FIGHTING SUPERBUGS

THE GLOBAL THREAT OF ANTIMICROBIAL RESISTANCE
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COVER: Michel Pierre works as a laboratory assistant at MSF’s Drouillard hospital in Port-au-Prince, Haiti—the only specialized hospital for burns in the country. Antibiotic-resistant infections are a growing problem for burn patients here. © Scott Streble

ABOVE: Ahmed, 38, was shot by the Israeli army during protests at the fence separating Gaza from Israel. Many of those wounded suffer from antibiotic-resistant infections. © Mohammed Abed
Dear Friends,

FOR NEARLY FIFTY YEARS, DOCTORS WITHOUT BORDERS/MÉDECINS SANS FRONTIÈRES (MSF) HAS BEEN RESPONDING TO THE MOST URGENT HUMANITARIAN CRISSES AROUND THE WORLD. FROM OUR ORGANIZATION’S FOUNDING IN THE WAKE OF WAR AND FAMINE IN BIAFRA TO OUR RESPONSE TO THE CATASTROPHIC 2010 EARTHQUAKE IN HAITI TO THE MASSIVE MOBILIZATION TO FIGHT THE EBOLA EPIDEMIC IN WEST AFRICA, WE’VE ALWAYS ADAPTED OUR RESPONSES TO MEET THE UNIQUE NEEDS OF OUR PATIENTS.

We’re now facing a very different kind of emergency, one that is far less visible and much more insidious. At MSF projects around the world, we see growing antimicrobial resistance—which means that many of the drugs we’ve relied on for decades to treat our patients are simply not working.

Antimicrobial drugs, and antibiotics in particular, are invaluable tools to stop life-threatening infections, curb outbreaks, and save lives. So what will we do without them? What are the alternatives?

I first encountered antibiotic resistance as a young intern in Philadelphia, while I was training in a free clinic for women. We learned to follow the antibiotic updates year after year as chlamydia and gonorrhea were becoming increasingly difficult to treat. When I began working with MSF and my practice expanded to include patients around the world, I came to understand how urgent the threat of antimicrobial resistance, or AMR, truly is.

The World Health Organization has declared that “antibiotic resistance is one of the biggest threats to global health, food security, and development,” yet international efforts to combat it tend to focus on wealthy countries.

AMR is a particularly pressing problem in countries with weak or failing health systems, poor sanitation, and especially in regions at war. If these criteria sound familiar to you, it’s for good reason: nearly all of the places where MSF works fall into one or more of these categories. Around the world, our teams are encountering drug-resistant bacteria, often at worryingly high rates.

In our reconstructive surgery program in Amman, Jordan, for example, up to 60 percent of the infections our doctors and nurses treat in war-wounded patients from across the Middle East are resistant to antibiotics. In Gaza, more than a thousand Palestinians are now suffering from chronic bone infections—many of them resistant to antibiotics—after being shot by the Israeli army during demonstrations that began in 2018. And in Port-au-Prince, Haiti, where MSF runs the only specialized center in the country for the treatment of severe burns, patients are particularly vulnerable to antibiotic-resistant infections that can further complicate already difficult recoveries.

To face this threat, we are doing what we always do when confronted with a new challenge: we adapt and we innovate. In these pages you’ll learn about the many ways our teams are working to fight antimicrobial resistance in our projects from the forests of Cambodia to the fields of southern Mali. We’re also sharing research and expertise with partners and national ministries of health. A challenge as complex as AMR requires a broad slate of strategies tailored to unique contexts and needs, from the implementation of cutting-edge technology to decidedly low-tech, community-based solutions.

None of these efforts would be possible without your support. Donors like you ensure that MSF is able to find ways to provide our patients with the highest quality care possible, no matter the emergency. We will continue to look for opportunities to improve our medical operations and help preserve lifesaving antibiotics for future generations. Thanks, as always, for all that you do.

Sincerely,

Africa Stewart, MD
President, MSF-USA Board of Directors
WHAT YOU NEED TO KNOW ABOUT

WHAT CAUSES ANTIBIOTIC-RESISTANT INFECTIONS?

When bacteria are repeatedly exposed to antibiotics or exposed to incomplete or suboptimal doses, those that are sensitive to the drugs are killed while the few that are resistant to them survive and become dominant.

HOW IS MSF FIGHTING SUPERBUGS?

Without urgent action, simple cuts and common diseases could once again become deadly, since there won’t be effective medicines to treat them. MSF’s approach to fighting antibiotic resistance (ABR) is based on three focus areas.

**Prevention:** Improving infection prevention and control (IPC) standards in health facilities by implementing proper hygiene policies and procedures.

**Diagnostics:** Expanding access to microbiology laboratories that can accurately diagnose bacterial infections and support surveillance.

**Antibiotic stewardship:** Training doctors to ensure that antibiotics are not overprescribed or inappropriately prescribed and teaching pharmacists to supervise access to them. We’re also advocating for policy changes to help combat ABR.
ABR is growing at alarming rates in countries with failing health systems and poor sanitation, and especially in regions at war. Resistance to antibiotics is especially common in places where off-the-shelf or counterfeit antibiotics are widely available.

We are working to strengthen diagnostic capacity in resource-limited and complex settings. MSF has microbiology labs in **Jordan** (Amman and Irbid), **Iraq** (Baghdad), **Palestinian Territories** (Gaza), **Yemen** (Aden), **Mali** (Koutiala), **Niger** (Madarounfa), **Liberia** (Monrovia), and **Central African Republic** (Bangui).

**WHAT’S THE DIFFERENCE BETWEEN ANTIBIOTIC RESISTANCE AND ANTIMICROBIAL RESISTANCE?**

**Antibiotic resistance (ABR)** refers specifically to bacteria that no longer respond to commonly used antibiotics.

**Antimicrobial resistance (AMR)** is a broader term describing the ability of microbes—including bacteria as well as viruses and some parasites—to survive the drugs used to kill them.
**An interview with Dr. Nada Malou, MSF microbiology advisor**

**What is your role at MSF?**

My job is to help Doctors Without Borders/Médecins Sans Frontières (MSF) teams access diagnostic tools, mainly by opening microbiology labs and determining what diagnostic tests standard MSF labs should include. Properly testing people for infections is a key part of prescribing them the appropriate antibiotic and preventing the likelihood of antibiotic resistance (ABR).

I have been involved in opening labs for MSF in places like Mali, Jordan, Yemen, and Central African Republic (CAR). Today we have 11 projects that have access to microbiology labs—five are run 100 percent by MSF, and six are operated in collaboration with national Ministries of Health or private institutions.

