UPDATES FROM THE FIELD

EMERGENCY RESPONSE AND RECOVERY

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ON THE SCENE: A COMMITMENT TO EMERGENCY RESPONSE

Our world today is affected by many front-page crises, from refugees in Syria and its neighboring countries to Zika virus in the Americas. And while these are happening, we must quickly respond to other outbreaks and natural disasters and help with recovery in areas devastated by war and disease.

It's rewarding work, but difficult – our responders are often first on the ground to help with emergencies, sometimes venturing into dangerous and uncertain situations. We embrace the unknown, sharing our expertise while continuing to learn more as we confront the world's most urgent health problems. It's a mission that is close to our hearts.

From the beginning of a crisis, response teams spring into action. As events unfold, we answer countries' needs with experts in health, nutrition, infectious diseases, mental health, reproductive health, surveillance, coordination and logistics, and water, sanitation, and hygiene. We are also there afterward to support recovery of public health systems, working closely with countries and partners to put the pieces back together so that countries can withstand and better respond to the unexpected.

At times, the task can seem overwhelming. But the importance of this work cannot be underestimated. Not only is it the right thing to do, but the relationships and systems we build during emergencies can help protect us all in the future.

In this issue of *Updates from the Field*, you will read personal stories from responders working in extraordinary circumstances. From setting up surveillance systems in refugee camps, to developing mass immunization campaigns, to improving care for mothers and babies, to evaluating mental health in post-conflict settings, we are on the scene.

RADM JORDAN W. TAPPERO, MD, MPH
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IN THIS ISSUE

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http://www.cdc.gov/globalhealth/healthprotection/fieldupdates/index.html

HELP AND HOPE FOR SYRIAN REFUGEES:
THE MANY WAYS WE TAKE ACTION IN A CRISIS

The scale of the Syrian crisis is nearly beyond comprehension: 4.9 million refugees, 6.6 million people displaced inside Syria's borders.

But the numbers don't tell the whole story.

What is it like to be on the ground? How do you help when systems are overwhelmed and communication is difficult, if not impossible? How can you make a difference?

CDC's Emergency Response and Recovery Branch (ERRB) has been on the scene since 2012, working to protect the health of those affected by the crisis. We have conducted more than 85 humanitarian public health missions related to the crisis, making this our second largest humanitarian response to date, surpassed only by ERRB's work following the 2010 Haiti earthquake.

In the middle of the chaos, we are there to help. We gather information, track disease, immunize people, provide nutritional counseling, train workers, and strengthen systems.

We partner. We teach. We learn.

The challenges are many, and the problem is growing. Globally, one in every 113 people is now either a refugee, an asylum-seeker, or an internally displaced person (IDP). Fifty-one percent of them are children. But we're out there every day – sometimes only a few miles from the conflict. We're working closely with others in the region to look at issues and solve them, even as the situation shifts from moment to moment.

These are our stories.

TIMELINE OF SELECT EVENTS

To learn more about our response in Syria and other activities, visit our website: http://www.cdc.gov/globalhealth/healthprotection/errb

- **March 2011:** The Syrian crisis begins.
- **May 2011:** Camps for refugees open in Turkey.
- **July 2012:** Za'atari refugee camp opens in Jordan.
- **August 2012:** CDC works with international partners during an initial assessment mission to Jordan.
- **September–October 2012:** CDC travels to Za'atari refugee camp in Jordan to make recommendations to UNHCR for a surveillance, outbreak alert, and response system.
- **December 2012:** The number of refugees in countries neighboring Syria reaches 500,000.
- **March 2013:** CDC conducts a 5-day training course in Jordan for more than 50 health professionals representing all the countries affected by the Syrian crisis.
- **March 2013:** CDC and its partners evaluate emergency reproductive healthcare services for Syrian refugees in Za'atari camp and urban refugees in Irbid, Jordan.
- **March 2013:** CDC evaluates existing mental health programs among Syrian refugees in Jordan.

Tents house refugees in Za'atari refugee camp, 2012 (Source: Farah Husain, CDC)

"The first time I set foot in the Za'atari refugee camp in Jordan, in Fall 2012, I couldn't have imagined how much the crisis would grow. At the time, the camp hosted about 25,000 Syrian refugees – today, that number has more than tripled. It's easy for diseases to spread quickly in situations like this, so the camp asked us to help set up a system to catch and report outbreaks early. Shortly after that, we helped set up an Early Warning Alert and Response Network (EWARN) to track priority diseases in northern Syria. It was a difficult time — there was no information coming from opposition-controlled areas, and no UN agency could go in. We had to set up the EWARN system from Turkey. This is the same system that later reported a polio outbreak in Syria, enabling us to act quickly to start vaccinating and stop the spread."

— *Farah Husain*

Tuberculosis testing at a health facility in Mafraq Governorate, Jordan (Source: Susan Cookson, CDC)

"I was in Jordan and it was snowing. Many people were living in tents. I couldn't imagine what it must be like to live there, especially in the desert summers. We went into the city, into apartment complexes where other refugees were living. We talked to them and tried to address their concerns about tuberculosis (TB) – concerns for their families and concerns about interruptions in treatment. We realized how much the refugees really wanted someone to pay attention and help provide care for them. People were coming to Jordan because they couldn't receive treatment at home in Syria. Some had developed multidrug-resistant tuberculosis, which is more lethal and more costly to treat than other forms of TB. This is a reality in the disruption of health services when people are forced to migrate: diseases that should be eliminated quickly can take months to treat and may end up being much worse than if treated promptly."

— Susan Cookson

- **May 2013:** CDC, WHO, and UNHCR support a mass measles vaccination campaign in border areas of Jordan, addressing a decline in vaccination rates from 90% before the conflict to under 50% by 2013.
- **May - July 2013:** CDC helps establish EWARN system in northern Syria to help workers identify diseases most likely to cause an outbreak.
- **May - August 2013:** CDC sends staff to Turkey and Jordan to strengthen disease detection for priority health conditions.
- **June 2013:** CDC and partners train healthcare professionals working on Syria's frontlines on how to collect data for EWARN and investigate outbreaks.
- **June 2013:** CDC works in Jordan to increase awareness about how TB spreads and to improve the ability of healthcare professionals to diagnose and treat TB among Syrian refugees.
- **July – September 2013:** CDC sends two epidemiologists to serve as UNICEF health advisors in the Za'atari refugee camp.
- **July 2013:** One year after opening, Za'atari camp hosts 120,000 refugees.
- **August - September 2013:** CDC works at Za'atari camp to evaluate how data on reproductive health are being collected and shared.
- **August 2013:** The second round of the measles vaccination campaign takes place in Jordan.
- **August 2013:** The number of Syrian refugee children exceeds 1 million.
- **September 2013:** The number of Syrian refugees passes the 2 million mark, with an additional 4.25 million IDPs.

