Responding to Global Health Crises:

Lessons from the U.S. Response to the 2014-2016 West Africa Ebola Outbreak

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IBM Center for
**The Business
of Government**

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FOREWORD

On behalf of the IBM Center for The Business of Government, we are pleased to present this report, *Responding to Global Health Crises: Lessons from the U.S. Response to the 2014-2016 West Africa Ebola Outbreak*, by Jennifer Widner, professor of politics and international affairs, Woodrow Wilson School at Princeton University.

In 2014, an unprecedented outbreak of Ebola virus in Liberia, Sierra Leone, and Guinea shined a spotlight on global capacity to deal effectively with a fastmoving epidemic that crossed international borders. Given the seriousness of the situation, the U.S. Agency for International Development (USAID) Office of U.S. Foreign Disaster Assistance (OFDA) deployed a Disaster Assistance Response Team (DART), as an interagency platform for coordinating operations to end the outbreak. In the event of a war, earthquake, hurricane, or other disaster outside the United States, OFDA can quickly mobilize such a team to assess humanitarian needs, assemble expertise from many parts of the U.S. government, contract with trusted global partners to provide essential services, and help manage the response, drawing on a pool of flexible funding to finance the activities. The DART worked in concert with a corresponding response management team in Washington, D.C., which helped assess strategy, and lead an U.S. interagency response to quell the outbreak.

DANIEL J. CHENOK

Professor Widner, who directs the Innovations for Successful Societies, a Woodrow Wilson School research program on improving government performance, has extensively researched and reviewed the U.S. DART deployment to stop the spread of Ebola in West Africa. Her report describes how collaboration among multiple agencies, across national governments, and with a full spectrum of global partners was integral to the U.S. response. The report draws on original research and extensive interviews of DART leadership and key stakeholders involved in the response.

JOSH MANDELL

The report assesses the DART in four phases. Under each phase, the author details insights and key lessons learned that frame practical advice for effective collaboration across agencies and national governments. From this rich narrative, the author also conveys the actions taken by the DART to ameliorate and transcend core challenges in mobilizing a response to a global health crisis.

According to Professor Widner, DART staff often described their work as "building the plane while flying," which was an apt description for the Ebola crisis. Before responding to a disaster, end goals, roles, and protocols must be clear, but leadership could plan only up to a point. We hope that this report, which tells a story about effective crisis response collaboration—and from that story offers insights, reflections, and lessons learned—can help government leaders and stakeholders who may encounter similar situations to prepare and respond effectively and efficiently.

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EXECUTIVE SUMMARY

From early August 2014 to January 2016, an USAID Disaster Assistance Response Team, or DART, deployed to Liberia to help coordinate efforts to stop the spread of Ebola.

The DART was the first to involve a large-scale partnership with the U.S. Centers for Disease Control and Prevention (CDC) to combat an infectious disease outbreak. Although the deployment, which scaled up earlier assistance, took place five months after the first reported cases and required extensive adaptation of standard practices, it succeeded in helping bring the epidemic under control: the total number of people infected—28,616—was well below the potential levels predicted by the CDC's models. This case study highlights the challenges of making an interagency process work in the context of an infectious disease outbreak in areas where health systems are weak.

The DART Concept

The idea behind the DART—elite response specialists charged with coordinating the U.S. response to disasters overseas—was the product of a learning process that started in 1964, when the U.S. government realized it needed to increase its effectiveness in dealing with earthquakes, storms, and other types of humanitarian crises outside its borders. When the size or scope of a disaster requires it, USAID, and its Office of U.S. Foreign Disaster Assistance (OFDA) sends a DART to crisis-affected areas. Deployable within hours of an emergency, this team of humanitarian experts and technical advisors are on the ground to assess the situation firsthand, identify the most urgent needs, and coordinate an effective U.S. government response. The DART and its parent, the Office of Foreign Disaster Assistance (OFDA), gradually developed a distinctive approach to fostering collaboration across government—an approach that was at the center of the U.S. response to the Ebola crisis.

U.S. DART Response in Four Phases

As the outbreak shifted from rural areas to urban settings or as testing became more available, needs and the opportunities changed. Successive DART leaders faced wholly new challenges and tasks. This report illustrates the DART response over four phases:

1 Phase One: August—September 2014

In order to implement the goals set in the initial strategy, the initial DART had to coordinate with diverse partners. Doing so required establishing structures and implementing practices that fostered close cooperation and allowed for adaptation as obstacles materialized and the course of the epidemic shifted. In this phase, the DART focused on fostering collaborating with the Liberian government. It was essential to devise a way to collaborate effectively with Liberia's president, cabinet, and health ministry as well as with any medical providers still operating in the country. Given the seriousness of the outbreak, the DART had to recruit response partners. Attracting external implementation partners to manage burial teams, staff Ebola treatment units, organize last-mile delivery of supplies, and handle other functions proved more challenging than in other DART interventions. This DART response was different. The Centers Disease Control and Prevention was vital to the DART response and building that

relationship is integral. The CDC and OFDA had to work out system and process differences on the fly and then make sure everyone on the ground understood. Mandatory predeployment briefings for all new personnel helped ease the problem. In late August 2014, just as the DART began to implement its priority activities and Liberia's new Incident Management System came into being, the number of new Ebola cases began to rise rapidly. The Obama administration issued an executive order to deploy the military. The DART had to integrate the military and its limited contribution into the response. During this phase with so much going on, strengthening diplomatic reach became an essential element of the intervention. The DART had to manage continued bad news and responding quickly and effectively was a critical and continuing task.

2 Phase Two: Bending the Curve—September-October 2014

At the end of September 2014, nearly two difficult months after the DART had deployed the overarching mission goal remained unchanged—doing whatever was needed to bend the curve—and the DART leaders job was to make the system run effectively in order to reduce the number of new infections.

One central focus was to get more Ebola treatment units, called ETUs, up and running in order to segregate sick people from healthy people. Another was to create a rapid-response system to serve remote areas of Liberia. Hot spots were popping up in the countryside as the rainy season tapered and people were once again mobile. The DART wanted to create a sentinel system to detect new cases and a flexible response capacity to quell new outbreaks before they expanded. This initiative, known as RITE for Rapid Isolation and Treatment of Ebola, created on-call teams to investigate and respond to news of an outbreak in a remote area. It also provided pre-packaged kits of essentials—rehydration fluids, infection prevention materials— and a new testing capability that reduced the time for a diagnosis from roughly one day to a mere fifteen minutes. Some of the previous challenges began to ease too. The DART continued to focus on partnering with the Liberian government. The DART team continued building an effective working relationship with the CDC and the U.S. military in order to ensure the effort achieved its goals. The need to finesse differences in organizational culture also extended to the DART's relationship with CDC and the military. The DART's goal was also to bend the line, but it was hard to know the line's shape at any particular time, never mind how it would change. Bending the line was a data-driven result in a world where data were ridiculously terrible or fuzzy and unreliable. Swedish health statistician Hans Rosling, internationally known for his work on data visualization, came to Liberia in mid-October 2014 to support the IMS data management committee. Scientific expertise was more useful than it had been earlier—and there was more of it available, now that other systems were beginning to work effectively.

3 Phase Three: Getting to Zero—November to December 2014

In November 2014, Mia Beers took over as DART leader. Although Rosling's charts showed the number of new infections had declined, Beers worried that unreported cases could be wild cards, and that the crisis could erupt anew. If the outbreak rekindled, international responders said, there would not be enough beds. And if it ended, there would be unused capacity. As the situation began to improve in Liberia, new challenges arose. It was clear that the epidemic was behaving differently in each of the three countries involved. Infection rates had come down in Liberia, but rates were spiking in neighboring Sierra Leone. The DART began working to hone a regional strategy. From mid-November, the number of reported new infections continued to decline, although small outbreaks occasionally popped up. By year end, the number of new infections had fallen to fewer than 100 per week. Small outbreaks could always ignite, but it looked increasingly possible to extinguish the epidemic.

4 Phase Four: Transitioning Out—December 2014 to July 2015

At the end of December 2014, Doug Mercado, another DART veteran became the DART leader. Mercado had helped lead refugee protection in conflict zones around the globe. He arrived on January 2 and stayed through July 2015. His challenge was to think about how to shift the orientation and think about rightsizing to match the epidemiological profile of the disease. Revising goals and making new plans required a joint effort. The DART also concentrated on building Liberia's own health capacity and helping wind down the emergency phase of the U.S. response. High on the list was what to do with the Ebola treatment units that the U.S. had completed after the number of new infections had started to decline. The DART worked to end U.S. military participation, which had completed a list of tasks assigned by the DART. The next question was whether—and how—any of the emergency Ebola infrastructure that the U.S. government had helped build could be adapted and left behind to strengthen future health capacity in Liberia. The DART had to come up with a plan.

Insights for Effective Interagency Collaboration: Ebola Outbreak Response.

This report identifies specific insights from the U.S. DART Ebola response that can help others in similar situations more effectively manage interagency collaboration. Many of these insights offer value and are applicable beyond a crisis response context.

1. Overcoming differences in procedures and organizational culture

2. Leveraging the value each response partner brings however limited

3. Establishing geographical scope

4. Developing a structure for collaboration

5. Planning for the response and exit

6. Funding the DART mission

7. Unique nature of the Ebola crisis and response

Though this report focuses on a health crisis response during specific timeframe global public health experts recognize the importance of continual vigilance and perhaps reluctantly accept that their work may only stave off an outbreak for a period of time. This was the case with Ebola in West Africa as 2018 saw another outbreak in the Congo.

INTRODUCTION

In 2014, an unprecedented outbreak of Ebola virus disease in Liberia, Sierra Leone, and Guinea shined a harsh spotlight on global capacity to deal effectively with a fast-moving epidemic that crossed international borders. By the end of July, the outbreak had started to overwhelm health care systems in all three affected countries.

In Liberia, health centers began to close, and its President Ellen Sirleaf appealed for help from the United States. A crucial initial question was whether the U.S. government should authorize the USAID's Office of U.S. Foreign Disaster Assistance (OFDA) to deploy a Disaster Assistance Response Team, or DART, as an interagency platform for coordinating operations to end the outbreak. In the event of a war, earthquake, hurricane, or other disaster outside the U.S., OFDA could quickly mobilize such a team. (See The DART Concept).

THE DART CONCEPT

The idea behind the DART—elite response specialists charged with coordinating the United States' response to disasters overseas—was the product of a learning process that started in 1964, when the U.S. government realized it needed to increase its effectiveness in dealing with earthquakes, storms, and other types of humanitarian crises outside its borders.

The DART footprint was flexible and could expand or contract based on a situation, sometimes growing to more than 50 team members when necessary. "You look at what the hazards are and choose the kinds of people you need based on that," said Tim Callaghan, the first Ebola team leader. A typical DART drew members from the U.S. Commissioned Public Health Service, the U.S. military, the U.S. Forest Service, and the Los Angeles and Fairfax County, Virginia, fire departments, as well as from OFDA and its roster of other specialists stationed around the world. It included writers who could document activities, communications specialists, and logisticians as well as people with skills essential to a given situation.

To collaborate effectively, a DART used an incident command system based on a model put in place throughout the United States starting in the 1980s. Designed for speed and effectiveness, the teams had pre-established lines of authority and sharply defined role expectations. Key partners trained together in advance because there was no time to learn the ropes in the middle of a crisis.

In the field, DART workers assessed the situation firsthand, identified urgent needs, determined which NGOs or international organizations had the capacity to assist, and coordinated the overall U.S. response, keeping the effort focused until the job was complete.

One example of an interagency process, the DART and its parent, the Office of Foreign Disaster Assistance, gradually developed a distinctive approach to fostering collaboration across government—an approach that was at the center of the U.S. response to the Ebola crisis.

For more on OFDA's prior engagement in infectious disease outbreaks, see Office of Inspector General U.S. Agency for International Development, Lessons from USAID's Ebola Response Highlight the Need for a Public Health Emergency Policy Framework, Audit Report 9-000-18-001-P, January 24, 2018, p. 21.
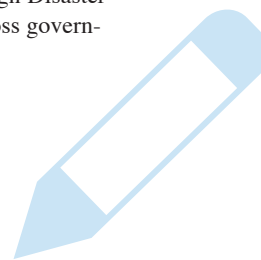
The DART assesses humanitarian needs, assembles expertise from many parts of the U.S. government, contracts with trusted global partners to provide essential services, and helps manage the response, drawing on a pool of flexible funding to finance the activities. The Obama administration tasked OFDA to lead an interagency response.

From early August 2014 to January 2016, an OFDA DART deployed to Liberia to help coordinate efforts to stop the spread of infection. The DART was the first to involve a large-scale partnership with the U.S. Centers for Disease Control and Prevention (CDC) to combat an infectious disease outbreak.

The disease caught experts by surprise. In late May new infections appeared, and by the end of June there were 51 Ebola cases and 34 deaths in Liberia—plus 297 additional cases and just over 191 deaths in neighboring Sierra Leone and Guinea.[1] Moreover, while previous outbreaks had occurred in remote parts of Central Africa, in this instance travelers quickly carried the disease to urban areas.

The Switzerland-based NGO Médecins Sans Frontières (MSF, or Doctors Without Borders) pushed the WHO to declare a public health emergency of international concern, an action that would mobilize resources to help contain the epidemic. However, internally divided about what to do and lacking adequate capacity to respond on the scale needed, WHO's leaders demurred.[2] Liberia's president, Ellen Sirleaf, called for global action, but the response was slow.

To activate a DART was not a small matter. "It's a big deal when you create a DART," said Tim Callaghan, who later helped lead the response. "It sends a signal. It's a brand name. It is like sending in the SEALS," the U.S. Navy's special-operations force. The National Security Council (the White House's international security policy forum) and USAID had to make hard decisions about whether enough capacity was available. At the time, OFDA had DARTs in place in South Sudan, Syria, and Iraq, and the office had never managed four large DARTs simultaneously.

There was an additional hurdle. OFDA had seldom deployed a DART to contain an infectious disease outbreak, and the office had never worked closely with large numbers of CDC personnel to do so. When the Obama administration gave the go ahead to OFDA to respond, the office recognized it would have to revamp some of its standard practices for managing an interagency effort to address a humanitarian disaster overseas.

Although the deployment, which scaled up earlier assistance, took place five months after the first reported cases and required extensive adaptation of standard practices, it succeeded in helping bring the epidemic under control: the total number of people infected—28,616—was well below the potential levels predicted by the CDC's models.

This U.S.—focused case study highlights the challenges of making an interagency process work in the context of an infectious disease outbreak in areas where health systems are weak. Senior decision makers were cautious. In mid-July, OFDA and the CDC each sent representatives to assess conditions in Liberia. Operations were in disarray. Liberia's own response personnel and logistical capacity were stretched thin. There were urgent needs for basic supplies such as chlorine and body bags. The Liberian health ministry's newly created National Public Emergency Task Force had set up essential committee functions, but decision-making responsibilities were unclear. The Ministry of Internal Affairs and Sirleaf's office, both of which had

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1. See the CDC detailed case count accessed at https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/case-counts.html
2. A timeline of the WHO's involvement in the outbreak can be accessed at http://www.who.int/csr/disease/ebola/one-year-report/who-response/en/

important roles to play, were left out of some key meetings of the task force. And because of the number of functions she had to supervise, Chief Medical Officer Dr. Bernice Dahn, head of the Liberia response, was swamped with work. Meanwhile, the number of new cases was increasing at an alarming rate. Within days, the risk came into sharper focus when two American health workers serving in Liberia with NGOs Samaritan's Purse and SIM USA contracted Ebola. The two flew back to the U.S. on the only airplane in the world that was known to have the equipment needed to conduct safe medical evacuation of Ebola patients.

