

Ebola Virus: From Medical Emergency to Complex Disaster?

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Ebola haemorrhagic fever is a fatal disease caused by a new virus which has no known cure. Few outbreaks have been documented. Two major epidemics occurred in Africa in 1976. When a new epidemic was detected in Zaire in the spring of 1995, it was widely perceived as a threat to the West. Public attention was intense. A massive intervention, led by UN and US agencies, followed and put an end to the epidemic within less than two months.

The intervention was successful for several reasons. Effective cooperation benefitted from the network which had been initiated by virologists since the 1976 outbreak, NGO activism and international pressure. Cultural under-currents had prepared the West for the outbreak. The prestige and competency of the international responders – particularly the UN World Health Organization and the US Centres for Disease Control and Prevention – helped to keep the emergency a simple one; amenable to a disciplined public-health approach. Initiatives of the Zairian authorities that might have transformed it into a complex disaster were effectively amended.

A future outbreak may be harder to cope with. Unless resources are better balanced between scientific work on new viruses and grassroots organizations that play a crucial part in handling most epidemics, the current progress may be short-lived. The next Ebola outbreak in Zaire might find the country in political turmoil. Access for public health responders may be severely limited and compounded by security and human rights issues. A complex emergency could, then, form easily.

Introduction¹

In May 1995, a deadly epidemic was identified as an outbreak of Ebola haemorrhagic fever. The Ebola epidemic in Zaire received wide public attention and massive organized intervention. The event originated in a region that is part of the 'periphery' in today's highly stratified world society. It is not surprising, then, given Zaire's poverty and low international status, that the response depended to a large degree on, and was shaped by, foreign organizations. What needs explaining, rather, is the massiveness of the intervention and its success.

The response to this outbreak involved large, internationally reputed organizations, such as the US Centers for Disease Prevention and Control (CDC) and the UN World Health Organization (WHO). Important contributions were made by less known and smaller groups, such as the Zairian Red Cross Society and Catholic Relief Services (CRS). As a result of the first outbreaks in 1976, a network of response organizations already existed; it sprang into action through a quickly formed, narrow-focused alliance. Old hands from a former outbreak were recalled and new players were added as needed.

This paper explores the reasons for the successful intervention and the prospects of effectively meeting future outbreaks with similar arrangements. It will be argued that the epidemic was successfully defeated because it remained a simple disaster in which the key

actors were able to maintain a unified professional perspective. The threat posed to the West meant that resources came forth. This may change in the future. Zaire is poised for greater turmoil. The next outbreak could, therefore, lead to a complex disaster² situation with an explosive mixture of public health, security and human rights issues. In order to prepare for new epidemics, investment has to be carefully balanced between research on new viruses and the nurturing of organizations that can supply the necessary popular participation in disaster response.

History of Ebola outbreaks

The Ebola virus was first discovered during two epidemics which hit Zaire and Sudan in 1976. The virus belongs to a family known as *Filoviruses*. *Filoviruses*, like some other viruses, can cause haemorrhagic fevers in humans:

The usual hosts for most of these viruses are rodents or arthropods (such as ticks and mosquitoes). In some cases, such as Ebola virus, the natural host for the virus is unknown. All forms of viral haemorrhagic fever begin with fever and muscle aches. Depending on the particular virus, the disease can progress until the patient becomes very ill with respiratory problems, severe bleeding, kidney problems and shock. The severity of viral haemorrhagic fever can range from a relatively mild illness to death (CDC, 1995a: 1).

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Table 1

Year	Country	Cases	Fatalities Per Cent
1967(?)	Germany	2	unknown
1976	Sudan	280	53
1976	Zaire	318	90
1977	Zaire	1	100
1979	Sudan	34	65
1989	USA	4	0
1995	Zaire	293	79

Source: Schwartz (1995) and World Wide Web (WWW)

Once human beings become infected with the Ebola virus, it is spread through close person to person contact or as a result of hypodermic needles being re-used when treating infected patients (CDC, 1995a:2). Airborne transmission has not been established.