"When measles popped up in Syria, it was tough to get samples out of the country to confirm the diagnosis. Before we knew it, the outbreak had spiraled into a regional crisis. When the virus spread to surrounding countries, including Jordan, Lebanon, and Turkey, the international community planned emergency vaccination campaigns. I went to Jordan to assist in the two northern governorates that border Syria. We vaccinated both the Syrian and Jordanian communities, because around half of the refugees in Jordan don't live in camps. We achieved over 90% coverage there, then focused on a nationwide campaign, working closely with international partners and the ministry of health to stop the spread of this contagious and deadly disease."

— Eugene Lam

Eugene Lam and team monitoring a measles vaccination drive in northern Jordan (Source: Eugene Lam, CDC)

Survey team members measuring the height of a Syrian girl in Za'atari camp to assess her nutritional status (Source: Eva Leidman, CDC)

"In Za'atari, we went door to door to collect information about the nutritional status of Syrian refugees living in the camp. We know that malnutrition is often a problem among refugees; however, it's also linked with many infectious diseases, like measles. We measured children to see how they were doing: weight, height, mid-upper arm circumference, and their hemoglobin levels. While there were few malnourished children, we found many with anemia. Together with partners, we recommended programs to make sure refugees have easy access to fortified flour and more nutritious diets. We have also worked with partners who are providing services inside Syria's borders, where our challenges are different. We have had to provide remote support to local partners who are able to reach places we cannot go, and these partners deserve a lot of the credit. It's dangerous work."

— Eva Leidman

October 2013: EWARN detects a polio outbreak in opposition-controlled Syria, initiating a vaccination campaign.

November 2013 - March 2014: CDC provides ongoing assistance with acute flaccid paralysis surveillance for polio cases.

July 2014: CDC travels to Jordan to help UNICEF conduct a quality review of nutrition and health surveys of Syrian refugee and host populations.

December 2014: CDC presents the impact of EWARN at a symposium in Gaziantep, Turkey.

July - December 2015: CDC develops guidelines with partners to evaluate EWARN in response to the Syrian crisis.

October 2015: Iraq reports an outbreak of cholera in refugee camps.

November 2015: In Iraq, CDC helps plan and conduct the first round of an oral cholera vaccination campaign, strengthens surveillance for cholera, and implements water, sanitation, and hygiene procedures.

December 2015: CDC helps conduct the second round of the Iraq oral cholera vaccination campaign and post-campaign coverage survey.

"You try not to think about it – how close you are to danger. Mosul had been taken over, and ISIS was mere hours away. Near the Iraqi city of Erbil, people in camps tried to make life as normal as possible — children going to school, trying to carry on with everyday life. I was there to help respond to an outbreak of cholera in the country. In addition to working on clean water and sanitation, the Iraq Ministry of Health and key partners were conducting a two-dose oral cholera vaccination campaign to try to prevent the outbreak from moving into Syria. After the second round of immunization, we helped conduct a coverage survey using electronic tablets to send real-time data, allowing us to make corrections immediately if needed. We found that vaccination coverage was close to 90%, despite the complexity of the situation."

— Eugene Lam

Girl receiving oral cholera vaccine in a camp for displaced Iraqis, Erbil, Iraq (Source: Eugene Lam, CDC)

Leisel Talley distributing supplemental nutrition items and other care products in Croatia (Source: S. Osterman, UNHCR)

"The fog was thick at the Slavonski Brod station as refugees spilled off the train. They wouldn't stay long — about an hour. They filed through tents, receiving basic supplies: hygiene kits, hot tea, meals, and clothing. A separate, small tent provided access to minimal healthcare along with space for infant feeding, clothing, and breastfeeding support. This is where I stood. I had 15 minutes to give a comprehensive infant feeding assessment in my 20-foot by 20-foot tent. We asked mothers if they were breastfeeding, which we encouraged. We managed a bottle exchange for mothers with dirty or broken bottles who didn't want to breastfeed or cup-feed. To ensure safer artificial feeding, we offered ready-to-use, liquid formula instead of powdered infant formula. I was just one of many who were working to make the best of a terrible situation. All of us in that station seized every minute to help replenish, educate, and prepare these tired travelers for the next grueling leg of their journey."

— Leisel Talley

December 2015: CDC travels to Croatia to address infant and young child feeding among migrants transiting through Europe.

January 2016: CDC evaluates EWARN in refugee and IDP camps in Iraq.

January 2016 - present: CDC mental health expert mentors an Emory University student to conduct a mental health survey among Syrian refugees in Atlanta.

