the extraordinary care being provided by local frontline health workers despite dire conditions in West Africa. The Coalition called for greater support for well-trained frontline health workers so that resilient health systems could be built at the community level. The FHWC, by its immediate response to the Ebola epidemic, demonstrated that partnerships can be resilient and have the capacity to mobilize quickly to respond to crises. These partnerships are particularly effective because they are agile and flexible; are based on mutual trusting relationships; and, are willing to be bold by coming to consensus quickly and by taking risks. As described in Box 3.4, through its own resilience, the FHWC had a positive impact on the global response to the world's largest-to-date Ebola outbreak. Shortly after the spread of Ebola reached global headlines, the FHWC developed an advocacy plan that had an impact on the response of member organizations, the U.S. government, and the global health security agenda.

Box 3.4 Frontline Health Workers Coalition: Adapting strong partnerships to leverage Ebola's spotlight on frontline health workers

The Frontline Health Workers Coalition (FHWC) is an alliance of United States-based organizations working together to urge greater and more strategic U.S. investment in frontline health workers in developing countries as a cost-effective way to save lives and foster a healthier, safer and more prosperous world. With its secretariat housed at IntraHealth International, FHWC has 36 US-based members including NGOs, trade organizations, advocacy campaigns, and corporations. The coalition engages in regular communications efforts to highlight the impact of frontline health workers as central to building resilient health systems; produces fact sheets and policy analyses; reports on key issues, such as the importance of frontline health workers to ending preventable maternal and child deaths; and, organizes regular briefs to the U.S. Congress and administration. When the Ebola epidemic grabbed headlines in late 2014, FHWC quickly developed a plan that included providing key policy recommendations to the U.S. government about funding needs and the urgency of protecting local frontline workers. Additionally, FHWC participated in a key congressional hearing on Capitol Hill and developed a health workforce costing analysis focused on Guinea, Liberia, and Sierra Leone. Furthermore, FHWC advocated for providing specific health workforce targets in the Global Health Security Agenda action package and supported the adoption of the first-ever global strategy on human resources for health with concrete targets and financing recommendations, which was unanimously approved by the World Health Assembly in May 2016. Finally, FHWC advocated for the creation of a multi-year, costed, cross-agency U.S. government strategy with an implementation plan for increasing access to frontline health workers. By acting quickly, leveraging the global attention to frontline health workers and the systems that support them, the FHWC was able to influence both short- and long-term advocacy to support and expand the health workforce to save lives and ensure long-term attention to, and investments in, frontline health workers and global health security.

Lesson 9: Diverse partnerships have driven attention toward innovative community health models that are showing positive impacts on health systems.

A panel of USAID health sector specialists highlighted the range of partnerships that USAID has used to create positive results at the community level, whether it is ending preventable maternal and child deaths, creating an AIDS-free generation or protecting communities from infectious diseases. "Diversity is important to resilience," explained Nazo Kureshy, USAID's Team Leader for Community Health, Office of Health, Infectious Diseases and Nutrition. USAID is actively moving beyond health service delivery to include governance, social behavior change communication and community empowerment. She described USAID's partnership with UNICEF to support national acceleration strategies and strengthen linkages between communities and health systems in seven countries around the world. While this partnership required 1:1 leveraging of resources, many USAID projects have been able to achieve even higher leverage ratios.

For example, "USAID's Vision for Health System Strengthening" documents examples where USAID was able to leverage up to US$26 of private sector support for neglected tropical diseasesfor each dollar invested by USAID.

Victoria Graham, Senior Technical Advisor for USAID's Office of Population and Reproductive Health explained how international donors "look for partners that take the least amount of effort for the lowest funding to achieve the greatest health impacts." She gave the example of working with non-traditional groups, such as faith entities (religious groups with a centralized structure), to promote family planning, which these groups are more comfortable using the terminology "healthy, timing and spacing of pregnancy." She gave an example from rural Malawi, where 250 people convened under a makeshift pavilion for worship and could be an opportunity for sharing health behaviors. By building trust in the community, religious and lay leaders can be especially powerful in relaying health messages to community members, through radio announcements, newsletters, etc. "Faith entities are extremely resilient," Ms. Graham claims, as they manage to survive political upheavals and natural calamities. In fact, they often act as the protective fabric that holds the community together in times of crisis.