**Why does work on antibiotic resistance matter?**

Antibiotic resistance is a universal problem, but the solutions for MSF are different because the resources we have in the types of places we work are generally lower than what is available in Europe or the US. We cannot see ABR as a geographically localized problem, as [globalization means that] bacteria are now more easily traveling to other places—now it is “bacteria without borders” and “resistance without borders.”

Antibiotics were one of the most important medicines discovered—a gamechanger in the history of infectious diseases. But today we are running out of antibiotic options because bacteria have become resistant to so many of the current drugs, and companies haven’t invested in creating new ones. Prescribing the best antibiotic for a patient based on their microbiological results is important to ensure that we are treating patients properly and in a timely manner, but it’s also important in terms of public health that we are not creating more and more resistance by giving broad-spectrum antibiotics without having a targeted approach in terms of treatment.

**What’s MSF’s strategy to tackle antibiotic resistance?**

We have three pillars we believe play the most important roles in curbing resistance: increasing diagnostic capacity, improving infection prevention and control (IPC) in our facilities, and promoting the rational use of antibiotics so people only get the antibiotics they truly need when and for the length of time they need them. In our projects, we have microbiologists and infectious disease specialists, we have staff members responsible for hygiene and infection control, we have pharmacists who supervise access to antibiotics—and then, of course, we have the management team who is also involved in making sure we don’t lose sight of these pillars.

**Why is tackling resistance a priority for MSF?**

MSF’s focus on ABR began in the Middle East when we started receiving war-wounded patients with open fractures that were more susceptible to infections like osteomyelitis, a bone infection. From the first day—the first patient—we had to face this problem, because the bacteria we were dealing with were highly resistant to many drugs. This was partly because of the overuse of over-the-counter antibiotics in places like Jordan, Iraq, and Yemen.
We started asking ourselves, “Why is the patient I am treating with antibiotics not responding? Maybe there is [drug] resistance?” Curbing resistance is also important where patients are malnourished, have higher rates of severe burns, or have malaria or HIV, since when you are immunosuppressed you have a higher risk of getting an infection and needing antibiotics.

What are the biggest challenges fighting ABR in low-resource settings?

If clinicians see that their patients are not responding—and they don’t have tools to diagnose the exact infection and identify which antibiotic would be most effective—their temptation is to switch to a more powerful antibiotic. While doctors may think that’s the best or only option to save the person in front of them, we want to avoid this kind of blind prescription of antibiotics because it can lead to more resistance.

Then you have the problem of hygiene and infection control in health facilities. We have to train staff to enforce IPC measures, like properly washing their hands between patients. Staff also need to know how to implement a proper isolation area for patients with drug-resistant infections. You need to know that patients infected with the resistant bacteria are isolated and that those bacteria are not going to spread across the hospitals. This is, to be honest, one of our biggest challenges—more than the diagnostic challenges and more than the rational use of antibiotics.

How can MSF make an impact when this is such a complex, multidisciplinary, global problem?

It is true that it is not enough to have only MSF working to curb resistance. I think that at the level of our hospitals we can only have an impact on the direct clinical management of our patients. But that’s why one of our advocacy strategies is to share our experience with other actors in order to have more and more people and organizations involved in this.

We are large and, in some areas, we are the only actor that has the ability to adhere to those three all-important pillars [to tackle ABR] in the same facility and show that this model works. Another way MSF has an impact is resistance surveillance. In Mali, for example, we worked to have our microbiology lab recognized as a surveillance laboratory to monitor resistance in the region [see story on page 6]. I think MSF can have a huge impact if our work can help shape and reinforce national surveillance systems.

INNOVATION: NEW TOOLS TO DIAGNOSE AND TREAT DRUG-RESISTANT INFECTIONS

ASTapp: MSF is developing a smartphone app to help diagnose antibiotic resistance in low-resource settings. Diagnosis of infections can be challenging in many of the places MSF works, due in part to the fact that there are usually few laboratories or specialists who can read and interpret antibiograms—tests used to determine how susceptible bacteria are to different antimicrobial medicines. ASTapp would allow non-specialists to more easily analyze and interpret antibiogram pictures on their smartphones or tablets. This information can help them determine exactly which antibiotic a person should get, reducing the use of broad-spectrum antibiotics and the chances of resistance. The project was recently awarded a Google Artificial Intelligence Impact Challenge grant of $1.3 million.

MiniLab: To address the problem of a lack of laboratories and trained staff in low-resource and emergency settings, our teams are testing a new concept in Haiti called the MiniLab. Without the tools and expertise required for a proper diagnosis, people aren’t always given the right antibiotic for their particular infection. The MiniLab is a small-scale, portable structure that can be easily assembled where needed and used by non-experts with relatively little training. If the pilot in Haiti is successful, MSF will launch a second trial in a different part of the world in 2020.

MSFeCARE: MSF uses a tool called MSFeCARE—or electronic clinical algorithm and recommendation—to improve the quality of care and more appropriately prescribe antibiotics to treat acute illnesses in children from two months to five years old. Using a tablet application, eCARE guides health professionals through a step-by-step, point-of-care assessment of the patient’s symptoms and signs. The app provides expert recommendations and standardized procedures to diagnose and treat acute illnesses. So far, eCARE has been used in remote areas where diagnostics aren’t widely available, including in MSF projects in Mali, Niger, Nigeria, Tanzania, Chad, and Central African Republic.
Mali’s rains fall heaviest in the southern region of Koutiala, a center for cotton farming once known as the “white gold” capital. The wet weather unfortunately also provides ideal conditions for mosquitoes to breed—and for the spread of malaria. Malnutrition is endemic here, contributing to high mortality rates. In Koutiala, one in four children does not live to see their fifth birthday.
Doctors Without Borders/Médecins Sans Frontières (MSF) runs one of our largest pediatric programs in the world here in Koutiala city. As the rainy season starts, admissions increase and can reach up to 1,000 patients per month during the malaria peak, which usually occurs between July and December.

In addition to the dangers posed by malaria and malnutrition, MSF became concerned about another threat facing children in our care. Several years ago, MSF noticed that 60 percent of patient deaths at Koutiala hospital were related to sepsis of an unknown cause. Sepsis is a complication triggered by an infection elsewhere in the body that has spread to the blood and can lead to tissue damage, organ failure, and death. At the time, most patients with sepsis were treated with broad-spectrum antibiotics, which are generally effective against a wide range of bacterial infections. But in most of the cases in Koutiala, these normally reliable drugs didn’t work, and patients were dying very quickly—often within the first 24 to 48 hours after admission.

