INFORMATION AND COMMUNICATIONS TECHNOLOGY RESPONSE TO THE LIBERIA EBOLA CRISIS

Desk Review and Recommendations for Private Sector Engagement

Submitted by:
NetHope Global Broadband and Innovations Alliance (GBI)
Cooperative Agreement AID-CIO-A-10-00001
To the U.S. Global Development Lab

With the Executive Summary and Recommendations
Written by the U.S. Global Development Lab

October 24, 2014

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PREFACE

Funding for this report was made possible by the generous support of the American people through the U.S. Agency for International Development (USAID) collaborative agreement with NetHope funding the USAID Global Broadband and Innovations Alliance (GBI). USAID asked NetHope to provide an overview of the state of the information and communications technology (ICT) capabilities in Liberia in three key areas: (a) network and Infrastructure, (b) software and platforms, and (c) digital payments to be used as enabling tools to assist in containing Ebola.

This report was created as part of a two-week rapid assessment. It includes information from first-hand reports from multiple response organizations, discussions with USAID Mission staff in Liberia and implementing partners, and desk research. It is meant to provide a snapshot of the current on-the-ground situation in Liberia and is a first step toward a longer, more exhaustive assessment necessary to gather empirical data.

About NetHope

NetHope, founded in 2001, is an information technology collaboration of 41 leading international non-governmental organizations (NGOs) representing more than $40 billion (U.S.) of humanitarian development, emergency response, and conservation programs.

NetHope's member organizations serve millions of beneficiaries in more than 180 countries. Through member collaboration and by facilitating public-private partnerships with major technology companies, foundations, and individuals, NetHope helps its members use their technology investments to better serve people in the most remote areas of the world.

Ever since 2004, NetHope has provided its members and the broader international development community with assistance in meeting the ICT needs that arise following major disasters, including the 2004 Southeast Asia Tsunami, 2008 Cyclone Nargis in Myanmar, 2010 Haiti Earthquake, 2011 Japan Earthquake/Tsunami, 2011 Horn of Africa Famine, 2012 Typhoon Bopha, and 2013 Typhoon Haiyan in the Philippines. NetHope is a long-time member of the United Nations Emergency Telecom Cluster (ETC) and works closely with the ETC in conducting assessments, identifying and procuring solutions, and allocating communication assets to where they are needed most without duplication of effort.

EXECUTIVE SUMMARY

The Government of Liberia (GoL) and development partners are faced with the daunting task of responding to an Ebola epidemic of unprecedented scale and complexity. This effort has been hindered by a lack of basic information about the incidence of new cases and geographic spread of the disease. The command and control function at the forefront of the response requires near real-time information to manage the response in an effective and accountable manner. These data-sets are required to manage the complex logistical distribution of personnel and material—combined with an adaptive two-way messaging system to convey accurate and compelling prevention and behavior change information to affected populations. Information and communication technology (ICT) tools are critical in combating the spread of Ebola and support the Pillar I response for contact tracing, case management, logistics management, and community mobilization, including the ability to distribute payments and financial support to Ebola responders and affected communities.

To address the information needs required to respond to this complex emergency, a desk review was carried out to assess the role of ICT in the response. The U.S. Agency for International Development (USAID) partnered with NetHope under the USAID Global Broadband and Innovations Alliance (GBI) and collaborated with IBI International under the USAID Liberia – Governance and Economic Management Support Program (GEMS) to conduct this rapid assessment using interviews with leaders in the humanitarian sector, technology partners, and Liberia experts. The assessment was conducted between Oct. 11 and 21, 2014, with a three-person team on the ground and support from a dozen external contributors. This assessment gives a snapshot of how ICT infrastructure, software, and data systems are being used in the Liberian Ebola response. It is not claimed to be an authoritative or exhaustive catalogue of all systems and approaches deployed or contemplated in the sector.

For the purpose of this assessment, Information and Communications Technologies (ICT) refers to the hardware, software, and telecommunications infrastructure, along with the human resources necessary to implement and maintain reliable data, voice, and text communications for the control and management of the Ebola epidemic in Liberia. The report contends the integration, harmonization, and availability of ICT infrastructure is a critical cross-cutting pillar in the response to the Ebola humanitarian crisis as well as necessary for the long-term socio-economic development of Liberia. This spans Pillar I—the containment, control and management of the epidemic—and Pillar II, the mitigation of second order impacts. Equally, ICT supports Pillar III, effective decision-making and leadership, and arguably Pillar IV, global health security.

ICT tools are critical to the Ebola response for one principal reason. As the epidemic continues to rise at an exponential rate in Liberia, doubling every two to three weeks, the strategy of expanding containment through a limited number of treatment facilities will soon be outstripped by the number of new cases. By the beginning of November, the projected number of Ebola Virus Disease (EVD) positive cases in Liberia will exceed 7,000.[1] The number of available beds in the Ebola Treatment Units (ETUs) as

[1] A.J. Kucharski, A. Camacho, F. Checchi, et al. *Evaluating the Introduction of Ebola Community Units in West Africa*. (London: Centre for the Mathematical Modelling of Infectious Diseases, Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, 2014). Email: john.edmunds@lshtm.ac.uk. Unpublished manuscript.

currently planned will be able to meet only a small portion of isolation and treatment needs. To address this gap, Liberia has adopted a Community Care Center (CCC) model to bring isolation and care closer to communities, thus reducing time to care and reduction of onward infection. In this context, mobile network platforms provide a vital set of tools to support this hard-to-reach population of infected individuals and affected households with life-saving information, essential commodities and financial support, and monitoring of vital epi-surveillance information. Such efforts would also reach closed user groups of healthcare workers and other frontline personnel.

TABLE A. NETWORK AND INFRASTRUCTURE

Findings	Recommendations
• Voice, data and text messaging coverage and quality diminishes considerably outside the capital and main town centers. • The increasing telecommunications demands of the Ebola response community on the network infrastructure will only exacerbate the strain on the weak network. • Broadband infrastructure is limited to the African Coast to Europe (ACE) cable terminus landed in Monrovia, functioning at only 20 percent of capacity, and with limited local distribution confined to the capital area. Internet access outside the capital is dependent upon 2G distribution via mobiles and individual Very Small Aperture Terminal (VSAT) installations. • The operational capacity and business viability of the three principal mobile network operators (MNOs) has degraded. Operators report reduced revenues due to the loss of high-value clients as well as higher operating costs due to fuel, logistical, and equipment maintenance inputs. • The relatively new Liberia Telecommunications Authority (LTA) appears willing to engage in temporary measures to support the telecommunications sector with Ebola response.	PILLAR I: EMERGENCY RESPONSE • Deploy rapidly emergency communication equipment (VSAT, Broadband Global Area Network [BGAN]) and appropriate handsets/tablets/dongles for immediate use. • Provide technical assistance to support industry needs for network and tower equipment installation and maintenance (e.g., multiplexer to distribute ACE fiber cable in smaller increments) and establish an Internet eXchange Point (IXP) in Liberia to reduce in-country data traffic. • Deploy O3b ground stations to meet the near-term Ebola response-related broadband needs and longer-term GoL targets for rural broadband access through expansion funded via Universal Access Fund (UAF). • Provide technical assistance to LTA and MNOs to manage donor/humanitarian requests for call data records (CDRs), spectrum reallocation, short-code requests, and partnerships. PILLAR II: MITIGATION AND RECOVERY • Address key market-level constraints to network viability including credit guarantees, logistical support for equipment, maintenance and fuel, improved power generation, and tower expansion. Any support to the private sector would be contingent on a relaxed regulatory regime and operator collaboration on tower-sharing, roaming, etc. • Address key information and policy gaps by conducting a regulator-industry lead ICT sector performance review to benchmark performance across a set of standard ICT indicators including mobile and broadband quality of service, coverage, cost, universal service fund management, and policy environment.

TABLE B. SOFTWARE SYSTEMS FOR RESPONSE, COORDINATION, AND SOCIAL MOBILIZATION

Findings	Recommendations
• Use of ICT-based decision support tools for case identification and management remains nascent, representing a critical limiting factor in the control and containment of the epidemic. • The weak coverage and quality of the mobile network infrastructure limits the utility of higher-end devices (smartphones) and services (cloud-based). Instead, solutions must work on simple/feature phones and caching devices. • Central planning and coordination appears weak due to uncertain and/or contested mandates and authorities. Nevertheless, consolidation around a few open-source platforms and data-stores focusing on District Health Information System 2 (DHIS2), Open Data Kit (ODK)/Formhub, iHRIS and RapidPro (collectively known as mHero). • The humanitarian and global health communities have adopted/introduced a plethora of ICT tools, systems, and platforms without explicit protocols for coordination, data sharing, and message content alignment. • Crowdsourcing and mapping solutions including an Ushahidi-instance has made geographic information system data and maps widely available to the response community, representing one of the most collaborative and open platforms in Liberia at present. • Consensus around a common data resource is emerging, and available via online open data platforms like ReliefWeb (United Nations Office for the Coordination of Humanitarian Affairs) and Healthcare Data Exchange. • The use of ICT tools for data collection, two-way communications, training, telemedicine, and other applications in ETUs is currently limited by connectivity issues, as well as potential contamination.	PILLAR I: EMERGENCY RESPONSE • Assure that data being collected is in line with the needs of the responders and work to limit data collection to those needs. • Immediate technical assistance to establish data plans, standards, and frameworks to improve a coordinated ICT response. • Work with the GoL to effectively coordinate shared ICT resources among the response community. • Significant central investment in software platforms that are open, interoperable, and enable multiple stakeholder participation. Preference should be given to platforms that strengthen national systems. • Due to weakness of the infrastructure, focus on simple systems like basic call centers and short message system (SMS) first and then transition to more complex IT solutions. • Technical assistance in aligning training efforts to include common approaches to collecting data and using platforms invested by the broader community. PILLAR II: MITIGATION AND RECOVERY • Transition and sustainability plans for data and communication services set up in the context of the response to become long-term programs. • Investment in training of local capacity in ICT tools and knowledge.

TABLE C. DIGITAL PAYMENTS

Findings	Recommendations
• Liberia's economy is predominantly cash-based, and all forms of digital payment alternatives are still in nascent stages of deployment, availability, and use. • The majority of GoL healthcare workers are receiving their salaries as direct bank deposit with no major disruption. Thus far, the banking infrastructure experience is the same with greater inaccessibility due to quarantines, curfews and roadblocks, and self-imposed avoidance of crowded spaces. • Contract and temporary Ebola response workers are paid in cash through ad-hoc systems established by their direct employer. • The electronic payment infrastructure is limited and insufficient to support digital payment solutions for salary/stipends or social protection payments at present, but strategic investments in agent networks and interoperable payment/voucher platforms could increase acceptance quickly and could leave behind inclusive market systems to support broad-based economic growth and financial inclusion.	PILLAR I: EMERGENCY RESPONSE • Conduct a detailed diagnostic of current and future payments needs including salaries, benefits to Ebola responders, and social transfers. • Appoint a regional payments czar to coordinate and manage shared digital payment efforts across the affected countries accessible to multiple organizations. PILLAR II: MITIGATION AND RECOVERY • Consider investment in quickly deployable digital, card-based payments systems prioritizing the expansion of payments across rural areas to ensure that health workers continue to staff ETUs and CCCs. • Bolster interoperable merchant acceptance and cash-out points to support electronic vouchers and/or payments pushed to pre-paid cards as well as mobile money, especially around the ETU and CCC areas where workers are concentrated through private sector engagement.

ACRONYMS

ACE	African Coast to Europe (fiber cable)
ATM	Automated Teller Machine
BGAN	Broadband Global Area Network
CBL	Central Bank of Liberia
CCC	Community Care Center
CCL	Cable Corporation of Liberia
CDC	U.S. Centers for Disease Control and Prevention
CDR	Call Data Record
DCP	Data Coordination Platform
DHIS2	District Health Information System 2 (open source)
EFT	Electronic Funds Transfer
ETC	United Nations Emergency Telecommunications Cluster
ETU	Ebola Treatment Unit
EVD	Ebola Virus Disease
FLB	Forward Logistics Bases
GBI	USAID-funded Global Broadband and Innovations Alliance
GEMS	USAID Liberia – Governance and Economic Management Support Program
GoL	Government of Liberia
ICT	Information and Communications Technology
iHRIS	Integrated Human Resource Information System
IMC	Incident Management Coordination
IXP	Internet eXchange Point
Libtelco	Liberia Telecommunications Company (national operator)
LISGIS	Liberian Institute for Statistics and Geographical Information Systems
LTA	Liberia Telecommunications Authority
MNO	Mobile Network Operator
MOHSW	Liberian Ministry of Health and Social Welfare
NETF	National Ebola Task Force

NGO	Nongovernmental Organization
ODK	Open Data Kit
PIN	Personal Identification Number
POS	Point of Sale
SMS	Short Message Service (text message)
UAF	Universal Access Fund
UNCDF	United Nations Capital Development Fund
UNICEF	United Nations Children's Fund
UNMEER	United Nations Mission for Ebola Emergency Response
USAID	U.S. Agency for International Development
VSAT	Very Small Aperture Terminal (satellite Internet)
WARCIP	West African Regional Communications Infrastructure Project
WHO	World Health Organization

TEAM

This effort was led by NetHope and the USAID Digital Development Team within the U.S. Global Development Lab. The table below shows the key authors and reviewers who have contributed to the creation and review of this assessment.

TABLE D. KEY AUTHORS AND REVIEWERS

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LIBERIA: SNAPSHOT OF EBOLA OUTBREAK

On March 21, 2014, Guinea's Ministry of Health notified the World Health Organization (WHO) of a rapidly expanding outbreak of Ebola Virus Disease (EVD). Since then, the outbreak has spread to Liberia and Guinea. WHO and the health ministries in West African countries continue to report new cases as EVD rapidly spreads.

TABLE E. EBOLA CASES AND DEATHS

Case Definition	Cases	(+/-)	Deaths	(+/-)
Confirmed	965		1241[1]	
Probable	2106		803	
Suspected	1594		661	
All	4665	(+403)	2705	(+221)

Table E shows the confirmed, probable, and suspect cases and deaths from EVD in Liberia listed in the WHO Situation Report (Ebola Response Roadmap Update) from Oct. 22, 2014. Table F details facts about Liberia. For more on the West Africa Ebola outbreak, please refer to Annex A.

TABLE F. LIBERIA FACTS AT A GLANCE

Category	Data
Population	4.294 million
GDP Per Capita	US$340
Life Expectancy	60 years
Fertility Rate	4.7
Under 5 Mortality Rate	94
# of Doctors Before 2014 Ebola Outbreak	200
# of Doctors Now	50
Education (15-49) None Primary Only Secondary+ Only	 33% female, 13% male 31% female, 29% male 36% female, 58% male
Household Composition	average of 5 people, 35% female headed, 46% under age 15
Mobile Penetration	69%
Internet Penetration	7.4%
Fixed Line Penetration	0.4%
Major Mobile Operators	MTN Liberia (LoneStar)—49% Cellcom—41% Novafone—8% Libtelco—1%
Ownership of Goods	65% of Liberian households own a mobile phone, 14% have a television, and 59% own a radio. Households in urban areas are more likely to own a mobile phone, television, or radio than rural households.

I. NETWORK AND INFRASTRUCTURE

INTRODUCTION

The national and international response to the current Ebola crisis in Liberia will rely on a range of interventions to contain the outbreak. Table 1 lists some of the most critical interventions and the types of enabling technologies that will be required, leveraging broadband data networks to solve the health crisis:[2]

TABLE I: CRITICAL INTERVENTIONS AND ENABLING TECHNOLOGIES

Interventions	Purpose	Danger If Lacking	Use of Technology
Data-Driven Decision Making	Enable the establishment of a clear situational overview and understanding of where interventions are needed.	Lack of information flowing from affected rural areas reduces efficiency of response and increases likelihood of duplication and gaps in response.	High-speed data connectivity Text messages
Contact Tracing	Track down all people that an infected person has been in contact with. Used as a basis for identifying who gets quarantined, fed, and monitored.	Lack of sharing causes people not to be monitored, and lack of food distributions will result in people leaving quarantine.	High-speed data connectivity Text messages
Social Mobilization	Provide public health messaging and behavioral change guidance to the population on how to avoid getting infected.	Without behavioral change, infections continue to increase.	Text messages Intelligent voice response systems High-speed data connectivity
Payment to Workers	Pay the growing workforce of healthcare workers and burial teams for their services.	Without effective way of paying staff, they will strike and patients will suffer.	Mobile payments Text messages
Psychosocial Support	Provide front-line healthcare workers with psychosocial support, including ability to communicate with loved ones and decision support systems.	Stressed workers will be more likely to make mistakes in their work.	Voice Text messages Intelligent voice response systems

[2] This "Network and Infrastructure" report section is based on in-country interviews with representatives from CCL, CARE, CDC, CellCom, Concern Worldwide, eHealth Africa, ETC, EUCPM, GoL, ICRC, IFRC, IHP, International Medical Corps, International Rescue Committee (IRC), LastMileHealth, Liberian Institute for Statistics and LISGIS, LTA, Mercy Corps, the Liberian Ministry of Health, MTN/LoneStar, National Task Force on Ebola, Oxfam GB, Plan International, Samaritan's Purse, Tony Blair's Africa Governance Initiative, USAID-GEMS, USAID/Office of U.S. Foreign Disaster Assistance Disaster Assistance Response Team, United Nations Disaster Assessment and Coordination, UNDP, UNHCR, UNICEF, UNMEER, UNMIL, WFP, and WHO.

