PART THREE
THE ROAD TO ZERO

> This outbreak, and the threat it poses to the region and the world, will not be over until the last case is identified, isolated and under treatment.
>
> **David Nabarro,**
> Secretary-General's Special Envoy on Ebola

> It is fair to say from our experience that once you have all the pieces together—that is the case management with all the requirements, the ambulances, all that—and you have a robust social mobilization or community engagement, and effective isolation and safe burial, it works. This strategy works. When one of these pieces is missing, the re-transmission continues at an increasing pace.
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> **Amadu Kamara,**
> Ebola Crisis Manager for UNMEER in Sierra Leone

As 2014 drew to a close, the chains of transmission in Mali appeared to have been broken, with no new cases reported for weeks. Areas that were once hotspots, such as Lofa County in Liberia, had become Ebola-free. Yet, in other areas, most notably northern Guinea and western Sierra Leone, case numbers continued to rise sharply, prompting the launch, in Sierra Leone, of a surge—a concerted effort by the government and its partners to hunt and eliminate the virus wherever it existed.

With an evolving landscape of transmission, the response in 2015 will also evolve. The emphasis of the first phase in the post-September scale-up had been on reducing the intensity of the outbreak throughout the region. This has been accomplished by encouraging behaviour change and safe burials and by improving access to effective diagnosis and treatment. While maintaining the priorities and tactics of the 2014 phase of the response, the 2015 phase—now being introduced throughout the region—emphasizes community-by-community implementation of responses that are adjusted in response to needs.

"We need an additional focus on establishing a very strong network of virus detectives", says David Nabarro. "Skilled experts to search out people who have illness, to check to see if they have got Ebola, to help them isolate themselves while being treated—and then to follow up their contacts. It's called case finding, surveillance and contact tracing. It's the extra piece of work that's needed now. But unfortunately it's painstaking work. The work is done by people close to the communities—hundreds and hundreds of them, all over the affected countries. You have to break down the task so that each team is dealing with a micro-outbreak of disease through the skilful detectives. You have to cover the whole population, build the trust of local leaders, and work with them to find out where there is illness; you have to trace people with disease, study each chain of transmission, understand how each person has become infected and help them to get access to good treatment."

According to Stephen Gaojia, Sierra Leone Incident Manager for Ebola: "We believe a decentralized response is going to be critical to get us to zero in the shortest possible time." His words are echoed by Anthony Lake, UNICEF Executive Director. "Rigidity in our operations, or in our thinking, is the enemy of success. We have to be flexible because this is not one big Ebola

crisis; it is a shifting group of multiple local crises that have to be addressed. A cookie cutter approach will not work; we have to be flexible in each local context. That means looking at the anthropology of different areas because cultural practices differ—for example burial practices in parts of Sierra Leone will be very different to the burial practices in parts of Liberia—and looking at the historical context of each community. If we are to succeed in convincing people to alter some of their deeply ingrained practices we have to understand the local characteristics of these communities in detail, in ways we have not before."

For example, areas exhibiting most success in reducing and eliminating the incidence of Ebola have been those where the local community has become educated and actively engaged in practices that minimize the possibility of transmission. Significantly less success has been achieved in locations where the population exhibits reticence—fear or denial, sometimes manifested in violent rejection of community outreach workers and medical teams.

A flexible response—adapted to the unique conditions of densely populated urban areas, remote rural locations, and towns and villages close to national borders—will characterize the response going forward. It will need the continued, and even intensified, attention of all partners working together with a common goal: zero cases. The outbreak began with one case, and the threat it poses will only end when there are none. The zero case scenario is achievable. It has been accomplished previously in Uganda, the Democratic Republic of Congo and, more recently, in Nigeria and Senegal. But, ending the outbreak means establishing alert and response capacities in each local government area, ensuring timely and reliable disease surveillance, coordinating all responders, continued strong engagement by the health sector and the provision of safe services to minimize the damage to societies and economies.

"We simply must find the resources required, no matter the cost, to get to zero cases as soon as possible," says Jim Yong Kim, President of the World Bank. "Any delay will dramatically increase the price in terms of both lives and money. For Senegal, the cost to treat one patient and track all of his contacts was more than $1 million. For Nigeria, one infected person led to 19 other cases, and more than 19,000 contacts traced by over 800 health care workers at a cost of more than $13 million. In Guinea, Liberia and Sierra Leone there are not one or 10 active transmission lines, but hundreds. Defeating Ebola now will cost billions—but it will spare the rest of the world from the spread of the virus, save lives in the countries, save money over the long-term, and help the countries rebuild their economies. Looking forward, building a system that helps prevent epidemics from spiraling out of control in the first place will also cost billions of dollars. But this, too, is a cost we must bear, as the costs of inaction would prove far higher."