Lesson 10: Private entrepreneurs can be a powerful force for extending healthcare products and services to a large number of people.

While there was a lot of discussion at the conference around public-private partnerships, as The Power of Private Partnerships[2] plenary panel showed that entrepreneurial partnerships also offerstrong opportunities for increasing scale and impact on local health systems. The three speakers on the panel have worked at companies that have collectively reached over 50 million people in developing countries with their products and services. By partnering with other private sector organizations, each of their companies was able to innovate and scale solutions to healthcare challenges, ranging from ensuring high quality anti-malaria production, to digitally screening ear infections, to offering reasonable cost health insurance. Each company's experience was unique and when working with the private sector, the following advice was communicated.

Alden Zecha, Partner at WeScaleImpact shared an example of how partnerships between private sector players are not always easy, especially when a small company partners with a large one. At a previous position, Mr. Zecha's small company partnered with the large pharmaceutical corporation Novartis to distribute high quality, anti-malarial medication in Nigeria. The key to the partnership was to align motivations and expectations early on and to set up systems for clear communication. Mr. Zecha further clarified that, "Motivations and expectations do not necessarily have to be the same for each partner, but they cannot be in conflict."

Ting Shih, CEO of ClickMedix, explained how her company worked with the medical equipment manufacturer Medtronic in India to increase digital ear infection screenings along with patient referrals to local hospitals and healthcare providers for treatment. She emphasized that when entering a partnership and designing an innovative healthcare solution, a company has to avoid making assumptions so that co-creation can occur without pre-judgements, allowing for client feedback to adjust the product and partnership as necessary to ensure success.

Peter Gross, Marketing Director at MicroEnsure, discussed how in insurance, the challenge is distribution. Therefore, in Nigeria, MicroEnsure partnered with the telecom Airtel to offer the telecom's subscribers three insurance products (life, accident, health). He stressed that it is important to know your customers and MicroEnsure purposefully designs all of its products and policies to be very basic and never in conflict with national insurance plans. For customers looking for more advanced or increased coverage, MicroEnsure offers upgraded plans.

Though private companies are able to reach a large number of clients, reaching the poorest of the poor with healthcare products and services still remains a challenge. Offering products and services that are non-discriminatory and accessible to all equally is one way companies have tried to overcome the gap, but it still persists. This may be an area in which a wider range of partnerships, including with government entities, donors and non-profit organizations, is needed to crack the nut.

IV. Scaling Technology and Innovation to Increase Impact

The third core theme for *Cracking the Nut Health* was "Scaling Technology and Innovation to Increase Impact." This theme was selected based on the technological revolution and its promise of bringing creative health care solutions that are better, faster and cheaper. "Technology is the easy part" quipped a presenter at the conference. Often technological and other innovations are viewed as the pinnacle of hard-won progress, but to make them truly effective, there are many more aspects to consider: people must be trained; policies must be implemented; and plans, budgets and financing models for scaling must be envisioned early on. Technology can offer exciting opportunities to collect vast amounts of data, but it must be used to channel data back into the health system, where it can be critically analyzed and applied. This chapter demonstrates how health sector innovations can and should be integrated into the existing health system to ensure that they are accessible and adopted by all stakeholders, and highlights some of the related lessons learned from related health sector implementers.

Lesson 11: Demonstrating the value of technology is key to government adoption, ownership and use.

Oftentimes technology can seem like too large of an investment for governments and other stakeholders. It is essential to demonstrate that technology interventions not only allow for improved connectivity and results, but also have a return on investment or "value for money" that governments can support and sustain. For example, Nigeria is implementing the technology-supported GxAlert system to improve Drug-resistant Tuberculosis (DR-TB) patient notification and enrollment in approxiately 200 labs across the country. See Box 4.1 for some of the key benefits of GxAlert in Nigeria. GxAlert has provided sustainable value in technical, programmatic and monetary ways.