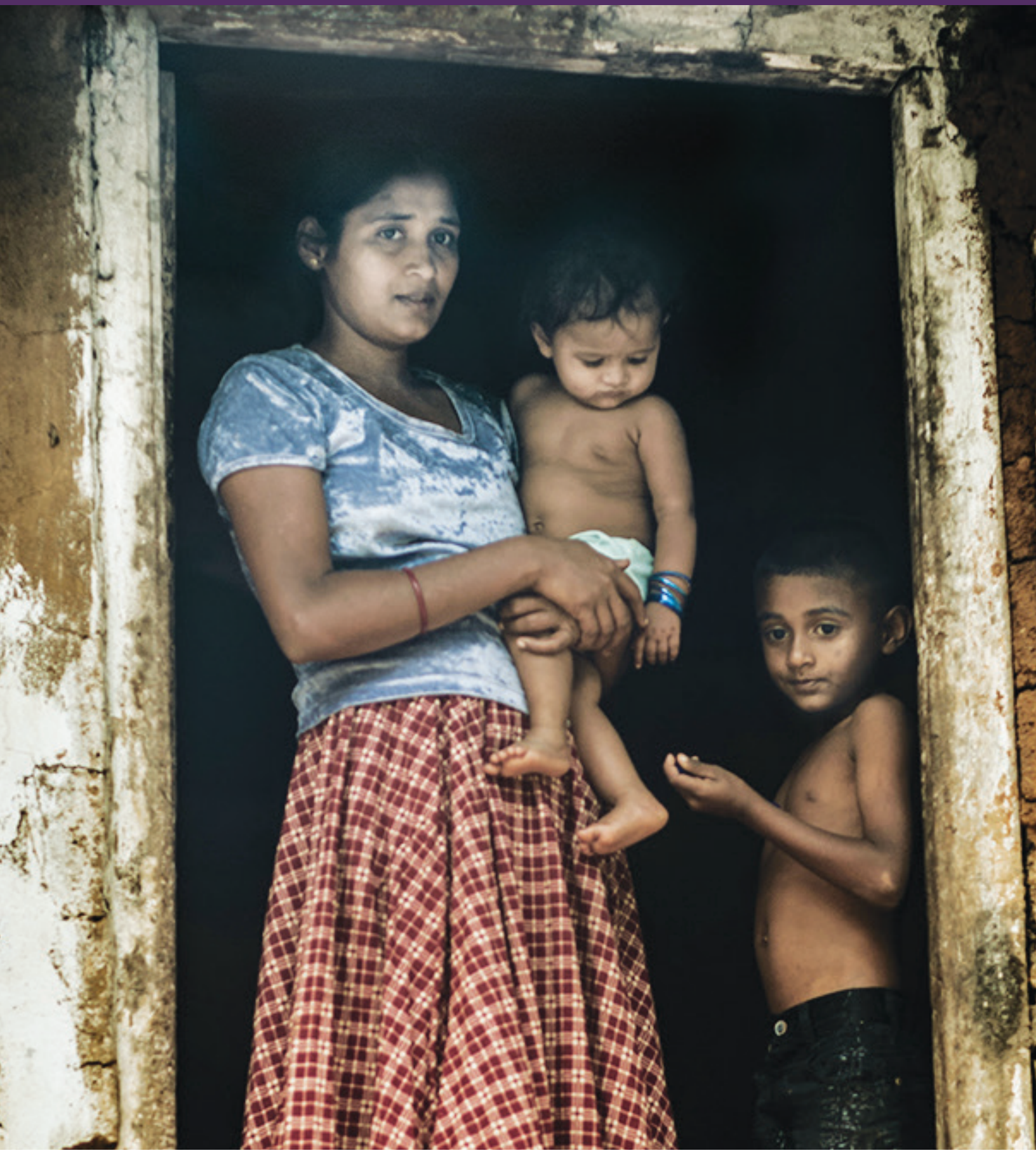
April 2016: CDC assists the U.S. Embassy in Greece in a rapid public health assessment of refugee sites across Greece after implementation of the European Union-Turkey agreement.

May 2016: CDC conducts the first ever face-to-face EWARN training for staff from southern Syria.

Present: As the crisis expands, CDC continues to provide expertise and assistance to Syria's refugees.

"We had traveled halfway across the world to train people, but we were suddenly looking at the very real possibility of facing an empty classroom. Our students, a group of Syrian clinicians eager to learn more about the EWARN surveillance system, were stuck at the border. We ended up having to condense our training into just two days, but we were grateful we were finally there in person after many trainings over Skype. The Skype trainings were very inefficient; a conversation that should take 30 minutes would take two hours. Imagine what happens when you try to do a three-hour training! The clinicians wanted to take what they learned in the training and share it in their country because there are a lot of clinicians who need this information. When we asked them about the danger they might face, especially in the north, they told us, 'We don't care anymore. We want to do this.'"

— Kristi Cordes and Colleen Hardy



Sometimes the scars of war are not visible (Source: Sergio Carbajo)

HEALING HEARTS AND MINDS IN SRI LANKA

Barbara Lopes-Cardozo

Looking at survivors of conflict, it can be easy to miss the mental and emotional damage they are suffering. But we can't underestimate the effects of lingering psychological issues like depression, post-traumatic stress, or anxiety — not just on one person, but on the whole community. As we try to fix buildings and treat physical injuries, we must not forget to repair the mind and heart.

We know from our studies in war-torn areas like Kosovo and Afghanistan that feelings of anger – and desire to take revenge – are common, and sometimes may be part of post-traumatic stress disorder (PTSD). If these feelings aren't addressed, the cycle of violence is more likely to continue. We also know that a society's ability to function can be affected by high rates of depression. We have only really begun to recognize the far-reaching impact of conflict on mental health over the last decade.

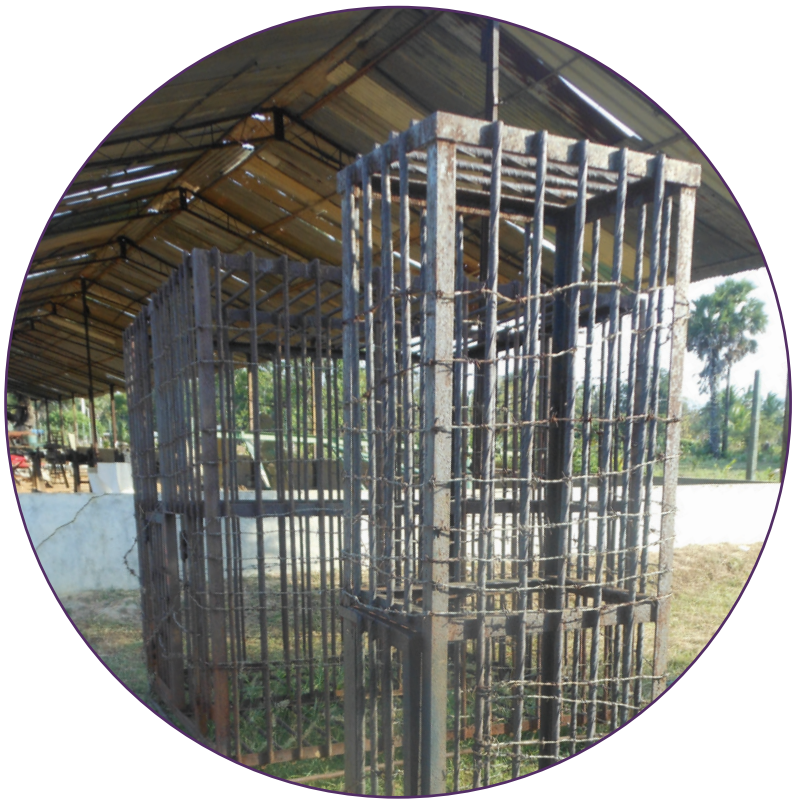
The people of Sri Lanka know what it's like to live with violent conflict. Estimates are that 80,000 to 100,000 people died as a result of the civil war that lasted more than 25 years. The fighting officially stopped in 2009, but the mental health consequences of such a protracted and painful crisis cast a long shadow. Our team went there to look more closely at the issue and see how we could help.