The fatality rate is particularly high for Ebola, but only a few outbreaks have been recorded so far. Two men working with African monkeys in Germany are suspected to have died from the illness in 1967. An isolated incident of Ebola killed a child in Zaire in 1977. In 1979, another outbreak occurred in Sudan. In 1989, four workers handling macaques imported from the Philippines in a laboratory in Reston, Virginia, USA were infected sub-clinically (see Table 1).

The two major outbreaks in Zaire took place in different areas. Even though the 1976 outbreak was far away from the capital Kinshasa, transmission to this city did occur. The 1995 outbreak was much closer to Kinshasa. However, despite the relatively small distance, no cases in the capital became publicly known³ – a most significant fact as one shall presently see.

Chronology of the Zaire outbreak in 1995

As later reconstructed by the CDC, a charcoal-maker near Kikwit, a town 550 kilometres east of Kinshasa, was the first person infected with the virus. He died on 13 January. By early March, twelve members of his family had died (Brown, 1995). Simultaneously, a Shigella I dysentery epidemic was underway in Kikwit which masked the Ebola outbreak in its early stages. The first hospital workers may have become infected as early as February, when an Ebola patient was treated at the Kikwit II health centre and subsequently transferred to the General Hospital. On 11 April, members of a resuscitating team, handling a patient mis-diagnosed for typhoid, were infected. Rapid infection of unprotected health workers and of other hospital patients ensued, eventually prompting most patients to flee, thereby carrying the disease into the community.

In April, local doctors had been asking for help for weeks before receiving foreign attention. Aid organizations later explained that Kikwit was not in a priority province for what little assistance was still being given to Zaire (French, 1995).⁴ On 20 April, the medical director of the Kikwit General Hospital went to Kinshasa. He enlisted Professor Muyembé, a virologist and veteran of the international commission investigating the 1976 outbreak, to go to Kikwit on 29 April. Muyembé suspected a haemorrhagic fever right away and helped to establish appropriate nursing procedures. He organized the first volunteer committees specializing in rumour control, education of the public and collection of the sick and dead. He collected blood samples which were, at first, sent to Belgium and then to the CDC in Atlanta.

With Muyembé working in Kikwit, several NGOs during the first week of May became convinced that an extraordinary crisis was building. On the weekend of 5 and 6 May, Catholic Relief Services, the Protestant church, Doctors Without Borders (Médecins Sans Frontières) (MSF) representatives and government officials formed a coordination committee in Kinshasa. It was decided to do an assessment and distribute supplies together. The Protestant Mission Aviation Fellowship flew a first consignment, some US\$3000 worth of locally purchased medicaments and surgical gloves, to Kikwit on the 6 May.

That same day, WHO and CDC were notified by health authorities and the US Embassy in Zaire of a likely outbreak of Ebola viral haemorrhagic fever. The CDC received Muyembé's samples on 9 May and had results hours later. The next day, scientists from the WHO and CDC, reinforced by the Pasteur Institute (France) and the National Institute of Virology (South Africa), arrived at the 350-bed Kikwit hospital. They found it abandoned except for some twenty patients lying among bodies of many other dead victims. On the 11 May, the US Chargé d'Affaires in Zaire declared a disaster in response to the virus. The WHO officially confirmed the outbreak was Ebola, adding that in view of the dispersal of patients and staff from the hospital, more cases of Ebola disease were likely to occur in the vicinity. The same day, the US military immediately sent a cargo plane with medical supplies to Zaire.

Other international organizations also sent teams. The International Federation of Red Cross and Red Crescent Societies (IFRC) rushed in to help organize the work of 600 volunteers. Essential health-worker supplies were rushed in by MSF from Belgium. Members of this organization branched out to do surveillance in areas surrounding Kikwit. MSF officials soon identified outbreaks in nearby Mosango and in a third town – Yassa Bonga – 250 kilometres (160 miles) from Kikwit. Vanga also had some cases. At this point, prognoses varied. On 14 May, Professor Muyembé claimed the situation was starting to come under control in Kikwit. Two days later, however, the WHO reported that the number