On August 5, 2014, OFDA Director Konyndyk gave the go-ahead to deploy a DART, as Liberia's health care centers, hospitals, schools, and other public institutions closed their doors to prevent further transmission. Although the initial focus was on Liberia, the plan was to support all three affected countries if asked to do so. (The heads of the U.S. diplomatic missions in Sierra Leone and Guinea would soon follow Malac in issuing disaster declarations.) The team had to move swiftly. If it did the right things, thousands of lives could be saved and a wider disaster averted.

Developing the U.S. Ebola Response
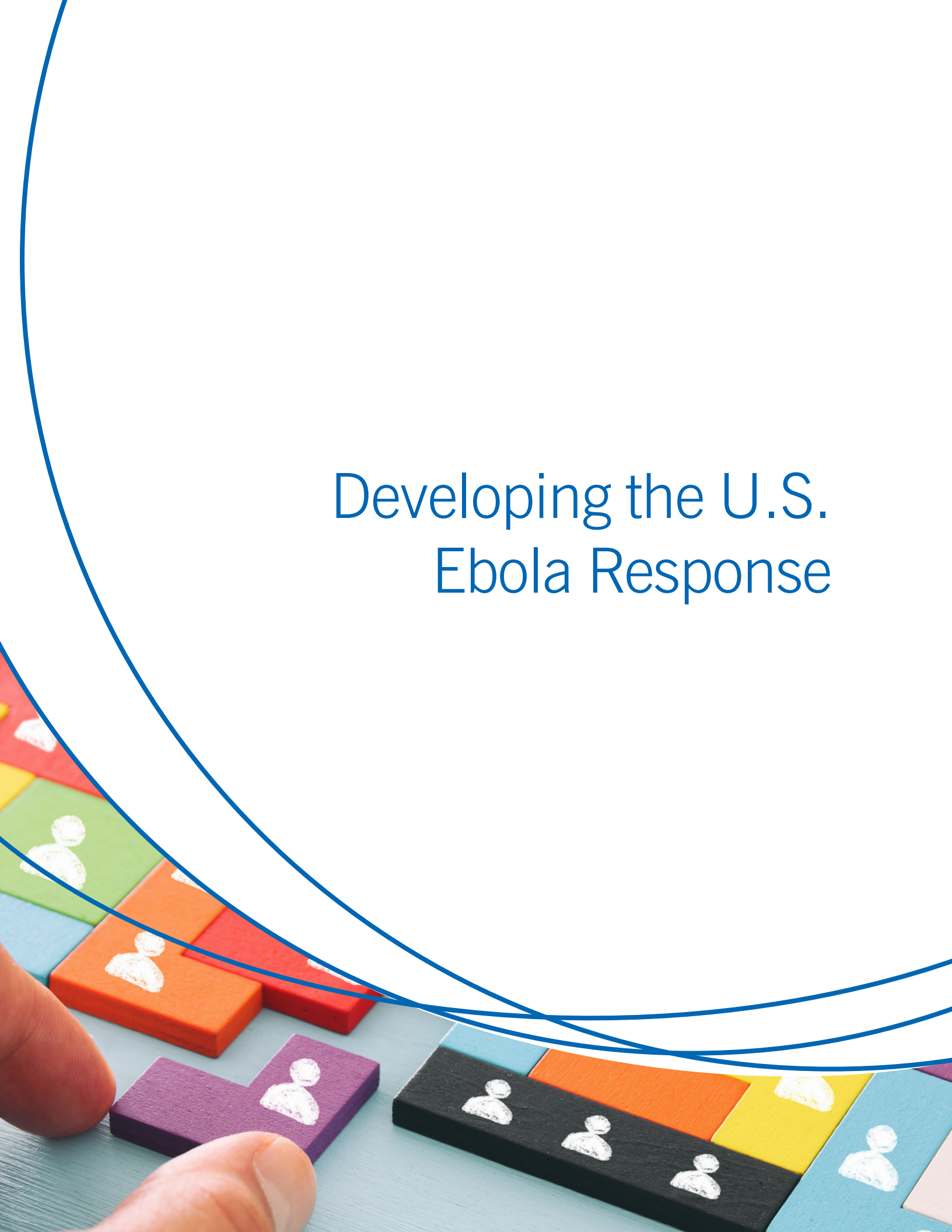
OFDA staff often described their work as "building the plane while flying," and the Ebola crisis was an example in extremis. Before responding to a disaster, end goals, roles, and protocols had to be clear, but OFDA leadership could plan only up to a point.

Learning and adapting at high speed. Strategy and tactics had to evolve as circumstances changed and more information became available. Although the DART concept stressed preparation, once in the field the emphasis was on learning and adapting at high speed.

Tag-team approach to leadership. Strong and capable leadership was crucial to the success of the DART. The DART team needed people who had experience in coordinating novel, complex operations that engaged many partners from the NGO world and the United Nations. Prime candidates included veteran OFDA people who played important roles either at the office's headquarters or as heads of regional field offices. Aware that such high-level people could not be absent from their regular jobs for extended periods, OFDA leadership opted for a "tag-team" approach in which leadership would pass sequentially on a planned schedule. The lineup included:

- Tim Callaghan, head of the Latin America regional office and a veteran of the 2010 Haiti earthquake response and other high-profile recovery efforts

- William Berger, who headed the Asia regional office and had led the DART that responded to the 2011 Fukushima Daiichi nuclear disaster in Japan

- Mia Beers, head of the Humanitarian Policy and Global Engagement Division, who was experienced in leading DARTs in complex crises across several continents

- Doug Mercado, who was on OFDA's call-up roster and had 25 years of experience in humanitarian relief in places ranging from Nicaragua to Bosnia. At the time, he was with the UN's World Food Programme.

Identifying needs, setting priorities, and coordinate response activities. Callaghan, the first team leader, had to identify humanitarian needs, set priorities, and coordinate response activities with key stakeholders that included several parts of the U.S. government, the governments of the three most-affected countries, UN agencies, and NGOs that had experience with the kinds of frontline service delivery needed. He worked closely with Ambassador Malac, who oversaw all U.S. non-military operations in Liberia. He was also the primary U.S. liaison to Liberia minster of health.

Establishing a proper division of labor. Before the DART deployed, OFDA and CDC agreed that the latter agency would oversee medical and health decisions. Given the DART lacked that competence, it was easy to agree to such a division of labor. However, overall management of the response was under the purview of the DART leader, who was in charge of the overall effort and reported to the U.S. ambassador in Liberia and to OFDA's Washington headquarters.

To assist the DART team on the ground and provide a link to CDC operations, two deputies—one from each organization—were appointed. Justin Pendarvis, OFDA's public health adviser, filled one position. Pendarvis had helped carry out the assessment that led the White House to deploy the DART. Because of his past work with NGOs in Liberia, he had personal relationships with people in Liberia's health ministry, and he knew the conditions under which the DART had to operate. The second deputy was Jordan Tappero, director of the CDC Global Health Center's Division of Global Health Protection, where he led CDC's Global Health Security. Tappero would lead the CDC effort as well as serve as second deputy on the DART. To help bring the CDC's expertise to bear, three other CDC people also joined the initial team of 12. Their numbers—and the overall size of the team—would grow quickly.

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Communication, communication, communication. A crucial aspect to a properly functioning DART effort involves communication, communication, and more communication. The DART team leader checked in daily with the response management team in Washington, which handled requests for support. A mission tasking matrix, called MITAM, kept track of actions and who was responsible for completing them. (see Figure 1: Mission Tasking Matrix Sample Page) OFDA leader Konyndyk also consulted regularly with team leaders and initiated a conversation focused on strategy every weekend. In addition, an interagency conference call—weekly or daily, depending on circumstances—kept senior officials in different parts of government in the loop, including the National Security Council (the White House's voice), the Defense Department, USAID, the Department of Health and Human Services, the CDC, and others as needed. The purpose was to share information, give people a chance to ask questions about rationales behind the decisions, troubleshoot major policy issues, and think ahead. Separately, OFDA's parent agency, USAID, set up its own Ebola "secretariat," which held open meetings, sometimes twice a day, to improve coordination between the different parts of the agency engaged in Ebola-related activities that fell outside the DART's focus, such as recovery planning and innovation.

Figure 1: Mission Tasking Matrix Sample Page.

Source: World Bank SO Website, "Participatory Tracking: Data Collection"

Engaging senior U.S. government leaders. To strengthen these systems, USAID senior leaders took on additional tasks. Administrator Shah was the interlocutor with the secretary of the Department of Health and Human Services, the White House national security adviser, and the president. At certain times during the crisis, he briefed the president twice a week with information prepared by OFDA teams. Shah "played a huge role," Konyndyk said. "He was very focused on the details—in part because the president was." Nancy Lindborg, USAID assistant administrator, played an important role by communicating with CDC Director Frieden

and helping span the gap between agencies. "The health world and the crisis response world didn't know each other—literally did not know who their health colleagues were," Lindborg said. Sensitive policy decisions belonged with the president, acting through the National Security Council. Obama became more personally involved than presidents usually did, and he insisted that decisions rest on science and evidence, which pushed the DART to collect more types of data more frequently than in previous disaster interventions. In Liberia, Ambassador Malac initiated morning meetings seven days a week with DART leaders and invited her own senior staff so that all were getting the same information. She assigned embassy personnel to follow up on specific issues if the DART needed assistance. Malac considered these meetings vital: "Everyone got the same message, and if someone needed help with the foreign ministry or liaising with the military, we did that." When the DART had to coordinate response efforts with the Liberian Ministry of Health or Sirleaf, the team leader worked closely with Malac, who could pick up the phone and make the high-level calls required.

Getting to Work on the Ground

After arriving in Liberia in August, the DART team leader quickly learned that an important part of their job was to fit into the situation on the ground. "We had to make decisions about how to be most effective alongside ongoing efforts," Pendarvis said. "We generally lean on UN-led clusters [of humanitarian agencies] to help outline a plan and to jointly identify needs with the host government. But that option didn't exist at this stage in the response. So we [the DART members] took greater responsibility for planning and identifying the partners that could help fill needs—and for developing guidance. That was unique for us." (see Humanitarian Clusters Not Activated.)

HUMANITARIAN CLUSTERS NOT ACTIVATED

Normally, a DART coordinated its response efforts with the humanitarian cluster system, first established by the United Nations in 1991 and updated in 2005. The clusters were preconfigured groups of agencies and NGOs that specialized in providing certain major elements of disaster relief, such as water, sanitation, and hygiene; logistics; food; telecommunications; and protection. A UN organization such as the World Food Programme or UNICEF led each cluster. The UN Office for the Coordination of Humanitarian Affairs helped put a plan in place, develop and disseminate operational guidance, and organize field support.

In July-August 2014, the West Africa Ebola outbreak presented an unfamiliar, complex emergency. Within the UN system there was no precedent for handling an infectious disease outbreak that was also a humanitarian crisis or disaster, defined by the UN Office for Disaster Risk Reduction defined as a disruption involving "widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope with using its own resources." The UN secretary-general did not activate the Office for the Coordination of Humanitarian Affairs in its traditional capacity as the UN coordination body. As a result, the DART had to play a greater role than in normally did in helping partners to frame a strategy and work together, aided by a World Health Organization "Road Map," released at the end of August 2014.

Although the changing situation would surely require midcourse adjustments, the situation required an initial strategy. The team focused on the big picture. The DART's goal was to reduce the number of new infections to zero, flattening the epidemic curve, which graphed the cumulative number of cases. "Bending the curve" or "bending the line" was the lodestar. To achieve that target, the conventional medical response would be to quarantine or closely monitor all those who had been exposed and quickly isolate the sick. That approach required:

1. Special facilities with trained staff and management personnel

2. Testing capacity to distinguish between people who had malaria and people who had Ebola (both diseases caused fevers and headaches)

3. Ways to help healthy people stay safe

4. Cooperation and support of affected communities to investigate each suspect case and rapidly identify those who may have been exposed.

From the outset, however, it was clear that there was no way to build enough treatment and isolation capacity to meet the need during Liberia's intense May-October rainy season. And this delay had serious consequences: a shortage of such facilities would raise questions about safety and likely would hurt the recruitment of medical personnel from other parts of the world.

"You needed Ebola treatment units, but they were hard to build quickly—especially during the rainy season, when roads were washed out," said Callaghan, the first DART leader. "The question was how to isolate those who were ill without those units. This problem was a big source of stress, and we needed the CDC's advice about this." Callaghan recognized that his team had to take other steps to reduce the spread of infection. He said he decided to focus first on "burials, messaging, and logistics," as well as expanding laboratory capacity.

The Ebola virus spread most easily just after death, support for fast but safe and dignified burials became a crucial component of the DART's strategy to stop the spread of infection. Doing this effectively meant working with community leaders and partners such as the Red Cross and the NGO Global Communities to form, train, and deploy burial teams, as well as promote new ways to honor and bury those who died.

Social mobilization—helping people take steps to protect themselves—was essential to support safe burials but also to help people avoid contracting the virus in other ways. UNICEF had launched a messaging campaign on Ebola detection and prevention in April, but the effort had mixed results.

Logistics were key to a successful strategy. Burial teams needed training and supplies such as gloves, protective suits, chlorine disinfectant sprayers, and body bags. Quickly moving those items to Liberia was essential—in Monrovia, the capital, bodies lay in the streets, because no one wanted to touch them without special protection. OFDA had some of the items in its stockpiles. "The WHO, the World Food Programme, and private businesses were also beginning to bring in supplies, so we needed a coherent system for facilitating imports and managing the inventory," Pendarvis said.

The DART also imported mobile lab facilities to reduce the time required for evaluating an Ebola test from four days to four hours. That step enabled MSF (Médecins Sans Frontières, or Doctors Without Borders), which had been one of the first responders and continued to work in Liberia throughout the crisis, to sort people more rapidly and reduce the chances of infection. Eventually there were seven mobile labs from the U.S. Defense Department and one from the CDC–National Institutes of Health.[3]

A critical element of the initial strategy—and one that carried through subsequent phases of the intervention—was flexibility. The team had to reassess priorities and make trade-offs constantly. For example, DART leaders saw little alternative to home-based isolation until there were enough community isolation centers and Ebola treatment units. But MSF worried that this approach would spread the disease, because people who were ill might try to go to the fields or markets for food—or a relative would make a mistake and come into contact. Instead, MSF wanted a fast and massive investment in makeshift facilities like those it had built, with floors made of shipping pallets and walls and ceilings made of plastic sheeting.