We began in 2008 by conducting a survey of mental health in part of the country. Not surprisingly, we found elevated levels of PTSD and depression. We returned in 2010 to look at the mental health of aid workers. We tend to assume that workers can just keep going no matter what, continuing to provide care for affected populations, but we find that they too suffer from psychological issues related to the war. Many aid workers in Sri Lanka were forced to flee their homes. We often forget that helpers need help too.

In Sri Lanka, with our partners from Anglia Ruskin University in the U.K., we have plans to do another survey in the northern part of the country. This new survey will not focus just on patients, but also on the functioning of health facilities. While Sri Lanka has a good national health system overall, the country doesn't have enough trained mental health professionals. For instance, there are only one or two psychiatrists serving the whole northern province of 1.2 million people.

Because of this, we are working with Sri Lankan researchers, who are now at Anglia Ruskin University, to train primary care providers on how to recognize and treat mental health problems, according to the model of the Mental Health Gap Action Program (MH GAP) established by the World Health Organization. Our next step is to research the effectiveness of these programs.

To rebuild a healthy society after conflict, we must address these mental health issues. Healing emotional wounds is critical to truly moving forward in peace.



Prisoner cages used during the war in Sri Lanka (Source: Max Nerlander, CDC)

A RAPID RESPONDER ENGAGES A COMMUNITY TO FIGHT ZIKA

Tasha Stehling-Ariza

When I tell people I'm an epidemiologist, their faces often go blank. Luckily, explaining complicated ideas is part of my job.

In fact, an epidemiologist has many jobs, and one of them is making sense of complex and evolving situations. On my most recent deployment to Panama with CDC's Global Rapid Response Team, my ability to explain the unknown became a critical skill. I arrived on the scene just as the Zika outbreak was taking hold.

People in the community had questions: What is Zika? How do I prevent it? If I'm pregnant, how can I keep my baby safe?

Digging for answers proved to be more difficult than we expected, because not much was known about the virus. My team and I combed through the science to piece together facts about Zika virus, the mosquitoes that transmit it, and Zika outbreaks that had occurred in other parts of the world.

We then developed materials to get the message out. However, we soon encountered another obstacle: giving people information about Zika wasn't going to be enough to beat it. Although people understood how to help prevent Zika, they didn't see it as a serious threat. They didn't understand why they should bother to wear insect repellent or clean up standing water in their neighborhoods.

Tasha (right) at work in Panama (Source: Tasha Stehling-Ariza, CDC)

For many, Zika can be all too easy to ignore. Many people infected with the virus won't have symptoms or will have only mild symptoms. But for pregnant women, the effects can be devastating. Zika virus infection during pregnancy can cause microcephaly, a birth defect where a baby's head is smaller than expected when compared to babies of the same sex and age. Zika infection can also lead to other severe fetal brain defects.

One pregnant woman, afraid for her unborn child, urged her neighbors to help clean up trash piles and other places where Zika-carrying mosquitoes can hide. She was counting on everyone around her, knowing that the health of her baby was in the hands of her community.

Influencing the way people behave is not easy, but with open communication, ongoing education, and strong community support, change is possible. By encouraging everyone to care about fighting Zika – pregnant or not – the potential to stop the virus is within reach. As every rapid responder knows, even in situations where we don't have all the answers, we can still make a big difference.

> "By encouraging everyone to care about fighting Zika – pregnant or not – the potential to stop the virus is within reach."
>
> — *Tasha Stehling-Ariza*
> *(Epidemiologist, CDC Global Rapid Response Team)*

DETECTING DISEASE 24/7: ON THE LOOKOUT FOR HEALTH THREATS ACROSS THE GLOBE

The Global Disease Detection (GDD) Operations Center Team

In December 2015, four men who lived, worked, and ate in one neighborhood in Angola developed the same symptoms and died. Our team at the Global Disease Detection (GDD) Operations Center received a tip from the CDC country office in Angola and quickly brought together experts from around CDC to help determine the cause.