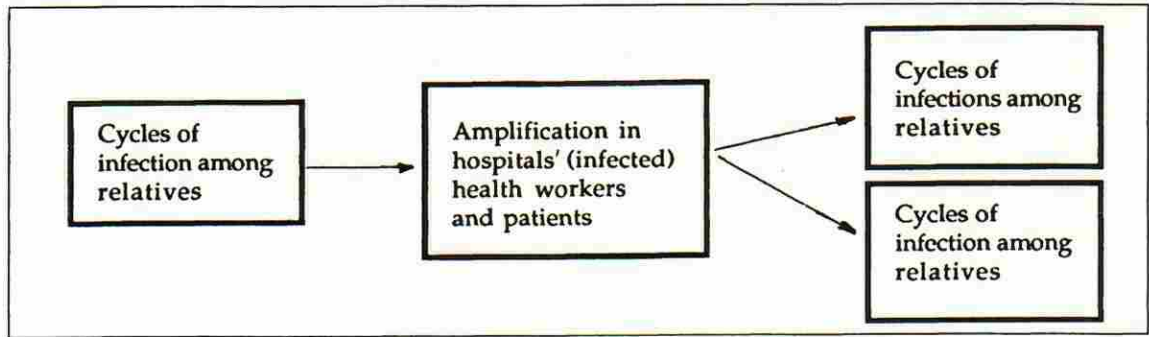


Figure 1: Course of the Epidemic

of cases has quadrupled every 10 to 12 days in the previous three weeks. The government reinforced quarantine measures, begun some days earlier, in order to block traffic from Kikwit to Kinshasa; then, yielding to WHO protests, re-opened the roads, closed them again a few days later and, finally, narrowed the quarantine to Kikwit only.

At this point in time, the measures instituted by the international organizations began to yield results. On 26 May, the WHO announced that the emergency phase of the outbreak was over. The WHO would now turn its efforts to rebuilding the health infrastructure, while continuing epidemiological surveillance. The calculations of total fatalities continued to increase into June, but most were previously unidentified cases which had occurred before May. By 15 June, the situation in the Kikwit area was under control, although the Zaire Red Cross continued surveillance in other areas. The misdiagnosis of a patient, thought to have an amoebic dysentery, touched off another infection of twelve more persons. The last patient was admitted to the hospital on 24 June. The total number of infected people identified was 293, of which 233 (79 per cent) died of the disease. About 90 of the victims were health workers; their relatives and friends were the majority of the rest of the victims. The course of the epidemic is summarized in Figure 1.

Operations continued for another two months through two 19-day incubation periods. Training of hospital and public health with regard to the treatment of the infected was initiated. The training included techniques for obtaining human specimens for isolation and diagnosis. Mammalogists and other technical staff went into the field to find the source of Ebola. Over 32,000 specimens, including 18,094 mosquitoes and 1,600 rodents, were collected (Manning, 1995), yet the source of the outbreak remained a mystery. The emergency was officially ended on 24 August.

Future plans involve the organization of a surveillance system that would identify future outbreaks of Ebola. This will be accomplished by taking skin snips of victims and putting each snip in formalin, then sending it back to the CDC for testing. Educational manuals will be produced and on-site training of Zairian medical personnel, specifically

chief medical officers and hospital infectious disease doctors, will be initiated. Some international and church-affiliated NGOs in Zaire have already begun their own, more broadly defined, medical emergency preparedness project, in which the Catholic diocese of Kikwit is likely to become a partner.

The longer wave: Cultural change

Ebola outbreaks had occurred before, the latest even in the United States in 1989. Yet, 'Ebola' was not a current notion in the popular disaster vocabulary such as earthquakes, terrorist attacks and other infectious diseases. It was, however, on the way to becoming a household word by the time the 1995 epidemic hit the media, in a bizarre cultural climate that makes one feel that 'life followed art'.