ON-THE-GROUND SITUATION

In recent years, both the public and private sectors in Liberia have made great strides to improve telecommunications infrastructure. Despite advances made, communications capabilities remain limited in both capacity and reach. There is only about 25 km of fiber optic cable (enabling high-speed Internet access) in Liberia, all of it in the capital region. Internet access is extremely slow and expensive or unavailable in virtually all areas outside the capital. With the influx of technology-enabled emergency responders moving into Liberia, the limited, fragile, and degrading infrastructure may not meet the demands placed on it. A number of responders operating in various rural areas are already reporting that phone calls may not go through for hours, text messages are being delivered days late, and mobile money transfers are taking up to a week to process. Most mobile network operators (MNOs) have been severely financially weakened in recent months, with limited capacity to invest in new infrastructure.

ON-THE-GROUND NEEDS

Dramatic improvements are needed immediately to (a) provide adequate voice and data service levels to poorly connected, predominantly rural communities hardest hit by Ebola, and (b) unlock and enhance high-speed Internet options for the capital city where government and non-government actors are orchestrating the overall response.

EBOLA RESPONSE PLANS

In the near term, the international community is deploying temporary satellite-based connectivity solutions for its immediate needs in the rural areas. These include providing connectivity to Forward Logistics Bases (FLBs), Ebola Treatment Units (ETUs), CCCs, and response organization offices. These satellite-based solutions (BGANs and Very Small Aperture Terminal [VSAT]) are expensive to run and maintain and will need to be replaced by longer-term rural broadband solutions. The response community is using 9-12 months as the planning timeframe for the Ebola outbreak to be brought under control.

PRIORITY

An immediate and ongoing engagement is needed with public and private sector information and communications technology (ICT) actors on the ground to gain an understanding of current constraints and plans to support the Ebola response. Concerns regarding the financial viability of the telecommunications sector, particularly in light of reports of declining revenues, loss of high-value clients, escalating operating costs of fuel and transport, and equipment maintenance. The sector must develop viable options for accelerating their immediate-to-near term expansion plans for service coverage and quality into priority locations. Further, capacity building efforts for ICT infrastructure partners must be coordinated with the United Nations, international nongovernmental organizations (NGOs), and broader international Ebola response community. Coordination is critical to ensure future capacity meets emergency communication needs but also factors in and aligns with the local telecom environment and existing plans within Liberia. Funding is required to roll out longer-term broadband solutions into the affected communities and address connectivity needs beyond the first three months.

Private sector technological donation of in-kind expertise, services, and equipment is needed to execute the installation of rural broadband in as short a time as possible.

PRIORITY NEEDS

Funding is required to roll out longer-term broadband solutions into the affected communities and address connectivity needs beyond the first three months. Private sector technological donation of in-kind expertise, services, and equipment is needed to execute the installation of rural broadband in as short a time as possible.

ASSESSMENT

KEY PLAYERS

- **Local ICT Regulatory Authority**—The local telecommunication regulatory body is the Liberia Telecommunications Authority (LTA). It is an important partner to enable spectrum allocation, VSAT licensing, tower-sharing agreements, call data record (CDR) access, and approval of non-standard equipment. Furthermore, the LTA is currently engaged in developing a new Universal Access Fund (UAF)[3] with support from the World Bank. This work is near completion and may provide an opportunity for collaboration and shared investment. LTA has expressed their willingness to play a leading role in partnering with the international response community and its partners in building out a rural broadband network for the Ebola outbreak.
- **Ministry of Post and Telecommunication**—The ministry is responsible for establishment of ICT policy, but has very limited technical capacity and budget.
- **Cable Corporation of Liberia (CCL)**—CCL was established to oversee the African Coast to Europe (ACE) undersea fiber optic cable into Liberia. It is 55 percent owned by the government, with the four major MNOs as the remaining shareholders. Several reliable sources estimate that only around 15-20 percent of the fiber cable capacity into the country is being used. A release of significant bandwidth "for public good" during the emergency would provide backhaul for rural broadband efforts.
- **Local Private Sector**—A key component in the private telecom sector is the establishment of the ACE undersea fiber landing in Monrovia, which became operational in 2013 (see above). The four MNOs (MTN/LoneStar, CellCom, NovaPhone, and Libtelco) all leverage the ACE fiber as their main backhaul into the country. At this stage there is no national fiber backbone building off of this gateway, beyond the roughly 25km of fiber laid by Libtelco in Monrovia. There is an endorsed plan for a national broadband backbone, but its implementation has not started.
- **International Ebola Response Community**—The United Nations Emergency Telecommunications Cluster (ETC) works to oversee the overall coordination and implementation of emergency telecommunication efforts in the Ebola outbreak. The key actors within the ETC are as follows:

[3] A Universal Service Access Fund leverages fees on MNO operations to fund access projects in areas that are underserved due to commercial reasons.

- **United Nations Mission for Ebola Emergency Response (UNMEER)**—Provides overall coordination of the Ebola response. UNMEER relies upon the ETC to provide immediate connectivity at the 7 FLBs planned in Liberia. UNMEER is in discussions with O3b, a Mid-Earth Orbit satellite company, for the installation of multiple satellite ground stations that could provide broadband data into the impacted areas of Liberia in the longer term. At present, however, UNMEER's plans do not contemplate engaging with the private sector as UNMEER is wholly focused on the short-term emergency response efforts.
- **Emergency Telecommunications Cluster**—World Food Program (WFP) is the lead of the ETC in the West Africa response. In addition to supporting UNMEER with FLB connectivity, ETC/WFP have plans for providing connectivity for up to 30 additional locations (ETUs) and potentially 65 CCCs over the next three months. ETC/WFP are currently seeking for funding and implementation partners to help with these plans.
- **NetHope**—As a consortium of 41 leading international NGOs worldwide, NetHope is coordinating the ICT efforts amongst its member NGOs and other implementing NGOs, enabling collaborative solutions to connectivity needs in rural areas. NetHope is working with UNMEER and ETC/WFP to help implement the overall connectivity strategy of the response. In addition, NetHope is driving plans for longer-term rural broadband solutions that support the MNOs and enable the NGO community to deliver and sustain broadband connectivity in the rural operation areas.
- **NetHope Member International NGOs**—At present the 21 NetHope member NGOs operating in Liberia[4] rely heavily on their own VSATs for international data, as well as local MNOs for their local mobile (voice and texting) services. These NGOs are, in many cases, currently sharing bandwidth via satellite with other response organizations in the most rural areas.
- **USAID Governance and Economic Management Support Program (GEMS)**—USAID-GEMS is a USAID-funded five-year technical assistance program to improve performance through strengthening public sector capacity in Liberia. USAID-GEMS works with key government entities to develop, document, and implement systems, processes, and procedures; build management capacity; implement a comprehensive civil servant training initiative; strengthen the government's capacity to manage natural resource concessions; facilitate the implementation of the government's national ICT policy; and operate a modern national payment system.
- **West African Regional Communications Infrastructure Project (WARCIP)**—WARCIP is a program established by the World Bank to foster greater economic and infrastructure integration. It is intended to address gaps in connectivity in West Africa by financing the development of national communications systems and their connectivity to other such systems across the sub-region.

[4] Action Aid, Americares, CARE, Catholic Relief Services, ChildFund International, Christian Aid, Concern, Direct Relief, FHI 360, Global Communities, IFRC (and various Red Cross agencies), International Rescue Committee, International Medical Corps, Oxfam, PATH, Plan International, Samaritan's Purse, Save the Children, SOS Children's Villages, and World Vision.

CURRENT COMMUNICATIONS INFRASTRUCTURE ASSESSMENT

What does the supply and demand of communications tools and services look like today? What is available and how is it working? Inside the capital city region access to broadband Internet services varies in quality with mobile Internet services faltering with the increasing demand. Monrovia has recently installed a fiber optic ring of roughly 25 km, connecting some ministries and commercial customers. Outside of Monrovia, however, access to broadband is very limited. Mobile data access is more readily available, but in many rural areas is limited to voice and text. Very little mobile coverage exists in the most rural communities of Liberia. The Ebola outbreak has increased the demands on mobile networks, particularly in rural areas. In addition, behavior changes discouraging group association and free information hotlines have increased demands on mobile data and voice services. Compared to pre-Ebola mobile network performance, network service coverage and quality for data, voice, and text appears to have degraded to the point that it is not a viable resource for the response community in rural areas. A number of response organizations operating in various rural field locations, have reported that where services were available and working two to three weeks ago, those same services are no longer accessible on a reliable basis.

What tools are being used today and what are they using them for (e.g. security, logistics, data collection, social mobilization, etc.)? Responding organizations have been using voice, text, and data services where they have been available to provide security communications, data collection, and sharing as well as for epidemiological contact tracing and humanitarian assessments. In addition, the public is using the mobile infrastructure to report suspected cases by calling the national call-centers. Some responding organizations have started using text messages and intelligent voice response systems to promote behavioral change amongst the populations.

How have recent changes stressed the existing systems? Emergency responders who have been working in the field all point to a rapid deterioration of voice, text, and data services over the MNO networks over the past month. This is caused in large part by the increased demand for services in rural areas brought about by the Ebola crisis. This demand will only increase as additional ETUs and CCCs are set up. It's estimated that for each patient, at least 10 other people will be providing health services, contact tracing, and other services that may require telecommunications.[5] In addition to overloading the capacity of existing networks, there is a pressing need to expand the range of the existing networks to reach the Ebola-impacted areas. A recent price war has substantially reduced the financial capacity of MNOs, particularly those not owned by a major multi-national such as Lonestar / MTN. State-owned LibTelCo, which owns the fiber optic ring and ducts in Monrovia, has virtually no financing capacity to build out its network. This will impact MNOs' ability to invest to build out networks and capacity to serve demand.

[5] For each patient bed, there are about 4.5 healthcare workers. In addition, there will be contact tracers, burial teams, and various support services. This number does not include family members, who most of the time will be around the ETU waiting for news of their loved ones.

FUTURE STATE ASSESSMENT

Why is a surge in demand predicted and why is there so much focus on the communications infrastructure? Virtually every response organization points to one or more interventions that they have planned to address the outbreak (see overview), many of which require high quality voice, Internet, and text service to implement effectively. Many fear that with the current degradation in network performance, their planned interventions will further saturate the network capacity and cripple many of their planned programs.

What are key players doing to address these needs? Are new key players entering the market? As referenced above, within the international emergency response community, there are active coordination-collaboration discussions taking place under the auspices of the ETC and immediate interventions, such as VSATs and Broadband Global Area Network (BGANs), being deployed to provide emergency connectivity. These solutions are rapid response, high-cost solutions that, if funded, will address the short-term needs and many of the risks associated with a potential failure in the existing networks.

What are longer-term options? Longer-term options include, but are not limited, to:

- Funding and providing technical support so that existing MNOs can extend backhaul capabilities to rural areas and increase the number of transponders on local base stations. (This option is at least 90 days out post funding).
- Funding and supporting alternative backhaul solutions such as the UNMEER/NetHope/O3b solutions that can provide broadband quality services and redundancy to rural areas. Ultimately this solution would require close cooperation (which seems highly likely given ongoing discussions) with the local MNOs and regulators.

KEY CHALLENGES

Options for viable responses ranges from initial network performance surveys to identifying and quantifying specific recommendations for key investments to gaining local and international support (funding and technical) from the key public and financially stressed private sector players. In the near term, rapid deployment solutions (VSATs and BGANs) are being deployed but are too expensive for a long-term response. Deploying more long-lasting solutions leveraging existing fiber and possible new backhaul options (e.g. O3b) will require funding and take 90 days or more to implement. The extension of these backhaul options through last-miles solutions—such as wide area wifi, 3g broadcast, or low-power wimax using available television white space spectrum—will require considerable governance, collaboration between public and private sectors, and key equipment upgrades.

RECOMMENDATIONS

RECOMMENDATIONS FOR NEXT 60 DAYS (PILLAR I)

TABLE 2: SHORT-TERM RECOMMENDATIONS FOR PRIVATE AND PUBLIC SECTOR INVESTMENTS

Investment	Description	Key Actor(s)	Priority
Emergency Connectivity	Deployment of VSATs and BGANs to serve the immediate emergency need of organizations already working on the ground and to enable information flow to become more efficient from rural areas.	International Response Community	High
Mobile Network Reliability	Deployment of technical assistance to MNOs to strengthen their mobile network infrastructure, in particular into the rural areas by improving backhaul capacity and increasing number of transponders on towers in congested areas.	GSMA Private Sector International Response Community	High
Government Connectivity	Work with LTA, CCL, Libtelco, and Ministry of Post and Telecommunications to rapidly increase bandwidth into key government response offices. Support to government agencies in improving their internal network capacity.	USAID Private Sector	High
Rural Broadband	Work with LTA in funding and implementing targeted rural expansion that meet emergency response needs and are consistent with Liberia's UAF and rural expansion plans.	USAID World Bank Private Sector	High
O3b Ground Stations	Gain agreement with LTA for deployment of O3b ground stations to meet the near-term Ebola response related needs, such as to add longer-term value to Liberia's telecom expansion plans.	International Response Community	High
Rural Broadband Roll-out	Work with UNMEER, O3b, NetHope members, and local operators in rolling out broadband services into critically impacted rural areas.	International Response Community Private Sector	High
IXP	Establishment of an IXP in Liberia to reduce in-country data traffic. African Union had committed to setting it up but delayed due to Ebola outbreak. Need for technical assistance and equipment to implement. This will ensure all data traffic that is going between MNOs does not need to go over the ACE fiber cable.	Private Sector African Union	Medium
Multiplexer	Installation and setup of a multiplexer to enable CCL to distribute unused bandwidth in smaller sizes than STM-1 (155Mbps) to potential users. Need for technical assistance and equipment to implement. This will enable CCL to split up the unused bandwidth into smaller portions and thereby lower costs for smaller Internet service providers.	Private Sector	Medium

Investment	Description	Key Actor(s)	Priority
MNO Tower Expansion	Work with international private sector on lowering setup costs ($200K) and operational costs ($4K/month) for mobile towers in rural areas. A lower-cost, hybrid energy-based solution is required to ensure commercial viability of mobile network expansion.	Private Sector	Medium

RECOMMENDATIONS FOR NEXT 3 TO 24 MONTHS (PILLAR II)

TABLE 3: MEDIUM- AND LONG-TERM RECOMMENDATIONS FOR PRIVATE AND PUBLIC SECTOR INVESTMENTS

Investment	Description	Key Actor(s)	Priority
Replace Emergency Connectivity	Replace emergency communication solutions (BGANs/VSATs) with longer-term more sustainable solutions, such as rural broadband networks.	International Response Community	High
Rural Broadband Rollout	Further strengthen communication infrastructure capacity in areas that are currently served by the MNOs through expansion of rural broadband into additional areas not covered in short-term plans.	Private Sector International Response Community	High

OVERSIGHT AND COORDINATION RECOMMENDATIONS

- **Empower public and private sector partners to come together to deliver what is needed most.** This involves three activities:
  - Engage with MNOs to explore options for shared investment (including UAF or public-private partnerships) for extending existing fiber solutions.
  - Explore the ongoing UNMEER-O3b-NetHope dialogue with a focus on determining if and how such an effort can be melded into the local UAF-current MNO networks, and national broadband plans. If it cannot be integrated, then gain approvals to proceed with the pure rapid response solution required to meet the international community's Ebola crisis response requirements.
  - Provide technical assistance and equipment to enable the strengthening of the connectivity infrastructure and a rapid build out of a rural broadband network in the country.
- **Establish an "investment oversight function" that will give bilateral donors and others comfort that Liberian public and private sector actors are acting on agreed-upon plans and tracking to committed outcomes.** The nature of the telecom deployment is that this will consist of a series of projects, where the outputs would consist of meeting project milestones. The outcomes will be the actual "lighting up" of the communications linkages in those areas where the expansion takes place. From a broader USAID perspective, the outcomes will be associated directly to the

enablement of value-added services that are provided over the expanded network (e.g., data, social, payment, etc.)

- **Engage local actors.** Local dialog is currently underway through NetHope's Gisli Olafsson and USAID-GEMS's Anthony Waddell with several local telecom providers, including those that own-operate the ACE fiber landing, cable providers, and key MNOs. In addition, LTA has been approached to play a leadership role in driving these efforts. The initial set of discussions is very encouraging on both tracks. It is important to bring these actors together with the ETC to effectively coordinate the response efforts across both public and private organizations.
- **Design for local governance.** The ideal scenario is such that there is sufficient local on-the-ground support from both the public and private sectors, so that implementation is governed by, and implemented through, local firms. It is expected that a small on-the-ground management team will need to be put into place to work closely with these local entities and provide coordination with donors and the international response community.
- **Foresee the implications of a failure to act.** Communications and information is the lifeline for every major response effort.
    - Failure to bolster existing mobile networks will negatively affect most community mobilization efforts, all digital payment options, and many elements of contact tracing and case management. Curbing the outbreak will take significantly longer without effective ICT-based ways to change people's behavior, pay front-line workers, and effectively track potential infections as well as a lack of a clear understanding of where the need is most.
    - Failure to improve high-volume data services will cripple virtually all decision support interventions and lead to duplication of efforts and gaps in the response.

In the short term, the key is to move quickly with proven emergency response solutions that are not reliant on the government or the private sector, while at the same time build up the partnerships needed for medium- and longer-term solutions. It is also essential to engage in good faith, transparent dialog with the government and the private sector as they are essential to long-term, sustainable solutions.