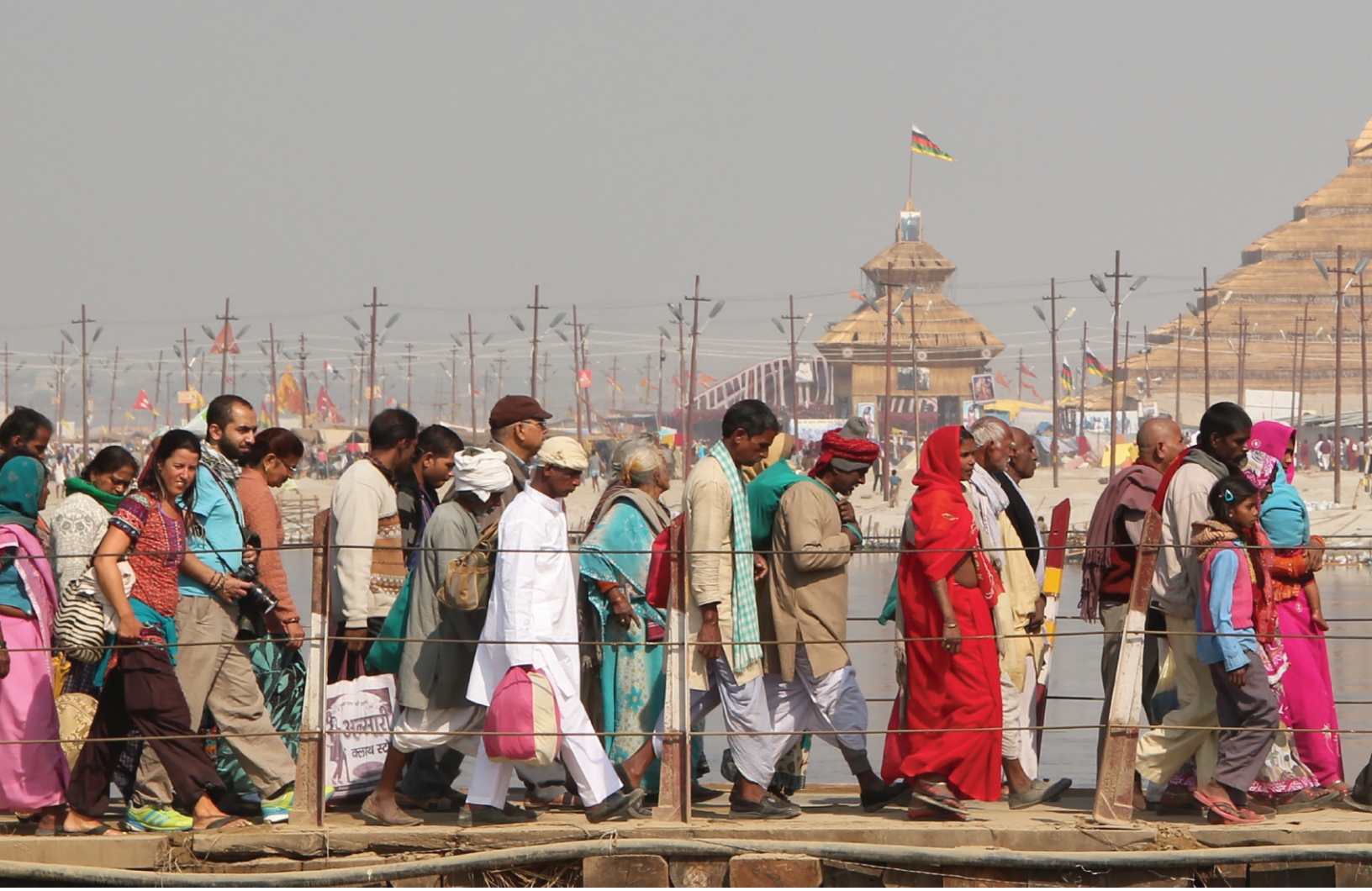
The Angola Ministry of Health soon confirmed the outbreak as yellow fever and requested assistance from CDC. Within two weeks, we assembled and deployed a response team. To date, we have supported more than 30 CDC responders who are actively working to stop the outbreak in Angola.

Here in the GDD Operations Center, we're always watching for information that might require action. We conduct event-based surveillance, which means we get our reports from all kinds of sources – not just through traditional channels like hospitals and health departments. Working 24/7 to detect disease, we sleuth through unofficial, unstructured channels worldwide. We surf the web, read blogs containing health-related information, and use advanced internet text-mining systems to help relevant reports get pushed directly to us. We also scan Twitter and, in some instances, can use it as an early source of information for a developing emergency.

Surrounded by computer and television screens, our team of epidemiologists monitors a wide range of health threats, including diseases and deaths among both people and animals, issues with contaminated food or water, and chemical and radioactive incidents. This real-time detection enables CDC to assess the risk to public safety quickly and to respond appropriately to health threats.

Not all information comes in a tidy report, especially for unfolding outbreaks and emergencies. When unconfirmed reports of disease or rumors of unexplained deaths reach CDC's GDD Operations Center, it's our team's job to find out if there's an epidemic in the making.

Luanda, Angola, where, thanks in part to CDC's work, six million people were vaccinated against yellow fever (Source: Justin Williams, CDC)