The end of the Cold War has accelerated a radical re-drawing of the intellectual and affective map of the planet. The dominant opposition of two equally powerful and stable blocks has given way to the concept of a stable core and a periphery in constant turmoil. This ideological constellation has no parallel in recent Western history. One may have to go back as far as the ancient Roman empire to find congenious systems of thought. The Roman world was one of strict, even physical, division between the reign of its law versus the peoples who lived outside its fortified borders, the *limes* (Rufin, 1991). The barbarians would vacillate between peaceful trade and unpredictable belligerence. They spoke languages and followed customs that made communication with them difficult. While it was necessary for the Romans to regulate exchanges across the *limes*, by contract, threat and expedition, the empire lacked the power to instill order, peace and reason deep into the barbarian world. In a similar *figura*, instability of the marginal South has nowadays been accepted as an unfortunate, hard-to-change reality. A new emphasis on containment of crises has replaced the quest for convergence and, with it, the solution of root causes (Duffield, 1995). The new orientations have found their way into public policy, most noticeably in the significant shift on the part of the North away from development investment to relief assistance for the South (Borton, 1993; Adams and Bradbury, 1995).

Expectations for future stability and growth vary significantly for the different regions. Africa has received the most pessimistic assessments. Zaire, bled out by a long dictatorial regime, bodes particularly ill. Gurr (1994: 364), in a world-wide survey of ethno-political conflict, places this country on the brink of greater conflict, similar to the ones that engulfed Sudan and Angola. Others, more optimistic, point out that the trend towards greater relief assistance is multi-dimensional: in addition to strengthening the machinery for relief delivery, donor countries are increasingly taking responsibility for social and public policy in crisis countries (Adams and Bradbury, 1995). Although recent interventions in countries such as Somalia, the former Yugoslavia and Cambodia have had a mixed record, repetitious interventions could, eventually, produce entirely new forms of governance. These could reverse the simple expulsion of an indomitable group or intractable problem to the other side of a fixed boundary, a reality captured by the *limes* metaphor.

Western society had been culturally prepared for a disease outbreak to be considered a threat in the heart of Africa. The notion that the Congo was a vast area teeming with dangerous disease has been ingrained in popular culture since the journeys of Livingstone and Stanley in the last century (Ransford, 1983). More recently, environmental awareness brought a better understanding with lay people of the co-evolution of humans and disease agents. After 1980, when AIDS was reported to spread in the United States, importation of dangerous agents was recognized as a new threat (Le Guenno, 1995). In recent years, several new viruses such as *Marburg* and *Hanta* have become notorious. Older plagues lifted their ugly heads as a result of increased antibiotic resistance. Poorly understood host transitions, from monkey or rodent to man, amplified myths about 'nature's revenge'. One new disease, *necrotising fasciitis*, was widely documented for the gruesome and fast destruction of its victims. Works of art and popular science such as the 'Andromeda Strain' (Crichton, 1969) and 'Hot Zone' (Preston, 1994) anticipated or reinforced such themes. Those concerns over-lapped

with worries about biological terrorism (Bradford et al, 1994). In the realm of scholarly research, Garrett's (1994) 'Coming Plague' made its mark through its inter-disciplinary treatment of several major new viral diseases. The title of the book, very extensively reviewed – at least 125 print media reports referred to it *before* the Ebola outbreak⁵ – sent a clear message: the next big disaster is certain to come.

With great dramatic effect and equally great insouciance for scientific truth, the movie 'Outbreak', which aired only weeks before the Zaire epidemic, specifically referred the history of the Ebola epidemics. Thus, when the WHO received notification of the outbreak in Kikwit, Zaire on 6 May, 1995, not only concerned authorities and the medical profession, but the Western public at large, were highly receptive to the news.

The short wave: Public attention

Intensive international media coverage generated immediate public attention after the outbreak had been confirmed on 9 May. Judged by the number of reports caught in the Lexis-Nexis net, the attention curve kept climbing for a full two weeks. The world watched intensely for another ten days until the WHO announced on 26 May that the emergency phase was over. After that, attention trailed off slowly over several weeks (see Figure 2).