Maintaining essential services—a critical feature of the STEPP strategy—is necessary not just for ending the outbreak, but for the early recovery

> "Ebola has taught us some hard lessons. I see four clear issues that we must address as matter of urgency. First, robust and resilient health systems are absolutely critical to help countries withstand a crisis like Ebola; the shattered health systems of these countries must now be rebuilt. Second, preparedness, including a high level of vigilance for imported cases and a willingness to treat the first confirmed case as a national emergency, makes all the difference. Countries that did this defeated the virus before it had a chance to explode. Third, no single intervention can bring an Ebola epidemic like this one under control. Only a package of control measures, executed effectively and simultaneously, can do that. Finally, community engagement in all measures, including contact tracing, early reporting, and safe burials, is the linchpin of successful control.
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> **Dr. Margaret Chan,**
> WHO Director-General

> “This is not the last epidemic we will be facing as humanity. We know that epidemics will easily get out of control in those parts of the world where health systems are weak. So we need to figure out how to ensure that when those epidemics take place, we are better prepared for when an epidemic hits a weak region like the Mano River Area. That requires that we take another look at how WHO is organized and the means they have at their disposal.
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> **Donald Kaberuka,**
> President of the African Development Bank

of the affected countries. Already weak medical services have been hard hit by Ebola. In the words of Babatunde Osometehin, Executive Director of UNFPA: “Ebola is a symptom of a health system that is weak. If in fact it is strong, we wouldn’t have all this. We should ensure that we come out of those three countries with a better health system than we found in the beginning.” Donald Kaberuka, President of the African Development Bank agrees. “ We must now focus on two things: rebuilding the health systems of the three countries and rebuilding the economies of the region. I have agreed with the World Bank that we work on the social and economic rebuilding of the three countries once the epidemic is under control.”

“We should look to build a system that would truly protect the world from an even more devastating pandemic in the future,” says the World Bank President Jim Yong Kim. “We need to be ready right now to respond much more quickly and much more effectively the next time Ebola or any other virus breaks out. We know this can be done. It is going to be extremely difficult. It is going to take everything we know about public health.”

“The efforts to defeat Ebola are more than just a short-term emergency response—they are also contributing to long-term development and resilience in very practical ways,” says Anthony Lake. “For example, as we help countries develop community care centres, we are either linking them explicitly to rehabilitation and growth of primary health care facilities to tackle non-Ebola illnesses as well, or locating them in areas where future health service delivery is needed so that when the virus is defeated, the local health care systems will be strengthened. As a critical

Ebola vaccines and other treatments and therapies

There are as yet no vaccines to protect against Ebola licensed for use in humans but, under WHO guidance, evaluation of the most advanced Ebola vaccine candidates has been accelerated.

The two vaccine candidates currently being tested in humans are the cAd3-ZEBOV vaccine, being developed by GlaxoSmithKline, in collaboration with the United States National Institute of Allergy and Infectious Diseases, and the rVSV-ZEBOV vaccine, being developed by NewLink Genetics and Merck Vaccines USA, in collaboration with the Public Health Agency of Canada. Both vaccines have shown to be safe and efficacious in animals.

Phase I clinical trials (to test for safety and for dose selection) are underway for both vaccines. Trial participants are healthy adults in countries with no (or very few) cases of Ebola. For the cAd3-ZEBOV vaccine, trials began in the United Kingdom and the USA in September and in Mali and Switzerland in October. For the rVSV-ZEBOV vaccine, trials began in the USA in October and in Gabon, Germany, and Switzerland in November. Trials in Canada and Kenya are also due to begin shortly.

Phase II clinical trials of the cdA3-ZEBOV vaccine are expected to take place in several countries with no or few cases of EVD in West Africa in January 2015. The Phase II trials will test for safety and capacity to induce an immune response in larger numbers and in broader populations, including the elderly, children and persons living with HIV.

Wide-scale introduction of the candidate vaccines in affected countries will depend on the results of the clinical trials and review by regulatory authorities of vaccine safety

mass of community health care workers is trained to defeat Ebola, they are investing in the backbone of the local health systems of the future—and it is local health systems that reach the people most in need of health care."

As the Ebola outbreak advances and its pattern evolves, the response must lessen the long-term damage it causes. "The challenge for 2015 is going to be the transition from crisis to post-crisis knowing that we need to remain

WHO /Mathilde Missioneiro

and efficacy. Data from all trials is being gathered and analysed as rapidly as possible. Phase III clinical trials are planned to start in early 2015 in the three countries most affected by Ebola. The objectives of these trials will be to assess whether the vaccines protect against Ebola and to further document safety.

