

## Emergencies preparedness, response

### Factors that contributed to undetected spread of the Ebola virus and impeded rapid containment

One year into the Ebola epidemic. January 2015

**Several factors, including some that are unique to West Africa, helped the virus stay hidden and elude containment measures.**



WHO/S. Gborie

**CHAPTER 3 -** In Guinea, it took nearly three months for health officials and their international partners to identify the Ebola virus as the causative agent. By that time, the virus was firmly entrenched and spread was primed to explode.

By 23 March 2014, a few scattered cases had already been imported from Guinea into Liberia and Sierra Leone, but these cases were not detected, investigated, or formally reported to WHO. The outbreaks in these two countries likewise smouldered for weeks, eventually becoming visible as chains of transmission multiplied, spilled into capital cities, and became so numerous they could no longer be traced.

Countries in equatorial Africa have experienced Ebola outbreaks for nearly four decades. Though they also have weak health systems, they know this disease well. All previous outbreaks, which remained largely confined to remote rural areas, were controlled, with support from WHO and other international partners, in periods ranging from three weeks to three months. In those outbreaks, geography aided containment.

Clinicians in equatorial Africa have good reasons to suspect Ebola when a “mysterious” disease occurs, and this favours early detection. Laboratory capacity is in place. Staff know where to send patient samples for rapid and reliable diagnosis. Health systems are familiar with

Ebola and much better prepared. For example, hospitals in Kinshasa, the capital of the Democratic Republic of Congo, have isolation wards, and staff are trained in procedures for infection prevention and control. Governments know the importance of treating a confirmed Ebola case as a national emergency.

### **An old disease in a new context**

In contrast, West African countries, which had never experienced an Ebola outbreak, were poorly prepared for this unfamiliar and unexpected disease at every level, from early detection of the first cases to orchestrating an appropriate response. Clinicians had never managed cases. No laboratory had ever diagnosed a patient specimen. No government had ever witnessed the social and economic upheaval that can accompany an outbreak of this disease. Populations could not understand what hit them or why.

Ebola was thus an old disease in a new context that favoured rapid and initially invisible spread. As a result of these and other factors, the Ebola virus has behaved differently in West Africa than in equatorial Africa, challenging a number of previous assumptions.

In past outbreaks, amplification of infections in health care facilities was the principal cause of initial explosive spread. Transmission within communities played a lesser role, with the notable exception of unsafe burials. In West Africa, entire villages have been abandoned after community-wide spread killed or infected many residents and fear caused others to flee.

Also in past outbreaks, Ebola was largely confined to remote rural areas, with just a few scattered cases detected in cities. In West Africa, cities – including the capitals of all three countries – have been epicentres of intense virus transmission. The West African outbreaks demonstrated how swiftly the virus could move once it reached urban settings and densely populated slums.

In past outbreaks, the primary aim of rapid patient isolation was to interrupt chains of transmission. Today, with so many people infected, the primary aim must also include aggressive

#### **Testimony of Harrison Sakila, E...**



supportive care, especially rehydration and correction of electrolyte imbalances, which improves the chances of survival. Life-saving supportive care is difficult to provide in a typical West African health care setting but is improving as more treatment facilities are built by MSF, the UK and US governments, WHO, and other partners.

### **Damaged public health infrastructures**

Guinea, Liberia, and Sierra Leone, which are among the poorest countries in the world, had only recently emerged from years of civil war and unrest that left basic health infrastructures severely damaged or destroyed and created a cohort of young adults with little or no education.

Road systems, transportation services, and telecommunications are weak in all three countries, especially in rural settings. These weaknesses greatly delayed the transportation of patients to treatment centres and of samples to laboratories, the communication of alerts, reports, and calls for help, and public information campaigns.

### **High population mobility across porous borders**

West Africa is characterized by a high degree of population movement across exceptionally porous borders. Recent studies estimate that population mobility in these countries is seven times higher than elsewhere in the world. To a large extent, poverty drives this mobility as people travel daily looking for work or food. Many extended West African families have relatives living in different countries.