“We realized if patients are not responding to the antibiotic, maybe there is a resistance problem,” said Dr. Nada Malou, a microbiology and antibiotic resistance (ABR) surveillance advisor with MSF’s medical department. Currently based in Paris, she worked in Koutiala in late 2013, when the team was trying to solve the mystery of this high mortality rate. ABR often develops from overuse and misuse of antibiotics; it occurs when bacteria develop the ability to defeat the antibiotics designed to kill them.

MSF has been running a comprehensive pediatric program in Koutiala hospital since 2009 aimed at reducing morbidity and mortality of children under five. The hospital includes a pediatric unit, an intensive therapeutic feeding center for malnourished children, an emergency department, and an intensive care unit (ICU). In 2018, the team at the hospital conducted 160,000 outpatient consultations and supported 37 of the 40 health care centers in the broader Koutiala administrative region, which is home to more than 500,000 people.

In clinical settings like Koutiala, the incidence of ABR can also increase due to lack of treatment follow-up or adherence, inadequate diagnosis tools, and poor hygiene and infection control practices. Many patients admitted to Koutiala with malaria also presented with some sort of bacterial infection, so a new approach to diagnosis and treatment was needed.

SETTING A STANDARD FOR MICROBIOLOGY

After negotiating with the Malian Ministry of Health, MSF was given permission to add a microbiology department to the hospital’s central laboratory, which already included a hematology department (for blood cell counts and pre-transfusion blood tests) a biochemistry department (for testing organ function such as
kidney and liver), and a blood bank (for transfusions).

This microbiology department, which opened in 2014, allowed doctors to properly diagnose the cause of sepsis in their young patients and recommend the most appropriate treatments. It was the first lab of its kind built by MSF and continues to be the prototype for all new MSF microbiology labs today.

There were many logistical challenges to building and supplying the lab, and there is still much hard work to be done to keep it operating effectively. “We didn’t realize that creating a lab was just the first step,” said Dr. Malou. The team at the hospital had no experience with ABR, and years of training followed. It began with creating a training program for Ministry of Health interns from across the country. Interns spent one month in each laboratory department under the supervision of a lab technician.

One of the first interns MSF trained was Astan Dicko, who is now completing a master’s degree in microbiology. She is also MSF’s bacteriology supervisor. One of the biggest risks of ABR is the spread of resistant bacteria between patients in the ward. When a patient is diagnosed with ABR, Dicko is responsible for telling the team so that the patient can be immediately isolated. “Once the lab has the results, they’ll inform me if it’s ABR,” said Salimata Traoré, MSF infection prevention and control officer. “At that point, I implement the necessary measures to put the child in isolation so that the infection doesn’t spread.”

This year the pediatric department moved into a newly constructed, two-story, 185-bed facility that can accommodate the large influx of patients during seasonal peaks. The extra space and new layout enable improved infection prevention and control measures to help halt the spread of bacteria within the hospital. A new area in the ICU dedicated to patients with ABR means they can be isolated within the unit and receive the close monitoring they need.

It took two years for the microbiology program to be fully implemented. During that time there was no antibiotic steward on-site to advise on treatment of patients with ABR, so results had to be sent for analysis to an international network of MSF experts working with our telemedicine program. Today the antibiotic steward is Dr. Diawara Moussa Karim, who first worked with MSF in Koutiala in 2010.

“We’ve treated lots of children with success,” said Dr. Karim. One of the most unusual cases the team witnessed was a child who was admitted with meningitis and had also developed a bacterial infection. The child was first treated with ceftriaxone—an antibiotic that is usually successful in treating a wide variety of infections in Koutiala hospital—but their condition did not improve. A blood culture and analysis showed that the bacteria was in fact resistant to all antibiotics tested, except one very old antibiotic the team had stopped using years prior. They quickly switched the treatment accordingly, and shortly after the child was able to go home without any signs of infection—thanks to accurate diagnostics.

When a child is brought to the hospital with a fever, they are given a few basic exams. For example, doctors test blood hemoglobin levels to look for anemia and run a
FIGHTING SUPERBUGS

rapid diagnostic test for malaria. If the child has other symptoms like hypothermia, tachycardia (an abnormally fast-beating heart), a low white blood cell count, or is refusing to eat, the doctor might suspect an infection. It can take at least 24 hours to receive a positive reading from a blood culture indicating the presence of bacteria, but children admitted with symptoms this severe need treatment immediately.

IMPROVING SURVEILLANCE

The key to successfully managing ABR is to gather enough results to statistically show the resistance rates for certain antibiotics in a hospital. “It took us three years to have enough results [in Koutiala],” said Dr. Malou. “This is what we call surveillance.” The lab now collects about 6,000 blood cultures each year, which are analyzed to determine what antibiotics can no longer be used. “This is what we call a hospital-based antibiogram,” said Dr. Malou.

An antibiogram is a chart that shows how susceptible different strains of bacteria are to a variety of antibiotics. The results are used to inform empirical treatment (i.e. treatment protocols based on probabilities), so that doctors don’t have to wait for microbiology results to come back before starting targeted treatment. Antibiogram analysis helps ensure the likelihood of selecting the best antibiotic for the patient, thereby reducing the growth of antibiotic-resistant strains of bacteria. When the wrong antibiotic is used, only some of the bacteria are killed, leaving space for resistant bacteria to multiply.

THE MSF MICROBIOLOGY LAB IN KOUTIALA IS NOW A REFERENCE CENTER FOR THE SURVEILLANCE OF ANTIBIOTIC RESISTANCE IN MALI.

The team in Koutiala hospital and MSF’s medical department advocated for more than two years for the lab to be audited by Mali’s Ministry of Health so that it could be included in the national surveillance system. After a successful audit, the facility is now recognized as one of the reference laboratories for antibiotic resistance surveillance in Mali.

This means that the data collected from Koutiala hospital can help other hospitals in the region—which do not have access to a microbiology laboratory—adapt their empirical treatments as well. The data will also be shared with the World Health Organization’s Global Antimicrobial Surveillance System (GLASS), which monitors ABR around the world.

“I hope that Koutiala hospital becomes a reference of training in the management of multi-drug resistant bacteria,” said Dr. Karim, who looks forward to sharing knowledge with researchers and clinicians across Africa and around the world. “I also want to ... exchange experiences managing patients with bacterial infections.”
The accident happened in a flash. A three-year-old boy was playing at home when he collided with his grandmother, who was carrying a pot of soup. The hot liquid spilled all over his head, scalding him terribly.