Box 4.1: GXAlert provides real time diagnostic results to patients and providers

GxAlert is an open-sourced software that connects GeneXpert diagnostic machines to the health system; it sends GeneXpert diagnostic results for mycobacterium tuberculosis DNA and resistance to rifampicin (MTB/RIF) in real time to a secure web-based database to inform patients of their results so they can enroll in a treatment program. GxAlert also sends the results in an SMS alert to program decision-makers in the state and national TB program, shortening the new-case reporting period from months to seconds.

Results

- The proportion of DR-TB patients enrolled for treatment based on GxAlert messages received from 35 GeneXpert facilities jumped from 50% to 85% from April 2014 to March 2015.
- SMS or text message alerts are sent to TB Local Government supervisors, State program managers and National Program DR-TB enrollment officers upon GeneXpert confirmation of a MTB+ Rif+ case to speed treatment initiation.
- Weekly reports of all new TB+ cases are both emailed and sent by SMS to local health officials to ensure better connection between diagnosis, enrollment and treatment.
- Identified $100,000 worth of commodities that would expire before use, leading to the immediate reallocation and redesign of approaches to GeneXpert supplies.

Furthermore, during a time of crisis, political will and system-wide commitment to health policies all the way down to the community level are needed to improve resiliency. Experiences in countries that have faced recent crises, including post-Ebola Liberia, post-earthquake Nepal, and political instability in Pakistan, have shown that innovations need to be strongly embedded in existing systems to facilitate a system-wide buy-in from stakeholders (see Table 4.1 for a comparison of the policies and approaches used in these countries). While governments must be involved and lead for long-term sustainability, existing community health workers are often the greatest resources in coordinating an emergency response, as they are already embedded in the community. Projects, therefore, must focus—not on creating new systems and organizations—but on introducing approaches that can be used by all stakeholders and designing initiatives that build the capacity of governments, organizations and individuals.

Table 4.1: Resilient approaches used in Liberia, Nepal and Pakistan

Country	Liberia	Nepal	Pakistan
Crisis	Ebola outbreak	Earthquake	Political upheaval
Project	USAID/Liberia Ebola Recovery and Resilience Project	Female Community Health Volunteer Program	USAID/Pakistan Health System Strengthening Component
Particular Problem	Need to reach survivors and those made vulnerable by Ebola with targeted cash transfers.	Restore provision of health services at the community level.	Immunization rates in Sindh Province have dropped below 15% in rural areas.
Core approach to crisis	A mobile registration and beneficiary verification system that streamlined disbursements and ensured that payments reached those who needed support.	Re-training, resupply, and economic and psychosocial support for female community health volunteers to provide services at the community level.	Building capacity of health workers while training a cadre of community focal points to assist in registration of births and tracking of children.
Results (proof of resiliency)			Increase from 25% to 87% of pregnant women vaccinated

Lesson 12: To ensure a new technology or innovation will have an impact, design the intervention plan and budget with the final vision and scale in mind.

When envisioning a mobile health (mHealth) tool, public health practitioners often think about the phone or the application in isolation from the larger program context. In order for mHealth projects to be successful, it is important to design and plan for the eventual desired scale. This requires a real meaningful consideration of the budgetary implications, beyond the cost of hardware and software. To accomplish this, it helps to start by defining what success would look like, and working backwards to understand what it would take to get there.

For example, CommCare is a mobile application built by Dimagi to support frontline workers as they provide health services at the community level. While phones or tablets are needed to run CommCare, planning and budgeting need to consider the project life cycle, in terms of application design and testing, user engagement, training, refresher training, technical support and supervision. Dimagi encourages projects considering CommCare to start by defining the maturity they are hoping the system will have and the desired impact. With these goals, practitioners can monitor and evaluate their implementation more effectively. The maturity model and total cost of ownership model are two other tools that can help public health implementers to ensure they are budgeting for all the necessary programmatic impacts, to accurately gauge their performance in key areas and determine if they are on track to meet their goals, or identify the areas they need to improve. For more information on the particular tools that Dimagi has developed to assist implementers in these processes, please go to www.dimagi.com/toolkits.