Other treatments and therapies available or being evaluated include transfusion of convalescent whole blood and plasma donated by patients who have recovered. These have been prioritized for use as an investigational therapy. Convalescent whole blood is currently being administered in some Ebola treatment centres. Limited amounts of convalescent plasma are expected to become available in the near future, and trials in Guinea and Liberia are anticipated to begin shortly.

Of the pre-existing medicines that have been considered for re-purposing to treat Ebola, many have demonstrated efficacy against Ebola virus in test tubes (in vitro), however very few demonstrate any activity in monkeys infected with Ebola. Two antivirals have been identified as having promise—favipiravir and brincidofovir—and they will be entering clinical trials shortly.

WHO is working with all relevant stakeholders on each of the potential therapies and vaccines to continue to accelerate identification, verification, development and, if safety and efficacy are found, deployment. Final decisions on introduction are made by Ministries of Health. While target populations for mass vaccination are being discussed, experts agree that front-line workers should be among the first to be offered the vaccine.

WHO /MATHILDE MISSIONEIRO

> “A lot of people are dying from malaria and other causes that are not Ebola-related, even if Ebola is in the region, so restoration of healthcare systems and building resilience for healthcare is critical.
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> **Tolbert Nyansweh,**
> Liberia Incident Manager

mobilized on the crisis but at the same time finding the right time to start actions that are essential in the post-crisis,” says Ambassador Christine Fages, coordinator of France’s inter-ministerial task force on Ebola. “Health systems need attention. They have serious logistical difficulties—there are few health care providers and virtually no patients. We must find a way to restore the functioning of health systems using health care providers who have passed through the Ebola centres. There is the problem of the organization of health systems, training of caregivers, the restarting of supply chains and the integration of these health facilities in the social landscape of these countries. There is also economic reconstruction: the epidemic has a very negative impact on the economy of these countries. We must begin to see how we can help these countries economically to revive when the crisis is over. There is also the vaccine issue, research that we should continue even if the epidemic is slowing.”

“We have been discussing with the United Nations Secretary-General the possibility of holding a conference to take stock of where things are and what else needs to be done, says African Union Commission Chairperson Nkosazana Dlamini-Zuma. “Hopefully by then the epidemic would be on the decline and we can discuss what’s next. How do you get to zero cases? And what do we do post-Ebola? I think that we also need to gear up towards how other organizations, especially those with development and economic mandates, can come in to make sure the economies of these countries recover. It will also be good to mobilize humanitarian resources because Ebola has left some people destitute, especially some children who have lost parents, siblings—sometimes you just find one survivor in the family. We have to look at how

On 4 December 2014, German Ambassador to Ghana, Ruediger John, handed over 400 motorbikes for Ebola response at the UN Humanitarian Response Depot. The motorbikes will be used to bring blood samples to laboratories in the most affected areas of Guinea, Liberia, and Sierra Leone.
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Nkosazana Dlamini-Zuma, Chairperson of the African Union Commission, addresses a high-level meeting on the Response to the Ebola Virus Disease Outbreak. 25 September 2014. Ebola like all other tragedies has actually had the most effect on women and children—women because generally they are the caregivers—children because when your mother dies, then you are left without a parent then for the rest of your life you be facing a very difficult situation. So when we talk about the empowerment of women, it is to give them the strength and the resilience and resources at a family level and community level to be able to deal with things like these.
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we are going to assist countries to look after these children. Also, while we are all focusing on Ebola we must not lose sight of other diseases and other problems, because if we don't more people will then die of malaria, childbirth and so on."

In the words of Tom Frieden of the United States Centers for Disease Control and Prevention: "We have to invest in public health, not only when there is an emergency but also when there is not. If this doesn't convince the world that investing in public health is crucial nothing will. As horrible as Ebola is it's only one of a series of outbreaks that can occur if we don't strengthen the public health system. Strengthening public health is not a vague thing, it is very specific. Do you have a laboratory network? Do you have an emergency operating centre that can mobilize quickly? These are core, straight-forward public health functions that weren't in place before and they are why we have an epidemic."

According to David Nabarro, two things will result from the outbreak. "One is that there will be a real push towards much better health systems that are responding to people's needs and that are able to detect these kinds of illnesses in the future. Secondly, in coming years these societies in West Africa will be better prepared for disease outbreaks than any others in the world. Their people will be able to tell the rest of the world how communities can best understand such threats and withstand them. They will be able to teach the rest of the world about how to resist infection with Ebola and other haemorrhagic viruses. So there will be stronger health systems and more resilient societies—better able to deal with disease threats themselves and to show others how to handle them."