"He screamed, and his grandmother did too because she did not know what to do," the boy’s mother explains. The family could not afford private medical care, so they took a motorcycle from their neighborhood to the Doctors Without Borders/Médecins Sans Frontières (MSF) hospital on the other side of Haiti’s capital, Port-au-Prince. Since 2015, MSF has run Haiti’s only specialized hospital for burns. Located in the Cité Soleil slum, it frequently receives patients from the most crowded and impoverished areas of the city. Families here struggle to make ends meet, and household fires, cooking accidents, and gas explosions related to living in close quarters are all too common.

Recovering from a severe burn is a long and difficult process. Weekslong hospital stays involve repeated dressing changes, physiotherapy sessions, pain management, psychological care, and surgeries such as skin grafts. Outpatient care often continues for months, as many burn patients suffer long-term consequences of their injuries that must be carefully managed.

HAITI: A NEW DAY FOR PATIENTS WITH SEVERE BURNS
Most urgently, they must survive. The greatest risks come from dehydration, which can lead to death, and infections that can emerge as the body’s defenses are compromised. The skin is the immune system’s outer wall; when large areas of skin are destroyed by a burn, bacteria can enter the bloodstream, creating a life-threatening systemic infection called sepsis.

“IT’s a whole fight to keep the patient living because sepsis is a very challenging thing with burn patients,” says Wesly Michel Toussaint, an MSF doctor responsible for the antibiotic stewardship program in the hospital. “For each hour of sepsis, the patient’s chances of survival go down, and they can go into multiorgan dysfunction syndrome. The kidneys stop working, the lungs stop working, the whole body stops working well, and the person can go into shock and die.”

Further complicating matters, antibiotic-resistant infections are a growing problem for burn patients in Haiti, as in many other health care settings around the world.

“For health care facilities, it’s a big challenge,” says MSF’s medical coordinator Dr. Gabriel Kabilwa. “IT’s becoming ever more challenging for burn patients, because they are more susceptible to infection.”

**CHOOSING THE RIGHT TREATMENT**

Prevention is the first tool in the fight against infections. Wound dressings are regularly changed by surgeons in sterilized operating rooms. Wards are rigorously cleaned, patients are separated from each other by barriers and partitions, and hands are washed again and again.

Diagnosing an infection, however, presents many challenges. A fever could be the body’s inflammatory response to the trauma of a burn, or it could be the symptom of an infection. The crucial questions are what bacteria are present and which antibiotics should be administered.

“Before starting antibiotics, we systematically take blood samples,” Dr. Kabilwa says. “Once we have the result, we move to the antibiotic that is most effective.”

In some cases, bacteria that are normally treatable with certain antibiotics show signs of resistance, requiring lab tests to determine which other antibiotics will be effective. Using an antibiotic can lead to greater antibiotic resistance, so each decision to start or stop an antibiotic must be made carefully.
HAITI: A NEW DAY FOR PATIENTS WITH SEVERE BURNS

TOP: Montina Duperval, a physiotherapist, works with a patient to recover mobility after a serious burn. BOTTOM: Jesulène Tégé, a nurse, provides follow-up care to a patient who was severely burned © Scott Streble
“ANTIBIOTIC STEWARDSHIP IS FOCUSED ON ACHIEVING THE BEST OUTCOMES FOR EACH PATIENT WHILE MINIMIZING THE UNINTENDED CONSEQUENCES OF ANTIBIOTIC USE.”

— Dr. Wesly Michel Toussaint, an MSF doctor responsible for the antibiotic stewardship program in the hospital

“Sometimes you have one infection that is covered by the antibiotic and you have another bacteria that is not covered, so you have to find the antibiotic that covers the bacteria,” Dr. Toussaint says. “Sometimes you change the antibiotic because it is not working, while you await the lab result.”

When a multidrug-resistant infection is diagnosed, a patient is transferred to the hospital’s isolation ward. Dressing changes are done on a special rotation in the operating room to reduce the risk of transmission to other patients.

Patients with antibiotic-resistant infections typically require longer hospital stays, and their chances of survival are lower, Dr. Toussaint says. In difficult cases, a patient’s blood must be tested repeatedly and their treatment adapted until the correct antibiotics are identified. Recently, a 78-year-old patient being treated for a burn covering nearly 15 percent of his skin surface was struggling with an infection. He had an elevated heart rate and a low fever and was dependent on oxygen. After putting him on an initial treatment of first-line antibiotics, doctors ordered repeated blood tests and closely monitored the patient for days. Finally they were able to identify the right antibiotics to treat his methicillin-resistant Staphylococcus aureus (MRSA) infection, and he recovered.

ADAPTING TO THE NEEDS

In December 2018, MSF completed a major expansion of the burn hospital in Cité Soleil, with additional space between patient beds and three operating rooms. The staff inaugurated the building with a new name, Douvanjou, a Haitian Creole word for daybreak.

“We chose Douvanjou because the hospital is where a person can find care rapidly, any time of day or night,” explains the hospital’s medical director, Dr. Erneau Mondesir. “If you are burned, the risk of infection is lower if the patient comes right away.”

For the staff, some of the biggest challenges occur when severely burned patients arrive in groups. Explosions of cooking gas can strike multiple members of a household, and the staff often must stabilize five, six, or seven patients in the emergency room before admitting them. Major burns may require months of round-the-clock care with careful attention to hydration and nutrition to keep a patient strong enough to recover from a burn and fight infection.

Following the ups and downs of each patient can be a long process. Recently, the hospital treated a young girl with a severe burn who began treatment in the intensive care unit and later developed an antibiotic-resistant infection that required treatment in the isolation ward. After skin grafts and multiple courses of antibiotics, she was finally successfully discharged after 147 days.

“For me, my best moment is when the patient is discharged,” Dr. Toussaint says.

As difficult as it can be to treat antibiotic-resistant infections, so far the hospital has not encountered an infection that is resistant to all antibiotics, Dr. Toussaint says. Yet with antibiotics widely used without a prescription in Haiti—sometimes even sold on the streets—there is concern that such extensively drug-resistant infections may appear.

In MSF’s hospital the most powerful antibiotics are used judiciously, after careful discussions with multiple specialists. The staff follow protocols based on the principles of antibiotic stewardship, aiming to ensure that no patient develops an infection that is impossible to treat.

“Antibiotic stewardship is focused on achieving the best outcomes for each patient while minimizing the unintended consequences of antibiotic use,” Dr. Toussaint says.

In Haiti MSF is testing a new technology initiative, known as the MiniLab, to address the problem of a lack of laboratories and trained microbiology staff in many of the places where our teams work. (Read more on page 3.)
CAMBODIA: STAMPING OUT DRUG-RESISTANT MALARIA

Malaria is the world’s deadliest parasite, killing hundreds of thousands of people and infecting more than 200 million every year. Since the early 2000s, Doctors Without Borders/Médecins Sans Frontières (MSF) teams have relied on a combination of drugs known as artesiminin–based combination therapy, or ACT, to fight the mosquito-borne disease.