The attention curve is fascinating to follow on its temporal, social and material dimensions. These, of course, are inter-related, but it is important to distinguish between the public perspective and that of the intervening organizations. The fast upsurge, inherent to crisis news, was supported by the mobilization of the WHO and CDC (6–10 May); two organizations well-gearred to working with the media. In addition, the US declared a disaster and a military cargo plane left the US carrying emergency supplies. Those events substituted for the initial lack of reporters in remote Kikwit. More attention was spurred by news that the disease was spreading outside Kikwit and by the first images of the shaken

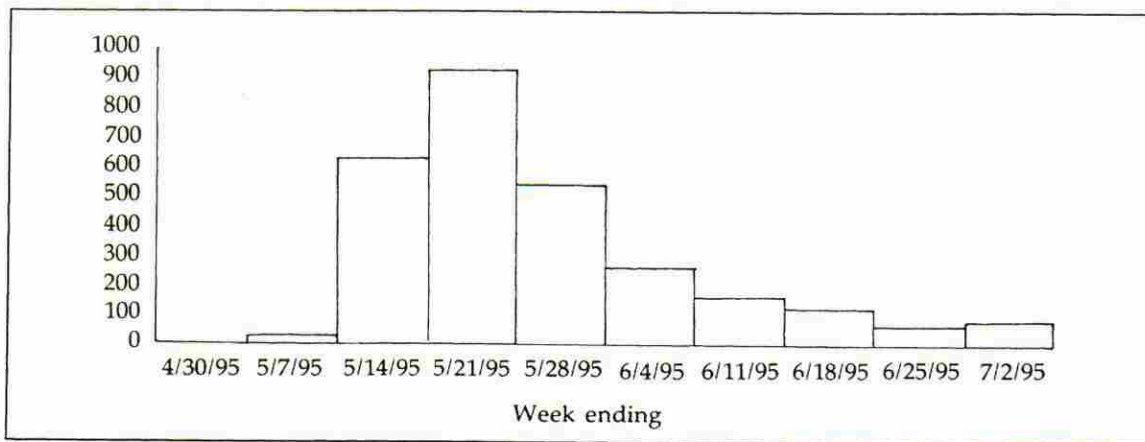


Figure 2: Ebola Reports, Print Media

community in Kikwit. The WHO added momentum by anticipating a significant increase of new cases for the second half of May. Very soon, however, the indicators that the organizations and the media were using to gauge the potential of the epidemic started to differentiate substantially.

The one question that claimed over-riding attention in the media coverage of the epidemics scenario was always whether the epidemic would reach Kinshasa, the capital of Zaire, and from there break out to the West. Although no one knew how many people had travelled out of the infested region in the days before the epidemic was recognized, the story of a nurse and a riverboat captain who absconded from Kikwit in mid-May became a grotesquely personalized touchstone test for the 'spread hypothesis'. Both were found and were believed to have tested negative (neither was in fact tested, as the CDC found out). This was noted with the same relief as the clearance of a Swiss reporter who had returned from Zaire with suspicious symptoms.

The responders, for their part, were guided by the total number of fresh cases and by signs that new infections were becoming less likely due to the effective disposal of dead bodies, changes in burial practice and the availability of properly trained, well-equipped volunteers. In other words, the medical profession was confident that the epidemic could be contained even if outbreaks occurred outside the Kikwit region. *Time Magazine* summarized the public view: 'the only good news was that the disease had not yet spread – as far as anyone could tell – to the 4 million people of Kinshasa, 250 miles to the west' (Purvis, 1995). Meanwhile, the WHO announced that the emergency phase was over (26 May). Note that these differences spring from different cognitive models of the world. A containment model, featuring multiple defense lines to keep danger out of the core countries, saw Kinshasa, the impoverished city of 'teeming millions', as an ideal breeding ground for the disease from where it would reach the West. The health profession preferred to look at various social environments – hospitals with workers lacking basic equipment, families taking care of the sick, travelling people – as niches for the agent and as transmission matrixes. In this perspective, danger lurked on the side of modernity rather than of the indigenous institutions:

If the primary mode of transmission of this virus is from patient to caregiver, then the establishment of new, large hospitals in rural Africa adds a new niche which previously was not there. Thus in years past, transmission of Ebola would be limited to household members instead of large numbers of health care workers. In that setting, these outbreaks probably would not be recognized and would spontaneously die out (Francis, 1995).