Lesson 13: Building clinical research tools that can be used across different country contexts allows researchers to leverage existing data to make scientific advances.

In an ever more interconnected world, the emergence of infectious diseases and drug resistant strains poses a global threat. Developing countries typically have limited resources to support the collection, storage, management and use of clinical data, but that data may be the key to solving these emerging problems. The National Institute of Allergy and Infectious Diseases (NIAD) at the National Institutes of Health (NIH) has been working with government officials and researchers across the globe to build clinical research capacity in low resource settings. NIAID is being supported by Deloitte in the development of the advance analytics solution for visualizing and analyzing the collected medical images, genomes, and medical records to unlock these anonymized data for worldwide access. For more information on these multi-country tuberculosis (TB) portals as a particular example, please see Box 4.2. By facilitating access to data, these systems connect researchers across the country or across the globe with the communities shouldering the burden of disease. While the needs of every research protocol, disease area and clinical team are different, following best practices for stakeholder engagement and user centered design are critical for the successful uptake of both the systems and the research findings.

Box 4.2 Multi-Country TB Data: When a global database is greater than the sum of its portals.

What? A network of in-country TB portals
Why? TB is a serious killer, and drug resistance is increasing. At the same time, there is little overlap between countries with high TB prevalence and countries with strong information technology infrastructure and clinical research capacity.
How? By building a portal to compile the rich clinical data that is routinely collected on TB patients, and implementing the same portal in multiple countries, data that was previously only available locally is now visible to clinicians and researchers across the globe.

Results:

- 5 countries participating in the data collection
- Data on 1,000 patients included in the system
- 14,000 CT and X-Ray images
- 134 full bacterial genomes sequenced

Lesson 14: Collecting data is not enough, results need to be critically analyzed to understand and assess impact.

Public health researchers and implementers always strive to monitor and evaluate the impact of their interventions. If there is a positive difference in program indicators between the beginning and end of the program, there is always a temptation to declare the intervention a success. However, Jaya Menon and Elin Murless from Catholic Relief Services (CRS) pushed conference participants to critically examine individual program indicators and question whether the improvements are large enough to consider the intervention a success. The ReMiND program, which runs in the Uttar Pradesh state in India, provides community health workers (known locally as Accredited Social Health Activists, ASHAs) with a mobile application to improve counseling to pregnant and post-partum women (See Box 4.3). In the process of discussing the difference between baseline and endline program indicators, conference participants uncovered the complexity that can be hidden behind numbers. They noted that while indicators related to counseling and interactions with the ASHAs improved markedly, these improvements did not seem to translate directly into health service utilization. A careful reading of the data allowed a better understanding of the challenges of a program that focuses solely on demand creation, and highlighted the importance of always looking critically at data.

Box 4.3: Spotlight on the ReMiND Program: Implementation and Impact

How does it work?

- **ASHA:** Provided with the ReMiND MNCH mobile application and phone, received training on counseling skills, and a REMiND-trained supervisor and mentor
- **Pregnant or post-partum mothers:** Receive frequent home visits from ASHA, stage appropriate counseling on care, knowledge of how to access health services, and are alerted to danger signs and referral.
- **ASHA Sangini (ASHA supervisor):** Trained through the ReMiND program to better support ASHAs.

Results
COVERAGE: 15% increase in women receiving a visit from ASHA during pregnancy
QUALITY: 28% of women were more likely to receive counseling from ASHAs, on twice as many topics
COST-EFFECTIVENESS:

- Over 10 years, ReMiND would result in a reduction of 16,918 maternal & 119,646 neonatal deaths
- This would be a reduction of 16.4% of maternal and 5.2% of neonatal deaths
- ReMiND incurs an incremental cost of USD 10 per disability adjusted life year averted and USD 292 per death averted

What's missing?

- ReMiND might not be targeting the right decision maker in the household – more input may be needed from mothers-in-law and husbands on changing maternal behaviors.
- More interventions may be needed on a provider level to target all levels of the health system.