II. SOFTWARE SYSTEMS FOR RESPONSE, COORDINATION, AND SOCIAL MOBILIZATION

INTRODUCTION

The National Ebola Task Force (NETF), USAID's Disaster Assistance Response Team, and UNMEER require near real-time information to manage the Ebola response in an effective and accountable manner. This effort has been hindered by a lack of basic information about the incidence of new cases, geographic spread of the disease, and the difficulty of conveying accurate and compelling information to affected populations. In this context, mobile phone platforms and software systems represent a vital set of tools to support this vast population of infected and affected individuals with life-saving information, essential commodities, and monitoring to accurately collect vital epidemiological surveillance information.

The software and platforms directly support the U.S. government's Pillar I response to the epidemic—the containment, control, and management of the epidemic including the mitigation of immediate impacts. A number of ICT tools have been directed toward key elements of the response, including:

- Healthcare workers and support staff (e.g., training, payments, and real-time communications)
- Health information and decision-support systems (e.g., surveillance and reporting, contact tracing, laboratory results reporting, human remains notifications, supply chain management, and referral mechanisms)
- General population (e.g., behavior change information campaigns, call centers, and social mobilization)

This assessment attempts to give a high-level picture of how software and data systems are being used in the response and then attempts to provide a more in-depth picture of systems that are being used by government and the organizations working to coordinate the response. It is not meant to be a catalog of all systems and approaches being used.

ASSESSMENT

SITUATION ON THE GROUND

- **Decision support systems for case identification and management remain a critical limiting factor in the control and containment of the epidemic.** As better quality and timely information becomes available to the Ebola Response Task Force, the need to streamline decision support systems using a business intelligence approaches will dramatically improve the planning, coordination, and execution of the Ebola response.
- **The deployment of control and containment tools has proven to be insufficient to cope with the scale, volume, and technical limitations of the methodologies.** These tools include case management, contact tracing, laboratory sample management, and social mobilization. For instance, the NETF recently switched the data management software for case management to District Health Information System 2 (DHIS2) because of the technical limitations of the U.S.

Centers for Disease Control and Prevention (CDC) Epi-Info 7 data system, the software used in all previous Ebola outbreaks. Likewise, traditional contact tracing approaches have failed due to the large volume and poor quality data retrieved from paper tracing forms, the considerable data entry challenge, and the resources required to safely and effectively mobilize contact agents. The contact tracing system does not scale well to an epidemic of this size and nature. (In Nigeria 20 cases required 19,000 home visits.)

- **The current weak status of the infrastructure poses a threat to the widespread use and adoption of ICT systems.** With reports of degrading telecom infrastructure, including long latency between short message system (SMS) texts and poor voice quality, only very simple systems will work in these conditions.
- **Domain authority is uncertain or contested in many areas, resulting in poor coordination and inefficiencies.** Senior response managers and decision makers appear to be overwhelmed by competing demands; consequently, insufficient attention is applied to problem definition and planning. Poor strategic direction has caused organizations and individuals in some areas to self-organize, sometimes with poor results. Whereas in others, they have remained on the side-lines or disengaged on the assumption that they were not required. Common dimensions that require coordination include division of responsibilities by function and by geographical areas, resource allocation, processes, data, and systems.
- **Central planning and coordination appears weak but there is consolidation around a few open-source platforms.** There appears to be de-facto agreement on certain authoritative systems and data-stores coming together around the DHIS2 data system with several ODK-based data collection systems using Formhub (or derivatives) to link remote data capture functions for case identification, tracing, and lab result management, Integrated Human Resource Information System (iHRIS) for health worker human resource information, and RapidPro as a SMS workflow engine. Integration of systems has started on an ad-hoc basis but needs focus and funding. NGOs joining the response have expressed interest in utilizing the consolidated platforms rather than building their own, if they are made available in a timely manner.
- **Individual organizations are using a wide range of ICT tools and platforms within their own programs and interventions.** The wide variety of ICT tools, systems, platforms, and approaches commonly utilized in both the Humanitarian Response and Global Health communities are being used by individual organizations supporting the global and local response. These efforts are focused on program-level improvements, and it is not clear that many are thinking about the larger needs of response coordination, sharing of data, and aligned messaging. This will likely yield duplicative efforts that may be most visible with messaging to the general public but also problematic for data sharing due to differences in how and what data is being collected. While much of this activity is quite beneficial to the response overall, it does become particularly problematic in areas such as procuring services and network access from telecoms and formulating consistent messaging.
- **The information currently available in digital format is often stuck in silos and not being shared widely within the response community.** Additionally there is a lack of clarity around what data can be shared with whom with different bilateral information sharing mandates in place and a confusing regulatory environment.

- **Geographical information system data are not easily shared across the response community.** A number of crowdsourced efforts including an Ushahidi-instance have made geographic information system data available to the response community. Geospatial mapping data is compiled and stored in open data formats via the Liberian Institute for Statistics and Geographical Information Systems (LISGIS) and working together with partners MapAction, iLab, and others. After initial challenges with sharing of data, this sector is now probably one of the most collaborative and open in Liberia at present. Yet data sets, such as cell tower coverage, are still not yet available to the response stakeholders.
- **Consensus around a common data resource is emerging.** An online resource of Ebola Virus Disease (EVD) open data has been made available through the United Nations Office for the Coordination of Humanitarian Affairs and Healthcare Data Exchange, and there are open online volunteer-managed mappings of data stores.
- **Financial management systems supporting the response are rudimentary and/or ad-hoc.** Price Waterhouse Coopers has been contracted to administer the financial affairs of the response and will replace all systems with its own. Transparency and accountability of international donor flows requires the concerted effort of the entire response community, both public and private. The Ministry of Foreign Affairs manages the GoL's donor coordination efforts based on an Access database.
- **Responders are mobilizing local technical teams to staff and support ICT initiatives.** There are mixed reports as to whether there is a shortage of local technical staff or just poor utilization of staff. But there is consensus local technical capacity is limited and likely unable to support a wide range of systems. The ability of the international community to provide direct technical support remains limited by ongoing travel restrictions, specifically the lack of medical evacuation insurance.
- **There are no known efforts to coordinate frontline worker trainings.** While coordination of trainings may be going on, the assessment did not surface any. For data harmonization to happen, frontline workers would need to be trained to collect and report the same data points, with or without ICT systems.
- **Mobile and computer-based tools will be difficult to use in the ETUs.** While research needs to be done on the potential infection risk of using mobile phones or tablets for data collection, the use of mobile phones in an ETU is likely to be not allowed unless it would be permanently left inside. In other tasks they will be viable. Mobile phones would be possible for contact tracing as the contract tracing teams already use mobile phones and do not require any protective gear. A driver or a dedicated data collector on the safe burial team could probably be used for data collection as they directly will not be handling any bodies.
- **Under current conditions ICT systems are difficult to implement.** Teams are experiencing difficulties in establishing a mandate and scope for their projects. Coordination between inter-related systems is difficult to achieve at an organizational and technical level. Systems are not able to achieve goals because of reliance on external dependencies that are not in place or performing as expected.

KEY LOCAL STAKEHOLDERS

LOCAL PRIVATE SECTOR

- **Mobile Network Operators**—Lonestar/MTN (49 percent), Cellcom (39 percent), and Novafone (10 percent)
- **Mwetana Consulting**—Network architecture and engineering firm

LOCAL PUBLIC SECTOR

- **MOHSW**—Liberian Ministry of Health and Social Welfare
- **LTA**—Liberia Telecommunications Authority
- **MOPT**—Ministry of Post and Telecommunications
- **LISGIS**—Liberia Institute of Statistics and Geographic Information Services
- **NETF**—National Ebola Task Force
- **Libtelco**—Liberia Telecommunications Company (national operator)

DATA TOOLS, STANDARDS, AND INTEROPERABILITY

At least four ICT platforms have emerged as dominant systems, running concurrently and somewhat interoperable with plans for further integration. The integration of these tools is facilitated by their adherence to Open Health Information Exchange standards,[6] their open source status, and the mobile health community's designation that they work in resource-constrained settings. Two of them are part of the national health system of Liberia, and they are collectively known as mHero.

- **DHIS2**—A health management information system (HMIS) adopted by MOHSW prior to the Ebola outbreak. The HMIS has been deployed in 49 countries, and serves as the government's repository for all aggregate health data. DHIS2 receives support from USAID, CDC, United Nations Children's Fund (UNICEF), World Health Organization (WHO), Health Information Systems Programme, Norad, Global Fund, and other partners. DHIS2 is currently being used as the primary data store. It is the national HMIS system but does not currently have offline capabilities. Work toward that objective is underway.
- **RapidPro**—Supported by UNICEF, RapidPro is a tool for basic mobile phone SMS messaging systems. RapidPro allows program staff with minimal technical knowledge to quickly create communication campaigns, monitor programs and activities, collect critical indicators on areas including essential medicines, and engage directly with beneficiaries and community members. RapidPro is being proposed as being open to all stakeholders. Short codes and telecom connections have been promised by Liberia Telecom Association and should be operational shortly. Work on voice and IVR support is ongoing, but the timeframe for deployment is not yet known.
- **Data Coordination Platform (DCP)**—Supported by WHO using Open Data Kit (ODK) on the mobile phone; Enketo for offline compatible webforms; and Ona (derived from Formhub), a

[6] See Open HIE at https://ohie.org/.

widely used tool for form creation, form distribution, data collection, and lightweight analytics on the cloud. DCP leverages the XLSForm standard and related ODK technologies, which are widely adopted standards and technologies. DCP shares similar functionality and much of the same code base as the Ebola Outbreak Center by eHealth Africa under the CDC and the KoboToolbox, which have been released to the larger response community by the Harvard Humanitarian Institute.

- **iHRIS**—Supported by USAID, WHO, UNICEF, and additional partners. Implemented in 19 countries, including Liberia, Sierra Leone, Nigeria, Senegal, Mali, Ghana and Togo. iHRIS serves as the primary centralized health workforce management tool and registry for the government, including the groupings of teams that can be messaged and training status of the health workforce.

Not all systems rest on this open architecture, however. Prior to the migration to DHIS2, Epi-Info was the preferred data store. Likewise, a great variety of single use applications have been deployed across domains. In addition, few applications are based on well-defined workflows and processes. Even fewer deployments present high level systems maps to describe interoperability (see Annex E for an example of the systems information and functional flowchart of the county health system Ebola response, prepared by eHealth Africa).

Real-time sharing of critical information across partners and functional areas is limited by the silo-based operating model adopted by most partners. Interoperability across functional areas requires the adoption of open standards, common reporting platforms, and feedback loops to reinforce adherence. Additionally, there is a perception as told by the NETF that "information is being hidden," perhaps deliberately. Siloed, closed, and undocumented information systems are difficult to understand, evaluate, and integrate.

FUTURE STATE OF THE LIBERIAN EBOLA SOFTWARE/SYSTEMS INTEGRATION

The currently emerging architecture described below (Figure 1) embraces the principles of "Open Standards, Open Data, Open Source, and Open Innovation"[7] and should be highly encouraged in all procurements and standard setting. Strong, open, and free two-way integration should be assured between competing platforms. Competing architectures should be considered on their merits, and carefully weighed against their disruptive or fracturing potential, commercial terms, impact on the immediate needs of the response, and longer-term sustainability.

There are five system requirements:

- All participating partners can access real-time access to organized data across functional areas and locations
- Data standards are enforced through common forms and lists (e.g., emergency operations center locations, county names, treatment locations, etc.).
- DCP will accept and share data with web forms, ODK, SMS (via RapidPro) and external platforms that is not targeted at DHIS2.

[7] "Principles for Digital Development" (endorsed by USAID), accessed Oct. 23, 2014, at http://ict4dprinciples.org/.

FIGURE 1: PROPOSED ARCHITECTURE LINKING DHIS2, DCP, AND RAPIDPRO THROUGH API

BRIDGES

- DHIS2 will manage cases, labs, and burials as well as storing aggregate data for ETU, CCC, and Health Centers.
- DCP will provide real-time integration with other tools, such as UNMEER's dashboards.

An example of the application of this architecture is given in Annex F on safe burials.

SYSTEMS KEY TO THE REPONSE MUST BE STRENGTHENED

PRIORITY REFORMS

Full-featured in-bound and out-bound call-center facilities are rapidly deployed. They should not be single use and should be able to be repurposed to meet the needs of the various campaigns and activities that will be required through the lifecycle of the epidemic. Off-shore (or a mix of off/on shore) facilities could be considered, if appropriate to the campaign audience to meet short-term needs using the good capacity on the undersea fiber cable.

SYSTEM GAPS

- Coordinated access to core telecoms services: Voice/IVR, SMS, and USSD for responder organizations.
- Open interfaces developed to allow easy third-party integration with the DHIS2 system.
- Open interfaces developed to allow easy third-party integration between RapidPro and DCP.
- Open interfaces improved to allow easy third-party integration between RapidPro and iHRIS.
- Open interfaces developed for other tools that gain multi-stakeholder adoption as the response continues.
- Core platforms/tools being used are centrally invested in to ensure that feature gaps or new requirements identified in the response can be quickly addressed by platform teams.
- Improved automated dispatch system implemented, providing real-time command, control, and coordination mechanism for all dispatch teams: investigators, ambulances, burial teams, and other case responders. Assets will be tracked, utilization levels monitored, and incidents logged, assigned, and tracked. Responders provided with tools to receive and respond to dispatch requests and to provide real-time and geospatial feedback on their deployment. System to integrate with the case healthcare case-management systems, providing them with one-stop-shop tools to report on the status and activities of affected parties, and initiate corresponding workflow.
- Laboratory testing services report test results to affected parties and systems. Laboratory point-of-contact facilities are tracked, provisioned, and monitored.
- Supply chain logistics for treatment and community centers to be fielded.
- Integrated information systems designed and deployed to ensure that quarantined individuals are provided with the necessary support services, including food.
- Lack of an automated Asset Management system.
- Lack of a Fleet Tracking and Management systems.

GOVERNANCE

- Liberian ICT partners involved in all aspects of the ICT response: governance, improvement plans, development, implementation, and operations.
- Compile a collaborative assessment of GoL's EVD functional requirements, priorities, and operational plan to satisfy information systems requirements.
- Information systems management strategy developed and informed with learnings from other emergencies serviced by the international responder community. In the short term, this will be a pragmatic strategy with care taken to encourage participation and transparency. An important consideration is that GoL is well advanced in plans for implementing an e-Government strategy to provide a whole-of-government response to the needs of citizens. GoL ICT sector representatives, including the ICT head of the NETF, have expressed the hope that these skillsets can be applied to GoL's handing of the EVD response, and that this could provide a learning

opportunity to validate a new way to organize in Liberia. The strategy could consider issues such as[8]:

- **Standards and Flows**—Providing the necessary constraints and transparencies to maximize potential for interoperability, sustainability of solutions, sharing and co-operation of data and methods, and define datasets and repositories. Care should be taken to attenuate short-term interventions with the long-term needs and plans of Liberia
- **Workflows to Support Decisions**—Ensure that systems are designed and enabled to inform decision makers across the response, and that a trusted shared situational experience is fostered
- **Professionalization**—Ensuring responsible and informed participation of all actors in the response
- **Experimentation**—Encouraging safe ("safe-fail") and rapid testing of innovations and proposals
- **Education and Training**—Capacity development should be designed to sustain use of solutions beyond the short-term needs
- **Support**—Provision of long-term support on use of platform/tools both by local and external teams

- Development of policy and guidelines for use of Call Data Records, and the technical assistance, tools, and instruments to implement the policy

COMMUNITY PARTICIPATION

- Mechanisms activated to enable citizens and targeted groups to participate in common communications services at low or no cost. Such mechanisms include reverse charge billing, zero rated numbers, free data access to specified web services, and closed-user-groups.
- A National Research and Education Network established and provisioned with the necessary infrastructure and integration with the Liberia Internet backbone to provide online educational services to targeted communities, including health workers and educational institutions.

RECOMMENDATIONS

RECOMMENDATIONS FOR NEXT 60 DAYS (PILLAR I)

IMPROVE SITUATIONAL AWARENESS

- Continue to centrally assess and map the systems and identify gaps and opportunities for improvement
- Catalog and create shared resources of platforms, services, data, and geodata

IMPROVE HUMAN CAPACITY, COORDINATION, AND GOVERNANCE

- Provide technical assistance for an improved GoL systems coordination role

[8] Disaster Relief 2.0—United Nations Office for the Coordination of Humanitarian Affairs.

- Provide technical assistance for development of data plans, standards, and frameworks to improve interoperability and harmonization and the governance and evangelization of what is established
- Provide technical assistance for coordination of training activities with a focus on shared data collection practices
- Provide technical assistance with the development of an information systems improvement plan
- Provide technical assistance with the development and deployment of priority information system gaps
- Provide technical assistance and infrastructure to develop and implement Call Data Record (CDR) guidelines
- Provide technical assistance to develop local ICT actors capacity in the operation and use of platform tools

INVEST IN THE TECHNOLOGY ECOSYSTEM

- Coordinate access to core telecoms services to underlay technical platforms with governance and contracting structures in place to share services
- Invest in software and data systems in a way that leaves improved national systems not tools that will be removed post response.
- Invest in core support for platform/tool development to ensure support and adaption of platforms as required by the response. (Most funding is currently directed to implementation but not platform support.)
- Invest into the development of software interfaces to ensure real-time interoperability between component systems

ADDRESS TECHNOLOGY GAPS

- Develop and expand flexible call center solutions
- Develop and deploy dispatch and monitoring systems
- Develop and deploy an automated asset management system
- Develop and deploy an automated fleet tracking and management system

RECOMMENDATIONS FOR NEXT 3 TO 24 MONTHS (PILLAR II)

IMPROVE HUMAN CAPACITY, COORDINATION, AND GOVERNANCE

- Support development strategies that incorporate the use of the technology practices used in the response to improve service delivery of critical public services in the future providing funding and/or engineering to strengthen platforms used in the response.
- Providing funding and technical resources (volunteer trainers—e.g. Geekcorps) to establish long-term ICT training centers in Liberia. (iLab is one of the few actors with the ICT capacity.)