Population mobility created two significant impediments to control. First, as noted early on, cross-border contact tracing is difficult. Populations readily cross porous borders but outbreak responders do not. Second, as the situation in one country began to improve, it attracted patients from neighbouring countries seeking unoccupied treatment beds, thus reigniting transmission chains. In other words, as long as one country experienced intense transmission other countries remained at risk, no matter how strong their own response measures had been.

The traditional custom of returning, often over long distances, to a native village to die and be buried near ancestors is another dimension of population movement that carries an especially high transmission risk.

### **Severe shortage of health care workers**

Prior to the outbreaks, the three countries had a ratio of only one to two doctors per nearly 100,000 population. That meagre workforce has now been further diminished by the unprecedented number of health care workers infected during the outbreaks. Nearly 700 were infected by year end and more than half of them had died.

Though the number of infected health care workers was highest at the start of the outbreaks, infections in doctors and nurses began to spike again in the last quarter of the year. The reasons for this spike are currently being investigated.

In Liberia, some evidence suggests that, as cases began to decline and the risk was perceived to be lower, stringent measures for personal protection lapsed. Protective measures in the community, such as frequent hand hygiene and keeping a safe distance from others, visibly declined. In Sierra Leone, which now has 5 times as many new cases per week when compared with Liberia, exhaustion among staff may help explain the increase.

As experience has shown, when a city experiences intense and widespread transmission, as happened first in Monrovia and then later in Freetown, the distinctions between “hot” and “low-risk” zones become blurred. Infections in at least some health care workers, who rigorously followed safe procedures while caring for Ebola patients in a hospital or clinic, are known to have acquired their infection in the community.

As of mid-December, MSF had more than 3,400 staff working in the affected countries. Of these staff, 27 became infected with Ebola and 13 of them died. Investigations by MSF found that the vast majority of these infections occurred in the community, and not in its treatment facilities, which have an outstanding reputation for safety.

### **Cultural beliefs and behavioural practices**

High-risk behaviours in the three countries have been similar to what has been seen during previous Ebola outbreaks in equatorial Africa, with adherence to ancestral funeral and burial rites singled out as fuelling large explosions of new cases. Medical anthropologists have, however, noted that funeral and burial practices in West Africa are exceptionally high-risk.

Data available in August, as reported by Guinea’s Ministry of Health, indicated that 60% of cases in that country could be linked to traditional burial and funeral practices. In November, WHO staff in Sierra Leone estimated that 80% of cases in that country were linked to these practices.

In Liberia and Sierra Leone, where burial rites are reinforced by a number of secret societies, some mourners bathe in or anoint others with rinse water from the washing of corpses. Understudies of socially prominent members of these secret societies have been known to sleep near a highly infectious corpse for several nights, believing that doing so allows the transfer of powers.

Ebola has preyed on another deep-seated cultural trait: compassion. In West Africa, the virus spread through the networks that bind societies together in a culture that stresses compassionate care for the ill and ceremonial care for their bodies if they die. Some doctors are thought to have become infected when they rushed, unprotected, to aid patients who collapsed in waiting rooms or on the grounds outside a hospital.

As several experts have noted, when technical interventions cross purposes with entrenched cultural practices, culture always wins. Control efforts must work within the culture, not against it.

### **Reliance on traditional healers**

Traditional medicine has a long history in Africa. Even prior to the outbreaks, poor access to government-run health facilities made care by traditional healers or self-medication through pharmacies the preferred health care option for many, especially the poor. Many surges in new cases have been traced to contact with a traditional healer or herbalist or attendance at their funerals.

After the outbreaks began, the high fatality rate encouraged the perception that hospitals were places of contagion and death, further reinforcing the lack of compliance with advice to seek early medical care. Moreover, many treatment facilities, hidden behind high fences and sometimes draped with barbed wire, looked more like prisons than places for health care and healing.

### **Community resistance, strikes by health care workers**

Control efforts in all three countries have been disrupted by community resistance, which has multiple causes. Fear and misperceptions about an unfamiliar disease have been well documented by medical anthropologists, who have also addressed the reasons why many refused to believe that Ebola was real.

People and their ancestors had been living in the same ecological environment for centuries, hunting the same wild animals in the same forest areas, and had never before seen a disease like Ebola. Equally unfamiliar were the response measures, like disinfecting houses, setting up barriers and fever checks, and the invasion by foreigners dressed in what looked like spacesuits, who took people to hospitals or barricaded tent-like wards from which few returned.