Lesson 15: By connecting data information silos, systems for analysis and decision making become more powerful.

As developing countries increasingly turn to digital solutions to improve health data collection, management, and use, they are finding themselves with a variety of standalone systems working in parallel with each other. Information about a single patient is stored across several systems that are unable to communicate with each other. The Open Health Information Exchange (Open HIE) is a community of practice working to develop standards and architecture to improve the interoperability of these siloed systems. OpenHIE develops and improves standards-based software to facilitate this exchange nationally, regionally and globally. OpenHIE is a process, it enables stakeholders to develop rational pathways to link information and systems together in useful ways. See Box 4.4 for three examples of how the OpenHIE process is being used in practice.

Box 4.4: OpenHIE Case Studies

Immunization Registries. A registry is a subset of all health data, and creating one is a necessary first "building block" in creating a national full shared health record in country. Immunization registries can be an ideal starting place to start a national health system database, because of their broad reach in-country, high volume, and links to all levels of the health system. To build an immunization registry, one needs to engage the Ministry of Health and other stakeholders to establish an eHealth strategy, find ways to solve the issue of no national unique identifiers, encourage the Ministry of Health to adopt already-established national standards, and to develop laws protecting patient health information.

DATIM: The HIV/AIDS Data Revolution. DATIM is a global monitoring & evaluation system funded by the President's Emergency Plan for AIDS Relief (PEPFAR). DATIM is focused on streamlining the data exchange between Ministry of Health systems across 50 countries. The system focuses on operating within country-led infrastructure while still enabling cross-country exchange. The OpenHIE reference framework of a community of practice is essential to scaling DATIM beyond HIV/AIDS. Currently, DATIM uses OpenHIE to develop facility registries, but will be soon working on using terminology standardization services to manage different versions of PEPFAR indicators.

Health Worker Communication Systems: mHero. mHero is a communications system for the Ministry of Health (MOH) to connect with health workers, in order to accomplish everything from assessing mental health service provision to reminding TB/HIV health workers of stock availability and to send reports. In Liberia, mHero incorporated already existing technologies, which had been in the country from some time, thus benefiting from existing data collections. mHero was designed with standards that allows for interoperability with other technologies and most importantly integrated into existing MOH structures and being led by the MOH in management and implementation.

V. Moving Forward

Given the many lessons gleaned from participants of *Cracking the Nut Health 2016*, some clear next steps emerged in addition to a general desire to continue to support this type of knowledge sharing and participatory event. Below are just a few of the key takeaways that health sector supporters and practitioners should consider when designing interventions to strengthen health sector resiliency.

Encourage governments and their partners/funders to share public health data online and facilitate its use. While many developing countries have collected significant amounts of health-related data, too often the information remains in silos, under-used and under-analyzed, when it could be leveraged to strengthen health systems to become more efficient and resilient. There is a large need for interventions that improve the quality, use and access to health sector data. Guatemala's National Social Indicators System – accompanied by mandates regarding the use and maintenance of public health data, as well as the government's efforts to make the data available to the general public – is an excellent example of how governments should commit to transparent and standardized data collection systems with mandates regarding use and maintenance of that data. Such approaches can build trust and facilitate information needed for improved health sector decisions. This information can be easily used to prioritize areas of unmet needs and drive investments in the health system.

Further explore the role of governance in health system reform, at national and sub-national levels. In particular, we need to build capacity of local communities to identify and communicate their needs to government through transparent channels. There is a tricky balance to including government officials in community level discussions, while protecting committees and other community health care governance structures from becoming too political. There were multiple breakout sessions and discussions about how to manage this delicate balance, with most agreeing that some level of community discussion on health issues should happen without the presence of high-level stakeholders and government officials. Nonetheless, there should be a system for extracting information on the common concerns shared broadly across the community on particular issues for a certain segment of the population, which can then be shared with the relevant government officials and other decision makers, especially those that can influence use of health sector funds.