"It was really difficult, but critical, to do things in parallel," Pendarvis recalled. "We didn't want to recommend that people remain in their homes if that was a death sentence for family members. But there were genuine concerns that creating a community isolation center would amplify the disease. There was constant tension between the options. A continuous challenge was to do no harm."

As the outbreak shifted from rural areas to urban settings or as testing became more available, needs and the opportunities changed. Successive DART leaders faced wholly new challenges and tasks.

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3.   Department of Defense archived news. Accessed at http://archive.defense.gov/home/features/2014/1014_ebola/

U.S. DART Response in Four Phases: Evolving Challenges and Critical Lessons Learned

As the outbreak shifted from rural areas to urban settings or as testing became more available, needs and the opportunities changed. Successive DART leaders faced wholly new challenges and tasks.

1 Phase One: August–September 2014

In order to implement the goals set in the initial strategy, Callaghan's team had to coordinate with diverse partners. Doing so required establishing structures and implementing practices that fostered close cooperation and allowed for adaptation as obstacles materialized and the course of the epidemic shifted.

Collaborating with the Liberian government. It was essential to devise a way to collaborate effectively with Liberia's president, cabinet, and health ministry as well as with any medical providers still operating in the country. "A lot of our effort usually goes into building a government's capacity to deal with its own situation," Callaghan said. Liberia was still recovering from a civil war that had ended 10 years earlier. Although ministries were functioning better, they still struggled to get things done quickly and efficiently.

The DART helped Liberia organize operations to create a workable decision structure that could respond to the dynamic demands of the Ebola situation. CDC personnel proposed an incident management system (IMS)—which had a direct line to Liberia's health minister—to replace the over-stretched National Public Emergency Task Force within the Ministry of Health. The assistant minister of health oversaw six IMS committees, each of which covered a function essential for containing an infectious disease outbreak: epidemiological surveillance, contact tracing, laboratory, social mobilization, case management, and logistics/support. A nongovernmental partner—a UN organization in most instances—co-chaired each committee with a Liberian official. Other ministries and organizations provided services and expertise to the committees, under the direction of the committee chairs. Soon there were daily IMS meetings—always attended by a DART member and a CDC representative as well as others with active roles in the response.

The Liberia IMS sent issues that required policy decisions, or high-level political clout, to a new President's Advisory Council on Ebola, consisting of Liberia's health minister, the U.S. ambassador, and several other ministers. The advisory council helped the president and the cabinet track progress and solve problems without getting bogged down in administrative matters.

Getting the system up and running turned out to be a slower, rockier process than anticipated, because the various participants had to learn their specific roles. "The time to create an incident management system is not in an emergency," Callaghan reflected. "You need to do the capacity building in advance." Usually the incident management system is more focused on a management process. In Liberia, the IMS was more focused on information sharing.

"It would have been unfair to export a U.S. domestic model of incident management," Pendarvis added. "We needed something between a command-and-control approach and a consensus-based coordination system, such as the humanitarian cluster system that the UN Office for the Coordination of Humanitarian Affairs usually set up. We needed a bit of both. We had to have some ability to forge agreements and coordinate."

Recruiting partners. Attracting external implementation partners to manage burial teams, staff Ebola treatment units, organize last-mile delivery of supplies, and handle other functions proved more challenging than in other DART interventions. Usually, those kinds of partners—

both within government and outside government—were quick to make themselves available. But after Samaritan's Purse and SIM USA staff members contracted Ebola at the end of July, rumors circulated that commercial airlines were going to shut down service. Already, people had started leaving Liberia—"the kinds of people we would need," Callaghan said.

OFDA reached out aggressively but was unable to mobilize the NGO capacity that it needed. Most organizations had abandoned their operations, having no way to protect their employees and lacking reliable means to move people into and out of Liberia. Nonetheless, MSF continued its work, and a few organizations, such as International Medical Corps and Global Communities, agreed to join the response, as did parts of the UN and the Switzerland-based International Organization for Migration (an intergovernmental organization that later became part of the UN).

Much of the fear was ascribed to a shortage of accurate information and an abundance of uncertainty. The DART team was asking NGOs to come manage Ebola treatment units, when they'd never done that before. Contracting the virus was not as easy as many thought, if people had adequate protection. The virus was not airborne; it was transmitted only through direct contact with bodily fluids. However, at the time there was no vaccine to protect people against the disease it caused; there were only a few doses of an experimental-treatment drug; and, there was only one plane, anywhere in the world, with the capacity to evacuate volunteers who fell ill.

Another source of uncertainty arose from speculation about whether countries would start to close their borders to travelers from the region, which would make it difficult or impossible for volunteers to return home. By the middle of August, the number of airlines serving Liberia had dwindled to two—Brussels Airlines and Royal Air Maroc, the Moroccan national carrier. Some countries had tightened border restrictions, and discussion of quarantine had exploded as a political issue.

Fear that the disease would spread globally had skyrocketed in the United States just as the DART was set to deploy. Blocking people traveling from the region from entering the U.S. or requiring mandatory quarantine in a third country making it much harder to staff the DART and recruit NGO partners. Such steps would make it even more difficult to find airlines and ships willing to carry cargo to Ebola-affected countries. To avert these problems, the CDC, the National Institutes of Health, the U.S. Department of Health and Human Services, and the U.S. Department of Homeland Security raced to introduce airport screenings and kits for self-monitoring at home.

Building a relationship with the CDC. The CDC was vital to the response. The agency deployed its people to remote areas and worked directly with those affected by the disease, setting up systems to trace personal contacts with infected people, managing cases, and testing therapies and vaccines.

The scale of its effort would eventually make the outbreak the largest emergency response in the CDC's history.[4] But the agency had little experience in mounting such a large operation in a region where infrastructure was poor and governments had limited capacities. Moreover, the CDC had its own processes and procedures, and its people were accustomed to reporting to their headquarters in Atlanta, which had activated its own Ebola emergency operations center.

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4. Tom Frieden, Forward to "CDC's Response to the 2014–2016 Ebola Epidemic—West Africa and United States," Morbidity and Mortality Weekly Report, Supplement, Vol. 65, No. 3, July 8, 2016. Accessed at https://www.cdc.gov/mmwr/ind2016_su.html

Despite the pre-deployment agreement that the CDC would oversee medical and health decisions while the DART leader had overall management responsibilities, the two differed in ways that complicated the partnership. As anticipated, some of the practical challenges of making the new interagency relationship work became clear only after the DART was in Liberia.

One significant difference was structural. The OFDA's incident command system delegated most of the operational decision making to field personnel. The CDC was more centralized. CDC Director Frieden had a direct hand in the day-to-day decision making of his agency's field operations. CDC employees, including CDC representatives on the DART, consulted each evening with the CDC's Atlanta Ebola emergency center. Issues that DARTs would normally handle at the field level—matters delegated by OFDA's director—tended to be elevated to Frieden within the CDC. That meant that the CDC director often would weigh in on issues the DART would have dealt with at the country level. Gradually the CDC's personnel in the field gained greater independence as U.S. domestic issues took more and more of senior CDC officials' time.

Further complicating the relationship was a difference in the status of the protagonists. Both Frieden and Konyndyk were presidential appointees. Although the two were counterparts in the Ebola response, Frieden had a higher public and political profile than Konyndyk did and had direct access to the White House. USAID Administrator Shah sometimes stepped in to help iron out disagreements and other wrinkles that resulted from the unusual structure.

Differences also affected lower levels of the combined operation. Because CDC workers had not received OFDA's disaster-response training, misunderstandings sometimes arose about what they could expect other partners to do. From time to time, CDC personnel working in remote areas instructed NGO partners to carry out specific tasks, forgetting that DART was in the lead and had contractual relationships with these organizations. The CDC and OFDA had to work out those differences on the fly and then make sure everyone on the ground understood. Mandatory pre-deployment briefings for all new personnel helped ease the problem.

Pendarvis, OFDA's public health adviser, said the differences had another important dimension: "The CDC was organizationally different. They are scientists, and they try to get the data right and target action accordingly. There was tension at points where we didn't have the data, but we had to act."

Integrating the military into the DART response. In late August 2014, just as the DART began to implement its priority activities and Liberia's new Incident Management System came into being, the number of new Ebola cases began to rise rapidly—especially in poor, crowded neighborhoods of the capital city, Monrovia. For the first time, the international public health community had to deal with rapidly spreading urban Ebola, instead of an outbreak in a remote rural area. The DART team faced questions from all sides, as doubts arose about whether the DART's approach would work. "I came back fervently convinced that the epidemic was outpacing the U.S. government response and the international response," Konyndyk recalled after visiting Liberia. "We were responding linearly, but the disease was growing exponentially."

International consensus was building that much more needed to be done. Both CDC and USAID leadership pressed the White House for stronger action. Some international voices even called on U.S. military involvement.[5] On September 9, 2014, President Obama received a let-

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5.   Helen Branswell. "MSF request for military help exposes severity of Ebola outbreak." MacLean's, September 3, 2014. Accessed at http://www.macleans.ca/news/world/msf-request-for-military-help-exposes-severity-of-ebola-outbreak/

ter from the Liberian health minister appealing for additional help. "Mr. President, at the current rate of infections, only governments like yours have the resources and assets to deploy at the pace required to arrest the spread," Sirleaf wrote. "Branches of your military and civilian institutions already have the expertise in dealing with biohazard, infectious disease, and chemical agents. They already understand appropriate infection control protocols..."[6]

On September 16, as the number of cases in Liberia topped 2,400 and approached 5,000 in the region as a whole, Obama issued an executive order to deploy the military.[7] (see Exhibit 2 in Appendix.) The U.S. Defense Department authorized the Africa Command to deploy almost 3,000 troops under a mission dubbed Operation United Assistance[8] under the command of Major General Darryl Williams.

The mission had specific objectives: to help train volunteers arriving from other organizations, to design and build a field hospital—the Monrovia Medical Unit—that would enable U.S. Public Health Service personnel to care for health workers who became ill, to construct Ebola treatment units, and to assist with logistics. Navy engineering and construction teams were quickly brought in. A port-opening team bolstered cargo-handling capacity in Senegal and Liberia, while the military also provided communications and planning support, as well as pilots and aircraft that could deliver supplies to sites unreachable during the rainy season. However, the Joint Chiefs of Staff also imposed strict limits on the military's role. The Defense Department did not want to handle tasks that civilians could do just as well, and it barred military participation in activities that might put soldiers at risk of infection. Moreover, the military's participation came with procedural entanglements. All task requests required approval by the Joint Staff in Washington. The stipulation represented an exception to the usual procedure during a disaster response, in which USAID identified needs and requirements and the Defense Department identified how to fulfill them. In past interventions, this process played out almost entirely at the field level, with the DART in the lead.

The need to get Washington's approval generated uncertainties and caused delays. The DART could not get fast answers in response to pressing questions about the scope of military involvement. Assuming that the Defense Department would decline a request, or that its clearances would arrive too late to be useful, OFDA and the DART leaders sometimes bypassed the process and sought alternatives to meet task needs. Doing so led to new problems. Finally, USAID Administrator Shah told OFDA to task the military formally with all requests it wanted to make, even though the response likely would be "no." The Defense Department eventually tapped Michael Lumpkin, assistant secretary of special operations and low-intensity conflict, to help manage the military's various roles in the crisis.

Strengthening diplomatic reach. Although Ambassador Malac had overall responsibility for U.S. government actions in Liberia, neither she nor others at the State Department were formally part of the interagency emergency response to the outbreak—in the sense that they were not included on the daily and weekly telephone coordination calls. Still, diplomacy rapidly became an essential element of the intervention.

Medical evacuation was one of the traditional responsibilities of the State Department, along with tasks more often associated with diplomacy, such as international negotiation and the

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6.   Unclassified Joint and Coalition Operational Analysis. "Operation United Assistance Study," August 20, 2015. Accessed at http://www.jcs.mil/Portals/36/Documents/Doctrine/ebola/OUA_study_summary_aug2015.pdf

7.   See White House press briefing for full text of the president's speech. Accessed August 2017 at https://obamawhitehouse.archives.gov/the-press-office/2014/09/16/remarks-president-ebola-outbreak

8.   See Joint and Coalition Operational Analysis. "Operation United Assistance: The DOD Response to Ebola in West Africa," January 6, 2016, p. 5. Accessed at http://www.jcs.mil/Portals/36/Documents/Doctrine/ebola/OUA_report_jan2016.pdf

issuance of visas. In that respect, the department had played a role in the Liberia response since July, when the two American citizens who worked with Samaritan's Purse and SIM USA had contracted Ebola. Although a private doctor had located the plane used to fly the two citizens back to Atlanta, it was the department's job to negotiate passage and to plan ahead to accommodate similar needs that might arise in coming weeks or months.

The need for greater attention and capacity within the State Department grew as OFDA conveyed a rising number of requests to negotiate with governments and international organizations, including the WHO. During the third week of September 2014, just after Obama announced Operation United Assistance, Secretary of State John Kerry created an Ebola coordination unit headed by Nancy Powell, a former U.S. ambassador to India.

Powell played an important role in ensuring that the DART and non-U.S. aid partners could move people into and out of the affected region. Some countries had already closed their borders to all flights from the region and refused to allow doctors, nurses, and others who offered their help to return unless they underwent three weeks of quarantine elsewhere. Powell's office had to negotiate to keep borders open. Maintaining air transportation was also essential to accessibility for aid workers. Powell enlisted Kerry, her French counterparts, and the UN to negotiate the use of air facilities in Senegal in order to warehouse supplies. Powell's office also worked to ensure the availability of transport for Ebola patients who had to leave the region. With only one plane in the world outfitted with the necessary containment equipment at the onset of the crisis, options remained few despite the involvement of the Defense Department and other countries' militaries. Later, the State Department partnered with Microsoft cofounder Paul G. Allen to commission a containment unit that could be rolled on and off a cargo plane,[9] and the United Kingdom and Germany crafted facilities to expand medical evacuation capacity.

Although the DART's purview extended to all three of the countries most affected by Ebola, the National Security Council considered Britain and France to be in better positions to work with the governments of Sierra Leone and Guinea, respectively. Sierra Leone was a former British colony, and France had once governed Guinea. The U.S. embassies in the two countries were not fully staffed at the time, so it made sense to divide the responsibilities. It was up to Powell to coordinate with Britain and France as they stepped up their involvement in the two West African countries.

Managing bad news. Responding quickly and effectively to citizens' concerns was a critical and continuing task in a public-health crisis where troubling developments were common.

An especially challenging instance arose during the third week of September, when Callaghan, who was about to hand off his responsibilities as DART leader to William Berger, received word that the CDC planned to publish an epidemic model and predictions of the number of people likely to become infected with the Ebola virus as well as the number likely to die if no interventions curtailed the epidemic and if citizens failed to alter their behavior. The estimated range had an upper bound of 1.4 million cases and roughly 500,000 deaths. Although few expected the worst-case scenario to pan out, the release of the model had the potential to spark a public panic that could hobble efforts to contain the crisis.

The media and public response was immediate. DART and CDC press officers worked to explain the numbers and respond to an onslaught of questions that came from all directions.