INVEST IN THE TECHNOLOGY ECOSYSTEM

- Develop a National Research and Education Network Internet Service Provider

- Encourage online educational and resource caches to move onshore after setup of IXP
- Provide cloud-based collaboration services to MOH and other key ministries (an example would be Google Apps for Government—free)

INVEST IN RESILIENCE

- Develop mechanisms to ensure a combination of the platforms and methods used in the response are "always on"—immediately available for countries to use to manage the next crisis.
- Planning for continuity of public information systems through integration onto GoL's e-Government platform. Examples include UNICEF's U-report, and others after the immediate emergency.

GUIDING PRINCIPLES

All efforts moving forward should make a strong attempt to embrace the Principles of Digital Development that most actors in the response have endorsed.[9] They are:

- Design with the user
- Understand the existing ecosystem
- Design for scale
- Build for sustainability
- Be data driven
- Use open standards, open data, open source, and open innovation
- Reuse and improve
- Address privacy and security
- Be collaborative

[9] "Principles for Digital Development" (endorsed by USAID), accessed Oct. 23, 2014, at http://ict4dprinciples.org/.

III. DIGITAL PAYMENTS

INTRODUCTION

Liberia's banking infrastructure is extremely limited and most payments and collections are conducted in cash. Government of Liberia (GoL) health workers are paid through the banking system, whereas additional contract workers and the growing cadre of Ebola responders (e.g., sanitation and burial teams) are paid in cash through ad-hoc systems established by their direct employers.[10] Further, no existing payment infrastructure can deliver social protection payments to affected households and communities for mitigation, such as the $32 million social safety net program being developed by UNDP and the GoL.

Should (a) the capacity of the banking system erode significantly enough to endanger the timely delivery of public sector payroll, or (b) policymakers identify the ability to extend benefit payments on a large scale and beyond urban centers as critical to countering Ebola and its economic impact, donor-supported expansion of Liberia's nascent digital payment infrastructure will be required. If planned and implemented correctly, investments in Liberia's payments sector can leave behind enduring economic infrastructure once the epidemic has passed. In particular, coordinated investments in and use of common digital payments platforms (be they merchant transaction points or open looped systems) could play an important role in the near-term response effort and will certainly be critical to the country's longer-term recovery. In the absence of coordinated action, the humanitarian response community is likely to deploy stand-alone, bespoke cash delivery systems that terminate at the end of the response rather than providing a lasting foundation for broad-based economic growth in Liberia.

DIGITAL PAYMENTS LANDSCAPE

Digital payments systems include electronic funds transfers (EFTs), card-based systems (debit, credit, or electronic vouchers) that use point-of-sale (POS) terminals or automated teller machines (ATMs), and mobile phone-enabled transaction services ("mobile money").[11] Digital payments systems support payment processing over a communications network that is faster, safer, convenient, traceable, and capable of being pushed remotely and enables data analytics. Importantly, digital payment systems rely on distributed networks of agents to facilitate exchanging cash for electronic money and vice versa. This enables instantaneous remote money transfer to and between individuals without access to traditional brick-and-mortar banking infrastructure. Prior to the Ebola outbreak in Liberia, the government and development community had been collaborating to grow the nascent commercial mobile payments

[10] In 2012, prior to the Ebola crisis the monthly payroll for more than 8,000 health workers in Liberia was estimated at USD $1.5 million with an average per person salary of USD $192/month. While anticipated payment volumes are not available for Liberia, financial incentives now are being used. Using Sierra Leone as a proxy, incentive payments for approximately 12,608 medical staff, burial teams, sanitation workers, community mobilizers, etc. will amount to USD $669,239 /month. For more detail, see Annex G.

[11] For a list of digital payments used in emergencies, see the guide from the Cash Assistance Learning Partnership included in Annex H.

sector in order to improve public sector spending and expand financial inclusion among Liberians, the majority of whom are excluded from the banking system.

Digital payments fall into three types with different levels of effort, speed of deployment and implications for long-term support to build a lasting digital payments infrastructure:

- **Proprietary (closed loop) pre-paid card or electronic voucher systems** are the easiest to deploy as they use single purpose equipment provided to select merchants in the target service area typically recruited and trained by response organizations. The equipment and merchant use is typically discontinued when the assistance need terminates.
- **Open-loop pre-paid card or electronic voucher systems** require more thought and level of effort to process multiple payment types (card agnostic) and connect to a centralized processing center. These systems can provide a common platform, use a shared agent network and single EDC device, and have a longer application that does not end with aid efforts.
- **Mobile money systems** are commercially provided financial services that give registered users the ability to conduct basic transactions (e.g., sending, storing, and receiving money) through individual accounts accessed via mobile phone handsets. One mobile money service (branded as "MTN Mobile Money" and offered by MNO Lonestar) is already available in Liberia but has limited reach. While scaling the commercial payments sector offers the most promising long-term benefits in terms of sustainability and development impact, registering users and building out agent networks in the midst of the health crisis would present many challenges. Moreover, concentrated investment in one provider may discourage competition, which is ultimately required to make the services affordable.

Card-based digital payment or electronic voucher systems may provide a more immediate solution. The required merchant acceptance will result in additional transaction points that can support the further migration and scale of mobile money. By intentionally keeping the longer-term goal in mind, card-based payments can be structured to add merchant acceptance points to the agent network infrastructure, increase capacity of communications networks in currently unserved areas, and increase citizen use and satisfaction with digital payment systems that could drive further adoption.

Given the current low levels of debit cards and limitations in the electronic payment system, considerable investment is needed to expand the existing payments network in the country to meet these short- and medium-term Ebola-response objectives. The introduction of card-based payments will help make the payments infrastructure more accessible and reliable. For electronic payments to support the needs of the Ebola response effort, a set of highly targeted support activities would need to be directed to key GoL institutions and private sector partners.

LIBERIA'S PAYMENTS LANDSCAPE TODAY

BANKING SECTOR

Despite having a functioning banking system of nine commercial banks, Liberia is largely still a cash-based economy. There is a total of 80 branch offices (in only 10 out of 16 counties) concentrated in the urban areas (60 percent of the branches are in Montserrado County), while 51 percent population live in

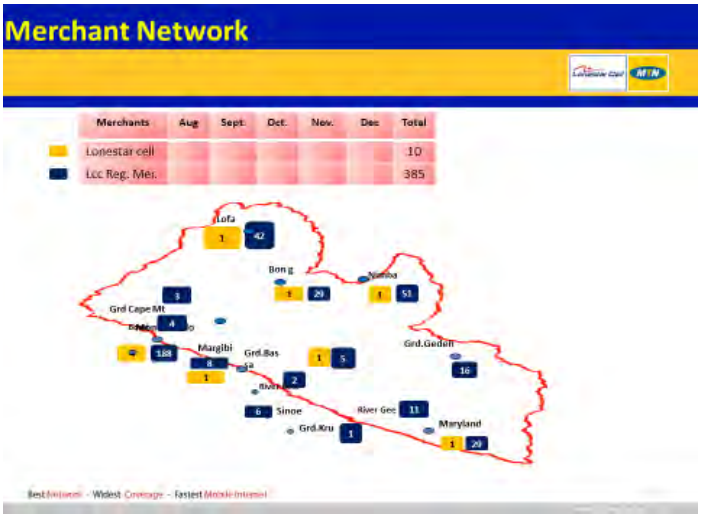
rural areas. The lack of financial access points outside the bank branch system poses an enormous challenge to payment disbursement and cash out through the current banking infrastructure. Only four commercial banks (Ecobank, Guaranty Bank, International Bank, and United Bank of Africa) issue debit cards (10,000 issued and usable only at the issuing bank's ATMs—which require a personal identification number [PIN], often not provided). The ATM network is limited (28 ATMs), concentrated in urban areas, and frequently not-operational (liquidity and connectivity issues). There are less than 100 POS terminals in the country.

POS terminals can be deployed at merchant locations and have been used effectively to support quickly deployed electronic voucher systems and financial support payments in other emergency contexts; mobile POSs may be a better option. Liberia also has an informal banking sector of about 400 "community banks" registered with the Central Bank of Liberia (CBL). They operate as "savings clubs" organized by the local chief or respected community leader and can potentially function as sources of cash-out liquidity. Lacuna—a World Bank/UNCDF-funded project to build a robust credit union industry in Liberia—has already commenced enrollment of community banks under its apex umbrella, and has explicit intentions to offer mobile money as a financial product by the end of 2014.

MOBILE MONEY

One mobile money service exists in Liberia operated by Lonestar/MTN.[12] Lonestar's mobile money service, launched in 2011 using the Fundamo platform, is provided via licenses issued to two banks (Ecobank and Guaranty Trust Bank). Lonestar/MTN is in discussions with the CBL to apply for its own license in the near future under new mobile money regulations. Today, Lonestar has 350,000 mobile money subscribers (up from 200,000 in 2013) and 402 registered agents/merchants (a 100 percent increase from 2013). Currently, the mobile money system is not linked to a prepaid, debit, or credit card.[13] In other countries, such as Ghana, MTN is introducing a prepaid Visa card linked to its mobile money product. Lonestar/MTN recruits mobile money agents through a third party, BrandWorx. Agents are concentrated in the urban area and primarily in Montserrado (47 percent), Nimba (13 percent), and Lofa (10.7 percent) counties.[14] The capacity of the system is undermined by network

FIGURE 2: MERCHANT NETWORK MAP



[12] Lonestar founded initially by Charles Taylor is now majority owned by MTN. Benoni Urey currently owns a 20 percent stake in Lonestar. Urey is associated with the former Taylor regime, and Taylor remains on the U.S. Treasury Department's Specially Designated Nationals list, prohibiting him from conducting business with U.S. companies, citizens, and residents, and blocking all U.S.-based assets. Cellcom, the second largest MNO in Liberia, does not have a mobile money product but does permit the transfer of airtime.

[13] Other challenges with Lonestar's mobile money service are detailed in Annex K.

[14] MTN's tariffed mobile money rates are listed in Annex K.

connectivity in remote areas of Liberia and a limited agent network. While it is difficult to determine what would constitute sufficient capacity, the transition of 20,000 teacher salaries to mobile money was anticipated to take twelve months.

REMITTANCE FIRMS

Three remittance firms—Western Union, MoneyGram and Ria—service the $378M remittance market in Liberia.[15] Retail remittance agents are pervasive in the major urban areas and typically found at the largest general or grocery store in most district capitals (Western Union and MoneyGram have roughly 70 locations each; Ria has under 10). Remittance agents are non-exclusive generally servicing both Western Union, MoneyGram, and mobile money for domestic remittances. These access points could be leveraged quickly for a card-based systems and migrate to mobile money.

REGULATORY ENVIRONMENT AND GOVERNMENT SUPPORT TO REDUCE CASH PAYMENTS

Liberia has an enabling environment for mobile money and the government has endorsed use of digital payments. In 2014, the CBL liberalized its mobile money regulations to permit non-banks to provide service directly. While the regulations have not yet attracted new service providers they envision a competitive market with multiple providers. One challenge in attracting new entrants is Liberia's population size which makes it a relatively small market and less lucrative market compared to other countries in Africa. In the past year, government ministries have piloted the use of mobile money for salary payments to teachers, civil servants, and in economic support programs for youth.[16] The government was motivated by legal and regulatory changes that mandate the elimination of cash in all official transactions; at present, approximately 50 percent of payroll disbursements for government workers are via direct deposit, while the remaining personnel have obtained waivers and receive checks/cash based on the inaccessibility of the banking system. In a cost-benefit analysis comparing the mobile money option with the EFT for most transactions within Monrovia and check/cash elsewhere, an annual benefit of US$6 million was estimated to result from migrating approximately 22,000 eligible GoL workers to mobile money.

FUTURE STATE ASSESSMENT/CHALLENGES: DISTRIBUTION AND CAPACITY

The four primary challenges to mitigating the risk of payment disruptions with digital payments are:

- The sufficiency and reliability of ICT networks to support transaction processing in real time or with some acceptable level of delay
- The limited presence of front end transaction points for cash out and processing of digital payments (i.e. inadequacy of the current merchant network in size and geographic scope)

[15] In 2012 these remittances were one-third of Liberia's GDP, ranking it second in the world.

[16] For a list of government-sponsored pilots, see Annex J.

- The limited capacity of service providers to manage the transaction flow and provide customer support as well as lack of incentives for investment by new providers into a small market like Liberia
- The low level consumer experience with digital payments and pervasive lack of financial literacy—even among the more educated population, such as teachers

RECOMMENDATIONS

The most immediate need (beyond connectivity, an issue addressed separately) is to provide functioning payment points in close proximity to those needing to cash out digital payments. Investment in this expansion should build for long-term sustainability of digital payments systems that will outlast the crisis and support the country's economic recovery. The large number of people likely to be eligible for Ebola-related disbursements (especially through cash transfers), the high transaction values, and the nationwide scope of the Ebola-response facilities could prove to be a catalyst to the migration of a sustainable digital payments ecosystem. An evaluation of current payment system vulnerabilities requires an assessment of anticipated payment flows and determination of payment location density and liquidity requirements to build the ecosystem.

RECOMMENDATIONS FOR NEXT 60 DAYS (PILLAR I)

- Create a geo-tagged map of existing payment access points and centers of economic activity.
- Appoint or support selection of a person/organization to coordinate and manage shared digital payment efforts that can be leveraged by multiple organizations.
- Consider investment in quickly deployable digital, card-based payments systems prioritizing the expansion of payments across rural areas to ensure that health workers continue to staff ETUs and CCCs.
- Bolster and create adequate merchant acceptance and cash out points that are interoperable and can service electronic vouchers and/or payments pushed to pre-paid cards as well as mobile money, especially around the ETC and CCC areas where workers are concentrated through private sector engagement for:
    - **Payment Agent Recruitment**—Identifying, incentivizing, training, supporting, and monitoring for quality control is essential to build a geographically diverse and operationally robust distribution network that can support user training and encourage digital payment uptake.
    - **Sharing Retail Payment Agents**—Remittance agents and FMCG distribution network retailers for companies like Coca-Cola (which recently trialed use of digital payment collection with a mobile POS solution) have existing networks of agents with liquidity and transaction experience that can be leveraged to expand the payment agent network for any digital payment system. The mobile money regulatory framework provides for non-exclusivity of agents and allows service provider contracting of agents without regulatory approval.
    - **Funding Short-Term Incentives for Agent Recruitment and Performance**—The main way to incentivize payment agents/merchants is by increasing the commission on transactions (or

more sophisticated agents might see value in loyalty schemes). This should be done in a manner whereby the payer covers the initial cash-out fee—as the GoL intends to do for payroll disbursements (subject to cabinet approval). Incentives are essential in the short term to quickly build out the agent network when consumer demand is still limited. Institutional bulk payments like MOHSW worker stipends can bolster the business thereby contributing to better supply and accustoming consumers for future use. The incentives could come in the form of paying merchants to attend training sessions to bolster their performance in the digital payments ecosystem—most are sole proprietors who cannot afford to close their shops even for half a day for fear of losing sales and therefore reducing their already marginal incomes.

- **Investment by payment companies with easily deployable, open loop POS terminals and ATMs** to strengthen the payment ecosystem and support cross platform payment functionality (such as a national payments switch).
- **Investment in independent ATMs (owned and operated by merchants)** capable of interfacing with the mobile money system and providing for cash-out points for consumers as well as higher commissions to merchants and supporting the wider roll-out of debit, credit, and electronic voucher cards.[17]

RECOMMENDATIONS FOR NEXT 3 TO 24 MONTHS (PILLAR II)

- **Provide and fund capacity at the mobile money service provider**. Lonestar is not adequately staffed to quickly ramp up its mobile money agent network or capacity. Technical and business talent is needed to support those efforts as well as training of new agents and new mobile money users through customer support, consumer awareness, education, and training.
- **Drive use and public awareness of mobile money through cash incentives.** This is in addition to funneling the MOHSW worker salaries and stipends in the short term, funneling social payments by development organizations for addressing medium-long term food security and recovery for vulnerable groups, and encouraging use and comfort with the digital payment technologies.[18]
  - Small mobile money or airtime payment for crowdsourcing proof of nearest mobile money agent/merchants, if possible with snapshot of site plus geolocation coordinates
  - Provide life insurance purchased through mobile money or airtime credit
  - Provide social transfer payments for EVD positive patients and their families, transitioning to death benefits in the event of fatalities caused by EVD

METRICS TO TRACK OUTCOMES

- Number of financial access points deployed/created (with rural/urban breakdown)
- Volume of transactions using digital payments related to relief efforts
- Value of transactions using digital payments related to relief efforts
- Reduction in cash transport

[17] A matrix on how electronic voucher systems can support longer term mobile money networks is in Annex L.

[18] See Annex J for the list of social safety net programs with financial incentives under consideration.