Support large-scale, sustainable finance models to inclusively serve the rural poor and other marginalized populations. While health finance was not a core theme of this conference, it consistently came up as an important factor in building a resilient health system. In fact, Katie Sears of Palladium described health financing as one of the biggest challenges for the Afghan government. Palladium is implementing USAID/Afghanistan's Health Sector Resiliency (HSR) project which aims to strengthen, reform and increase self-reliance of the Afghan health system. She explained that in Afghanistan, public sector primary health care is currently funded by donors but the Afghanistan government, with HSR assistance, is beginning to tackle this issue by advocating for more health funding and more efficiency to stretch those funds, as well as developing domestic revenue strategies, such as taxation and the introduction of user fees. In addition, the project is helping the health ministry engage the private sector so that they are full partners, contributing much needed resources and improving healthcare quality. Due to various interpretations of the constitution, the public has expected free health care and resisted the concept of paying for public services, despite the fact that Afghans spend an estimated $284 million annually seeking quality health care outside the country. The HSR project is also working hard to make sure that communities are

an integral part of the health system as they are essential to advocacy, mobilization and the monitoring of services.

There are multiple factors to consider to improve the sustainability of health care systems in developing countries. According to Beth Bafford of the Calvert Foundation, "it is very hard to make sustainability models work when only focusing on the rural poor." So, when Calvert Foundation considers debt investments, they look for ways to build access points across different income classes, including the middle class. "Just as with microfinance, we have found that a large volume of urban clients can help to cross-subsidize access for the rural poor." In terms of social impact, Calvert Foundation looks for investments that leverage one system to reach multiple populations with high quality and affordable health care services. Aron Betru of Milken's Center for Financial Markets also found that achieving volume is important to bringing healthcare costs down. Offering an example from when he was a guarantee fund manager, Aron explained how the Government of Ethiopia was able to increase women's access to long-term contraceptives by negotiating with Merck to adjust the payment schedule to be spread out over time instead of requiring one bullet payment. A guarantee was also placed with the manufacturer to reduce the risk associated with the delayed payments. By ensuring a certain purchase volume combined with the financial guarantee, the government was able to secure a high quality product at a lower price and reduced risk for the supplier—a win-win situation needed in many developing country markets.

For its equity investments in healthcare ecosystems and specialty clinics in sub-Saharan Africa and South Asia, The Abraaj Group – which has invested US$ 9.5 billion across various sectors – intentionally targets the middle and low income customer segments. By managing its healthcare investments in these regions under the same umbrella, Abraaj is able to find synergies and maximize its impact and commercial returns for investors. For example, Baily Kempner, a Principal of The Abraaj Group's Global Markets team, explained that the firm has invested in a hospital business in India which is considered a "center of excellence," to which managers and medical staff from other hospital businesses in Abraaj's portfolio would be sent to learn from their best practices. This type of peer exchange and learning is important in building capacity and responding to the unmet demand for health care in many countries.

Ultimately, there is a need for blended capital from public and private investors so that investments can be flexible and respond to the various needs of health sector businesses and related infrastructure. Blended capital can allow for price to adjust as needed to accommodate risks, as well as ability to pay. Donor and other public funds can be paired with such blended capital to support technical assistance to increase access to marginalized populations.

Ensure that women and youth have access to services, as we move toward advanced ecosystems in building resilient health systems. This implies that health care and outreach be cognitive of the specific needs of women and youth and that marketing and distribution channels work for them. *Cracking the Nut Health* highlighted some good examples (such as USAID/Nigeria's PLAN-Health project and CRS' ReMiND program in India), but more efforts need to be made in order for health systems to become truly inclusive and responsive to people's different needs.

As we have seen, resilient health systems are living, breathing, ever changing organisms, which rely on resilient people who are dedicated to making a difference. *Cracking the Nut Health* participants demonstrated their interest in being a positive part of that change and to continue to feed the chain of knowledge. Nonetheless, we have more work to do to break down silos and communication barriers, to improve interconnectivity and to prepare for the next global health crisis. We look forward to tackling these and other issues at *Cracking the Nut Health 2017*.