A second source of community resistance arose from the inability of ambulance and burial teams to respond quickly to calls for help, with bodies sometimes left in the community for as long as 8 days. The communities will comply with official advice if it benefits them. They are far less likely to comply if the result, like uncollected bodies, causes visible harm.

Burials performed by military personnel have been safe and efficient but not always dignified, especially in a culture that observes ancestral mourning rites and is accustomed to touching bodies of loved ones before they are buried in their finest clothes, in graves that are marked.

Strikes by hospital staff and burial teams have further impeded control efforts. Most strikes occurred after staff were not paid for weeks or months, did not receive promised hazard pay, or were asked to work under unsafe conditions associated with the deaths of many colleagues.

### **Public health messages that fuelled hopelessness and despair**

In the face of early and persistent denial that Ebola was real, health messages issued to the public repeatedly emphasized that the disease was extremely serious and deadly, and had no vaccine, treatment, or cure. While intended to promote protective behaviours, these messages had the opposite effect.

If hospitals and “Western” medicine offered no treatments, therapies, or cures, families preferred to care for their loved ones at home. In their view, if death is almost inevitable, let this happen as comfortably as possible at home, amid familiar and well-loved faces. Moreover, when patients were taken to treatment or transit centres, anxious families often received little information about the patient’s condition, outcome, or even the place of burial.

With time, and as entire households died of the disease, communities began to understand that keeping patients in homes carried a high risk for care-givers. However, the severe shortage of treatment beds, first in Monrovia and later in the western part of Sierra Leone, left families with few other options.

For unknown reasons that may include the stigma that surrounds this disease, the practice of hiding patients in homes continued in some areas, even after abundant treatment beds became available. The great stigma attached to Ebola explains why suspicious deaths are routinely tested for Ebola. Bodies that test negative can be buried in the traditional way, and families are freed from ostracism by the community.

### **Spread by international air travel**

The importation of Ebola into Lagos, Nigeria on 20 July and Dallas, Texas on 30 September marked the first times that the virus entered a new country via air travellers. These events theoretically placed every city with an international airport at risk of an imported case.

The imported cases, which provoked intense media coverage and public anxiety, brought home the reality that all countries are at some degree of risk as long as intense virus transmission is occurring anywhere in the world – especially given the radically increased interdependence and interconnectedness that characterize this century.

### **Background noise from endemic infectious diseases**

All previous Ebola outbreaks occurred in countries with a number of long-tenured infectious diseases that mimic the early symptoms of Ebola and help keep the disease hidden. The initial symptoms of malaria, for example, are indistinguishable from those of Ebola. Cholera is likewise endemic in the area and caused a large outbreak in Guinea and Sierra Leone in 2012 that lasted most of that year.

As a further complicating factor, the incidence of Lassa fever – which, like Ebola, is a viral haemorrhagic fever – is uniquely high in this West African region, with Sierra Leone recording the world's highest incidence of cases.

### **A virus with different clinical and epidemiological features**

Recent virological analyses have determined that the virus circulating in West Africa is genetically distinct from Zaire viruses seen in past outbreaks and in the 2014 outbreak in the Democratic Republic of Congo. As scientists have noted, the virus in West Africa takes a different clinical course with different epidemiological consequences, although these differences do not affect the infectious period, case fatality rate, or modes of transmission.

As noted in a major study and commentary published in *Science Magazine* on 29 August, the virus' genome – its genetic "identity card" – is changing "fairly quickly" in fixed ways. As the authors of the report concluded, "continued progression of this epidemic could afford an opportunity for viral adaptation, underscoring the need for rapid containment."

## **A fire in a peat bog**

In past outbreaks of Ebola virus disease and the related Marburg haemorrhagic fever, cases were concentrated in a small number of geographical foci, which simplified logistical demands. Under such circumstances, the principal responders, WHO, MSF, and the US CDC, could flood affected areas with staff and materials, hunt the virus down, and uproot it within several weeks to three months.

The situation in West Africa has been far more challenging, with cases reported in all or most parts of the three countries, including their capital cities. The demands of addressing this broad geographical dispersion of cases outstripped international response capacity at nearly every level, ranging from worldwide supplies of personal protective equipment to the number of foreign medical teams able to staff newly built treatment centres.