PREPAREDNESS FOR MILLIONS

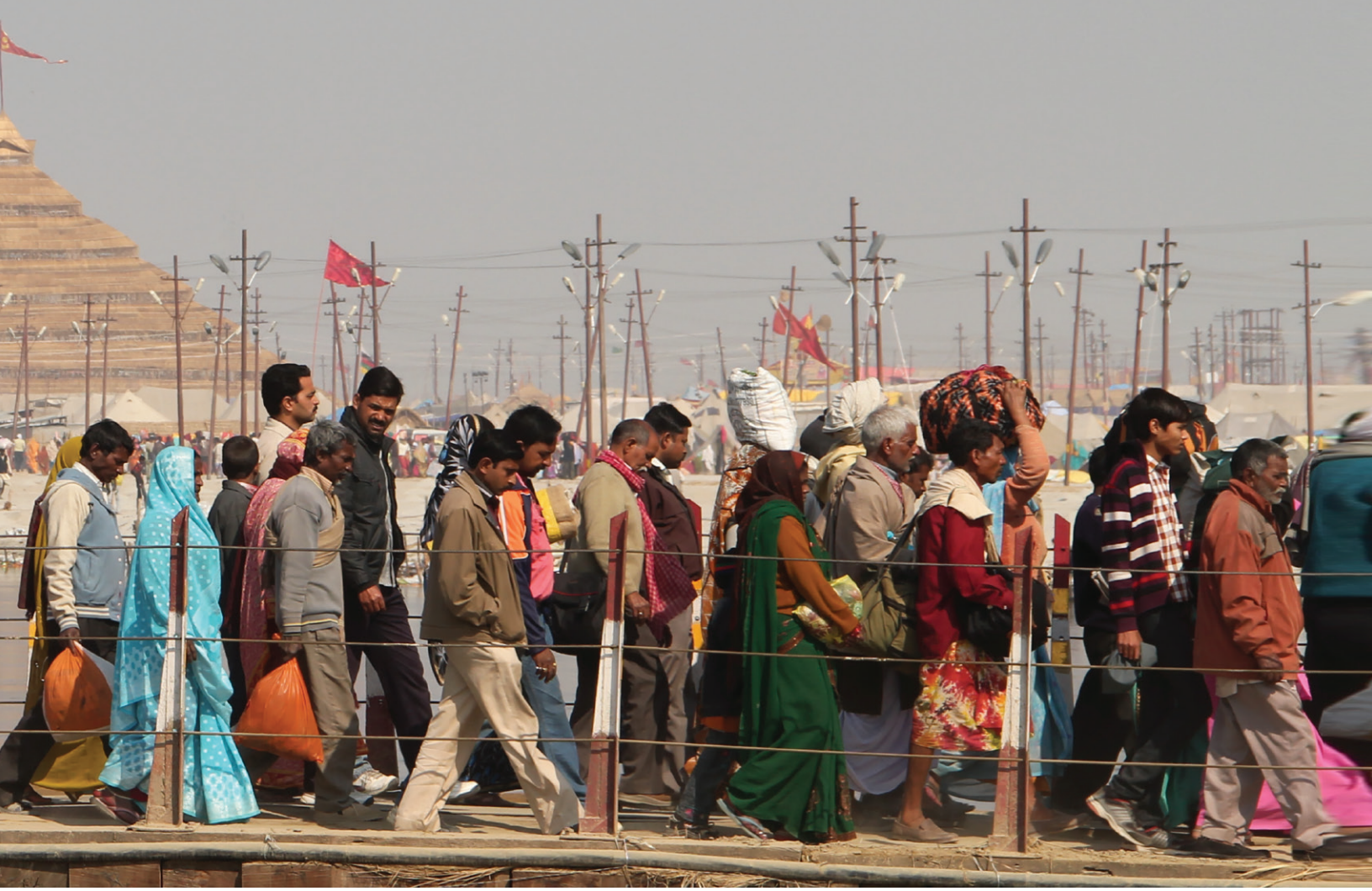
Daniel Brencic

Imagine a gathering on the scale of the Hajj or the Olympics in Rio de Janeiro, but instead of descending upon a city, more than a million religious pilgrims gather along the edges of a Hindu temple pool, waiting their turn to take a dip in the holy waters behind the thousands of sadhus, or holy men, who lead the procession. Makeshift food stands abound, water and sanitation is limited at best, and the constant crush of people is inescapable. It's loud, colorful, chaotic, and – if you're one of the lucky devotees – a transcendent experience.

Now imagine all of this unfolding without any major public health incident. That is what happened at the Mahamaham religious festival and other recent public health responses in India's Tamil Nadu state, thanks to a new initiative to strengthen public health emergency management.

Along with CDC staff Rajeev Sharma and Jenny Beaver, I have been working with the Tamil Nadu Directorate of Public Health and the National Institute of Epidemiology to develop an Emergency Operations Center (EOC). Its purpose is to coordinate and manage the public health aspects of mass gatherings, like the Mahamaham religious festival, or to respond to emergencies, like the historic floods that struck Tamil Nadu state in December 2015. We hope to connect this state-level EOC with the national-level EOC at the Indian National Centre for Disease Control in New Delhi that was developed through a previous CDC project.

The enormous influx of people during a mass gathering can pose many challenges for local health officials, who are often already working with limited resources and staff. Establishing an Emergency Operations Center facilitates a more efficient response and improves coordination between district, state, and national-level partners. Having a centralized location to coordinate partners, surveillance and laboratory data, communication messages, and the deployment of Rapid Response Teams to investigate sources of outbreaks may dramatically reduce response times, which can save lives, infrastructure, and money.



India uses a network of public health EOCs to make sure mass gatherings at festivals go smoothly (Source: Seba Della y Sole Bossio)

The same principles of emergency management can be applied to planned events like the Mahamaham festival or unplanned events like an infectious disease outbreak or natural disaster. The Global Health Security Agenda target is for public health EOCs to activate a coordinated response within two hours of identifying a public health emergency.

Partnership with Tamil Nadu state has been rewarding. Our partners in India are some of the hardest-working people I know, and it is great to see how they use creativity and innovation to achieve significant public health impact with limited resources. Tamil Nadu state partners are already preparing for the next festival mass gathering, while simultaneously conducting their routine disease surveillance program, which covers 67 million people. In India, being prepared for millions is not just part of a program, it's part of a culture of preparedness.

This project is funded through the U.S. State Department's Biosecurity Engagement Program.

> "Our partners in India are some of the hardest-working people I know, and it is great to see how they use creativity and innovation to achieve significant public health impact with limited resources."
>
> — *Daniel Brencic*
> *(Health Scientist, CDC)*

A WASH ENGINEER FOLLOWS CHOLERA FROM THE SOURCE

Anu Rajasingham

In 1854, John Snow helped usher in the field of epidemiology by tracing an outbreak of cholera to a local water pump, proving that the best way to solve a problem is to go directly to the source. When I went to Tanzania to investigate the same disease in 2016, contaminated water was still an issue. But I didn't find just a pump. Instead, I found a whole truckload of sources.

By this point, cholera had been reported in 19 regions of Tanzania. Without treatment, the disease can become deadly within hours. The best way to stop cholera from spreading is to make sure people have safe water to drink.

As a water, sanitation, and hygiene (WASH) engineer, I knew that killing harmful germs in water is often done by adding chlorine. But once I arrived, I realized it was not going to be that simple.

First, in urban Dar es Salaam, only about 10% of people receive their water from the piped network. Most residents rely either on water trucks that deliver water directly to households, or on private water vendors who sell water to community members from large tanks. Water vendors get their water from many different sources. We wanted to target the water being sold in cholera-affected areas in Dar es Salaam, but ensuring that all water sources were adequately chlorinated was going to be difficult.