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9. "Paul G. Allen Ebola Program Unveils Biocontainment Units," Philanthropy News Digest, August 13, 2015 accessed at http://philanthropynewsdigest.org/news/paul-g.-allen-ebola-program-unveils-biocontainment-units

The fear factor was huge. The DART team was trying to make a difference on the ground and these new numbers created more pressure for the team.

Focusing Liberians on what they could do to protect themselves was essential both to reduce the number of new infections and to ward off panic. The Liberia incident management system (IMS) ratcheted up its communications campaign, which engaged traditional leaders and communities in getting the word out about how to stay safe from the disease.

Four days after the CDC predictions went public, more bad news, this time in the United States, underscored the need for quick and effective responses to public concerns. On September 30, health officials in Texas reported that a Liberian man was ill with Ebola in a Dallas hospital, having flown, while asymptomatic, from Monrovia through Brussels to Washington's Dulles airport and then to Texas. The disclosure raised additional concern among the U.S. public and sparked calls for visa restrictions or quarantines that would limit travel from affected parts of West Africa—similar to those several countries had imposed earlier.[10]

The Department of Homeland Security worked with Powell's office at the State Department to persuade the states to agree on a policy that would protect U.S. citizens without undermining the international Ebola response. The negotiated arrangement allowed travelers from West Africa to enter through five U.S. airports. There they would go through heightened, CDC-designed screening and receive proper follow-up as needed. "It would have been almost impossible to recruit and retain medical and relief personnel without assurances that they could return to the United States when their tours were completed" or that they could get emergency evacuation if needed, Powell said.

2 Phase Two: Bending the Curve—September-October 2014

At the end of September 2014, nearly two difficult months after the DART had deployed, William Berger became the second DART team leader. He had led the U.S. disaster response in Japan when a tsunami triggered the Fukushima Daiichi nuclear melt-down—another atypical DART deployment. "Tim [Callaghan] had set up a robust system." Berger said. The overarching mission goal remained unchanged—doing whatever was needed to bend the curve—and Berger's job was to make the system run effectively in order to reduce the number of new infections.

One central focus was to get more Ebola treatment units, called ETUs, up and running in order to segregate sick people from healthy people. Another was to create a rapid-response system to serve remote areas of Liberia. Hot spots were popping up in the countryside as the rainy season tapered and people were once again mobile. Berger wanted to create a sentinel system to detect new cases and a flexible response capacity to quell new outbreaks before they expanded. This initiative, known as RITE for Rapid Isolation and Treatment of Ebola, cre-ated on-call teams to investigate and respond to news of an outbreak in a remote area. It also provided pre-packaged kits of essentials—rehydration fluids, infection prevention materials— and a new testing capability that reduced the time for a diagnosis from roughly one day to a mere 15 minutes. One study found that this approach reduced the time between a new case

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10.   For a list of countries that had banned travel, see Reuters Health News, October 23, 2014 https://www.reuters.com/article/us-health-ebola-travelban/travel-bans-issued-in-reaction-to-ebola-idUSKCN0IC2MK20141023 and for more on the U.S. response, see https://www.reuters.com/article/us-health-ebola-usa-newyork-idUSKBN0IG12920141027

and notification of health authorities by half, increased the proportion of new cases properly isolated to 81 percent from 25 percent, and increased survival rates to 50 percent from 13 percent.[11]

Some of the previous challenges began to ease too. The West African rainy season began to end and supplies were starting to flow more easily to the locations where they were needed. Conditions had started to improve, increasing the probability of success, but there were still stiff challenges to address. For example, staffing remained a persistent problem. With more visa restrictions still under discussion, limited transportation access and the Monrovia Medical Unit still unfinished, many valuable people with much-needed skills had to remain far from the action. To address these issues and achieve interim goals, Berger also had to help the agencies represented on the DART work more effectively with each other and with host country governments.

Partnering with the Liberian government. "For me, a central aim was to help the Liberian government work effectively with the CDC and international organizations or NGOs," Berger said. But achieving that goal required changes on several fronts. As more and more people arrived to assist, the Incident Management System had to adapt. "There were too many people at the meetings—especially once our military arrived," Berger said. "Everyone wanted to be there, but we didn't really need that many people at the table."

In response, DART helped introduce a daily meeting for six top decision makers to address key questions and decisions. When Liberian and IMS's international partners encountered coordination problems they could not resolve easily, the DART stepped in to assist. Sometimes, navigating the bureaucracy was a challenge," Berger said. "When someone shut something down, I had to work that back." One example was the tendency of some Liberian government employees to maintain a business-as-usual approach to their work while the rest of the country was in crisis mode. That kind of problem was especially common when NGOs tried to import supplies for treatment centers but ran afoul of customs agents who would not release shipments unless the NGO paid customs duties. Occasionally officials would not allow NGOs to unload supplies that did not appear on a central list of medical equipment permitted to enter the country.

The DART team worked with the Liberian president and health ministry to clear the bottlenecks. The team recognized that the president had to walk a thin line. On the one hand, to enable a speedy response her office had to lift import restrictions or streamline clearance procedures. Members of the public and aid donors both wanted to know their supplies were reaching the front lines of the fight against Ebola quickly. On the other hand, she had to deal with how her own government workers might perceive selective suspension of the rules for things like customs charges on relief supplies, a practice they had been warned against, as a form of corruption, in normal times.

Strengthening interagency relationships. The DART team continued building an effective working relationship with the CDC and the U.S. military in order to ensure the effort achieved its goals. CDC personnel were still learning how the DART worked and what its capacities were. Berger said he told his CDC deputy, Frank Mahoney (who had arrived at the end of September as Tappero rotated out), "If you've got a problem, let me know and we can try to fix it.'" For example, he said, "We had procurement people on our team. When ETU construction plans in Monrovia ground to a halt because of the mud, we purchased 20 tons of gravel

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11.   International Business and Technical Consultants, Inc. *Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016*, section on effectiveness, U.S. Agency for International Development, January 2018, p. 37 accessed at https://pdf.usaid.gov/pdf_docs/PA00SSBX.pdf (effectiveness).

to solve the problem when others didn't have that capacity." OFDA's standard operating procedure was to solve problems quickly instead of referring these decisions back to headquarters.

The need to finesse differences in organizational culture also extended to the DART's relationship with the military. The military had focused on designing ETUs, importing lab capacity, and strengthening logistics. Now the mission was to build the Monrovia Medical Unit and other treatment facilities, help train health care workers, assist with data management, continue providing logistics support at the airport, and helicopter access to hard-to-reach areas. As specified by the Joint Chiefs, the soldiers would neither treat patients nor come into contact with suspected cases. Major General Gary Volesky, who commanded the Army 101st Airborne Division, arrived with 1,400 troops, as General Williams rotated out.

Although the military participated regularly in joint training with OFDA, being a part of the DART team was an unaccustomed role for Volesky's division, which had served in Afghanistan and expected to go back there. "It was the first time in my career we [the 101st] deployed in support of another federal agency," Volesky said. He added, "It was also the first time in 30 years we had talked to MSF," a frequent critic of U.S. military operations.

Building ETUs to help contain the epidemic was a central objective, but it required medical experts to work with logisticians and military engineers, and its success depended on very careful planning and project management. "Detailing that out was a huge piece of work," said Berger. "You have to identify all of the steps required and how to sequence them, so that at the end of the day, you have enough ETUs, enough trained people to staff the ETUs, and enough equipment and supplies to sustain operations. It was incredibly complex, and we had to avoid any missteps, or everything would be delayed or, in the worst case, fall apart." The DART also had to negotiate which agencies would take responsibility for the facilities after Operation United Assistance completed them.

The 101st's operational planning teams wrote a campaign plan that included measures of performance and effectiveness, and they met with Berger and other members of the DART to make sure everyone was in agreement. They then refined the plans and built them into OFDA's mission tasking matrix, the MITAM, while also joining the nightly phone call with the Washington response management team.

Action items continued to go to the Africa Command and then to the Defense Department for review. Two innovations helped ease the problem created by the requirement for Joint Staff approvals. First, the Africa Command granted the on-the-ground military commander broader authority to approve a wide range of activities without having to submit each for clearance. Second, the military set up a separate task-monitoring system that enabled the DART to keep tabs on progress on specific tasks, such as the number of beds in a treatment unit that would become available on a specific date.

As the DART leaders had anticipated from the start, other partners remained frustrated with the limits placed on the military. The CDC wanted the 101st to transport blood samples on its helicopters and fly personnel directly to communities. One CDC representative told a military after-action team: "[Department of Defense] helicopters will take us to remote locations, but will not transport us out of 'hot zones.' We had people who had to walk out of the jungle, which took days and risked injury. It didn't make medical sense. The people who walked out could turn around and get back on a DOD helicopter to fly somewhere else the next day. Even

if we had been exposed to the disease, we wouldn't be symptomatic at that point, so there wasn't any risk to the crew of the helicopter."[12]

Communications systems also presented a persistent challenge. The military's heavy reliance on classified computer networks made it difficult to share epidemic-related information until Volesky's team offered to post information on the U.S. Africa Command's Ebola website, where everyone could reach it. Lack of interoperability between different software packages used by different parts of the military also hampered collaboration—even within the Defense Department. And in an environment in which both electricity and Internet connectivity were limited, communication sometimes required hand delivery of printed material.

Less-obvious factors also occasionally hindered interagency collaboration in a group effort in which flexibility was a prime consideration. Once focused on a task, the military locked onto its goal, and difficulties sometimes arose when the shifting situation required adaptation. For example, it was hard to alter engineering plans and construction schedules, as the dimensions and location of the outbreak shifted.

Enhancing cooperation with the host government was part of the challenge of interagency collaboration too. Throughout, the in-country U.S. military command aimed to build relationships with Liberia's military. It supported Liberian government partners, helping them see the challenges firsthand, set priorities, and organize themselves to respond effectively. The U.S. military could fly anywhere, and when it did a Liberian leader was usually along for the ride. This included Liberian leaders who enabled the team to reach a better understanding of the problem and work together more closely on the ground.

Tracking progress: Data. The DART's goal was to bend the line, but it was hard to know the line's shape at any particular time, never mind how it would change. Bending the line was a data-driven result in a world where data were ridiculously terrible or fuzzy and unreliable.

Although it was relatively easy to measure outputs—new patient beds created or numbers of communities reached through social mobilization, for example—assessing impact on the epidemic itself was much harder in the fast-shifting situation. "Data was missing or went uncollected—including the names of some of the people cremated—and it was important to correct that problem," Pendarvis said. But sometimes there would be multiple entries for the same person, so double-counting was also common. If data filing was delayed for some reason, the later input of the accumulated information could produce a sharp change in trends that confounded evaluation and analysis.

Swedish health statistician Hans Rosling, internationally known for his work on data visualization, came to Liberia in mid-October 2014 to support the IMS data management committee. Rosling had devoted much of his career to studying disease outbreaks across Africa. He believed he could help solve the Ebola data conundrum. Rosling wanted to cut through the thicket of information the IMS received from the field. The first step, he said, was to create an epidemic curve based only on positive lab results. Then it would be possible to build an algorithm capable of recognizing duplicate entries. To address the problems caused by delayed data-entry, he suggested using a 21-day moving average to chart the epidemic's path. His ideas required the work of people adept at using spreadsheet software Excel, and the U.S. military 101st had people with such skills. When Rosling's group finished its work at the end of October, it was clear that the curve of new infections had indeed started to flatten—and

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12. Unclassified Joint and Coalition Operational Analysis, "Operation United Assistance Study," August 20, 2015, Slide 3.3.3. Accessed at http://www.jcs.mil/Portals/36/Documents/Doctrine/ebola/OUA_study_summary_aug2015.pdf

had actually begun to do so at the end of September and early October, just after the CDC's worst-case prediction had made headlines. The findings were unexpected and heartening, and they fueled optimism that the fight against Ebola was producing tangible gains.

Pendarvis praised Rosling's success in producing an accurate picture of what was happening: "He was able to show data in a compelling way for people who didn't understand how much error there might be in the big forecasts." Rosling's new graphs helped power a subtle but tangible shift in tactics as the goal turned to halting all new infections rather than curbing their growth. At this point, the response could become more technical and focus on identifying events that might trigger hotspots, stopping the spread of the disease before it happened. Scientific expertise was more useful than it had been earlier—and there was more of it available, now that other systems were beginning to work effectively.

3 Phase Three: Getting to Zero—November to December 2014

In November 2014, Mia Beers took over as DART leader. Beers was a veteran of the Haiti earthquake DART as well as the 2004 Indonesia tsunami, the 2006 crisis in Lebanon, and the conflict in Somalia. At the time, she was director of OFDA's Humanitarian Policy and Global Engagement Division.

Anticipating Unreported Cases. Although Rosling's charts showed the number of new infections had declined, Beers worried that unreported cases could be wild cards, and that the crisis could erupt anew. "We didn't know where this would go," she said. If the outbreak rekindled, international responders said, there would not be enough beds. And if it ended, there would be unused capacity.

Beers cast a watchful eye on the data as the situation unfolded. As part of Operation United Assistance, the United States planned to support a total of 17 ETUs, each of them with 100 beds.[13] The Monrovia Medical Unit, a 25-bed clinic staffed by the U.S. Public Health Service, would care only for health care workers who fell ill—a measure initially considered essential for attracting and retaining people with medical skills to help respond to the outbreak. The Monrovia facility opened in November, along with one ETU, and three additional centers were scheduled to come on line in December.

Honing a Regional Response Strategy. As the situation began to improve in Liberia, new challenges arose. It was clear that the epidemic was behaving differently in each of the three countries involved. Infection rates had come down in Liberia, but rates were spiking in neighboring Sierra Leone. In Guinea, there were fewer reported cases overall than in Liberia or Sierra Leone, but the disease kept popping up. In a region with porous borders, an outbreak in a neighboring country could easily reignite the spread of the virus in Liberia. OFDA sought new ways to assist nearby countries, including sending a small DART to help contain an outbreak in Mali. (see Exhibit 3 in Appendix.)

In Sierra Leone, the DART had only a modest presence, and the United Kingdom had stepped up its activity in cooperation with the United States. The U.K. effort there began incorporating elements of the Liberian approach and had established a similar incident management system but with a more pronounced role for Sierra Leone's military.

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13. Joel Achenbach and Lena Sun, "U.S. Ebola fighters head to Africa, but will the military and civilian effort be enough?" Washington Post, October 25, 2014. Accessed at https://www.washingtonpost.com/national/health-science/us-ebola-fighters-head-to-africa-but-will-the-military-and-civilian-effort-be-enough/2014/10/25/1ceba6a8-5b99-11e4-8264-deed989ae9a2_story.html?utm_term=.4ffff43d25db

Guinea was another story. France had started to assist, but relations between the two countries were strained. Guinea's government was less open and less engaged. Sirleaf and Liberian disaster management officials had thrown themselves into the effort to contain the epidemic in Liberia, but Guinean leadership emerged only slowly.