But when the parasite began showing worrisome signs of resistance to ACT in Cambodia, MSF shifted tactics: not just treating people who were sick, but tracking down every case—including those who were carrying the malaria parasite without symptoms—in an attempt to completely eliminate the disease in the region.

Using a community-based strategy, MSF worked with local groups to root out malaria in some of the most isolated forest communities in Cambodia’s Preah Vihear province. Their ultimate goal: to avoid the spread of resistant parasites to countries where there are high numbers of malaria cases and high mortality rates—in sub-Saharan Africa, for example—a potential public health disaster that MSF malaria expert Martin De Smet called “the nightmare scenario.”

Spread by the bite of infected female Anopheles mosquitoes, the malaria parasite attacks red blood cells, causing high fever and other flu-like symptoms and anemia. Severe cases may attack organs including the brain, causing convulsions, coma, and even death. It’s also one of the most common diseases Doctors Without Borders/Médecins Sans Frontières (MSF) teams treat around the world. For decades, we’ve used basic prevention techniques to halt the spread of malaria: Since the mosquitoes that carry the parasite usually bite between dusk and dawn, treating homes with safe, long-lasting insecticides and distributing insecticidal bed nets are good ways to help keep people safe in areas where malaria is common. More recently, MSF has used a technique known as seasonal malaria
chemoprevention, in which antimalarial drugs are distributed preventatively during times of the year when the chances of transmission are particularly high.

The ACT regimen, with the powerful antimalarial artemisinin as its foundation, has proved an effective tool against Plasmodium falciparum, the deadliest species of the parasite in humans, for some time. In recent years, however, the malaria parasite has developed a worrying resistance to artemisinin, especially in Southeast Asia.

**SIGNS OF RESISTANCE**

“We always hoped artemisinin would keep its full efficacy,” said De Smet, the leader of MSF’s Malaria Working Group, based in Brussels. “But in the past six to seven years in Southeast Asia, particularly Cambodia, we’ve been increasingly concerned about the efficacy of the drug.”

Artemisinin works quickly, staying in a patient’s bloodstream for just a few hours. Normally a course of treatment with ACT takes just three days. So when the drug started taking longer to eliminate the malaria, De Smet and his team became concerned—not just that the falciparum parasites were developing resistance, but that this resistance could spread.

Resistance to older malaria drugs historically began in Southeast Asia, spreading through countries like Myanmar and India before arriving in Africa, De Smet said. No one knows precisely why resistance seems to originate in this region, but it could have to do with the use of artemisinin without so-called “partner” drugs, or the widespread availability of substandard malaria medicines. The threat was still relatively low in these cases, however, because ACT treatment was still highly effective.

So when malaria in Cambodia began showing signs of resistance to the usually reliable treatments, De Smet and his team knew they had to act. In collaboration with Cambodia’s National Malaria Control Program and the Pasteur Institute of Cambodia, MSF put a plan in motion. “The philosophy of the intervention was that we wanted everybody who had malaria to end up being diagnosed and treated,” said De Smet. “That means well-functioning diagnosis and treatment in all health care facilities.”

However, in Cambodia’s Preah Vihear province, where the project focused, there was a problem: in this region, many people live in villages deep in the forest, where accessing health facilities is difficult or impossible, especially during the rainy season.

**BRINGING THE PROJECT TO THE PEOPLE**

To solve this problem of access, MSF teams brought treatment closer to the patients who needed it, developing a network of village malaria workers. These volunteers from villages in Preah Vihear were trained by MSF teams to recognize the symptoms of malaria, test for the presence of parasites, and, if those tests came back
positive, provide the correct drugs in the correct doses. This community-based initiative eliminated the need for teams of mobile health workers.

“MSF supported development of the system, trained people, and assigned workers in the areas where they were needed,” explained De Smet. “These people are now integrated into the public health system and receive a small salary for their work.”

But not everyone who carries the falciparum malaria parasite exhibits symptoms. This can occur when the patient is not yet sick but will become so later, or if they took some sort of drug—perhaps substandard malaria medicine—that suppresses the amount of parasites in the body but is not strong enough to truly clear them. Either way, this leaves open the possibility of infecting others.

To address these tricky cases, MSF organized active screenings throughout the region of people who might be sick but do not present classic symptoms of malaria like fever, chills, and muscle aches. “We went to villages and contacted people who worked in the forest or on plantations,” said De Smet. “If you’re in that situation we test. We described during our health education sessions that it’s possible for people to have asymptomatic malaria, and we explained that an MSF team will come to offer free screening and treatment, and why it’s important to be screened even if you’re not feeling sick.”

These teams traveled to villages, setting up in meeting places or the homes of the appointed village malaria workers. They worked closely with community leaders to help explain testing and treatment, and to ensure that individuals were able to provide informed consent. “We had villages where on one day more than 100 people came to be tested,” said De Smet. “So we made sure that we were also available very early in the morning or late in the evening, when people come home from work.” Teams often stayed in villages overnight to ensure that as many people as possible were tested and, if necessary, responsibly treated.

Finally, MSF teams conducted epidemiological surveillance as well. “If we had a malaria patient, we’d ask: ‘Where were you? Have you been working in the forest? Where did you go, were you with colleagues? Family members? Friends?’” By tracing the everyday social connections of people who contract the falciparum parasite, we were able to track the spread of malaria and ensure that every case was tested and treated.

“The impact is clearly there”

The project, which originally began in 2014, officially came to an end on May 2, 2019, with promising results. “In the area where we worked in Cambodia, there has been both a very strong decrease in cases and the asymptomatic malaria ‘reservoirs’ [people carrying the parasite without exhibiting symptoms],” said De Smet. “In the last screening season we did not find a single positive falciparum case, which means we think we indeed managed to largely eliminate these reservoirs of the parasite.”

The methodology has now for the most part become standard in Cambodia. “The way we screened and combined our activities, working from the bottom up and avoiding a one-size-fits-all solution—that strategy has been very well-perceived and appreciated,” said De Smet.

At a spring 2019 meeting in Cambodia’s capital, Phnom Penh, MSF shared details of the project with various organizations and individuals working on efforts to fight malaria, including members of the World Health Organization, Cambodia’s national malaria program manager, public health departments, and the Malaria Consortium, a nongovernmental organization that sustains the work MSF initiated. The upshot was clear: the MSF strategy had not only succeeded, it could form the blueprint for more successful malaria interventions in Cambodia and elsewhere.