The impact of such views on the larger public must have remained marginal; they required a level of

cognitive complexity in crisis reporting that exceeded the capacity of all but the most educated consumers and could not effectively compete with simple indicators such as outbreaks in Kinshasa and abroad. The slow pace of tailing off may be explained by the fact that the increases in Kikwit cases reported in late May and in June kept the spread hypothesis open; most of these cases were old ones that had occurred before May and with which the WHO updated its statistics as its back-tracking efforts progressed.

Although diagnosed or predicted by some, the panic in the West did not occur. A Reuters correspondent reported on 12 May that 'the deadly Ebola virus ravaging part of Zaire has caused a worldwide panic because of its horrifying effects'. This was at the time when the WHO itself assumed that the number of cases was quadrupling every 10 to 12 days. But spatial models prevailed over temporal ones. No epidemic was ever discovered in Kinshasa. And except for an incident in Rio de Janeiro, where a passenger suffering a heart attack caused a panic in a plane arriving from South Africa, public excitement in the West did not cross the threshold of serious concern.

Equally marginal were the voices that took a wider view of the epidemic. Only a minority of the media and the responders took the opportunity to look at the magnitude of suffering caused by other epidemics in Africa, or at public-health needs in other areas. What Howard French (1995: B3) wrote from Kikwit may be representative of a critical current, but not of the West at large:

Western world's attention span fails to match flood of misery – from only a few hundred kilometres to the east, word has filtered out of an older scourge: 250 people have been stricken with polio. Simultaneously, deadly cholera rages in Mali. To the south, in Angola, 30,000 people were recently infected with sleeping sickness. And a few weeks back, thousands died when meningitis swept across a broad belt of West Africa. Unlike Ebola, all of these plagues are easily mastered by modern medicine, so Westerners need not fear their spread. But all of them already have killed, or likely will kill, far more Africans than today's celebrity virus. And for Africans, the troubling question arises why none of this continent's daily, deadly encounters with mostly preventable diseases hardly provokes a flicker on the screen of the world's conscience.

Among the responding organizations, it was one of the organizations deeply involved in the grassroots dimension of the combat, the International Federation of Red Cross and Red Crescent Societies, that spoke out most clearly for a broader approach:

The development of a (Zairian Red Cross) national community-based first-aid programme ... is clearly a long-term activity that will have to be supported (from outside). ... A plan of action will be developed that will allow the Red Cross to be better prepared to prevent and respond to disasters in general. In this context — and before the Ebola epidemic — the Zairian government asked the Federation to assist in

developing a national Disaster Preparedness Plan. ... The plan will also enable the National Society to deal more efficiently with a series of other epidemics which have appeared in several regions: polio, rabies, typhoid, tuberculosis and sleeping sickness (IFRC, 1995b).

The influence of that and similar positions can be measured to have remained insignificant. The press used the Federation's communiqués twenty times less often than those of the WHO and CDC together. It would be misplaced to accuse these organizations of callous disregard for the wider context of human suffering. That the world's attention remained focused on the Ebola outbreak was not of their making, although it did facilitate their immediate task. It is difficult to see how broader approaches would have been practical during the crisis. For the short-term mission, the sharp focus of both public opinion and interveners turned out to be functional.

Organizational factors

Given the fact that the crisis remained localized in a little known area of Zaire, the breadth of multinational involvement was remarkable. The international organizations cooperating in Kikwit were headquartered in the USA, France, Belgium, Switzerland, Italy, Sweden and South Africa. They represented the gamut of inter-governmental, governmental and non-governmental organization types, as is otherwise typical of large and complex emergencies. Some specialized in some advanced-technological aspect, others had links with local grassroots organizations necessary for popular participation. They belonged to social movements of very different ages and traditions. Their mobilization was fast, producing a confirmation of the diagnosis within three days from the original notification, the departure of a military supply aircraft from the US within another two days and a field laboratory capable of detecting Ebola within two weeks.