- Increased efficiency in time for payment delivery and receipt (completed payments versus not getting paid currently)
- If electronic vouchers used, frequency of use of digital payments/electronic vouchers and application (i.e. food security)
- Numbers of unique recipients

ANNEX A: U.S. GOVERNMENT FACT SHEET

WEST AFRICA – EBOLA OUTBREAK

FACT SHEET #4, FISCAL YEAR (FY) 2015

OCTOBER 22, 2014

NUMBERS AT A GLANCE

9,911

Total Number of Suspected and Confirmed Ebola Virus Disease (EVD) Cases in Acutely Affected Countries*

U.N. World Health Organization (WHO) – October 22, 2014

4,868

Total Number of EVD-Related Deaths

WHO – October 22, 2014

4,665

Total Number of EVD Cases in Liberia*

WHO – October 22, 2014

3,706

Total Number of EVD Cases in Sierra Leone*

WHO – October 22, 2014

1,540

Total Number of EVD Cases in Guinea*

WHO – October 22, 2014

*Includes laboratory-confirmed, probable, and suspected EVD cases

HIGHLIGHTS

- Liberian President Ellen Johnson Sirleaf urged all countries to support the response to the EVD outbreak on October 19, citing the increasing economic impact and continued risk of the disease spreading to countries outside of those already affected
- The East African Community plans to send 600 health workers—including 41 doctors—to EVD-affected countries in West Africa
- To date, the U.S. Government (USG) has committed more than $344.5 million in funding for the EVD response in West Africa, including funds from USAID, CDC, and DoD

USG FUNDING TOWARD EVD RESPONSE

TO DATE IN FY 2014 & 2015

USAID/OFDA[1]	$118,835,465
USAID/FFP[2]	$20,469,521
USAID/GH[3]	$13,840,000
USAID/Liberia	$5,000,000
USAID/Guinea	$3,482,000
USAID Pledged Funds	$45,308,627
DoD[4]	$120,900,000
CDC[5]	$16,722,000[6]

$344,557,613 [7]

USG ASSISTANCE TO THE WEST AFRICA EVD OUTBREAK RESPONSE

KEY DEVELOPMENTS

- The U.N. World Health Organization (WHO) announced the official end to the EVD outbreaks in Nigeria and Senegal on October 17 and 20, respectively, after both countries completed two 21-day cycles without an additional reported case. CDC supported the governments of Nigeria and Senegal with epidemiological surveillance as part of the countries' successful response efforts.
- The U.N. Mission for Ebola Emergency Response (UNMEER) held a four-day U.N. system meeting between October 15 and 18 at UNMEER headquarters in Ghana's capital city of Accra. The meeting produced an operational framework for a unified and coordinated approach for international support in affected countries. The Chef de Cabinet of the U.N. Secretary-General, the Director General of the WHO, the Executive Director of the U.N. World Food Program (WFP), the Special Envoy of the Secretary-General on Ebola, and the U.N. Special Representative of the Secretary-General (SRSG) and Head of UNMEER Anthony Banbury attended the meeting with international partners, including the USG.
- SRSG Banbury plans to travel to the acutely-affected countries in the coming days to brief authorities on the proposed operational plans.

[1] USAID's Office of U.S. Foreign Disaster Assistance (USAID/OFDA)
[2] USAID's Office of Food for Peace (USAID/FFP)
[3] USAID's Bureau for Global Health (USAID/GH)
[4] U.S. Department of Defense (DoD)
[5] U.S. Centers for Disease Control and Prevention (CDC)
[6] CDC funding as of September 30; total includes estimated salaries and benefits and funding from all sources. USAID/OFDA funding to CDC—$3 million—is not included in this total.
[7] Total funding figures reflect committed USG humanitarian and development funding to date. This number represents a subset of the total USG effort.

1

CURRENT SITUATION

- The U.N. reported on October 16 that it had received only $100,000 for the Ebola Response Multi-Partner Trust Fund created in mid-September, a fraction of the nearly $1 billion that the U.N. is requesting, according to international media. By October 22, deposits in the trust fund had increased to $13.9 million. The U.N. trust fund provides a flexible platform to finance unfunded response priorities, including patient care, social mobilization, and community engagement.
- Approximately 22 percent of confirmed EVD cases are among children and youth under the age of 17 years, according to the U.N. Children's Fund (UNICEF). As of October 20, UNICEF had identified nearly 2,000 children affected by the outbreak, including more than 560 orphans stemming from the outbreak.
- As of October 22, WHO reported more than 9,900 reported cases of EVD and nearly 4,900 resulting deaths in Guinea, Liberia, and Sierra Leone.

Liberia

- Major General Gary Volesky—commander of the 101st Airborne Division and incoming commander of the Joint Force Command (JFC)—arrived in Liberia on October 19 to replace the outgoing JFC Commander Major General Darryl Williams. On October 21, U.S. Ambassador to Liberia Deborah R. Malac, CDC staff, and representatives of the USG's Disaster Assistance Response Team (DART) met with Major General Volesky and DoD personnel to discuss ongoing EVD response efforts and the overall USG strategy.
- On October 17, a third cohort of trainees—60 workers, including 35 clinicians and 25 non-clinicians—completed classroom and mock EVD treatment unit (ETU) trainings held by the Liberian Ministry of Health and Social Welfare (MoHSW) and WHO. Trainings are divided into two phases—phase one comprises classroom training and work in a simulated ETU, and phase two is a mentorship component where students undertake work in an active ETU. Health care workers are undergoing trainings to increase the number of qualified personnel to staff additional ETUs as they begin receiving patients in the coming weeks. To date, 175 people have completed the non-mentoring portion of the training.
- MoHSW and WHO are working to improve infection prevention and control (IPC) at the Island Clinic ETU in the capital city of Monrovia. MoHSW and WHO plan to reduce the number of beds to 100—originally planned for 160—and increase the frequency of monitoring staff as measures to improve overall infection control.
- In recent weeks, CDC representatives have partnered with U.S. Peace Corps staff to provide EVD-related assistance throughout Liberia. Peace Corps representatives have provided valuable cultural insight and translation services. In addition, Peace Corps has provided drivers and program staff to support CDC representatives conducting county-level EVD response activities. On October 19, CDC and Peace Corps representatives trained 140 community members on EVD prevention in Voa community—a refugee population in Bomi County. As of October 21, the community had reported 53 EVD-related deaths.
- USAID/OFDA recently committed more than $12 million to non-government organization (NGO) partner Mercy Corps to oversee a national, community-led social mobilization campaign. Mercy Corps' social mobilization campaign aims to reduce EVD infection rates through increasing awareness of the disease and promoting behavior that reduces transmission risk. Messages about the disease and behavior to reduce EVD transmission continue to be a pressing need in Liberia.

Sierra Leone

- On October 17, the U.N. Food and Agriculture Organization (FAO) convened a second meeting of key stakeholders in Sierra Leone to formalize the Food Security and Livelihood Working Group. FAO called upon those present—including government ministries, U.N. agencies, NGOs, and donors—to coordinate a food security response. Participants raised two immediate concerns—the status of the current agricultural season and increasing food prices during a period of reduced economic activity. WFP noted that it is designing a rapid survey to measure disruptions to agricultural production and marketing. In addition, WFP is supporting the Ministry of Agriculture, Forestry, and Food Security to strengthen price monitoring to better understand the impacts of EVD on food security and livelihoods and provide data to guide interventions.
- Between October 16 and 17, UNICEF held a two-day conference in Kenema for 36 EVD survivors. CDC and NGOs operating in the area attended, as well as a representative from the Ministry of Social Welfare Gender and Children's Affairs, who also serves as the co-chair of the Social Mobilization Pillar at the national EOC responsible for overseeing

survivor issues. According to CDC, survivors expressed strong interest and willingness to support the ongoing EVD response. Key issues surrounding EVD survivors include lost livelihoods, difficulty reintegrating due to stigma from community members, and other psychosocial trauma. At the meeting, employment was identified as a key issue; all 36 EVD survivors present were unemployed, including 13 health care workers.

- In conjunction with UNICEF and the Emergency Response Consortium—a network of seven non-governmental organizations (NGOs) involved in EVD response activities in Sierra Leone—CDC is training health care staff at peripheral health units on critical IPC measures. CDC recently conducted a national level train-the-trainers workshop for 22 trainers in Sierra Leone, with all of the trainers scheduled to train at least 20 public health workers in each of Sierra Leone's districts, creating a cadre of more than 260 district-level trainers. In turn, the district-level trainers will conduct IPC trainings at all 1,200 peripheral health units throughout the country. The national master trainers have conducted one district-level training in the capital city of Freetown and in five other districts, with plans to provide trainings in the remaining districts by the end of October.
- WFP announced that 20 ambulances and 10 burial vehicles provided by the World Bank arrived in country on October 18. WFP will deliver the vehicles to Sierra Leone's Ministry of Health and Sanitation in the coming days, strengthening the overall capacity of the government's response.

Guinea

- Health officials recently reported that two individuals in Guinea's Siguiri Prefecture tested positive for EVD—the first confirmed cases in the prefecture. Following the case in Siguiri, a suspected EVD case previously reported in Kankan Prefecture also tested positive for the disease, making it the first confirmed case in Kankan. With the newly confirmed cases in Kankan and Siguiri, WHO reports EVD cases in 17 of Guinea's 21 prefectures.
- On October 15, the International Federation of the Red Cross and Red Crescent Societies (IFRC) conducted a training-of-trainers session in the capital city of Conakry for Guinean Red Cross teams conducting safe burials. Approximately 40 trainers originating from 18 prefectures throughout Guinea participated in the session. IFRC plans to conduct a similar training in Macenta Prefecture—one of the most affected regions in Guinea—in the coming weeks.
- Several areas of Guinea, including parts of Beyla, Boké, Coyah, Forécariah, and Yomou prefectures, continue to resist EVD interventions, according to the Government of Guinea (GoG). Currently, the GoG is drafting letters to local community leaders to appeal for support in the EVD response, while GoG partners work to identify a comprehensive list of villages refusing interventions.
- CDC and partners continue to support the GoG to establish a national emergency operations center (EOC). The national EOC will coordinate the EVD response, linking to coordinating bodies at the regional and prefecture levels. CDC is providing material and technical support, including input on short and long term activities, while assisting with the organizational structures for EOCs at national, regional, and prefecture levels.

LOGISTICS AND RELIEF COMMODITIES

- A shipment of 12 USAID/OFDA-procured tents arrived in Monrovia on October 10. The DART plans to provide the tents for use in constructing an ETU in Margibi County's Kakata town—one of the most affected areas of Liberia.
- On October 19, a shipment of 1,300 USAID/OFDA-funded bags to safely transport human remains arrived in Sierra Leone for the EVD response. USAID/OFDA has consigned the bags, valued at $32,500, to UNICEF. Bags to safely transport the remains of deceased EVD patients are critical for reducing the spread of EVD, as the bodies are highly infectious. Response actors had recently reported bags to be in short supply in Sierra Leone. A second shipment of 1,200 bags is scheduled to arrive on October 26.

FOOD SECURITY AND LIVELIHOODS

- On October 16, the DART in Sierra Leone accompanied WFP on a food distribution in Rumani, a small village 10 kilometers from the center of Port Loko District. The distribution was for a small number of families that had just been re-quarantined, following newly reported deaths in the village in the midst of an initial 21-day quarantine period.
- During the week of October 12, WFP delivered 2,430 metric tons (MT) of food assistance to approximately 144,600 people across eight counties in Liberia. WFP increased its monthly distribution target by 35 percent in October, planning to reach nearly 270,000 people in the month.

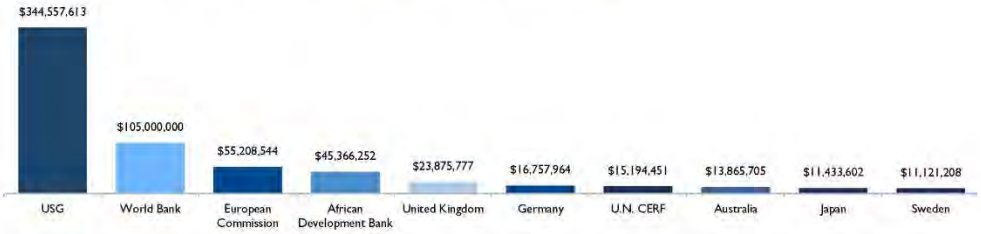
- Since April, WFP has provided more than 13,125 MT of food to approximately 776,000 EVD-affected people in West Africa. WFP is providing crucial food and nutritional assistance to communities under medical quarantine, patients receiving care, and EVD-afflicted families.
- Within the framework of the current USAID/FFP development programs, consortia led by ACDI/VOCA and Opportunities Industrialization Centers International in Sierra Leone and Liberia have responded to the EVD crisis by supporting host government, WHO, and CDC efforts to prevent the transmission of EVD. This includes coordinated messaging on EVD prevention and care, as well as providing key sanitation and safety equipment, including water buckets, chlorine, and soap to households and businesses. USAID/FFP partners have also provided logistical support to government ministries of health through the use of office space, vehicles, and fuel for contact tracing, information dissemination, and overall operations.
- USAID/FFP is working with partners and host governments to identify ways to support or address short- and medium-term acute food needs in the next 3–12 months. USAID/FFP will plans to structure food assistance investments to incentivize local markets and rice importers to sustain market functionality in the region.

INTERNATIONAL RESPONSE

- The Government of Sweden's (GoS) International Development Cooperation Agency recently announced SEK 25 million—$3.5 million—to support EVD response efforts in Liberia through the Swedish Civil Contingencies Agency (MSB). The GoS support is providing accommodation, logistics, and medical support for medical response personnel in Liberia. Additionally, GoS is providing cooled rooms at five ETUs where staff working outdoors in full personal protective equipment can rest, increasing the safety and endurance of health care workers. Between October 18 and 19, staff and two cargo planes arrived in Liberia with equipment to establish a camp for international response personnel, as well as medical personnel to provide health support for international staff.
- The Government of the U.K. (GoUK) airlifted blood storage kits, centrifuges, personal protective equipment, and other medical supplies valued at almost £900,000—$1.5 million—into Freetown, Sierra Leone, on October 18. The medical equipment will support a planned ETU in Kerry Town, Western Area. The U.K.'s International Development Secretary Justine Greening stated that the airlifted supplies to Kerry Town were to support one of six ETUs that the GoUK plans to support constructing.
- On October 21, nearly 150 additional British Army personnel—mostly medics—arrived in Sierra Leone. The arriving personnel will operate an Ebola training academy, where local health care workers and hygienists will train in IPC.
- The Government of China recently contributed $6 million to support WFP's emergency operation aiming to assist approximately 1.3 million EVD-affected people in Guinea, Liberia, and Sierra Leone with food assistance. WFP plans to evenly distribute the funds between the three countries.

2014 TOTAL FUNDING FOR THE EBOLA RESPONSE*

PER DONOR



* Funding figures are as of October 22, 2014. All international figures are according to the U.N. Office for the Coordination of Humanitarian Affairs (OCHA) Financial Tracking Service and based on international commitments during the 2014 calendar year, while USG figures are according to the USG and reflect USG commitments from FY 2014 and FY 2015, which began on October 1, 2013 and October 1, 2014, respectively.

CONTEXT

- EVD is a severe illness transmitted through direct contact with the blood, body fluids, and tissues of infected animals or people. There is currently no cure or preventive vaccine for EVD.
- On August 4, U.S. Ambassador Deborah R. Malac declared a disaster due to the effects of the EVD outbreak in Liberia. U.S. Chargé d'Affaires Kathleen FitzGibbon declared a disaster in Sierra Leone on August 13. On August 15, U.S. Chargé d'Affaires Ervin Massinga declared a disaster in Guinea.
- The USG deployed a field-based Disaster Assistance Response Team (DART) on August 5 and established a corresponding RMT based in Washington, D.C. The DART—comprising disaster response and medical experts from USAID/OFDA, CDC, and DoD—is working to identify key needs stemming from the EVD outbreak, amplify humanitarian response efforts, and coordinate all USG efforts to support the EVD response.

USG ASSISTANCE TO THE EBOLA RESPONSE PROVIDED IN FY 2014 & 2015[1]

IMPLEMENTING PARTNER	ACTIVITY	LOCATION	AMOUNT
USAID/OFDA[2]			
REGIONAL			
African Union	Health	Guinea, Liberia, Sierra Leone	$10,000,000
CDC	Health	Guinea, Liberia, Sierra Leone	$3,000,000
UNICEF	Health	Guinea, Liberia, Sierra Leone	$600,000
U.N. Humanitarian Air Service (UNHAS)	Logistics Support and Relief Commodities	Guinea, Liberia, Sierra Leone	$250,000
	Program Support		$1,536,004
LIBERIA			
Global Communities (GC)	Health	Liberia	$18,014,224
IFRC	Health	Liberia	$1,000,000
International Medical Corps (IMC)	Health	Liberia	$4,906,604
International Organization for Migration (IOM)	Health	Liberia	$28,048,894
International Rescue Committee (IRC)	Health	Liberia	$2,969,196
MENTOR Initiative	Health	Liberia	$1,598,314
Mercy Corps	Health, Humanitarian Coordination and Information Management	Liberia	$12,000,000
Project Concern International (PCI)	Health, Logistics Support and Relief Commodities	Liberia	$1,550,723
Samaritan's Purse (SP)	Health, Logistics Support and Relief Commodities	Liberia	$7,782,027
Save the Children (SC)	Health, Protection, Water, Sanitation, and Hygiene	Liberia	$8,276,263
UNICEF	Health	Liberia	$2,224,044
UNICEF	Logistics Support and Relief Commodities	Liberia	$680,333
USAID/OFDA-Airlifted Relief Commodities	Logistics Support and Relief Commodities	Liberia	$2,122,816

5

SIERRA LEONE			
IFRC	Health	Sierra Leone	$3,500,000
IMC	Health, Protection	Sierra Leone	$5,164,183
UNICEF	Health, WASH	Sierra Leone	$1,584,214
GUINEA			
IFRC	Health	Guinea	$999,552
Plan International	Health	Guinea	$1,028,074
TOTAL USAID/OFDA ASSISTANCE TO EVD RESPONSE EFFORTS			**$118,835,465**
USAID/FFP			
WFP	WFP Regional Emergency Operation	Guinea, Liberia, Sierra Leone	$20,469,521
TOTAL USAID/FFP ASSISTANCE TO EVD RESPONSE EFFORTS			**$20,469,521**
USAID/GH			
WHO	Health	Guinea, Liberia, Nigeria, Sierra Leone; neighboring at-risk countries	$8,950,000
Johns Hopkins Center for Communication Programs (JHCCP)	Health	Guinea, Liberia, Sierra Leone	$4,890,000
TOTAL USAID/GH ASSISTANCE TO EVD RESPONSE EFFORTS			**$13,840,000**
USAID/Liberia			
GoL Ministry of Health and Social Welfare	Health	Liberia	$5,000,000
TOTAL USAID/Liberia ASSISTANCE TO EVD RESPONSE EFFORTS			**$5,000,000**
USAID/Guinea			
	Planned Health Assistance	Guinea	$3,482,000
TOTAL USAID/Guinea ASSISTANCE TO EVD RESPONSE EFFORTS			**$3,482,000**
USAID Pledged Funds			
Uncommitted Funds to Response Agencies	Multi-Sectoral	Guinea, Liberia, Sierra Leone	$45,308,627
TOTAL USAID Pledged Funds			**$45,308,627**
DoD			
DoD		Liberia	$120,900,000
TOTAL DoD ASSISTANCE TO EVD RESPONSE EFFORTS			**$120,900,000**
CDC			
CDC	Health	West Africa	$16,722,000
TOTAL CDC ASSISTANCE TO EVD RESPONSE EFFORTS			**$16,722,000**
USG ASSISTANCE TO EVD RESPONSE EFFORTS IN FY 2014 & 2015			**$344,557,613**

[1] Year of funding indicates the date of commitment or obligation, not appropriation, of funds.