While working to hone a regional strategy, Beers also attempted, with limited success, to clarify roles with a new partner, the UN Mission for Ebola Emergency Response, or UNMEER, which was based in Accra, Ghana. Although formally established in the middle of September with the goal of coordinating the UN's agencies, UNMEER was still struggling to become operational. In a disaster, the UN's real expertise lay with its Office for the Coordination of Humanitarian Affairs, which the UN system had declined to activate. The DART had already engaged some of the UN agencies that led key humanitarian clusters normally involved in disaster response. At this stage, UNMEER was another player on a crowded field, and the UN's corporate culture and structure sometimes got in the way. For example, requests for frequent meetings—usually outside the affected countries—hindered the effectiveness of joint efforts even though the organization brought some highly talented and experienced people to assist.

From mid-November, the number of reported new infections continued to decline, although small outbreaks occasionally popped up. The Christmas holiday—when people traveled to see their families and there were more social gatherings than usual—portended an uptick in new infections. However, the disease surveillance and social mobilization campaigns appeared to work well. By year end, the number of new infections had fallen to fewer than 100 per week. Small outbreaks could always ignite, but it looked increasingly possible to extinguish the epidemic.

4 Phase Four: Transitioning Out—December 2014 to July 2015

At the end of December 2014, Doug Mercado, another DART veteran, became the DART leader. Mercado had helped lead refugee protection in conflict zones around the globe. He arrived on January 2 and stayed through July 2015.

Rightsizing the DART response. His challenge was to think about how to shift the orientation and think about rightsizing to match the epidemiological profile of the disease. Revising goals and making new plans required a joint effort. Beginning in early 2015, representatives of USAID, the CDC, the DART, and the State Department met weekly to determine what they needed in order to assist with recovery and unwind the response effort.

The border had become a source of increasing concern because Liberia would remain at risk of a new wave of infection as long as Sierra Leone or Guinea still had active epidemics and vice-versa. The DART had worked with the International Organization for Migration to set up temperature screening for vehicle passengers at official checkpoints along the boundaries between countries. But satellite images revealed people were dodging the screeners by crossing over through the bush—sometimes within yards of the border posts.

While working to contain the epidemics in Sierra Leone and Guinea, Mercado helped the Liberian IMS to set up community-based surveillance systems to help trained villagers recognize people who might have contracted Ebola and take steps to keep themselves safe. The Red Cross facilitated the process and engaged traditional healers and communities, provided instruction, and managed screening centers.[14]

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14. Mirabelle Enaka Kima, IFRC. "Preventing diseases from crossing borders in West Africa post-Ebola," March 21, 2016. Accessed at http://www.ifrc.org/en/news-and-media/news-stories/africa/guinea/preventing-diseases-from-crossing-borders-in-west-africa-post-ebola--72032/

Building Liberia's health capacity. Mercado also concentrated on building Liberia's own health capacity and helping wind down the emergency phase of the U.S. response. High on the list was what to do with the Ebola treatment units that the U.S. had completed after the number of new infections had started to decline. Mercado said, "I saw the ETUs and realized we were past the point where we needed all these beds." But adjusting plans for treatment units required difficult choices. The ETUs cost money to maintain as well as to build, and the DART could reduce costs by stopping construction, but what would happen if Ebola returned?

"We were between a rock and a hard place," Mercado recalled. "The Liberian government was still nervous. It took a lot of discussion to decide what to do." He negotiated to reduce the number of treatment units the military built in Liberia to 11 from the 17 originally planned. (The DART also funded construction of several additional ETUs by other partners, bringing the total number funded by the U.S. to 15).

Mercado worked to send home the military, which had completed a list of tasks assigned by the DART. Original plans had called for three six-month deployments, but the engagement mostly ended in late February 2015, when all but 30 U.S. soldiers left Liberia. (Operation United Assistance officially ended June 30.) The DART found other partners to replace soldiers who had provided services that required continuing work. An OFDA contractor, for instance, took over building the Monrovia Medical Unit.

For Mercado, the next question was whether—and how—any of the emergency Ebola infrastructure that the U.S. government had helped build could be adapted and left behind to strengthen future health capacity in Liberia. "In an emergency response, we try to do things to save lives. If we can leave something behind, that's great but it's not the key goal," he said. Most of the ETUs were like giant tents, with roofs and walls made of plastic sheeting that would deteriorate over time. A few were semi-permanent bamboo structures, and the DART could turn those over to local communities. Most of the warehouses and much of the lab capacity—though not all of it—were only temporary, too, and the DART would have to close them down. In addition, the DART had supported the purchase of vehicles and a cemetery through the NGO Global Communities, and it lacked a way to transfer such assets to the Liberian government or to other parties.[15] The DART had to come up with a plan.

Mercado was also part of early conversations about how to transition to recovery and development activities. There were no established procedures for navigating that phase. Some of the debates were about Liberian needs and the appropriate sequencing of new types of aid. But others centered on whether the DART's NGO partners—some of which had deep knowledge of communities, people, and the issues—ought to be part of recovery and development or whether these partners should hand over those responsibilities to the organizations that typically worked on health system strengthening and related matters. Highlighting one of the challenges, U.S. Ambassador Malac said, "It's hard to move from disaster response to development. The color of money is one issue. People don't want to give up resources. We were helped by the fact that there was a big USAID presence in Liberia already, and we had a lot of activity in health. That helped the glide path a little. But it took hard work."

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15. Office of Inspector General. Audit of Selected Ebola-Response Activities Managed by USAID's Office of U.S. Foreign Disaster Assistance in Liberia," Audit Report No. 7-669-16-002-P, December 4, 2015. Accessed at https://oig.usaid.gov/sites/default/files/audit-reports/7-669-16-002-p.pdf

OVERCOMING OBSTACLES

Two especially stubborn problems confounded the response throughout the crisis.

Staff Rotation and Turnover Issues. There were staff rotation issues with partner personnel. For example, the U.S. Public Health Service replaced the commander of the Monrovia Medical Unit three times within a period of about three months. Other key government partners, such as the CDC, pulled their people back to their headquarters every 30 days. DART members switched out every five to eight weeks. And the DART leaders stayed roughly six weeks each—except for Mercado, who remained on post for about six months.

In a situation in which people worked seven days a week, often for long hours, such rotations were important not only because of the stress of working under dangerous conditions but also because of the likelihood of burnout. However, personnel churn hampered efficiency by causing losses of experience and know-how and by disrupting crucial personal and professional relationships. "The Ebola response was a complicated operation with many stakeholders, and it took most people a month to learn their way around," Mercado said. "We really wanted people on their posts for a minimum of three months."

Personnel policies also drove much of the staff turnover. State Department-mandated medical-clearance requirements and other training required for duty overseas lasting more than 29 days took a long time to complete, and that made it hard to get people into the region. Some CDC and Public Health Service Commissioned Corps personnel lacked not only the clearances but also passports because they hadn't planned on being deployed overseas.[16] Eventually, the State Department made accommodations on a one-time basis. The CDC also began to send some of the same people back, which helped, DART team leaders said. There was little else that the DART could do to ease the problem—except to support frequent briefings and orientations, which helped smooth handovers but also consumed valuable time.

Political Realities. Unlike most of the disasters that DARTs handled, American citizens—and many of their political leaders—felt vulnerable to the dangers posed by the Ebola outbreak thousands of miles away. The Ebola death of a Liberian man in Dallas and infection of nursing personnel exposed the failure of hospital personnel and other workers to follow guidelines and requirements set by the CDC and other federal agencies regarding aspects such as exposure, waste, and transportation. The incident also heightened public anxiety, which escalated after a doctor in New York, who had returned from volunteer service in West Africa, came down with the disease.

Across the United States, hospitals began buying protective gear, exhausting the supply of materials needed to fight the epidemic in West Africa, where they were most needed. State-imposed quarantine rules made it harder for Ebola workers to return home, and political pressure to cut off all travel to and from the region grew.

There was no clear place to bring the domestic and international responses together in order to reduce the problems they created for each other. The National Security Council's agenda was crowded, and no other high-level forum was available to help work out differences. To fill the gap, Ron Klain was appointed to the new position of Ebola response coordinator, dubbed "Ebola czar." Klain set to work immediately after his October appointment. Although DART leaders had little direct contact with Klain, his actions helped ease some of the problems the team confronted.

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16. Edward N. Rouse et al. "Safe and Effective Deployment of Personnel to Support the Ebola Response — West Africa," Morbidity and Mortality Weekly Report, v. 65, 3, July 8, 2016. Accessed at https://www.cdc.gov/mmwr/volumes/65/su/pdfs/su6503a13.pdf

Assessing the U.S. DART Response and Aftermath
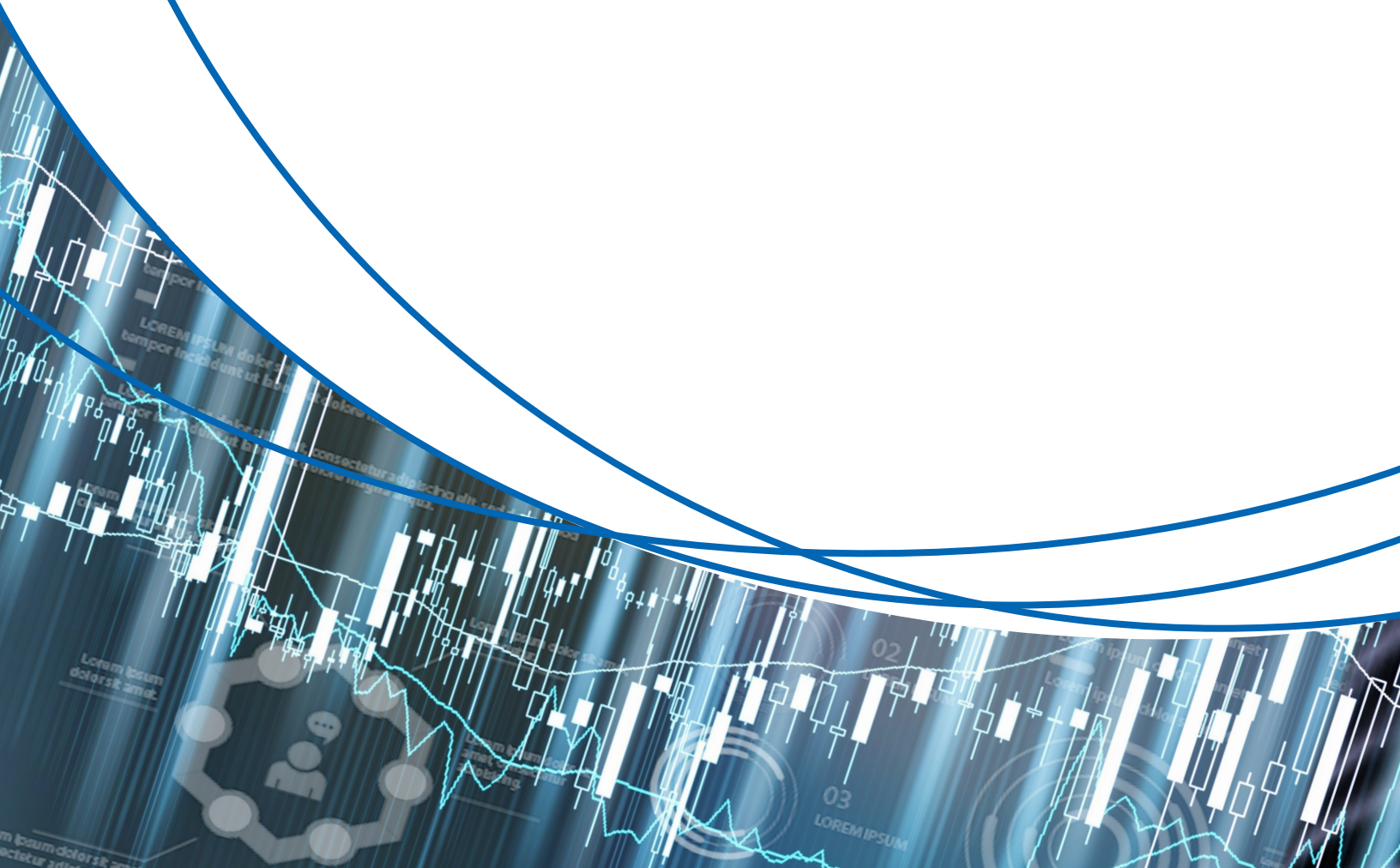
The World Health Organization declared Liberia free of Ebola on May 9, 2015. The disease reappeared in June and July, with six cases, but the country was again declared Ebola free in early September.[17] Sierra Leone and Guinea were declared Ebola-free in December 2015, and USAID deactivated the DART on January 4, 2016.

In March 2016, the WHO declared that the outbreak in West Africa was no longer a public health emergency of international concern, though there was still a risk that isolated cases could appear. All told, 28,616 cases were reported (suspected, probable, and confirmed) in the three countries, with 11,310 deaths.[18] In Liberia, there were 10,678 suspected, probable, or confirmed cases and 4,810 deaths.[19] The numbers of cases and deaths fell far below the CDC model's upper estimates.

The DART was one of many factors that contributed to ending the epidemic—not least of them the actions the citizens of Liberia, Sierra Leone, Guinea, and other countries in the region had taken on their own to protect themselves. Without the actions taken by the DART, it was likely that the epidemic would have spread more widely and taken a much higher toll.

The decision to deploy the DART was undeniably late. OFDA Director Konyndyk told a Joint Coalition Operational Analysis after-action interviewer, "If something like this [the disease] were airborne, we could not have remotely afforded the month to month-and-a-half that we spent running around ourselves, trying to figure out who was going to do what. That would just kill us—literally."[20]

A USAID-commissioned after-action report questioned the DART's effectiveness and relevance in the opening two months, when there were delays in starting key functions partly as a result of lags in amending OFDA contracts and moving funds and partly because the strategy, focused on Ebola treatment units, did not meet the demands of the situation. However, the report credited the DART with greater impact after October 2014, "when funding and activities increased and intensified."[21]

Although defining an effective strategy was central to bringing the epidemic under control (see text box 3), so were coordination and operational effectiveness. The question was how well OFDA's approach to managing interagency collaboration worked under the circumstances of an infectious disease outbreak.

17. Tolbert Nyenswah et al. "Ebola and Its Control in Liberia, 2014–2015," Emerging Infectious Diseases, 22(2), February 2016, p. 169.

18. See WHO Ebola Outbreak 2014–2015. Accessed at http://www.who.int/csr/disease/ebola/en

19. Data accessed at https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/case-counts.html

20. OFDA Director, USAID, JCOA Interview, 21 January 2015, as quoted in Joint and Coalition Operational Analysis, Operation United Assistance Study, 20 August 2015. http://www.jcs.mil/Portals/36/Documents/Doctrine/ebola/OUA_study_aug2015.pdf

21. International Business and Technical Consultants, Inc. Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, U.S. Agency for International Development, January 2018, p. 3 accessed at https://pdf.usaid.gov/pdf_docs/PA00SSC4.pdf (synopsis).

RIGHT STRATEGY?

Both the U.S. military and a 2018 inspector general report found that USAID did not have a clear strategy up front. The DART had to begin its work without either a formal U.S. government strategy, which appeared only in September 2014, or the UN's road map, published at the end of August.

DART leaders generally agreed that four things were essential from the start: social mobilization to encourage behavior change, effective isolation, contact tracing, and safe and dignified burials.