But there is still much work to be done. Despite the success of the project in Cambodia and the elimination of malaria in some countries, the numbers of cases continue to rise elsewhere—mainly in Africa. In order to control the spread of the parasite and achieve the ultimate goal of eradicating malaria worldwide, it’s essential to keep fighting resistance to existing drugs and investing in the development of new ones.
In Preah Vihear, Cambodia, an MSF nurse talks with a woman who tested positive for malaria to make an appointment to start treatment later that evening.

Staff at the Pasteur Institute of Cambodia in Phnom Penh conduct tests for malaria.

An MSF staff member carries out health promotion activities in Preah Vihear.

An MSF nurse visits with Saom Koem, who was treated for malaria two years ago, and replaces the family’s mosquito nets.

All photographs © Tim Dirven/Panos Pictures
YEMEN: GOING BEHIND THE FRONT LINES OF A HIDDEN WAR
There is an invisible war being fought in Yemen. Most people know only about the war in the headlines: the armed conflict between the forces of the Saudi-led coalition and the Ansar Allah group that has killed and injured thousands of people and uprooted more than three million forced to flee the fighting. That conflict has decimated the country’s health system, now ill equipped to treat the growing numbers of war-wounded patients and others with urgent medical needs. Which brings us to the other war underway to fight drug-resistant bacteria.

More than 60 percent of patients admitted to the Doctors Without Borders/Médecins Sans Frontières (MSF) hospital in the Yemeni port city of Aden suffer from antibiotic-resistant bacteria (ABR). These infections require complex diagnostics and prolonged treatment, further straining an already battered health system.

When our teams in Yemen saw patients who weren’t improving from standard antibiotic treatments, they changed their protocols and set up a microbiology lab to begin testing for ABR. At first, results were sent to MSF experts outside Yemen for interpretation and diagnosis. Proper diagnoses enable responsible use of the correct antibiotics—and more effective treatment.

Within two years, the microbiology and antibiotic stewardship programs in Yemen, now completely run by Yemeni staff, are among MSF’s most advanced in the world. The project in Aden has shown that the processes and protocols needed to combat the spread of ABR can be successfully implemented in even the most unstable conditions. But the fight is far from over, and urgent action is still needed to halt the public health crisis of antibiotic resistance on the front lines of war and beyond.

**THIS PAGE:** Hamoud, 40, underwent surgery at MSF’s hospital in Mocha, Yemen, after he was shot in the leg by a sniper. After the surgery he was referred to the hospital in Aden to recover in traction. He is originally from Sharab district in Taiz governorate, where he lives with his wife and four daughters. “Once I’ll be discharged from Aden hospital I will go back to my family in Sharab,” he said. © Agnes Varraine-Leca

**FACING PAGE:** Abdul Mollah, 29, is the inpatient department supervisor at the Aden hospital in Yemen. Mollah has worked for MSF since the hospital opened. © Agnes Varraine-Leca
CLOCKWISE FROM TOP LEFT: Patients sit outside the entrance of the trauma hospital in Aden, Yemen. When MSF opened the hospital in 2012 it was one of very few functional facilities performing surgeries for war wounds. Today, patients with complex injuries are frequently referred here from our hospital in Mocha. © Agnes Varraine-Leca

Waddah, 15, has developed a drug-resistant infection so is receiving care in the isolation department at MSF’s Aden hospital. © Ehab Zawati/MSF

The entrance of the operating theater and intensive care unit at MSF’s trauma hospital in Aden, Yemen. © Agnes Varraine-Leca

A staff member and a patient walk in the hallway of the Aden hospital in Yemen. Physical therapy is an essential part of the care patients receive at the hospital as they recover from complex and often life-changing injuries. © Agnes Varraine-Leca
The day Saad’s life changed forever started like any other. The 46-year-old man was beginning his day in Mosul, Iraq, where his family has lived for generations. “It was an incredibly hot, overcast morning, like lots of days,” he remembers. But as he walked to his car to go to work, a sudden explosion shattered the morning calm.

A bomb had gone off in the neighborhood. The blast was not close enough to kill Saad, but it mangled his leg, fracturing his tibia and fibula. Unconscious, he was rushed to a hospital for surgery.

“The first surgery I had consisted of inserting an internal fixation into my leg to enable me to walk again,” he said. This surgical method of stabilizing broken bones should have put Saad on the road to healing, but he suffered complications. “The recovery was excruciating,” he said.

When Doctors Without Borders/Médecins Sans Frontières (MSF) opened a post-operative care facility in eastern Mosul in April 2018 for people recovering from traumatic injuries, Saad was admitted. A biopsy showed that his internal fixation needed to be removed and replaced by an external one—and that he had developed a multidrug-resistant infection.

IRAQ: CARING FOR PATIENTS WITH UNHEALED WOUNDS

A MAJOR PUBLIC HEALTH CHALLENGE

Saad’s case is not uncommon. Almost 40 percent of patients admitted to MSF’s post-operative care facility in East Mosul arrive with multidrug-resistant infections, and antibiotic resistance is a problem throughout the country. While antibiotic resistance occurs in many countries where MSF works, its incidence is particularly high in Iraq and across the Middle East.

“Antibiotic resistance has not always been a major problem in Iraq,” said Karam Yaseen, who worked as a health promoter at the hospital where Saad was treated.
“Fifteen years ago, the use of antibiotics was fairly well-regulated, and we had a good medical system.”
But the start of the Iraq War in 2003 changed everything. With the country’s health system shattered by the conflict and people becoming increasingly desperate to find care, some antibiotics that previously required a prescription became easily accessible in markets. People started to use them more and more, whenever they were sick. Over time, those drugs became less effective.

“Now, in Iraq, a pharmacist can sell you antibiotics, even the injectable ones, without a prescription,” said Yaseen. “The availability of these drugs is directly linked to the patterns of resistance that we see today in bacteria.”

In the long run, antibiotic resistance has a tremendous impact on people’s health. If antibiotics lose their effectiveness, essential medical procedures can become too risky to carry out. Antibiotic resistance also complicates the recovery of patients suffering from traumatic injuries—like those MSF treats in eastern Mosul.

FIGHTING RESISTANCE

When our post-operative care facility opened last year, MSF implemented antibiotic stewardship and infection prevention and control measures to limit the impact of drug-resistant infections.

“It’s crucial to avoid the transmission of multidrug-resistant infections between patients in the facility,” said An Caluwaerts, MSF’s advisor on infection prevention and control. These measures can be as simple as making sure that people wash their hands properly, one of the most important ways to prevent transmission. “Undertaken at the right time, hand hygiene can prevent the spread of resistant or sensitive organisms present in our environment and in our body,” said Caluwaerts.