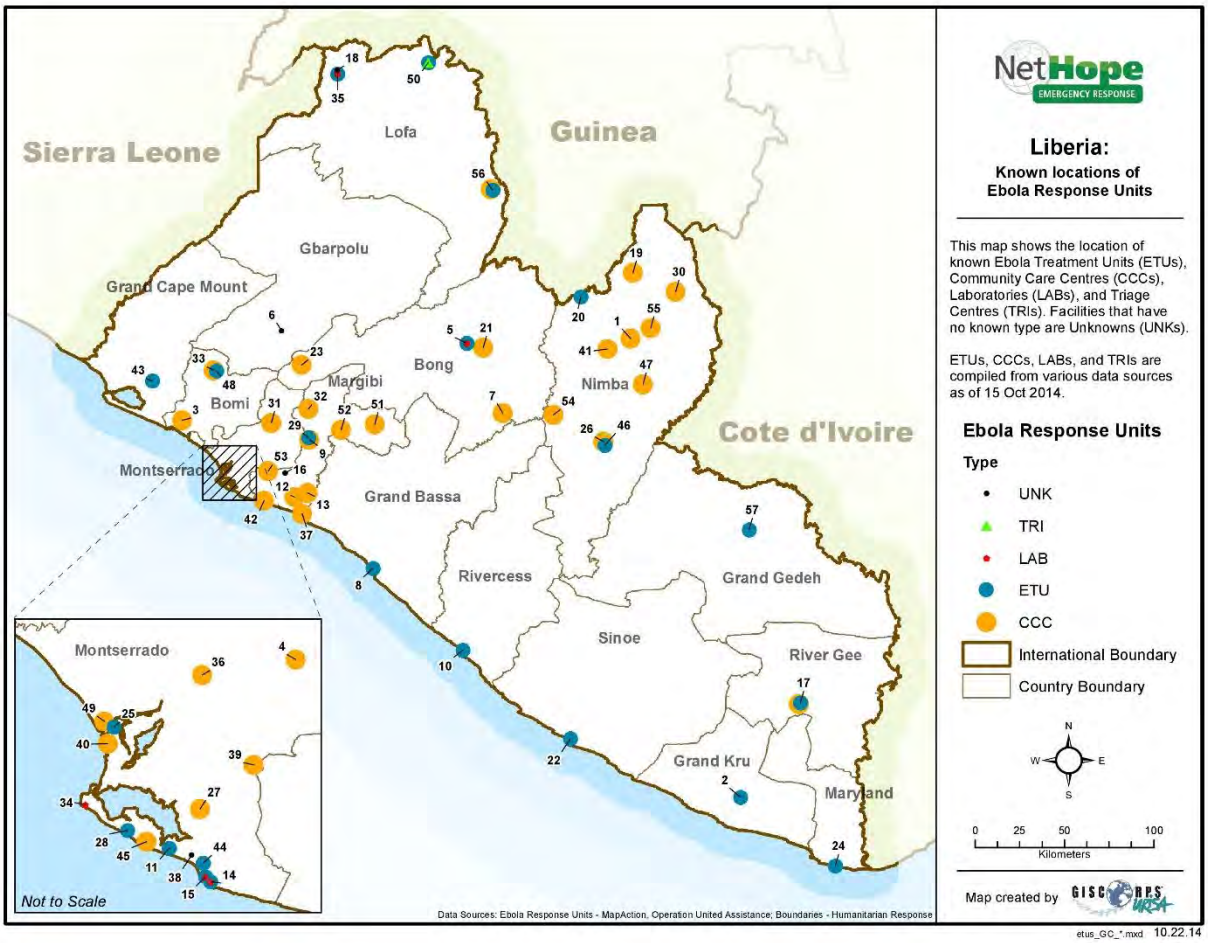
6

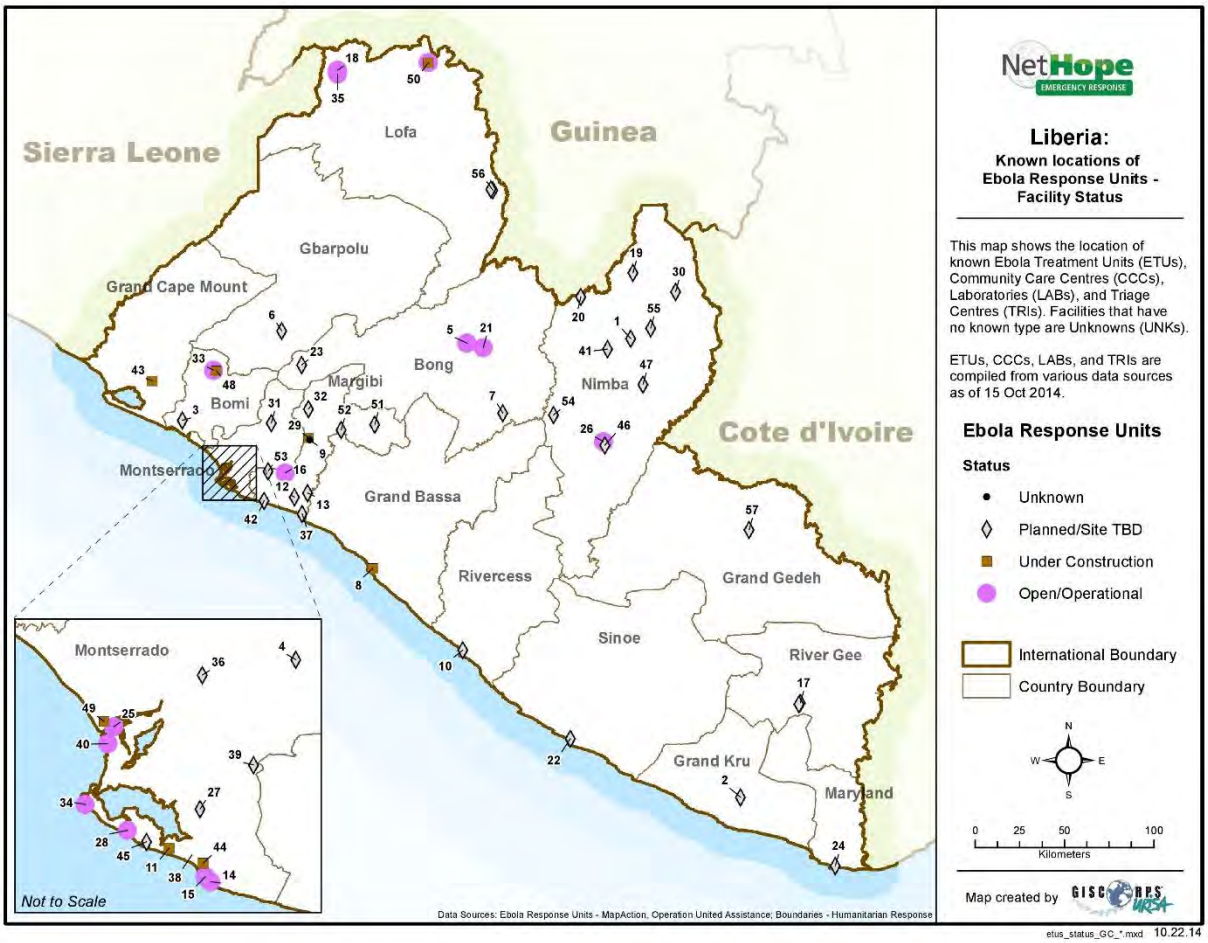
PUBLIC DONATION INFORMATION

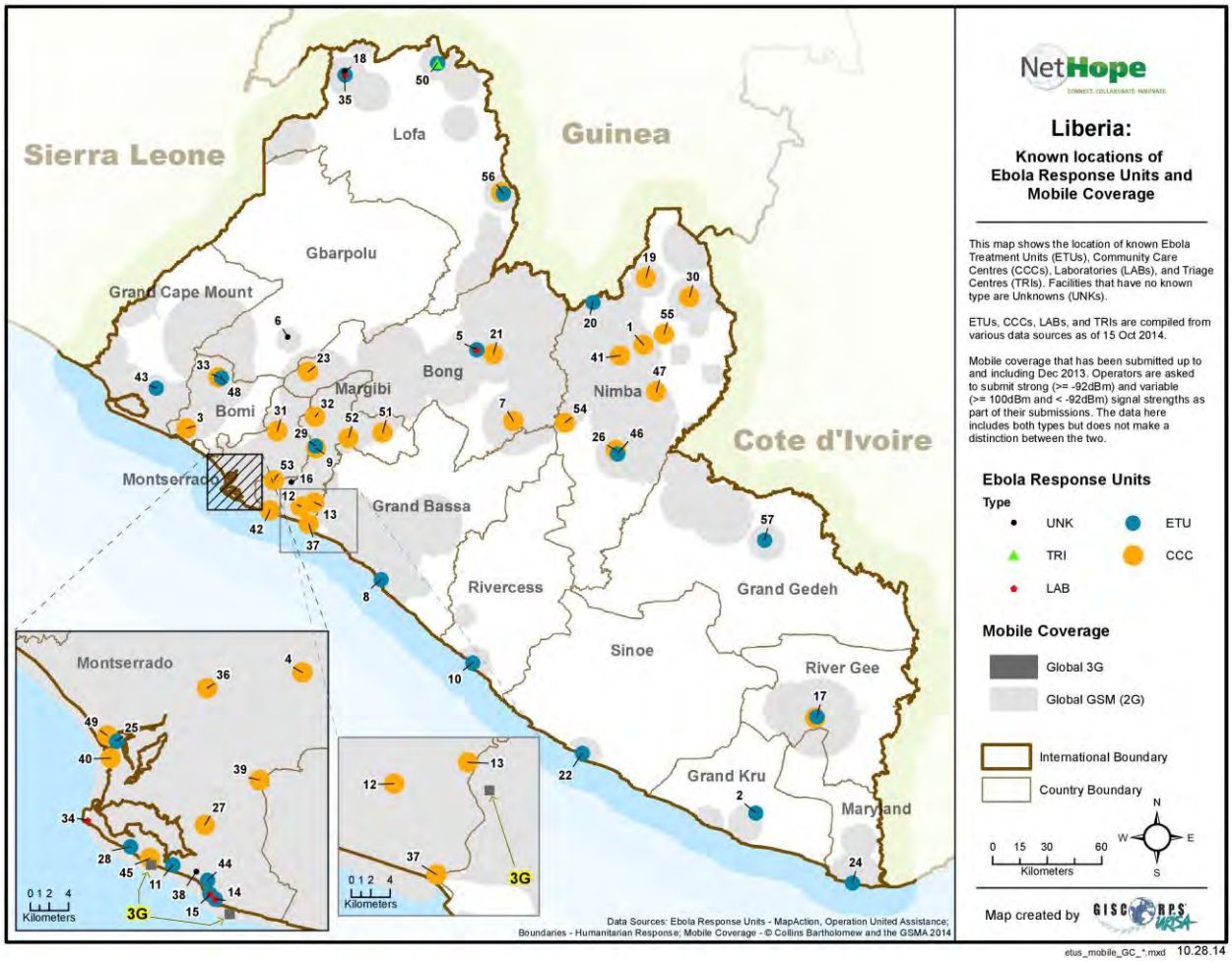
- The most effective way people can assist relief efforts is by making cash contributions to humanitarian organizations that are conducting relief operations. A list of humanitarian organizations that are accepting cash donations for disaster responses around the world can be found at www.interaction.org.
- USAID encourages cash donations because they allow aid professionals to procure the exact items needed (often in the affected region); reduce the burden on scarce resources (such as transportation routes, staff time, and warehouse space); can be transferred very quickly and without transportation costs; support the economy of the disaster-stricken region; and ensure culturally, dietary, and environmentally appropriate assistance.
- More information can be found at:
  - The Center for International Disaster Information: www.cidi.org or +1.202.821.1999.
  - Information on relief activities of the humanitarian community can be found at www.reliefweb.int.

USAID/OFDA bulletins appear on the USAID website at
http://www.usaid.gov/what-we-do/working-crises-and-conflict/responding-times-crisis/where-we-work

ANNEX B: MAPS


Sierra Leone
Guinea
Cote d'Ivoire
Lofa
Gbarpolu
Grand Cape Mount
Bong
Margibi
Bomi
Nimba
Montserrado
Grand Bassa
Rivercess
Grand Gedeh
Sinoe
River Gee
Grand Kru
Maryland
Not to Scale
Data Sources: Ebola Response Units - MapAction, Operation United Assistance; Boundaries - Humanitarian Response
NetHope
EMERGENCY RESPONSE
Liberia:
Known locations of Ebola Response Units
This map shows the location of known Ebola Treatment Units (ETUs), Community Care Centres (CCCs), Laboratories (LABs), and Triage Centres (TRIs). Facilities that have no known type are Unknowns (UNKs).
ETUs, CCCs, LABs, and TRIs are compiled from various data sources as of 15 Oct 2014.
Ebola Response Units
Type
UNK
TRI
LAB
ETU
CCC
International Boundary
Country Boundary
N
W
E
S
0 25 50 100
Kilometers
Map created by
etus_GC_*.mxd 10.22.14


Sierra Leone
Guinea
Cote d'Ivoire
Lofa
Gbarpolu
Grand Cape Mount
Bong
Margibi
Bomi
Nimba
Montserrado
Grand Bassa
Rivercess
Grand Gedeh
Sinoe
River Gee
Grand Kru
Maryland
Not to Scale
Data Sources: Ebola Response Units - MapAction, Operation United Assistance; Boundaries - Humanitarian Response
NetHope
EMERGENCY RESPONSE
Liberia:
Known locations of Ebola Response Units - Facility Status
This map shows the location of known Ebola Treatment Units (ETUs), Community Care Centres (CCCs), Laboratories (LABs), and Triage Centres (TRIs). Facilities that have no known type are Unknowns (UNKs).
ETUs, CCCs, LABs, and TRIs are compiled from various data sources as of 15 Oct 2014.
Ebola Response Units
Status
Unknown
Planned/Site TBD
Under Construction
Open/Operational
International Boundary
Country Boundary
N
W
E
S
0 25 50 100
Kilometers
Map created by
etus_status_GC_*.mxd 10.22.14


Liberia:
Known locations of Ebola Response Units and Mobile Coverage
This map shows the location of known Ebola Treatment Units (ETUs), Community Care Centres (CCCs), Laboratories (LABs), and Triage Centres (TRIs). Facilities that have no known type are Unknowns (UNKs).
ETUs, CCCs, LABs, and TRIs are compiled from various data sources as of 15 Oct 2014.
Mobile coverage that has been submitted up to and including Dec 2013. Operators are asked to submit strong (>= -92dBm) and variable (>= 100dBm and < -92dBm) signal strengths as part of their submissions. The data here includes both types but does not make a distinction between the two.
Ebola Response Units
Type
UNK
ETU
TRI
CCC
LAB
Mobile Coverage
Global 3G
Global GSM (2G)
International Boundary
Country Boundary
0 15 30 60
Kilometers
N
W
E
S
Map created by
Sierra Leone
Guinea
Cote d'Ivoire
Lofa
Gbarpolu
Grand Cape Mount
Bong
Margibi
Bomi
Nimba
Montserrado
Grand Bassa
Rivercess
Grand Gedeh
Sinoe
River Gee
Grand Kru
Maryland
3G
0 1 2 4
Kilometers
Data Sources: Ebola Response Units - MapAction, Operation United Assistance; Boundaries - Humanitarian Response; Mobile Coverage - © Collins Bartholomew and the GSMA 2014
etus_mobile_GC_*.mxd 10.28.14

ANNEX C: PILLAR I INTERVENTIONS AND SUPPORTING TOOLS

The following table lists the most critical interventions and the types of enabling technologies that will be required.