Expressing a view that the DART leaders all shared, Berger said: "If people had not changed their behavior, we could have built hundreds of ETUs and it would never have been enough. We had to keep people from catching Ebola in the first place." Fortunately, it proved easier than anticipated to surmount social mobilization challenges in urban areas. "We had never confronted 'urban Ebola' before, so there was a fear of the unknown," Berger said. "But what was so ironic was that it was easier to deal with than 'jungle Ebola.' Because we could use all of the existing community networks in urban settings to communicate messages so quickly, behavioral change was easier to accomplish in the city than in rural areas, where networks weren't as strong."

A USAID inspector general report later questioned why USAID and OFDA had not launched social mobilization campaigns sooner—before deploying the DART—and why the DART had not moved faster to expand that effort. Part of the problem lay in finding the right way to reach people. From April to the end of July, a public service campaign featuring the message "Ebola Kills"—borrowed from experiences in rural Uganda and other countries—appeared to generate a sense of resignation among Liberians instead of sparking public action on safety issues. Later slogans and participatory, community-based strategies proved more successful.

Strategy, too, lay at the center of the debate about whether treatment centers could have come on line sooner, when they could have saved more lives, and whether there were too many of them constructed after the number of new infections had started to decline. A USAID-commissioned after-action report noted that the CDC epidemic model, which estimated it was possible to control the epidemic "if 70% of the cases were isolated in health facilities" underlay the September 2014 decision to engage the military in building treatment units, a decision that was "forward-looking to accommodate a worst-case scenario..."

As MSF showed, it was possible to set up a simple treatment center of wood pallets and plastic sheeting without the labor, materials, and time the U.S. military invested. The NGO-built Ebola treatment units OFDA supported were available earlier than the units the Department of Defense constructed and had greater impact. "We tried to build to the gold standard, and next time around we might not do that," Doug Mercado, the fourth DART team leader, concluded. More simply built ETUs might have accelerated availability and saved lives.

Some also questioned why the DART did not terminate construction of Liberia ETUs earlier, when it was known that some of the beds were going unused. One New York Times article called the construction of the treatment centers a "misstep." Critics pointed to the empty beds as evidence of faulty calculations. But the people leading the response viewed the unused facilities as a hedge against a risk that the epidemic might explode again before it wound down. Until late October, no one knew what path the epidemic was likely to take, and acting conservatively—by building more capacity—made sense, DART leaders reasoned.

(See Norimitsu Onishi, "Empty Ebola Clinics in Liberia Are Seen as Misstep in U.S. Relief Effort," New York Times, April 11, 2015; the multi-volume assessment produced for USAID by International Business and Technical Consultants, Inc., Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, U.S. Agency for International Development, January 2018; Unclassified Joint and Coalition Operational Analysis. "Operation United Assistance Study," August 20, 2015; and Office of Inspector General U.S. Agency for International Development, Lessons from USAID's Ebola Response Highlight the Need for a Public Health Emergency Policy Framework, Audit Report 9-000-18-001-P, January 24, 2018.)

The quality of interagency collaboration hinged on answers to three questions:

- Was the internal governance process as effective and efficient as it could have been?

- Were the right people involved in sufficient numbers?

- Were team members able to operate safely and effectively?

"It looked chaotic from the outside, but ultimately, we had a pretty good internal-governance process in a very complex response, with groups not used to working together," Konyndyk said, with respect to the first criterion.

Nonetheless, there were undeniable challenges. The authority systems within the CDC and the limitations established by the Joint Chiefs together constrained DART leaders in Liberia from making rapid decisions and pushed more operational decision making to OFDA's Washington office, especially in the initial months. A USAID after-action report said the relationship with the CDC was slow and stilted at first but that "the coordination between CDC and OFDA became close, intensive, and extensive."[22]

On the ground, the incident management system (IMS) functioned differently from OFDA's conventional model by emphasizing information sharing and consultation more than management. The IMS also had a technical and scientific orientation and did not emphasize field operations and joint planning functions. In future responses, it would be important to strengthen the command and management dimensions.

At headquarters, there was also possible room for improvement. Although several participants said there were too many people on the interagency calls with Washington, the decision not to include the ambassador and the State Department created some awkward gaps in knowledge. U.S. Ambassador Malac said, "We fed stuff in but didn't get a lot back. A lot of the time we were surprised [by decisions]. In terms of shaping the response, the Washington interagency [consultations] imagined what was needed and didn't listen to what those of us in the field were saying."

Preparation was centrally important for harmonizing practices and building relationships, both of which were hard to do in the middle of a crisis. Earlier OFDA had organized a special disaster-response orientation program for its interagency partners and senior managers of specific NGOs. Incorporating the CDC into its activities was essential for improving performance in the future. The USAID-commissioned after-action report also recommended embedding OFDA staff with the CDC at CDC headquarters in Atlanta, Georgia.

Were the right people engaged—and in the right numbers? Those problems eased over time, but frequent rotations meant it was harder to make efficient and effective use of the staffing available. Quickly rebuilding relationships and getting know-how up to speed were difficult to achieve.

The answer to the last question—safety—was the easiest. The intensity of responding to this unprecedented outbreak was evident in the number of people who said the Ebola response set a new standard for tough deployments. The precautions put in place worked. No one in

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22. International Business and Technical Consultants, Inc. Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, U.S. Agency for International Development, January 2018, p. 3 accessed at https://pdf.usaid.gov/pdf_docs/PA00SSC4.pdf (synopsis).

the military or at the U.S. diplomatic mission contracted Ebola, thanks to pre-deployment briefings and continuous training and monitoring.[23] No local staff at the embassy got sick despite the fact that the embassy had about 600 employees, and some lived in neighborhoods where Ebola was rampant.

During a roughly 10-month period, this interagency effort provided more than 435 metric tons of essential supplies,[24] constructed 15 Ebola treatment units in Liberia in addition to the Monrovia Medical Unit (and supported additional Ebola treatment units in other affected countries), trained thousands of health care workers, and helped finance and prepare nearly 200 safe-burial teams in Liberia, Guinea, and Sierra Leone (including 70 in Liberia). Across the three countries, it also delivered food and other relief to over three million people whose livelihoods were affected by the epidemic.[25]

The DART launched social mobilization campaigns, created lab capacity, provided extensive logistics support, and helped coordinate the response. It aided Sierra Leone and Guinea when outbreaks there challenged the operations the United Kingdom and France were assisting, backing up the U.K. Department for International Development and French aid workers as needed. It also deployed a small DART to Mali for a month or so to combat an outbreak there, and it sent personnel to Guinea Bissau on an exploratory mission. USAID further provided $73.9 million for the WHO to cover the costs of that organization's response to the crisis, including medical personnel mobilized to assist.[26] (See Exhibit 4 and Exhibit 5 in the Appendix for summary financial data.)

In December 2014, a little over four months after the DART's work began, the U.S. Congress provided $5.4 billion in emergency funding for Ebola preparedness and response, of which about $2 billion supported work by the departments of Defense and Health and Human Services.[27] In the end, USAID and the State Department together used about $1.5 billion of the $2.5 billion allocated to them for their activities in the response and redeployed a substantial part of what remained to respond to an outbreak of the mosquito-borne Zika virus in Latin America and the Caribbean in 2015.[28] (See Following the Money)

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23. Cheryl Pellerin, "Liberia Is Making Progress against Ebola but Cases Continue," DoD News, Defense Media Activity. Accessed at https://www.defense.gov/News/Article/Article/603632/liberia-is-making-progress-against-ebola-but-cases-continue/

24. Lead Inspector General Quarterly Progress Report on U.S. Government Activities: International Ebola Response and Preparedness, June 30, 2015, p. 54 accessed at https://oig.usaid.gov/content/lead-inspector-general-quarterly-progress-report-us-government-activities-international-ebol

25. USAID-CDC "West Africa—Ebola Outbreak Fact Sheer #35 FY 2015, June 16, 2015, p. 4. Accessed at https://www.usaid.gov/ebola/fy15/fs35

26. Office of Inspector General U.S. Agency for International Development. Lessons from USAID's Ebola Response Highlight the Need for a Public Health Emergency Policy Framework, Audit Report 9-000-18-001-P, January 24, 2018, p. 3 accessed at https://oig.usaid.gov/sites/default/files/audit-reports/9-000-18-001-p.pdf

27. U.S. GAO Report to Congressional Committees. Emergency Funding for Ebola Response, November 2016. Accessed at https://www.gao.gov/assets/690/680769.pdf

28. Kevin Quealy, "The Cost of Hurricane Harvey: Only One Recent Storm Comes Close," New York Times, September 5, 2017 accessed at https://www.nytimes.com/interactive/2017/09/01/upshot/cost-of-hurricane-harvey-only-one-storm-comes-close.html Slightly different estimates at Data Center accessed at https://www.datacenterresearch.org/data-resources/katrina/facts-for-impact/ and CNN https://www.cnn.com/2017/08/31/politics/hurricane-harvey-recovery-money/index.html

FOLLOWING THE MONEY

One of the DART's responsibilities was to ensure U.S. government funds went where they were supposed to go. It was hard to determine whether the financial leakage exceeded levels normally encountered in similar situations. The International Federation of Red Cross and Red Crescent Societies reported it had lost to fraud about $5 million of $124 million in Ebola funds—about 4% of the total Ebola budget it managed—during 2014–16, mainly because of overpriced supplies, payroll discrepancies, and forged customs declarations. IFRC said that some of that money had come from OFDA. The magnitude of losses among other partners was unclear, though there were no reports of similar magnitude.

Tracking whether all payments were used exactly as planned during a worsening emergency would have produced delays that jeopardized the response. For example, partners had to pay community mobilizers and Liberian health-care workers, some of whom lacked identity cards. It was unlikely that all of the dollars allocated for payroll went only to the people who assisted, but trying to establish tighter controls would have limited ability to reach far-flung communities. As it was, some of the Liberian government officials and NGOs complained about strict rules that made it hard to shift supplies to locations where there were new outbreaks or across boundaries from one affected country to another.

Limiting over-purchasing was also a challenge. Especially in the early part of the crisis, uncertainties about the growth and extent of the epidemic created a quandary for those who had to purchase supplies and materials, because accurately anticipating needs was impossible. Even after it became apparent that new cases were diminishing, no one could say for sure that the epidemic would not flare up again.

The DART leaders insisted on buying local whenever possible. For example, when international organizations or NGOs wanted to import ambulances or other heavy equipment, the DART pushed back. It was faster and much more cost-effective to convert a pickup truck into an ambulance than to bring in vehicles that took up scarce time and equipment to unload when they arrived via cargo plane at the airport and were unsuited to the terrain.

(Relevant reports by the USAID Inspector General are accessible at https://oig.usaid.gov/ category/programs/ebola-oversight. See also BBC, "Red Cross apologises for losing $5m of Ebola funds to fraud," November 3, 2017 http://www.bbc.com/news/world-africa-41861552)

USAID's decision to reallocate funding planned for other emergencies and priorities while the request for Ebola funding made its way through Congress worked, though there were complications. The Ebola appropriation passed in December 2014 was intended to reimburse USAID for costs incurred and fund the remainder of the response going forward. However, a Government Accountability Office report found that of 271 reimbursements that USAID made for funds obligated before Congress acted in December 2014, 21—or a total of about $60 million out of about $1.5 billion spent—did not meet the requirements under the funding bill and corrective actions had to be taken.[29]

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29.   Government Accountability Office, "Emergency Funding for Ebola Response," Report to Congress, GAO-17-35, November 2016. Accessed at https://www.gao.gov/assets/690/680769.pdf.

Recommendations from DART Leaders

Because of the importance of containing global pandemics, the response to the 2014 West Africa Ebola outbreak became the focus of many reviews both official and unofficial. Within the U.S. government, the DART was the subject of several reports by the agencies that participated and their inspectors general (accountability officers). These highlighted a number of ways to improve, from expanding the use of pre-negotiated indefinite quantity contracts with trusted partners and enhancing the military's awareness of conditions that affected logistics, to new systems for supply chain management.[30]

However, leaders of the Office of U.S. Foreign Disaster Assistance OFDA DART were the first to caution against relying too heavily on lessons from the Ebola crisis as a blueprint for future disaster responses.

Open mind and a sense of humility. "You don't want to be fighting the last war," declared William Berger, second of four successive DART leaders. "Always go in with an open mind and a sense of humility, and understand there are things you don't understand. Pay attention to what's happening on the ground. It's about context and what people are thinking in the country, and those things will be different everywhere."

Flexible strategy and adaptive planning. Deborah Malac, U.S. ambassador to Liberia during the response, stressed that the dynamic character of the Ebola crisis demanded a flexible strategy that allowed for adaptation: "Everything was moving so fast...what was needed by [the] end of August was not what was needed by mid-September. In just two weeks, the needs changed."[31] To act quickly, future DARTs needed new and different contracting mechanisms that would allow them to shift away from some projects and programs and emphasize others as circumstances required.

Better data and feedback. Better data and feedback, throughout, were also crucial in order to adapt strategy and actions to the patterns of disease.[32] The push for evidence-based decision making created pressure to collect many types of information. However, "better data" was not necessarily synonymous with greater detail. On the contact tracing forms collected in the field, epidemiologists wanted complete assessments that included specific circumstances of individual cases, and they wanted to collect data at each point along a patient's journey. But entering large amounts of data into spreadsheets took time, and it was often impossible to synchronize information collected from patients, ambulance teams, treatment centers, and cremation or burial sites. As a public health specialist himself, deputy DART leader Justin Pendarvis understood why the epidemiologists wanted the detail, but he tried to focus colleagues on priorities: "The key was to make it as simple as possible and aim data collection and management toward what we needed."

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30.   In addition to the reports cited elsewhere in this case, see the USAID Audit Report, Lessons From USAID's Ebola Response Highlight the Need for a Public Health Emergency Policy Framework, 9-000-18-001-P
January 24, 2018 accessed at https://oig.usaid.gov/sites/default/files/audit-reports/9-000-18-001-p.pdf. Also see the multi-volume assessment produced for USAID by International Business and Technical Consultants, Inc. Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, U.S. Agency for International Development, January 2018 accessed at https://pdf.usaid.gov/pdf_docs/PA00SSC4.pdf (synopsis); https://pdf.usaid.gov/pdf_docs/PA00SSBX.pdf (effectiveness); https://pdf.usaid.gov/pdf_docs/PA00SSC3.pdf. (coordination); https://pdf.usaid.gov/pdf_docs/PA00SSC2.pdf (relevance)
31.   Deborah Malac, JCOA interview February 18, 2015, as quoted in unclassified Joint and Coalition Operational Analysis, "Operation United Assistance Study," August 20, 2015. Accessed at http://www.jcs.mil/Portals/36/Documents/Doctrine/ebola/OUA_study_summary_aug2015.pdf
32.   International Business and Technical Consultants, Inc. Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, U.S. Agency for International Development, January 2018, p. 6, accessed at https://pdf.usaid.gov/pdf_docs/PA00SSC4.pdf (synopsis)

Take action in spite of the unknown. Pendarvis added that any strategy or plan had to take into account the high level of uncertainty that persisted during the crisis despite improvements in information collection and data analysis. In a blog posting, he emphasized that uncertainty was no excuse for hesitation in a situation where time was the enemy: "No single factor explains how the disease was brought under control in Liberia…But here is one thing we do know: the effectiveness of the response depended not on limiting action to what was known at the time, but taking action in spite of the unknown."[33] The Ebola episode drove home a further lesson, he wrote: "A challenge for us is how to make decisions when 70 percent of the information is not good and you have different technical estimates."