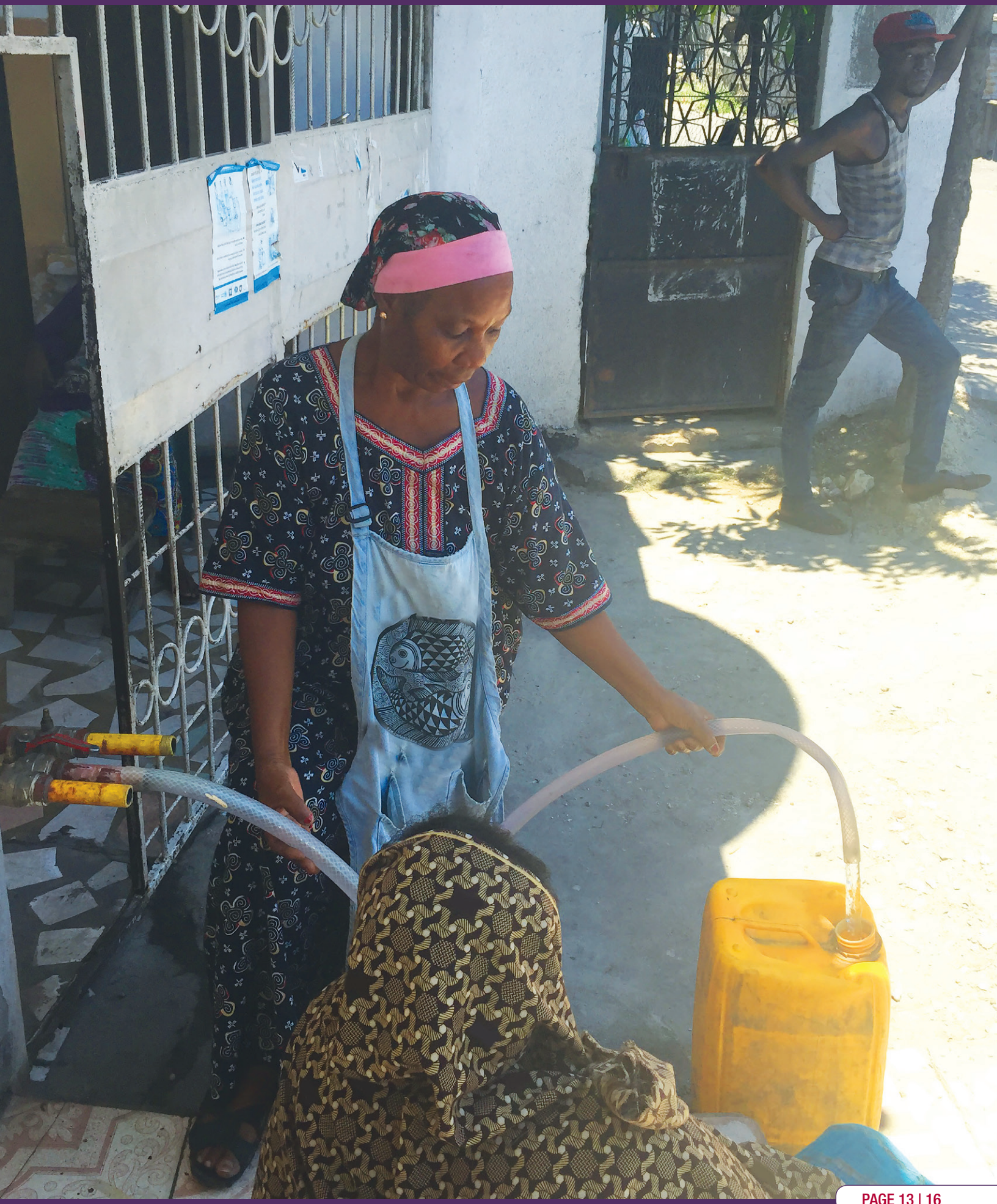
Second, while chlorine tablets are effective, there's a catch: chlorine breaks down over time. In Dar es Salaam, water from tanker trucks can be delivered from miles away and then stored in a vendor tank for days before it is sold. Therefore, even if we added chlorine to the tank on a truck, by the time households actually received the water, chlorine levels may have been too low for it to be considered safe.

Left to right: Testing free chlorine residual in a water truck that has just been filled; Filling water jugs to take home (Source for all photos: Anu Rajasingham, CDC)

With these challenges in mind, we decided the most reliable solution was to chlorinate the water inside the large vendor tanks in our target areas.

Along with our partners, we started a small project where 28 vendors from one cholera-affected ward agreed to treat the water in their tanks with chlorine tablets we provided. The vendors were enthusiastic, since using the tablets meant they were able to ensure they were selling safe water to their community members.

We visited these vendors multiple times to test their water and our results were encouraging. Most tanks had detectable levels of chlorine, and the vendors were eager to get more tablets. The project has expanded to 15 wards and more than 700 vendors. We are monitoring the results closely. This project gives us hope that cholera can be stopped, as long as we ensure water is treated – no matter the source.



PROTECTING MOTHERS AND BABIES

Humanitarian emergencies often disproportionately affect women of reproductive age and children. During a response, applying public health approaches that are both locally adapted and sustainable can improve outcomes and strengthen the resilience of women, children, adolescents, and their communities for generations.

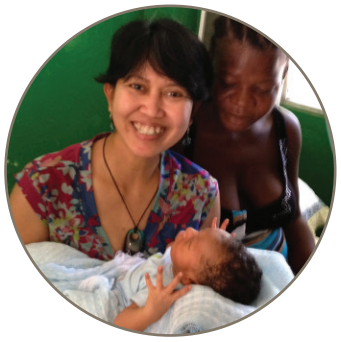
SAVING LIVES BY SAVING A SYSTEM

Endang W. Handzel

The thing about being a surgeon is that results are immediate. When I was a practicing clinician, pregnant women would come to me, and thanks to my training, I knew exactly how to help. But I felt I could do more.

After the 2010 earthquake and cholera outbreak in Haiti, the high maternal mortality ratio was a clear sign that the public health system did not have the basic building blocks needed to provide care. One problem was keeping track of pregnant women. Many were giving birth in places with few or no trained attendants, while others died, trapped in their homes, far from the care they needed.

My team and I worked to train medical staff and began using social mapping to keep track of each pregnant woman and her needs. Understanding why women were dying allowed us to create a system that connects women with care. Over time, results from this work can touch many lives.