During 2014, the outbreaks in West Africa behaved like a fire in a peat bog that flares up on the surface and is stamped out, but continues to smoulder underground, flaring up again in the same place or somewhere else. Unlike other humanitarian crises, like an earthquake or a flood, which are static, the Ebola virus was constantly – and often invisibly – on the move.

## **The long duration of the outbreaks**

The Ebola outbreak demonstrated the lack of international capacity to respond to a severe, sustained, and geographically dispersed public health crisis. Governments and their partners, including WHO, were overwhelmed by unprecedented demands driven by culture and geography as well as logistical challenges. Together, these and other factors, including the behaviour of the virus, created a volatile situation that evaded conventional control measures and constantly delivered surprises.

Faced with so much suffering and so many unmet needs, many partners in the outbreak response courageously took on responsibilities that went beyond their traditional areas of work and expertise. Some, including MSF, the US CDC, the International Federation of Red Cross and Red Crescent Societies (IFRC), the World Food Programme, and UNICEF built upon their well-established roles during health and humanitarian crises to expand their areas of engagement.

MSF, which provided the bulk of clinical care since the beginning of the outbreaks, used its treatment centres to collaborate in clinical trials of experimental therapies and also provided funding. The World Food Programme extended its unparalleled logistical capacities to support response operations that went well beyond the delivery of food. Its helicopters were used to get rapid response teams to remote rural areas. Its engineering teams supported the rapid construction of treatment facilities by WHO and others and the clearing of ground for cemeteries.

Hundreds of CDC staff, including epidemiologists with extensive experience in outbreak containment, were deployed to support surveillance, contact tracing, data management, laboratory testing, and

health education. UNICEF worked to promote child health and safe childbirth in addition to taking the lead on social mobilization.

IFRC used its vast network of volunteers to take on primary responsibility for safe and dignified burials. As WHO field staff observed, some operations encountered less community resistance when local staff were part of the response team, as is often the case with IFRC volunteers. However, given the cultural and religious sensitivities surrounding burials, the work of several teams was disrupted by violent community resistance, resulting in serious injuries to some team members.

The International Medical Corps, International Rescue Committee, and International Organization for Migration played major roles in staffing and managing treatment facilities, in Liberia and Sierra Leone, designed to meet all isolation, care, safety, and waste management needs. Staff provided by the International Medical Corps included mental health and psychosocial specialists.

### **Doing unfamiliar work**

Many organizations and agencies took on technical work normally handled by public health experts. UNFPA, for example, undertook contact tracing. The charity Save the Children assumed responsibility for managing a treatment centre built by the UK government in Kerry Town, Sierra Leone.

As the year drew to a close, several charities were struggling to care for Ebola orphans, estimated by some to number more than 30,000 in the three countries. Poverty, the heavy stigma attached to this disease, and the speed with which it can devastate a village made it difficult to find homes for orphaned children.

Manufacturers of essential supplies, like personal protective equipment, were also stretched to the limits of their production capacity, while WHO was left to ensure that donated supplies from existing stockpiles were of the right quality to protect staff during an outbreak caused by an especially contagious and lethal virus. Unfortunately, when the outbreak started, no gear specifically designed to protect against Ebola virus infection existed, and this problem raised some uncertainties throughout the year.

In a new role for WHO, the Organization supervised and funded the construction of treatment centres, as requested by ministries of health, and developed floor plans for safe facilities constructed by others.

Despite all this support from multiple sources, capacity was insufficient for most of the year or not available where it was needed most. The problem of insufficient capacity was greatest for foreign medical teams needed to run treatment centres. Many WHO staff sent to the field to serve as coordinators ended up donning protective gear and treating patients as well.

With response teams overwhelmed and resources stretched so thin, these laudable efforts to fill in the gaps raised some important questions.



Who is responsible for coordinating all these efforts? Who is responsible for ensuring that unfamiliar jobs taken on by some are properly done?

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Stories of Ebola survivors

Story from Guinea: Busting the myths about Ebola is crucial to stop the transmission of the disease

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Ebola virus disease outbreak