Managing in the context of uncertainty reversed the common business axiom that managers should focus on solutions rather than problems. The first DART leader, Tim Callaghan, said the key to dealing with the Ebola crisis was first to identify the problems and needs, and only then to consider possible solutions. "People always tend to talk about tools or solutions," he said. "But it's essential to first ask what the priorities are. Tell me what the issue is, and I'll figure out how to resolve it. As a DART leader, that's my job. Sometimes people offered solutions that didn't reflect the reality of the problems we faced. We have to find local ways to do things; for example, people wanted to use smartboards in the IMS, but there wasn't local capacity."

Get the right people on board with the right knowledge and experience. DART leaders offered other maxims for managers of infectious disease and disaster responses. Callaghan summed up a shared view: "What I would convey is: Get the right people, stay for a while, and get out to the field so you can see what's happening. A lot is based on personalities. You need people who are committed to getting the job done. We had the right people there—people who knew how to be flexible."

Others who were centrally involved emphasized that last point: the importance of having people with the right knowledge and aptitudes on the team. Many of the senior team members and some of their international counterparts had worked together before. Some had known one another at the NGO Mercy Corps earlier in their careers, and others had met during earlier disasters or epidemic outbreaks.

Having advance understanding of conditions, cultures, and people also was vital. "That's why having Justin was the most brilliant thing," said Berger. "He knew the names of people, and they were all friends." To help build that kind of knowledge, OFDA had disaster experts working in five regional offices and 22 field offices, dedicated to helping countries develop their own disaster response capabilities. Although these offices aimed to build capacity, they also forged relationships with people who had the local knowledge essential for navigating a crisis.

U.S. credibility matters and prompts global participation. OFDA Director Jeremy Konyndyk said, "U.S. government credibility is critically important in a situation like this. It was the U.S. government's saying it saw this situation as important that led others to get involved. The point when we saw the international community perk up was after Obama's announcement in mid-September [that the U.S. military would assist], when the UN high-level meetings took place. The UN General Assembly then called on the rest of the world to act, and that carried a lot of weight."

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33. Justin Pendarvis. DipNote, State Department Official Blog, "Unprecedented Coordination Helped Turn the Tide of an Unprecedented Outbreak," December 15, 2015. Accessed at http://2007-2017-blogs.state.gov/stories/2015/12/15/unprecedented-coordination-helped-turn-tide-unprecedented-outbreak.html

"The situation showed the importance of credibility—the personal credibility of a president and his press people and spokespeople," Konyndyk added, "and part of that credibility came from focusing on the science."[34]

INSIGHTS FOR EFFECTIVE INTERAGENCY COLLABORATION: EBOLA OUTBREAK RESPONSE

This report provides insights for addressing seven specific challenges that a DART would have to confront to manage an effective interagency collaboration in this context.

1. **Overcoming differences in procedures and organizational culture.** First, integrating new partners into a DART would require that team leaders negotiate differences in procedures and organizational cultures on the fly. OFDA had evolved structures and practices to help different parts of the government work together, but this time a large number of people from the CDC would join the effort without first having trained with other team members. Moreover, the CDC already had people on the ground in West Africa, and it had its own procedures for responding to infectious disease outbreaks. For example, in its work it employed an incident management system that differed from the incident command model that OFDA's emergency responders used.[35] In early July, while contingency planning was under way, the CDC had formed an Ebola emergency center at its Atlanta headquarters.[36] (see Exhibit 1 in Appendix)

2. **Leveraging the value each response partner brings however limited.** A crisis response may require the coming together of diverse partners, who contribute unique assets and resources. Depending on the crisis, these partners may stake out a specific role to play that may be limited in scope and contribution. Response leaders must work with what they can get from each partner. DART leaders in this case had to work with a rather reluctant U.S. military. Along with the civilian agencies of the U.S. Department of Defense, the armed services often provided logistical support and other assistance in disasters. This time was different. The Joint Chiefs of Staff said the military's medical expertise focused on the health of the armed services' own personnel and had no protocols for aiding in a disease outbreak affecting a foreign country.[37] If soldiers participated, they could not be involved in patient care, and they could carry out only tasks that demanded their special expertise.[38]

3. **Establishing geographical scope.** Nailing down geographical scope of the response was a third challenge. In consultation with the National Security Council and USAID Administrator Raj Shah, the DART team decided to focus on Liberia, where the outbreak was most serious, the country's president had reached out for help, and the U.S. government had the deepest relationship. Linked, smaller teams would work in Guinea and Sierra Leone, where planners expected the United Kingdom and France to lead anti-Ebola efforts. If the infection spread, the DART could expand its scope.

34. Jeremy Konyndyk later offered additional observations about organizing future international responses. See Konyndyk, "Joint Humanitarian Operations: How to Bring U.S. Humanitarian Assistance into the 21st Century," Center for Global Development, December 12, 2018 accessed at https://www.cgdev.org/sites/default/files/joint-humanitarian-operations-how-bring-us-humanitarian-assistance-21st-century.pdf

35. Chris Ansell and Ann Keller. Adapting the Incident Command Model for Knowledge-Based Crises: The Case of the Centers for Disease Control and Prevention, IBM Center for The Business of Government Collaboration Series, 2014. Accessed at http://www.businessofgovernment.org/sites/default/files/Adapting%20the%20Incident%20Command%20Model%20for%20Knowledge-Based%20Crises.pdf

36. The CDC's timeline of its involvement can be accessed at https://www.cdc.gov/about/ebola/timeline.html

37. Joint and Coalition Operational Analysis. "Operation United Assistance: The DOD Response to Ebola in West Africa," January 6, 2016. Accessed at http://www.jcs.mil/Portals/36/Documents/Doctrine/ebola/OUA_report_jan2016.pdf

38. Joint and Coalition Operational Analysis. "Operation United Assistance: The DOD Response to Ebola in West Africa." http://www.jcs.mil/Portals/36/Documents/Doctrine/ebola/OUA_report_jan2016.pdf

INSIGHTS FOR EFFECTIVE INTERAGENCY COLLABORATION: EBOLA OUTBREAK RESPONSE CONT.

4. **Developing a structure for collaboration.** Successful interagency collaboration rests on establishing a foundation, a structure from which to engage and exchange information, knowledge, and capacity to meet the ever-changing demands of a response. A fourth challenge the DART team faced was developing a structure for collaboration amongst response stakeholders, especially with host-country officials and humanitarian partners. The DART was designed to coordinate U.S. government assistance, but bringing the outbreak under control depended entirely on its ability to work with Liberian authorities, affected communities, and health care providers. Containing the epidemic required both sensitive policy decisions that only the sovereign government could make and deep local knowledge, which health ministry personnel and county governments possessed. At the same time, because Liberia was still rebuilding after a civil war, international organizations and NGOs would be on the front lines supporting the government to carry out essential functions such as helping communicate information, build facilities, care for patients, and bury the dead. Creating a means for coordinating effectively with the Liberian government and with these groups was key.

5. **Planning for the response and exit.** Though more familiar, because it was part of every OFDA operation, a fifth challenge was to plan not just for the emergency but for exit. In the initial phase of the response, the DART would assess the situation, identify needs, set response priorities, and start bringing in the skills and supplies required. The next phase was to drive the response until the outbreak was under control. In the final phase, the DART would wind down its primary activities and lay the path for subsequent recovery and development assistance, as needed, then transition out of the region.

6. **Funding the DART mission.** The sixth challenge was money—how to pay for an unusual mission, which came two months before the end of the U.S. government's budget year, when funding accounts were almost depleted. OFDA received an annual appropriation earmarked specifically for international disaster assistance, and to fund the Ebola effort fiscal officials at USAID and the White House decided to take exceptional measures, drawing down the office's remaining budget for the year and using part of it to help the CDC cover its related costs. Plans called for the extra spending to be recouped later with a special appropriation by Congress.

7. **Unique nature of the Ebola crisis and response.** Finally, the Ebola crisis differed significantly from other types of natural disasters, in which most deaths occurred immediately and conditions then improved. In an epidemic, the number of infections would continue to increase in the short run, no matter what anyone did. Especially during the turbulent initial period, aid groups would have to grapple not only with a virulent, deadly disease but also with a worsening sense of despair among affected communities.

Epilogue

Though this report focuses on a health crisis response during specific timeframe between 2014-2016, global public health experts recognize the importance of continual vigilance and perhaps reluctantly accept that their work may only stave off an outbreak for a period of time. This was the case with Ebola in West Africa as 2018 saw another outbreak in the Congo.

THE 2018 RESPONSE DEPARTED FROM THE 2014 STRATEGY IN SEVERAL WAYS

- WHO personnel remained in country and was supported by the U.N. peacekeeping mission.

- WHO established its own incident management system.

- World Food Program and UNICEF took up the roles they had played in 2014, drawing on what they had learned from the West Africa outbreak response.

- The difficulty of mounting a hands-on response under wartime conditions placed a premium on using vaccination to ring-fence the affected area, an approach unavailable at the time of the 2014 West Africa epidemic. The WHO rapidly vaccinated 60,000 people in the first months of the outbreak, though new infections continued to appear, and the CDC took responsibility for vaccinating health personnel in countries adjacent to the border area, to limit international transmission of the disease.

- Whether the incident management system put in place proved adequate to the task was still an open question.

There are formal "after action" reviews and reports on the USAID DART Ebola response. This report does not claim to be another in a line of such reviews. The purpose of this report is to tell a story about effective crisis response collaboration and from that story offer insights, reflections, and lessons learned that can help others that may encounter similar situations be better prepared.

APPENDIX

Exhibit 1: Organizational Relationships

White House National Security Council

Department of Health and Human Services

- **Assistant Secretary for Health**
  - Commissioned Corps U.S. Public Health Service
- **Operating Divisions**
  - National Institutes of Health (NIH)
    - **Centers for Disease Control and Prevention**
      - Centers for Disease Control and Prevention (CDC)
        - CDC Monrovia

Department of State -USAID

- **USAID Administrator**
  - Bureau for Global Health
  - Bureau for Democracy, Conflict & Humanitarian Assistance
    - Transition Initiatives
    - Food for Peace
    - Crisis Surge Support
    - Civilian Military Cooperation
    - Program, Policy, and Management
    - Conflict Management and Mitigation
    - **Office of Foreign Disaster Assistance**
      - Office of U.S. Foreign Disaster Assistance (OFDA)
        - Disaster Assistance Response Team (DART) Monrovia
  - Global Development Lab
- **Foreign Diplomatic Missions**
  - U.S. Embassy Monrovia

Department of Defense

- **Joint Chiefs of Staff**
  - **Unified Combatant Commands**
    - Africa Command (AFAICOM)
      - Joint Forces Command-Operation United Assistance
- **Defense Agencies**
  - Defense Threat Reduction Agency
  - Defense Logistics Agency
- **Armed Services**
  - Army
  - Navy
  - Air Force
  - Marines
  - National Guard
  - Coast Guard

Coordinate

44

Exhibit 2: DART Timeline and Epidemic Curve, Liberia
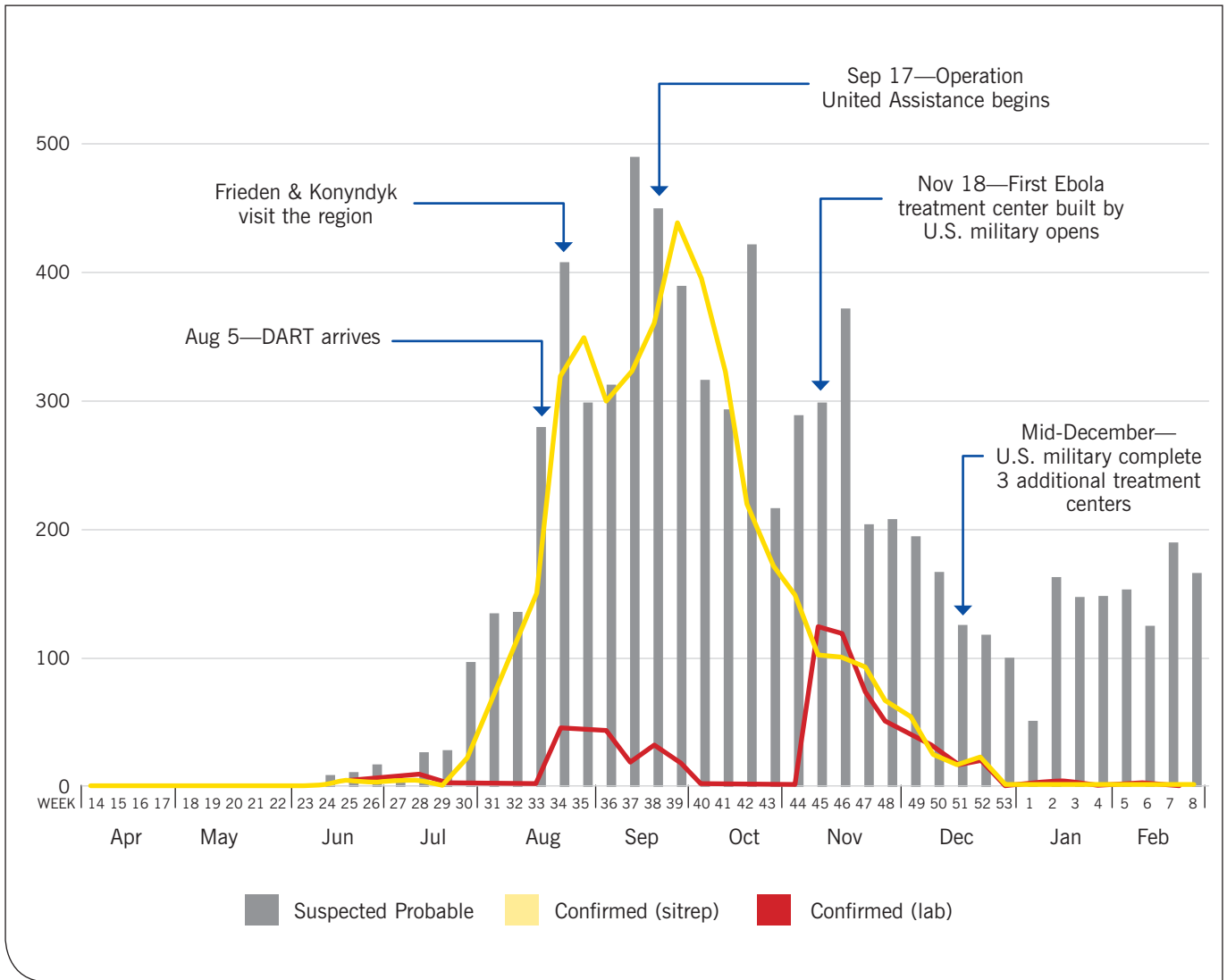
Exhibit 3: Number of New Infections by Week Across Three Countries