TABLE 4: CRITICAL INTERVENTIONS AND ENABLING TECHNOLOGIES

Intervention	Purpose	ICT Solution
Effective nationally-led incident management and coordination (IMC)	Establish and execute critical coordination, communications, and resource allocation for the national Ebola response, including centralized communications, surveillance, case identification, contact tracing, and reporting	Mobile data collection for case management and contact tracing two-way communications platform for reporting clinical decision support for case identification call centers and interactive voice response hotlines
Isolation and treatment (EPI)	Establish effective case identification, triage, surveillance, holding, isolation and treatment through ETUs or CCCs.	Mobile-based case identification, management and reporting tools e-Learning/training via video, sms, IVR SMS lab results SMS/IVR messaging and training for in-home and community-based infection control
Ensure the safe and dignified management of human remains (BURY)	Establishment of a national human remain collection notification system based on standard protocols	Staff registration and management via mobile Mobile-based data reporting tools on location of body pickup e-Payment via mobile Fleet management systems Call center hotline / SMS short-code for human remains collection requests
Health system support (HSS)	Training in PPE use, infection control, triage and isolation protocols; referral mechanisms; basic supplies; health staff compensation	e-Learning training protocols Clinical decision support tools for triage and isolation, Mobile health referral system, Logistics management information system, stock-out notification system Electronic payments and/or bank deposit notifications
Behavior change communications and social mobilization (SOC)	Social mobilization and outreach to address misconceptions and provide information	Call centers, IVR hotlines, one-way SMS blasts, two-way SMS education campaigns

ANNEX D: CURRENT STATE ASSESSMENT

TABLE 5: CURRENT STATE ASSESSMENT

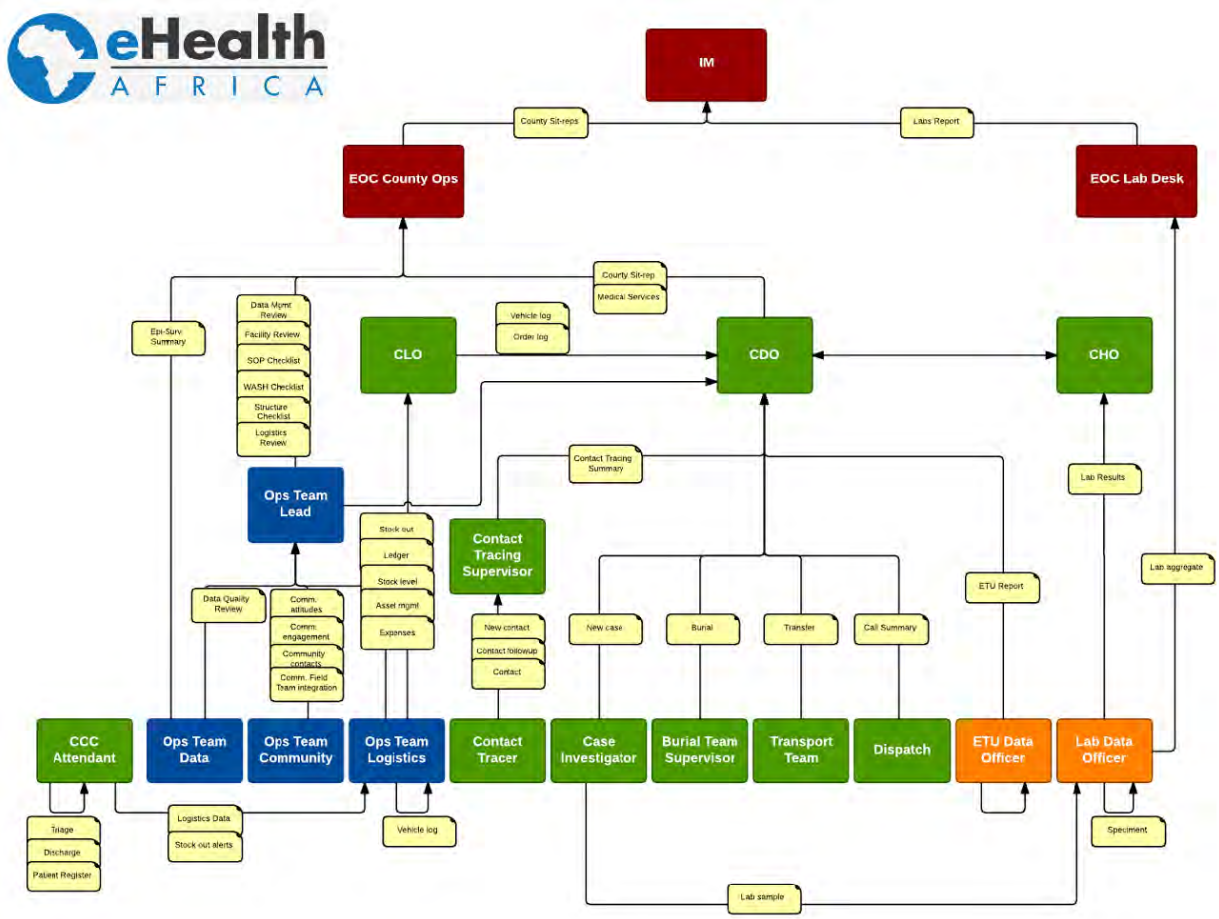
Sector	Information Systems status	Required improvements	Priority	IMC	EPI	BURY	HSS	SOC
Citizen Identification	Liberia has no National ID system, or Health ID system, posing significant challenges with identity ambiguity, not only with patient case management, but also with provision of entitlements	Personal Identification system for affected parties	low					
Call Centers	An in-bound national call center provides information services to the public, and routing of case incidents to a dispatch unit for processing. Agents have hand-held VOIP phones, rudimentary forms and no automation tools.	Fully automated call center services for improved interaction and analytics, in-bound and out-bound capability, with workflow management software and integration capabilities	High					
Communications platforms	GoL's Mass communications tools include MOHSW, MICAT website, MICAT twitter posts. Large ecosystem of development partner sites, blogs, twitter accounts etc.	Interactive communications systems to targeted communities via text, IVR. Communications support to NETF	High					
Call Data Records (CDR)	No clear National Policy or guidelines on access and use of CDR records	Policy on use of CDR records, and capacity to implement	High					
HMIS	The HMIS is scheduled to shift from Epi-Info onto the DHIS2 platform within weeks. This provides aggregate level reporting. Functionality for case-level tracking, linked lab results and safe burial reporting is under development. EVD data quality and completeness is a serious challenge. The system will be deployed to county level soon. Client workstations require reliable Internet connectivity for full functionality.	Off-line and mobile client interfaces to DHIS2 for case-level transactions Connectivity and interoperability challenges are major issues needing attention	High					
Case	Systems to track status of	Decision support system	High					

Sector	Information Systems status	Required improvements	Priority	IMC	EPI	BURY	HSS	SOC
management and tracking	suspected, likely and confirmed cases at individual and community level [to be determined]	critical for the command/control function						
Contact Tracing	Contact tracing activities vary across the counties. Paper-based systems provide base functionality in low-intensity areas, but have been overwhelmed in Montserrado. Some less active counties have achieved some level of automation	Development of toolset and methods matched to context: for rural (low density, offline) and urban settings (high density, online), and for intensity of transmission	Medium					
Team Dispatch Unit	The investigator, ambulance, burial and other response teams are controlled by an ad-hoc dispatch system that is largely informal, and with limited functionality. Dispatch data and reporting is captured into databases and mapping systems in batch mode, and which has limited integration	Effective automated dispatch system for Montserrado, with call management, team/asset tracking, scheduling and reporting, and integration with other systems. Counties with lower demand would require a simplified system	High					
Ambulance / Investigations	Rudimentary information systems are in place to support the activity of ambulances and investigation teams. Further study is required	Integrated Mobile-based toolset and devices for burial teams, including dispatch tracking and rich case reporting facilities	High					
Safe Burials	Rudimentary information systems are in place to support Safe Burial activity. In Montserrado Mobile tools have been developed but have not been adopted, as alternative tools are planned	Integrated Mobile-based toolset and devices for burial teams, including dispatch tracking and rich case reporting facilities	High					
Lab Results	Specimen submission, results tracking & patient matching is supported by ad-hoc systems which are being adapted to ongoing challenges, but still present serious challenges. There are plans to develop functionality to link Lab	Study to identify systems to improve feedback from labs to affected parties (family), integration with DHIS2, and to prompt consequential activities	Very high					

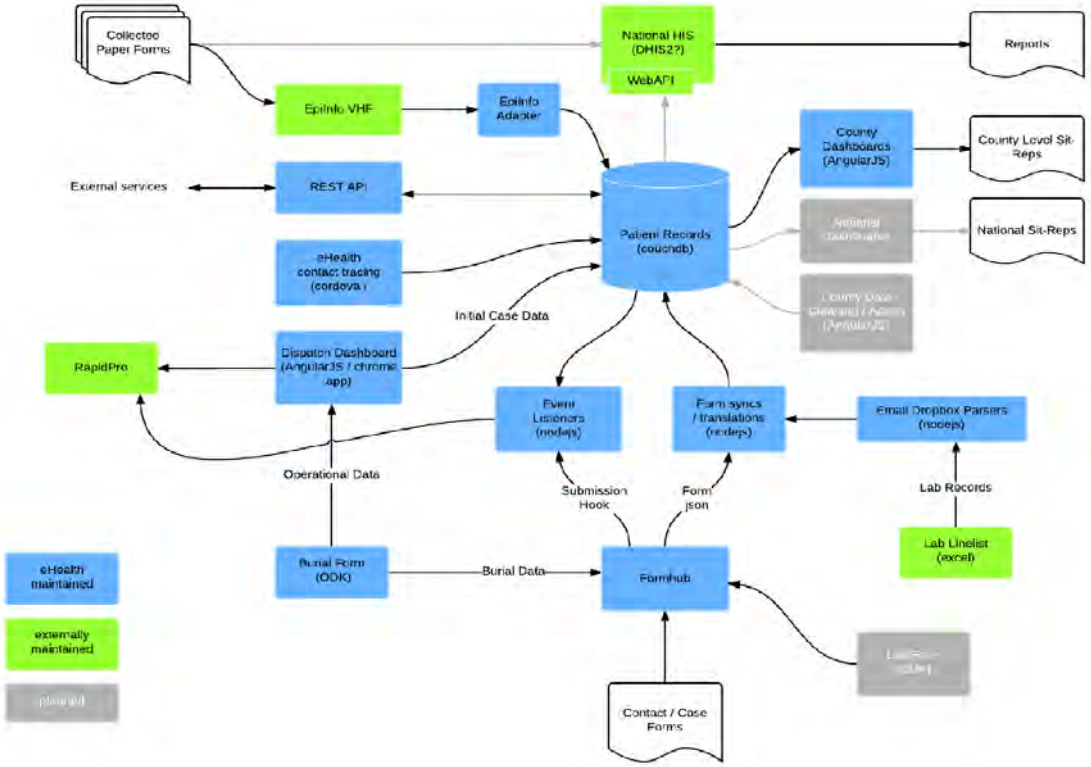
Sector	Information Systems status	Required improvements	Priority	IMC	EPI	BURY	HSS	SOC
	results to case-level tracking in DHIS2							
Testing facilities	Systems to identify and service laboratories, including point of care stations [to be determined]		Very high					
Supply Chain Logistics	Logistical information systems to ensure adequate and timely supplies of materials to treatment centers and affected parties [to be determined]		High					
ETU Management	Each ETU operator has independent systems. There are reports of shortcomings, and challenges with standardization of reporting. Further analysis is required	Study on improving information systems, data quality and reporting	High					
CCC Management	A comprehensive systems toolset is under development to integrate the CCCs into the County Health systems	Study on supporting improved information systems, data quality and reporting	High					
Home Care Management	[to be determined]		Low					
Quarantine & Feeding scheme	Rudimentary systems are in place to track quarantined patients, with serious short-comings	Integrated system to administer the quarantine of households and effectively address their needs. Linked to the above decision support systems to track individuals and contacts exposed.	High -					
Rehabilitation Management	Systems to track survivors, and provide supportive services [to be determined]		Medium					
Psychosocial Care	[to be determined]		Lower					
Personnel Surveys	A variety of interactive surveys and informational campaigns are under development to provide operational information and	Adoption of common communication channels. Central log of communications Surveys will require	High					

Sector	Information Systems status	Required improvements	Priority	IMC	EPI	BURY	HSS	SOC
	health and safety guidance to personnel. Where appropriate they are dispatched and filled by email, mobile/web client or 2-way text messaging	customized tools for targeted group identification, such as healthcare workers or other Ebola response workers.						
IPC Assessments	A variety of facility assessment forms and related systems are being developed for monitoring, control and audit purposes. Where appropriate they are dispatched and filled by mobile/web client or 2-way text messaging	Adoption of common communication channels. Central log of communications	High					
Asset Management & Warehousing	There is no automated national EVD asset management system; ad-hoc arrangements are in place pending deployment of a solution	Identification and deployment of an automated national Asset Management system	High					
Fleet Management	There is no automated national EVD fleet management system; interim arrangements are in place pending deployment of a solution	Identification and deployment of an automated national Fleet Management system	High					
Training Management	Training is pursued across many functional areas; MOH typically attempts to maintain a central registry of all trainings. Further research is required to better understand this	Standardized reporting tools	High					
Online education	With the educational system closed, and gatherings minimized, Health-workers and other responders will benefit from online learning opportunities. Children and adults will also benefit from online opportunities	Implement a National Research and Education Network, utilizing unused capacity on the undersea Internet fiber cable	Medium					

ANNEX E: IDEALIZED COUNTY HEALTH INFORMATION SYSTEM



ANNEX F: BURIAL TEAM SYSTEMS EXAMPLE



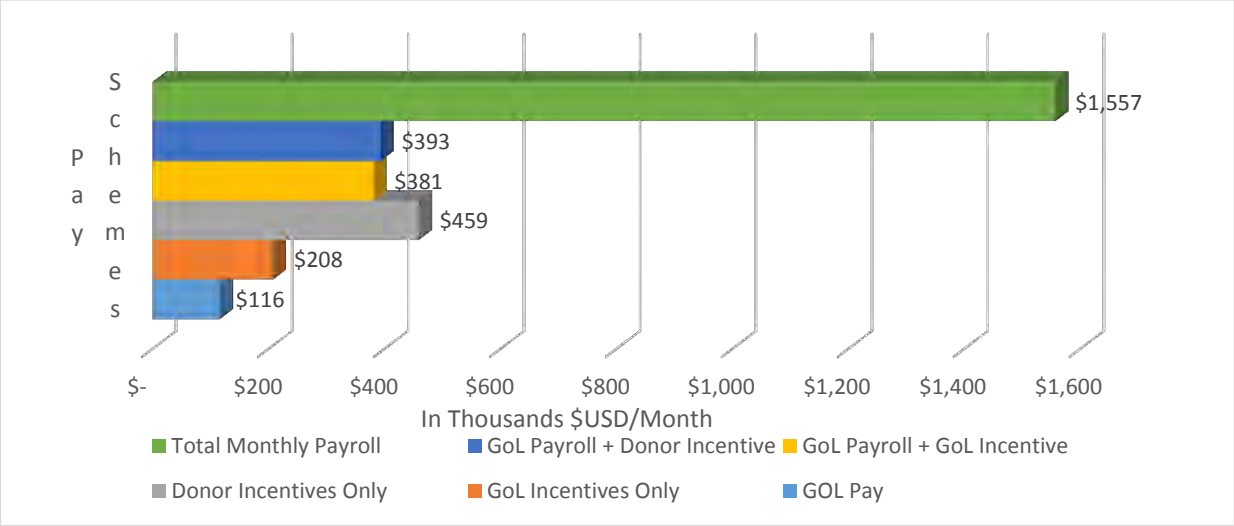
Source: eHealthAfrica

ANNEX G: SALARY AND PAYMENT INCENTIVE REFERENCES

HEALTH WORKER PAY IN LIBERIA

In 2012, the USAID-GEMS program surveyed health workers in Liberia on their pay. In the draft report,[19] an annualized payroll for the Ministry (including donor-provided pay) was summed to be approximately $18.7 million, or about $1.5 million/month. On average, mean pay per staff (8072) was calculated to be about $193/per month.

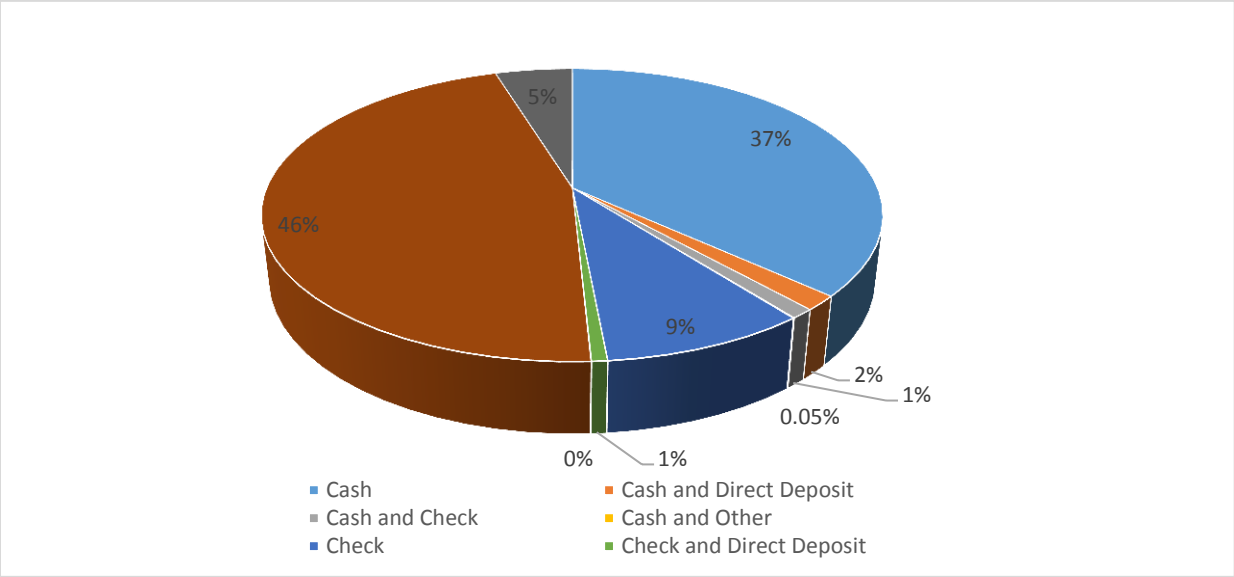
FIGURE 3. MOHSW PAY SCHEMES FOR HEALTH STAFF



The draft report indicates that 37% of all health staff receives cash as payment. Only 3% of respondents in this category are GOL payroll recipients. That is to say, nearly all of this type of payment comes from donors. With respect to convenience of pay, 46% of staff receives their pay via direct deposit. Of this amount, only 22% are in the North Central Region. Additionally, 9% of staff stated that they receive their pay in the form of a check. The North Central Region is defined as the counties of Bong, Lofa and Nimba.