Endang holding a baby who, thanks to her team's work, survived a complicated delivery, Haiti, 2013

SMALL CHANGES, BIG RESULTS

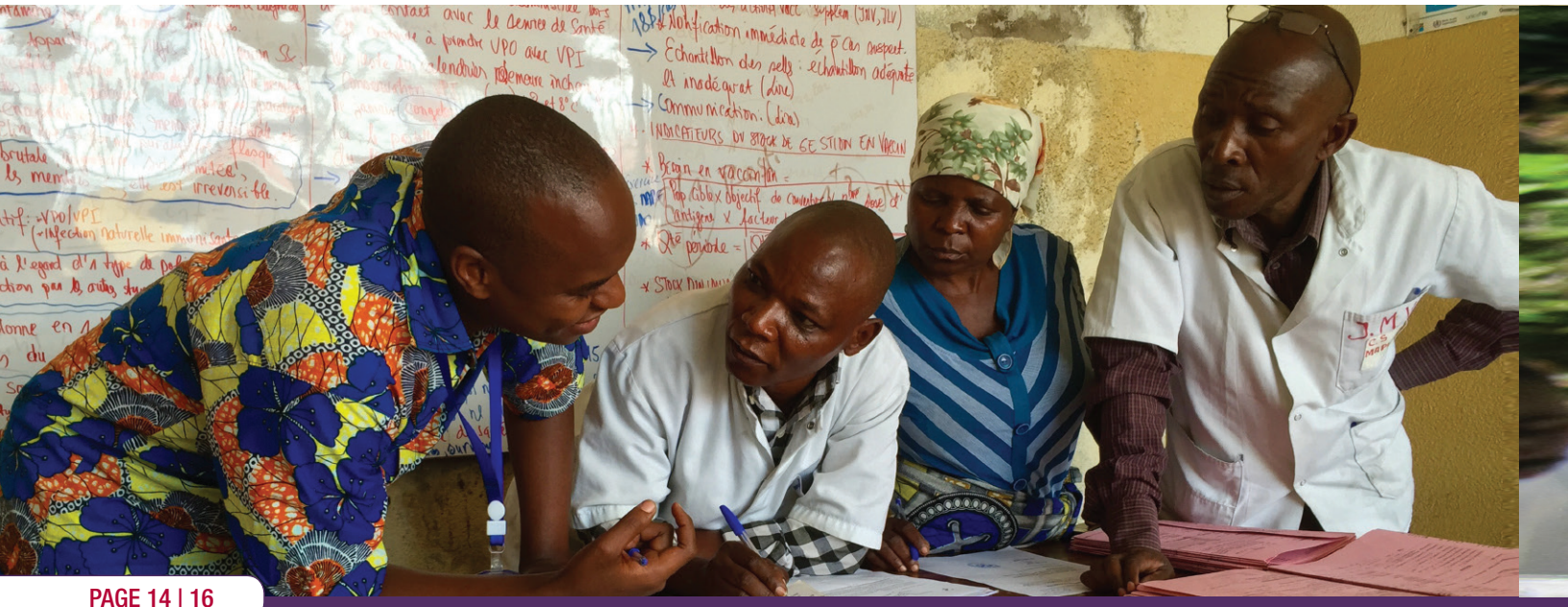
Kate Meehan

Though many of the rural healthcare facilities in the Democratic Republic of the Congo (DRC) are small, they are often all that stands between women and potentially fatal situations. For decades the DRC has been plagued by violence, which has recently increased in North Kivu Province.

Our research project aims to improve maternal and newborn health (MNH) in conflict settings. We are working with 12 healthcare facilities, which can be as much as a two-day walk through the forest from the closest road. We will train facility staff, equipping them with skills, like record-keeping, that will have a big impact on MNH but require few resources.

Displacement due to conflict or natural disaster does not stop women from becoming pregnant or giving birth; it is important that we support expectant mothers and babies during emergencies. Through our work, we hope to empower healthcare workers to enact small changes that can have a big impact.

While reviewing maternal and newborn health records with a midwife (center) in Goma, DRC, she had to leave twice to deliver babies (Source: Alaine Knipes, CDC)



NAVIGATING RECOVERY IN HAITI

Amber Dismer

In a public health emergency or disaster, recovery should begin early and inform response efforts. It's important to understand how a place has changed physically and how to get a healthcare system not only working again, but working better and more sustainably than before.

This is where geographic information systems (GIS) and GIS experts can help. GIS is used to collect, manage, visualize, analyze, interpret, and model geographic and health data, including roads, country administrative boundaries, health facilities, and the spread of diseases.

When Haiti began to rebuild its healthcare system after the 2010 earthquake, GIS was included early in recovery efforts. My colleagues and I trained staff from the Haiti Ministry of Health to use GIS to improve the national surveillance system and better target resources.

For example, in early 2016, we used GIS to optimize the national network for testing dried blood spot samples for HIV. The existing network operated on a hub-and-spoke model where healthcare facilities without the capacity to test (spokes) sent samples to facilities with the ability to test (hubs). Delivery was costly and variable, as facilities needed to send a person to transport samples to a nearby hub to be analyzed.

We wanted to look for ways to reduce transportation and personnel costs and to make the process faster – important factors to consider when resources are limited and saving someone's life depends on a rapid diagnosis. In the old hub-and-spoke system, there were instances of riders picking up samples from one healthcare facility, but then driving right past other facilities that also needed to send samples.

Working with partners, we used a GIS model to study the path drivers took, mode of transport used, type and quality of the roads, hours a facility was open, and transfer time of samples and test results. Two times a week, drivers needed to pick up samples from nine department hospitals, bring them to the National Public Health Laboratory for HIV testing, and return results to the department hospitals via motorcycles, cars, or public transport. We determined the best order and combination of healthcare facilities that each driver should visit, creating a streamlined, efficient system.

The Haiti Ministry of Health and partners used this GIS model to reduce costs by 50% from the previous year, with CDC financing 30% of the total system cost. The Ministry of Health's leadership and financial commitment ensured that this system could be launched and sustained. Improving a health system's efficiency and impact is everyone's responsibility, and GIS is a critical tool to help us all do that.

A boy by a road in Haiti, where geographic information systems save lives and money for healthcare facilities (Source: CDC)

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HEALING HEARTS AND MINDS IN SRI LANKA
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A RAPID RESPONDER ENGAGES A COMMUNITY TO FIGHT ZIKA
CDC's Global Rapid Response Team
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