“Contact precautions” are also fundamental: patients with multidrug-resistant infections are given single rooms in the facility, rather than staying in open-plan wards, to avoid the spread of infection to other patients and medical staff. Contact precautions also include the use of personal protective equipment, such as gloves and gowns; limiting the transport and movement of patients; using dedicated patient-care equipment; and making sure that patients’ rooms are thoroughly cleaned and disinfected regularly.

MENTAL HEALTH CARE AND HEALTH PROMOTION ARE ESSENTIAL

Because of their physical isolation within the hospital, patients with drug-resistant infections are more likely to experience psychological difficulties related to what they have experienced in the past as well as the challenges of their treatment.

“People who are in ‘contact isolation’ experience higher levels of anxiety, depression, and anger than other patients,” said Olivera Novakovic, a psychologist in MSF’s East Mosul project. “Many of our patients experienced traumatic events, and they have more time to think about it when they are in isolation rooms.”

MSF mental health staff are on hand to help them cope. “We’re developing individual psychological programs according to the age and the level of education of our patients,” said Novakovic. “Psycho-education is a crucial phase, because if the patient understands why he’s in contact isolation and what drug resistance is, naturally he will become more compliant with the treatment.”

At the same time, MSF’s health promoters raise awareness about multidrug-resistant infections among patients and caretakers. “Antibiotic resistance represents a severe threat to public health and it shouldn’t be underestimated,” said Yaseen, whose team conducts “awareness sessions” inside the hospital for caretakers who will be looking after relatives suffering from resistant infections.

Usually, caretakers who attend these sessions are eager to find out more about antibiotic resistance. Many are surprised by what they learn.

“They realize that antibiotics are not always the magical solution to everything—that antibiotics should always be on prescription, and that misusing antibiotics can do more harm than good,” said Yaseen.
When Ayman woke up, he was lying in a hospital bed in a stark and unfamiliar room. He had been admitted to the Doctors Without Borders/Médecins Sans Frontières (MSF) hospital in Gaza after he was shot during a protest along the boundary fence with Israel. The last thing he remembered was being prepped for surgery. “I didn’t know about the infection in the bone until I came here,” he said. “I came out of the operation and found myself in isolation.”

Ayman is one of the more than one thousand people in Gaza suffering from severe bone infections after being shot by the Israeli army during demonstrations over the past year and a half, according to MSF estimates. The demonstrations, which began on March 30, 2018, have become a weekly routine of bloodshed. More than 7,400 Palestinians have been injured by live ammunition, with around half suffering from open fractures, in which there is an open wound near a broken bone.

“When you have an open fracture, you need lots of things to get better: different types of surgery, physiotherapy, and avoiding the wound becoming infected, which is a high risk with these types of injuries,” explained Aulio Castillo, MSF’s medical team leader in Gaza. “Unfortunately, for many of our patients who have been shot, the severity and complexity of their wounds—combined with the severe shortage of treatments for them in Gaza—means they have now developed chronic infections. What’s more, we’re finding in preliminary testing that many of these people are infected with antibiotic-resistant bacteria.”

**ABOVE:** Mohammed, age 28, has had six operations so far to repair the damage from a bullet that shattered the bones of his right leg. © Alva Simpson White/MSF

**BELOW:** Ayman, 19, is being treated for a bullet wound as well as an antibiotic-resistant infection. He made a calendar to keep track of each day spent in isolation at the hospital in Khan Younis, Gaza. © Jacob Burns/MSF
FEW OPTIONS TO TREAT COMPLEX WOUNDS

Gunshot wounds by their very nature are prone to infection. With a dirty foreign body breaking the skin, it is vital that the wound be cleaned to reduce the risk of infection. With complex injuries such as those suffered by protesters in Gaza—including huge wounds and splintered bones that are hard to treat—many wounds stay open for long periods, making the risk of infection drastically higher.

High rates of antibiotic resistance in Gaza complicate the treatment of these infections. Bacteria have developed the ability to withstand many antibiotics commonly used to treat them. This often happens when antibiotics are overused, whether in the community or in the environment—a growing problem worldwide.

Antibiotic resistance makes the already difficult task of treating people like Ayman much harder. To get better he needs antibiotics, but with the usual option useless against the resistant infection, he has to take a stronger type that carries a higher risk of side effects. These “heavy-duty” antibiotics are also much more expensive.

THE EFFECTS OF ISOLATION

To prevent the spread of resistant bacteria within the hospital and to protect other patients, Ayman has to be isolated in a single room while he undergoes treatment. Everyone entering the room must wear protective clothing and clean their hands. His period of isolation will last a punishing six weeks.

While patients in isolation are not confined—they can leave their rooms if they wear protective gowns—the experience is still extremely difficult. “I feel like I’m in prison,” Ayman said. “I don’t like to be by myself. I could stay one year in a normal ward, but here . . . All I like to think about when I’m here is leaving.”

Because isolation can be so difficult for patients like Ayman, MSF social workers and counselors are on staff in the hospitals to support them during treatment. “After people hear that they must be in isolation they are shocked. They can even start crying,” said Amal Abed, an MSF social worker. “They don’t understand. They think that infection in the bones means certain amputation.” The psychosocial support team takes the time to sit with the patients and explain their condition to them—and why it is important they follow the precautions.

Forging connections between the patients can also help them to cope with the challenges of isolation. “We have to follow precautions, but we like to get them out of the rooms to sing, dance, or do an educational session with them and other patients,” Abed explained. “It’s more interesting when education is not done alone: other people can join in with their comments; start a conversation.”

UNIQUE CHALLENGES

Treating these infections would be challenging anywhere in the world, but in Gaza it is particularly difficult. With a health system reeling from the effects of more than a decade of Israeli blockade, Palestinian political infighting, and Egyptian restrictions on movement, MSF is working to provide care that would otherwise not be available.

“We have worked with the Ministry of Health to upgrade a laboratory so that it can analyze bone samples, a crucial part of correctly diagnosing these bone infections and knowing which antibiotics will work,” said Castillo, the medical team leader.

It is the first laboratory in Gaza equipped to do this analysis. Previously, each bone sample had to be sent to labs in Israel for testing. At the MSF hospital laboratory, the staff uses small samples of infected bone to grow the bacteria in Petri dishes. Different chemical bases let different types of bacteria grow, showing which types are present. Next, their sensitivity to different antibiotics is measured. Through these tests, our teams learn which infections they are dealing with—and the best tools to fight them.