[19] Ministry of Health and Social Welfare, Health Pay Survey Report Draft for Discussion (USAID/Liberia Governance and Economic Management Support Project and USAID-GEMS), September 2012.

FIGURE 4. MOHSW PAYROLL PAYMENT TYPES



FINANCIAL INCENTIVE STRUCTURES FOR RESPONSE WORKERS

The UNMEER Non-Cluster on Cash Transfers and Social Protection, reported in September that the Liberian MOHSW and unions have agreed to hazard pay for health workers. Payments will be financed by the World Bank and possibly the African Development Bank (for a total of 6 months). All the payments are done using the regular MOHSW payroll mechanisms. For each Ebola Treatment Unit, one supervisor will be paid $850 above their regular salary. All medical doctors working on the response will get $825 and ETU managers and general practitioners will receive $450 hazard pay. Nurses and lab technicians will receive $435 above regular salary. In addition, case investigators, social workers and ambulance drivers would get $350. Hygienists and logisticians working in healthcare facilities would receive $300 above their basic salaries. Drivers, contact tracers and security staff will receive $250. The minister said data officers will receive $75.

OTHER PAYMENT STREAMS FOR SOCIAL SAFETY NET PROGRAMS ACTIVATED

In Liberia, UNDP has designed a social safety nets program to reach 100,000 households via cash transfers and compensation schemes, for a total cost of USD 34.2 m.

TABLE 6. PROVISIONAL RECALIBRATION OF NEEDS AND REQUIREMENTS FOR SALARIES AND INCENTIVES IN LIBERIA

Mission Critical Actions	Ebola-related	General Health
	STOP the Outbreak	
1. Identify and Trace people with Ebola	Financial incentive to volunteers to conduct contact tracing and support (incentive) referral of specimens from the affected counties to the reference laboratory (there is no disaggregated cost for these activities, which are part of WHO package for a value of USD **29 m**); Incentive for health workers (no. not specified) for a cost of USD **5 m**;	UNHCR foresees Project Monitoring support Incentives for county administration support staff, for a cost of USD **200.000**
2. Safe and Dignified Burials		
	TREAT the infected	
3. Care for Persons with Ebola and Infection Control	WHO foresees to pay incentives to 100 additional distribution assistants who will be recruited to expedite NFI distribution (no amount specified)	
4. Medical Care for Responders		
	ENSURE essential services	
5. Provision of Food Security and Nutrition	FAO designed a program to facilitate women association initiative in terms of savings and loans at community level to increase social and financial resilience. S&L boosted by conditional cash transfer mechanism for 15.000 women (cost is **USD 2.1**)	
6. Access to Basic (including non-Ebola Health) services		
7. Cash Incentives for Workers	UNDP designed a social safety nets program to reach 100,000 households via cash transfers and compensation schemes, for a total cost of USD **34.2 m**	
8. Recovery and Economy		
	PRESERVE stability	
9. Reliable supplies of materials and equipment		
10. Transport and Fuel		
11. Social Mobilization and Community Engagement	UNHCR foresees to pay incentives to 600 neighborhood watch members to remain committed to the additional responsibilities (cost is **300.000 USD**)	UNHCR foresees incentives to all the staff of all the Health centers present in the country (cost is USD **5 m**)

Source: UNMEER: Non-Cluster on Cash Transfers and Social Protection. Draft Concept Paper on Cash Transfers (September 2014) at 10.

ANNEX H: DIGITAL PAYMENT MECHANISMS IN EMERGENCY RESPONSE AND THE DIGITAL PAYMENT ECOSYSTEM

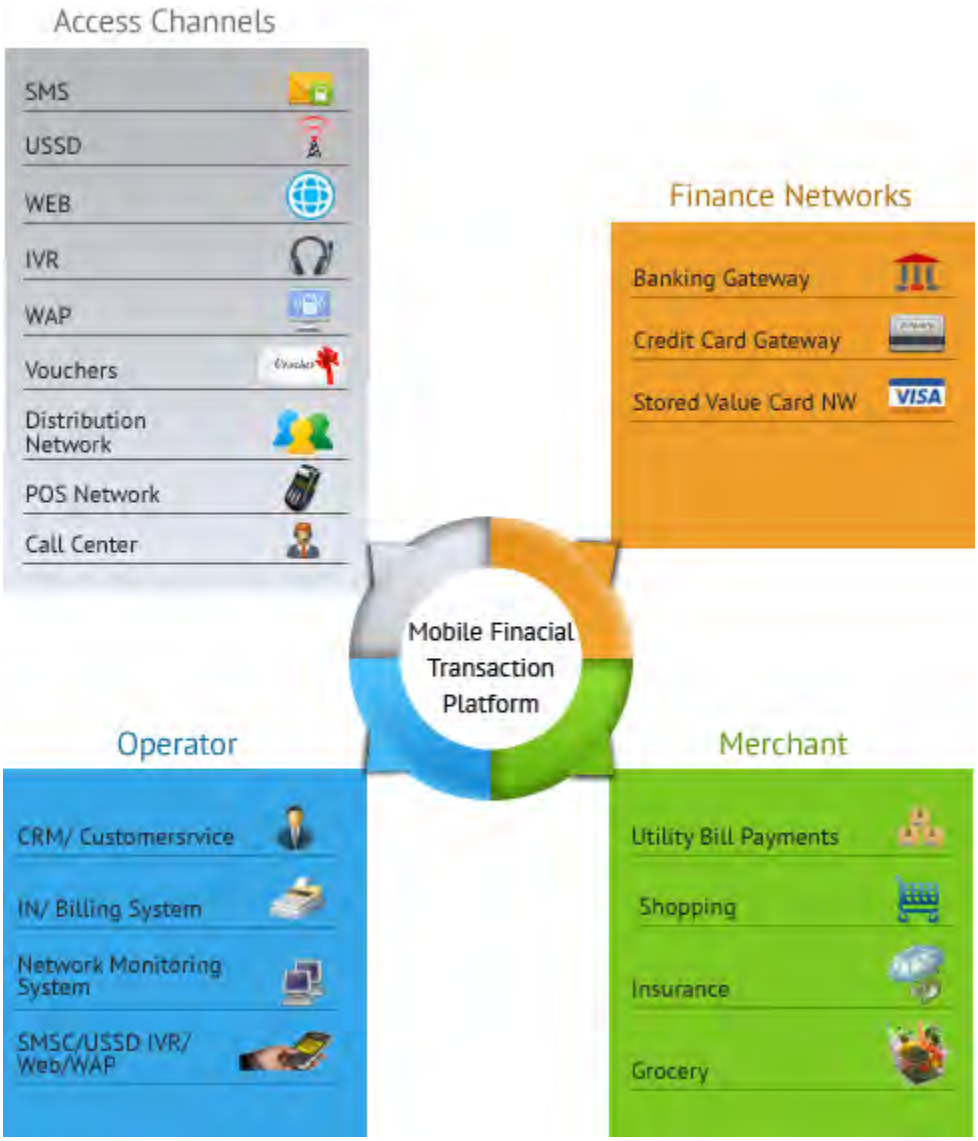
TABLE 7. DIGITAL PAYMENT OPTIONS

E-transfer mechanism		Beneficiary equipment	Infrastructure at the transaction point	Application
Cards	Magnetic stripe card	Card + signature (+ PIN at ATMs)	Merchant with PoS or ATM	Goods/services + cash
	Smart card	Card + PIN, signature or biometrics	Merchant with PoS or ATM	Goods/services + cash
	Contactless card	Card + PIN, signature or biometrics	Merchant with NFC PoS or ATM	Goods/services + cash
Mobile transfers	Mobile token	SIM + PIN	Agent with basic phone	Cash
	Mobile voucher	SIM* + Voucher number + PIN	Merchant with basic phone	Goods/services
	Mobile money	Phone +SIM + PIN	Agent/merchant with basic phone	Goods/services + cash
E-vouchers	E-vouchers	Voucher number + PIN	Merchant with smartphone or computer	Goods/services

* not always required

Source: CaLP: e-Transfers in Emergencies: Implementation Support Guidelines, Table 1 (http://www.cashlearning.org/resources/library/390-e-transfers-in-emergencies-implementation-support-guidelines).

FIGURE 5. DIGITAL PAYMENT ECOSYSTEM



A digital payment ecosystem requires a variety of participants to support the reliable and effective processing of digital payments.

ANNEX I: KEY PLAYERS

- **Payment Service Providers:** Lonestar, (Ecobank and Guaranty Trust); other parties have declared interest in becoming mMoney providers, but prospects have been dampened by the Ebola crisis. Other new entrants like electronic voucher companies such as Aya, Transversal, Squid, Zoona. Large global payment companies include Visa, Mastercard who have a limited presence and larger remittance firms such as Western Union and MoneyGram.
- **Private Sector Distribution Channel Parties**: Companies with an existing presence in Liberia and payment channels for distribution could play a greater role in facilitating digital payment acceptance and cash out points include the top beverage distributors (Coca-Cola and Club Beer), logistics & transportation firms (Fedex and airlines) and the major foreign investors (Firestone and the extractive industries)
- **Government of Liberia:**
  - Central Bank of Liberia (CBL)—has statutory authority over digital payments and banks
  - Liberia Telecommunications Authority (LTA)—has statutory authority over MNOs
  - Civil Service Agency (CSA)—is actively supporting mMoney for payroll disbursements; CSA has the statutory authority for the government payroll and is instituting a biometric verification scheme to reduce "ghost" workers
  - Ministry of Education (MOE)—currently has over 500 teachers receiving stipends via mMoney and around 70 teachers receiving their standard salaries via mMoney
  - Ministry of Finance (MOF)—previously agreed to undertake a mMoney pilot project for pensions (military) and conditional cash transfers (CCT)
  - Ministry of Youth & Sports (MOYS)—one "work for pay" program is currently disbursing stipends to around 800 participants, and MOYS had previously agreed to expand to a further 15,000 CCT stipends (seasonal work)
  - Ministry of Gender & Development (MOGD)—currently disbursing CCT stipends (UNICEF-funded) in four counties, potentially to increase to 5,000 recipients, including the blind and disabled
  - MOHSW: Not presently involved in the mMoney trials, but considered a prime target because, like teachers, the majority of its workforce is up-country.
  - International Community:
  - African Development Bank (support for incentives and the CBL)
  - United Nations Capital Development Fund (financial inclusion)
  - UNICEF (providing funds for children and disabled via mMoney)
  - UNDP (social safety nets program to reach 100,000 households via cash transfers and compensation schemes, for a total cost of USD 34.2 m)
  - UNMEER (coordinating response to the Ebola effort)
  - UNMIL (providing transport & security to GOL "paymaster" teams moving cash)
  - ITU (leadership issues on ICT issues)
  - The World Bank Group (providing support to LTA)
  - The World Food Program (leading response efforts in affected countries)

ANNEX J: USAID/GOVERNMENT AND DEVELOPMENT PROGRAM SUPPORT AND USE OF MOBILE MONEY

- USAID provided technical assistance to the CBL for a cost-benefit analysis that compared the mMoney option with the existing disbursement system which uses EFT (direct deposit) for most transactions within Monrovia and check/cash elsewhere. This analysis estimated a benefit of US$6 million annually by migrating approximately 22,000 eligible GoL workers to mMoney.
- USAID conducted a survey of health worker pay in Liberia in 2012 under the USAID-GEMS program to evaluate digital payment options.
- USAID has supported five mMoney pilot projects, which have provided a "proof of concept" that mMoney can be adopted much more widely (provided that there is further technical assistance to strengthen the ecosystem):
  - Advancing Youth Program (AYP): pilot disbursed stipends to teachers that provided continuing education; 99% of recipients were very satisfied with this payment mechanism and the Implementing Partner reported significant savings compared with check/cash disbursements.
  - Liberia Youth Employment Program (LYEP): pilot resulted in significant savings and eliminated rampant fraud; LYEP reports it continues to save close to US$10,000/month by using mMoney as compared with bank fees that were associated with check/cash disbursements; MOYS stated intention to utilize mMoney to pay stipends for a second seasonal employment program with 15,000 recipients.
  - Presidential Back-to-School Program: President Sirleaf instructed the MOYS Minister to utilize mMoney to pay stipends to around 5,000 youth; the entire scheme went from the weekend cabinet meeting to participant registration to full disbursement in less than 10 days.
  - Ministry of Gender CCT: Lonestar won a competitive solicitation (funded by UNICEF) and currently provides CCT stipends to beneficiaries in at least four counties; discussions continue to expand to 5,000 recipients.
  - MOE Standard Salary: This pilot proved that payments made via the GOL treasury system can be as easily done as direct deposit and for comparable transaction fees; MOE has just stated its commitment to roll this out to all teachers to eliminate check/cash transactions.

ANNEX K: LONESTAR TARRIFFED MMONEY RATES, AGENT DENSITY AND CHALLENGES/INTERNAL CAPACITY NEEDS

Mobile Money Tariffs—Lonestar (As of Oct. 18, 2014)

TABLE 8. CASH-IN (DEPOSIT)

Min	Max	Fees
50	35,000	Free

TABLE 9. P2P- TRANSFER TO MOBILE MONEY USERS

Min	Max	Fees
100	35,000	Free

TABLE 10. CASH-OUT (WITHDRAWAL)

Min	Max	Fees
50	1,000	50
1,005	6,000	100
6,005	15,000	200
15,005	35,000	350

TABLE 11. P2C—TRANSFER TO NON MOBILE MONEY USERS

Min	Max	Fees
50	1,000	75
1,005	6,000	150
6,005	15,000	250
15,005	35,000	400

TABLE 12. LONESTAR MOBILE MONEY AGENTS (OCT. 2014)

County	Count	% of Total
Montserrado	186	47.3%
NIMBA	51	13.0%
Lofa	42	10.7%
Bong	29	7.4%
Maryland	29	7.4%
Grand Gedeh	16	4.1%
River Gee	11	2.8%
Margibi	8	2.0%
Sinoe	6	1.5%
Grand Bassa	5	1.3%
Bomi	4	1.0%
Grand Cape Mount	2	0.5%
River Cess	2	0.5%
Cape Mount	1	0.3%
Grand Kru	1	0.3%
Total	*393*	*100.0%*

Lonestar's mMoney product has minimal internal staffing and faces a number of challenges most of which have been conveyed to the respective parties, with varying degrees of responsiveness. These include:

- Lack of dedicated troubleshooting/call center for mMoney
- Lack of harmonized SIM/MM KYC
- Single currency (LDs)
- Reliance on under-supported Fundamo platform
- Ghost workers/challenges in registering workers
- Government reliance on contract vs. salaried workers
- High fees accumulated by banking sector creates disincentives to move away from direct debit/cheques.

ANNEX L: BUILDING IMMEDIATE SOLUTIONS WITH THE LONG TERM IN MIND

Strategic ways to strengthen the local mobile money supply chain through a card/voucher program. There are similar stakeholders and standard operating procedures between electronic voucher and mobile money ecosystems. The below table identifies areas where electronic voucher programs can strengthen the ecosystem and uptake of mobile money.

TABLE 13. STRENGTHENING THE MOBILE MONEY ECOSYSTEM

Operating Procedures	Electronic Vouchers	Mobile Money
Participant/Client Registration	Register participants of the electronic voucher program.	Provide an option for these registrants to also register for a mobile money account. Have SIM cards on hand, during registration for those not already in possession of a phone.
Participant/Client Training	Train electronic voucher participants on key aspects of e-money; PIN codes, expectations of the agent/merchant, what do if you lose your card/phone.	In addition to key messages around agent/merchant expectation and PIN codes, provide additional training on mobile money menu options and other product specific functions.
Merchant/Agent Selection	Develop criteria and recruit merchants/agents in the specific regions your program will operate.	Adopt some of the existing mobile money agent criteria Lonestar already has established. Work with Brandworx when selecting new merchant/agents
Merchant/Agent Training	Train merchants on the electronic voucher product and fees. Work with them to understand customer service, in addition to reconciliation and cash repayment processes	In addition to electronic voucher product training, collaborate with Brandworx to develop curriculum that includes mobile money product training for merchants/agents as well
Acquirer/Super Agent Collaboration	Work with local bank to help facilitate the reconciliation and repayment processes once vouchers have been redeemed (or during a set time period).	If possible, work with super agents or banks that merchant/agents would use to manage cash liquidity. This will help facilitate a natural transition from voucher repayments to agent liquidity management