New EVD infections reported vs. timeline of OFDA-supported IP grant agreements, by country
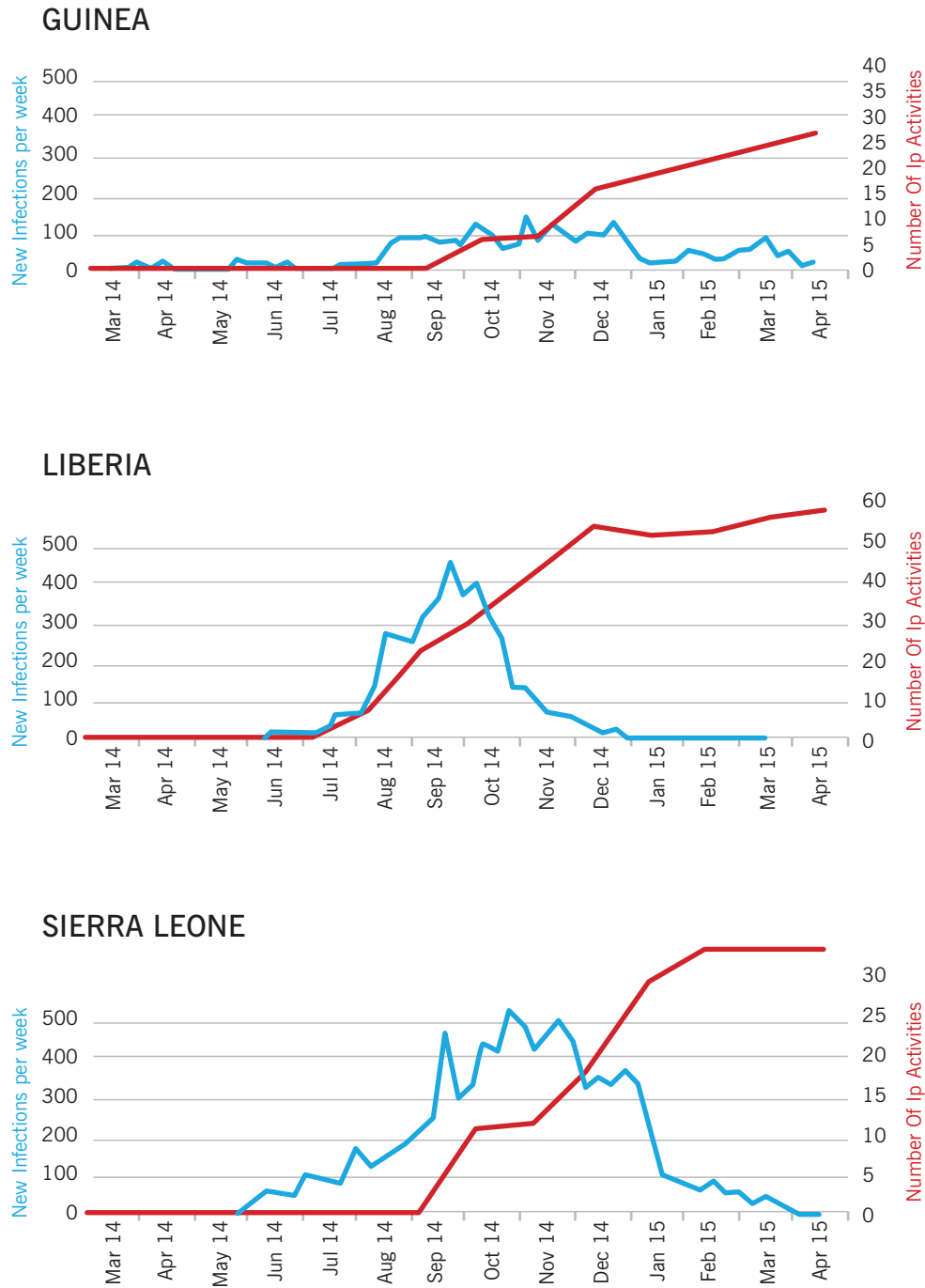
GUINEA

LIBERIA

SIERRA LEONE

Source: Reproduced from International Business and Technical Consultants, Inc. Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, section on effectiveness, p. 13, U.S. Agency for International Development, January 2018. Accessed at https://pdf.usaid.gov/pdf_docs/PA00SSBX.pdf.

Exhibit 4: Funding for Ebola Response 2014-2016

2014 and 2015 Total Funding for the Ebola Response*

PER DONOR

Donor	Amount
USG	$1,726,086,976
UK	$362,878,855
Germany	$165,046,907
World bank	$139,598,831
European Commission	$128,593,709
France	$108,358,081
Sweden	$87,345,743
Japan	$78,941,052
Canada	$78,020,740
Netherlands	$72,866,893

Axis: 0 2M 4M 6M 8M 1B 1.2B 1.4B 1.6B 1.8B 2B

* Funding figures are as of June 16, 2015. All international figures are according to the UN Office for the Coordination of Humanitarian Affairs (OCHA) Financial Tracking Service and based on international commitments during 2014 and to date in 2015, 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.

Source: Adapted from U.S. Agency for International Development and U.S. Centers for Disease Control and Prevention. West Africa—Ebola Outbreak Fact Sheet #35, June 16, 2015, p. 5. Accessed at https://www.usaid.gov/sites/default/files/documents/1866/west_africa_fs35_06-16-2015.pdf.

Exhibit 5: Funding for Ebola Response 2014-2016

Funding for the EVD outbreak response, 2014-2016

Entity	Amount
U.S. government	$2.4B
U.K. government	$362,878,855
World Bank Group	$1.6B
European Union	$720M
Japanese government	$185M
German government	$134M
Chinese government	$125M
French government	$97M

Axis: 0, 2M, 4M, 6M, 8M, 1B, 1.2B, 1.4B, 1.6B, 1.8B, 2B

Source: Reproduced from International Business and Technical Consultants, Inc. Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, section on effectiveness, U.S. Agency for International Development, January 2018, p. E-10, accessed at https://pdf.usaid.gov/pdf_docs/PA00SSBX.pdf.

Exhibit 5: Breakdown by affected country cont.
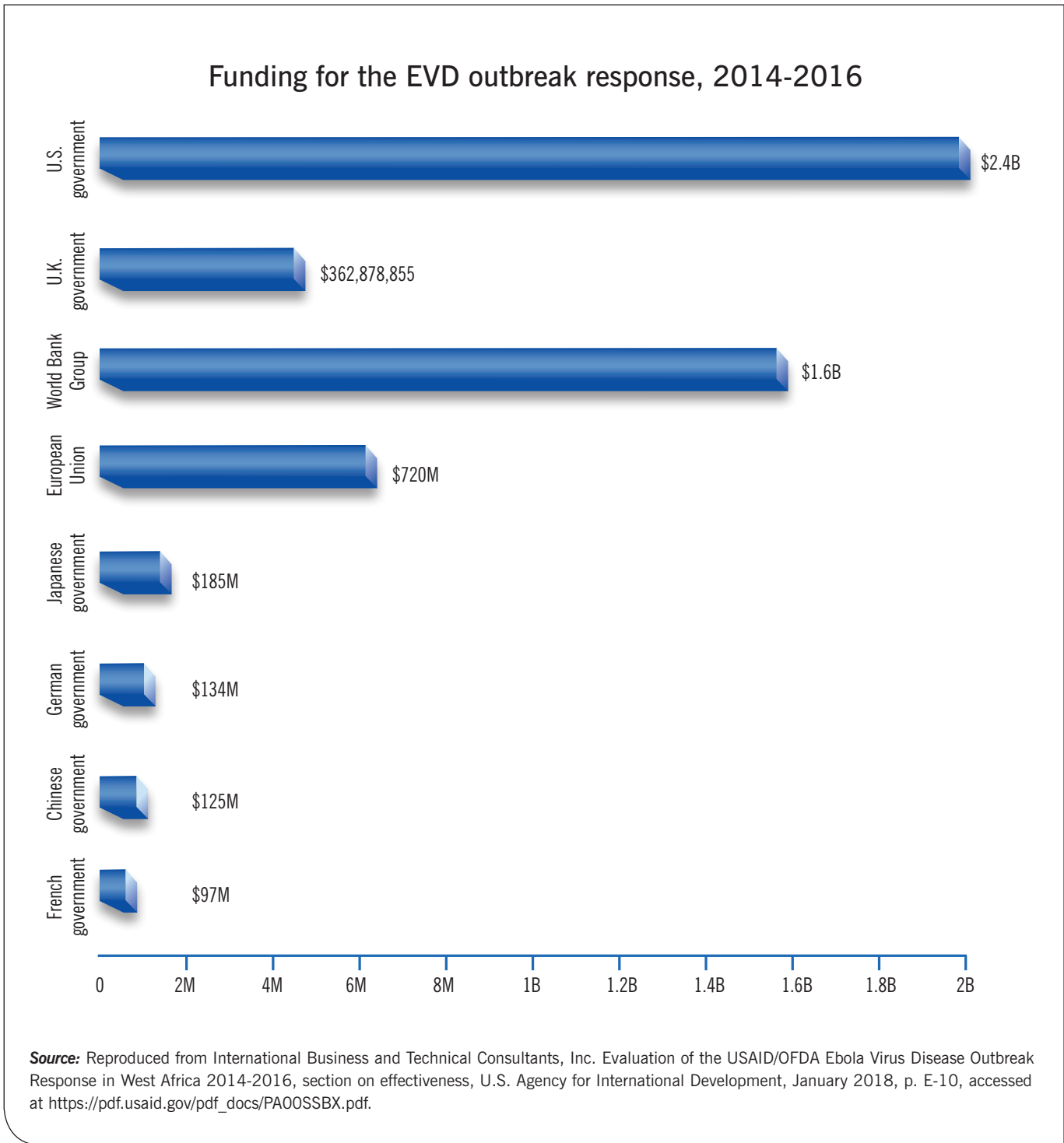
Percentage funding distribution by donor in Guinea

- 38% — U.S. government
- 24% — French government
- 10% — World Bank
- 8% — Euroean Commission*
- 6% — Ebola Response Multi-Partner Trust Fund
- 4% — Japanese government
- 10% — Other

Legend:
- U.S. government
- French government
- World Bank
- Euroean Commission*
- Ebola Response Multi-Partner Trust Fund
- Japanese government
- Other
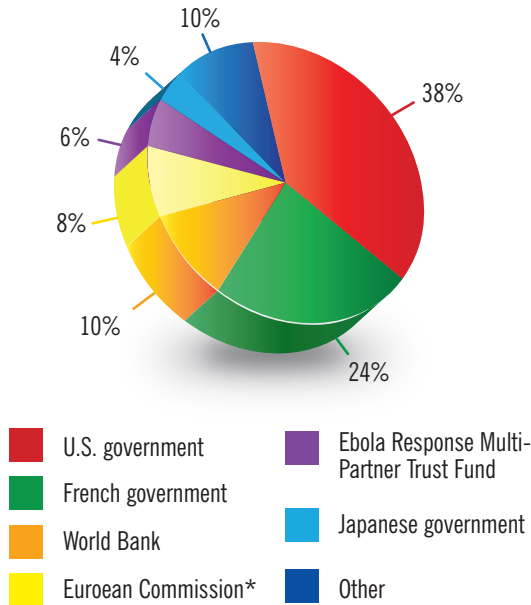
Percentage funding distribution by donor in Sierra Leone

- 46% — U.K. government
- 24% — U.S. government
- 19% — German Government
- 5% —
- 4% — Ebola Response Multi-Partner Trust Fund

Legend:
- U.K. government
- U.S. government
- Other
- German Government
- Ebola Response Multi-Partner Trust Fund
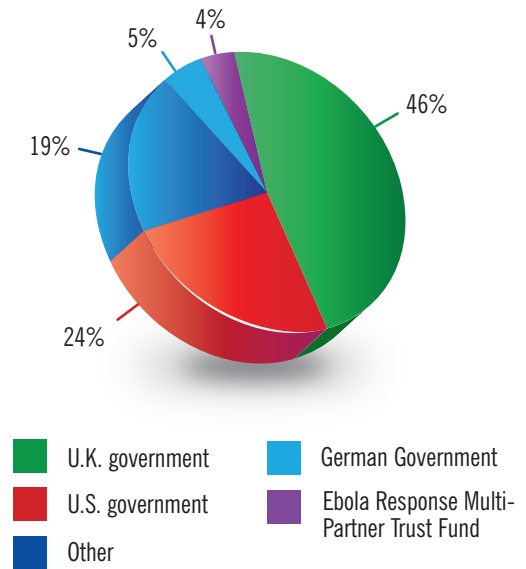
Percentage funding distribution by donor in Liberia

- 83% — U.S. government
- 7% — Other
- 5% — German government
- 3% — World Bank
- 1% — Euroean Commission*

Legend:
- U.S. government
- Other
- German government
- World Bank
- Ebola Response Multi-Partner Trust Fund
- Euroean Commission*
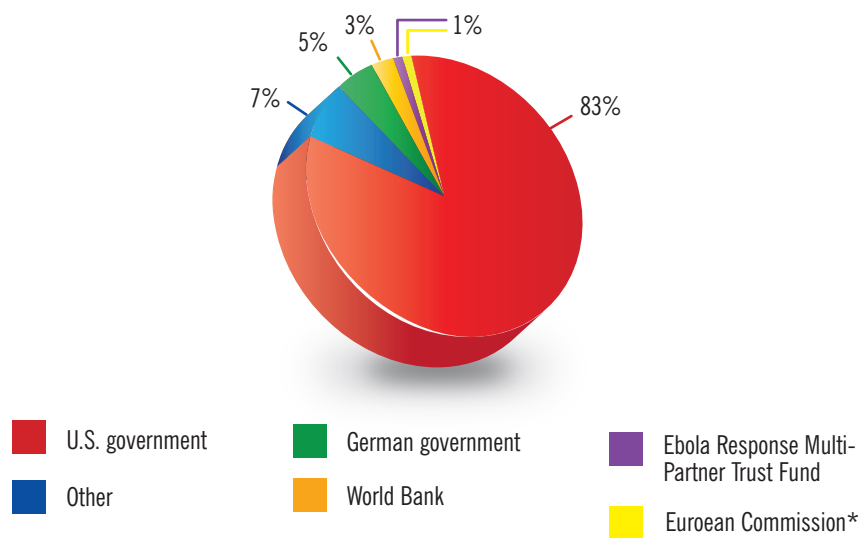
*European Commission's Humanitarian Aid and Civil Protection Department

Source: Reproduced from International Business and Technical Consultants, Inc. Evaluation of the USAID/OFDA Ebola Virus Disease Outbreak Response in West Africa 2014-2016, section on effectiveness, U.S. Agency for International Development, January 2018, p. E-10, accessed at https://pdf.usaid.gov/pdf_docs/PA00SSBX.pdf.

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JENNIFER WIDNER

To review the entire ISS Ebola series, which provides detail on specific functions (supply chain, social mobilization, contact tracing, Liberia IMS) go to https://successfulsocieties.princeton.edu/focus-areas/ebola-response

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39. https://successfulsocieties.princeton.edu/about/terms-conditions

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