“Treating these infections is a massive undertaking,” said Castillo. “We have upgraded this laboratory, opened two hospital wards and are opening another. It places huge demands on us in terms of the specialist staff we need, the drugs we have to supply, and the space we need in order to treat these infections. It’s hard but we’re trying our best to offer these people the surgery and treatment they need.”

For now, Ayman waits, taking his antibiotics intravenously for four hours each day. The medical team carefully monitors his treatment to ensure that the drugs are working and not having any adverse effects. He talks fondly of the days before the bullet changed his life—how he and his friends used to spend time together at night, dancing and listening to music.

“I want to return to my work as a cake maker,” he said. “To do that he’ll need further surgery, which he cannot undergo until he beats the infection. He is on a long and difficult road to recovery, moving toward an uncertain future.
especially difficult to cope with. The side effects of the drugs, the monotony of hospital life, and being separated from their family and friends for months on end can leave them feeling depressed and hopeless. As a result, some patients check themselves out of the hospital before their treatment is complete.

A PATIENT-CENTERED APPROACH

Incomplete TB treatment is a major concern, as it can lead to the development of drug-resistance. Ukraine is among the 20 countries in the world with the highest burden of drug-resistant TB (DR-TB), according to the World Health Organization (WHO). In Ukraine, DR-TB accounts for more than a quarter of new TB cases and almost half of previously treated cases. Drug-resistant cases are especially difficult to cure, with a treatment success rate in Ukraine of just over 50 percent.

In 2018, Doctors Without Borders/Médecins Sans Frontières (MSF) launched a pilot project in partnership with the regional TB hospital to improve the treatment of DR-TB in Zhytomyr based on the latest international
recommendations. The program offers patients more manageable and effective treatment options, including a shorter treatment plan that lasts just 9 to 12 months instead of the standard 20 to 24. It also uses new and highly effective oral TB drugs.

Until very recently, globally recommended treatment options available to people with DR-TB included up to 14,600 pills and painful daily injections that can cause devastating side effects.

MSF also works with local health providers so that patients can move to outpatient, home-based care as soon as they are ready. Through counseling and education, MSF’s mental health team assists patients with the challenges they face, both inside and outside the hospital, to ensure that they complete their treatment successfully.

NEW DRUGS, NEW HOPE

In December 2018, the World Health Organization announced new recommendations for the treatment of multidrug-resistant TB (MDR-TB), a form of the disease that is resistant to the two most powerful first-line TB drugs. According to the announcement, fully oral treatments should become the preferred medication option for most patients, and injectable agents are no longer among the priority medicines to be considered when designing longer treatments for MDR-TB. In particular, kanamycin and capreomycin—drugs known to cause severe side effects—are no longer recommended. Instead, the guidelines urge the use of newer, more potent drugs like bedaquiline and delamanid for all adult MDR-TB patients.

The WHO first recommended use of bedaquiline for treatment of drug-resistant TB in 2013. But uptake of it and other new TB drugs remains very slow, with the lifesaving medicines still inaccessible to almost 90 percent of people worldwide who could have benefitted from them in 2017.

In Ukraine, bedaquiline was registered in June 2018, while delamanid was registered in January 2019. MSF was one of the first organizations to offer these drugs to patients in Ukraine, and has been outspoken about the importance of expanding access to them. All new patients in the MSF pilot project in Zhytomyr are now prescribed oral TB drugs only, and we hope to see these guidelines become the standard in Ukraine and beyond.

MSF is one of the largest nongovernmental providers of care for patients with TB, which remains the deadliest infectious disease worldwide. In addition to providing DR-TB treatment in various countries, MSF conducts research with partner organizations to develop the evidence base for the therapeutic value of newer treatments. Our Access Campaign is also calling for these essential medicines to be more affordable and more widely available, and for greater research and development efforts to focus on treating DR-TB as a priority.
Ensuring better, longer lives for the greatest number of people is a core philanthropic priority for Bloomberg, a major corporate donor to Doctors Without Borders/Médecins Sans Frontières (MSF).

For decades, Bloomberg has supported MSF’s efforts to deliver emergency medical aid to the people who need it most, starting in 1994 with employee giving and corporate matching programs before expanding to making generous grants in 2004. Recently, the company committed to a three-year, $1.5 million grant to support our lifesaving medical humanitarian activities.

This July, Bloomberg employees got a hands-on look at the impact of their contributions on the lives of MSF’s patients by participating in an employee Day of Service.

“People would come to us all the time wanting to get involved in MSF’s work, but unless they’re a doctor or nurse or logistics expert, we didn’t really know what to offer them,” said Elias Primoff, MSF-USA’s deputy editor and volunteer organizer for the "mapathon" event. For their Day of Service, Bloomberg employees at offices around the world worked from satellite imagery to trace roads and buildings on digital maps used to assist MSF projects in Honduras, Chad, Burundi, and Democratic Republic of Congo (DRC).

“What’s really awesome about events like the Bloomberg mapathon is that they’re very useful for our work, and they’re a great way for people to get involved,” Primoff said. In a way, by making connections through these kinds of events, MSF is able to bring the field to our supporters.

Bloomberg’s Day of Service benefited the Missing Maps project, a collaboration among MSF and other partners that addresses the critical lack of geographic data that hampers humanitarian aid efforts in many of the places where we work. Before the emergence of open and shared map data, MSF staff in some cases had to literally lean out of helicopters, notebook in hand, to sketch rudimentary road and settlement maps in efforts to find population centers with patients requiring care.

The mapathon was “creative, impactful, and meaningful,” said Ken Cooper, Bloomberg’s global head of human resources. In total, 377 Bloomberg employees, including interns, volunteered for the event, which brought together contributions from the company’s offices in New York, San Francisco, Tokyo, Singapore, Hong Kong, Mumbai, London, and São Paulo.

“It was truly Bloomberg at its best—demonstrating the importance of global collaboration,” Cooper said, adding that it was amazing to see Bloomberg staff connected simultaneously around the world to work on such an important project.

ABOVE: Volunteers from Bloomberg’s offices around the world used their day of service to benefit the Missing Maps project, which helps gather vital geographic data to inform humanitarian aid efforts. © Laurence Lombart/MSF
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To find out how you can participate, please contact Mary Sexton, director of major gifts, at (212) 655-3781 or mary.sexton@newyork.msf.org, or visit doctorswithoutborders.org/multiyear.

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ABOVE: Maxim Alexson, who was burned in a fire at his worksite, waits to see a doctor at MSF’s Drouillard hospital for burn patients. © Spencer Platt/Getty Images