What enabled such a diversity of organizations to work together so effectively? Maintenance of focus and complementarity of resources are possible explanations. With few exceptions, participating organizations brought with them a public-health perspective for the work in Zaire. This meant that they shared confidence from the beginning that the crisis could be overcome by applying the experience gained from previous epidemics: surveillance, education of the susceptible and simple isolation procedures with infections that would stop the outbreaks. The public health outlook was challenged at one point when the Government of Zaire tried to quarantine the larger Kikwit area, which threatened to impose a military security approach. The WHO took a public stance against the quarantine and prevailed.

Organizations with different perspectives, such as those contributing to the logistics and the UN World Food Program, remained in ancillary roles. Public

health as a problem-solving perspective, and the medical experts as the dominant profession, prevented the focus from being diluted by a multiplicity of agendas sometimes found in complex emergencies such as humanitarian disasters (Benini, 1993). The Zairian authorities, apart from their rejected quarantine, supported the public-health approach. A national co-ordination committee in Kinshasa was continued under the leadership of the Ministry of Health. In Kikwit, the International Scientific and Technical Committee, chaired by a medical professor from Kinshasa University, was a leading actor. Historical continuity reinforced the dominance of the public health perspective: the Institute of Tropical Medicine in Antwerp, the Pasteur Institute, Kinshasa University, CDC and WHO had all participated in an international inquiry into the 1976 outbreak in Zaire (International Commission, 1978).

As to complementarity of resources, the critical match seems to have been the one between organizations supplying technical answers – correct diagnoses, isolation equipment – and other organizations geared to re-gaining popular support after the initial panic in Kikwit, particularly for the burial of the dead, case tracking and public education. The technological prowess of the CDC, the only organization to have bio-safety level-4 laboratories, the devotion and sacrifice of Italian nuns in the hospital and the Zairian Red Cross volunteers, were all factors that contributed to a focused and very effective response. Finally, the Zairians and to a degree also the French-speaking expatriate participants, had the cultural skills needed to mount the public education campaign that aimed at discouraging disease-spreading habits.

During both Ebola outbreaks in Zaire, the organizational field was characterized by a core coalition consisting of US authorities (embassy, CDC), the WHO and the Government of Zaire, with various church-related bodies playing important roles. The advent on the scene of two humanitarian movements – MSF and the Red Cross – and the assistance given by the US Air Force were significant novelties of the 1995 intervention.

Both interventions were effective, as the epidemics were ended. It is difficult to say how organizational learning from the first outbreak was transferred to the second. Calculating critical delays may shed some light on the question. As we are dealing with organizations that receive information through Kinshasa, our interpretation of the data in Table 2 uses the date of the first report from the field, not the index case date, as a benchmark.

It appears as though the capacity of the Zairian state to react, had further dwindled since 1976, whereas the international reaction, once Ebola was a strong assumption, was faster and more massive in 1995. In both outbreaks, the agent was identified in overseas laboratories from blood samples that doctors visiting from Kinshasa had collected *before* the international team arrived in the field. The initial

Table 2

<i>Activity</i>	<i>1976 Outbreak Day #</i>	<i>1995 Outbreak Day #</i>
Onset of symptoms in first recognized case (9/1/1976; 1/6/1995)	1	1
Kinshasa receives first report of epidemic (9/21/1976; latest 3/30/1995)	21	= < 84
First reaction of Zairian authorities (Both: visit of Professor Muyembé)	23	114
Diagnosis (1976: new agent; 1995: Ebola confirmed)	44	124
International team arrives in field	49	125
Last case (1976: died; 1995: admitted)	66	170

Sources: International Commission (1978: 273) for the 1976 outbreak. WWW chronological elements, CRS, Vanga Hospital for 1995 outbreak. Dates in US notation; Day numbers are cumulative.

onset in 1995 was masked. However, thanks to the 1976 predecessor, Ebola was an established concept in CDC and WHO and among Zairean virologists.

The differences between the two temporal patterns – reactions to unspecified epidemic outbreaks get slower, reactions to haemorrhagic fever alerts get faster – lend circumstantial support for the thesis that the international community does, indeed, take responsibility for the internal affairs of poor countries in crisis – when the crisis is threatening Western countries.

Long-term considerations

It is unlikely that the alliance of organizations that defeated the outbreak will continue as an on-going tightly-knit group working for the betterment of public-health conditions in Zaire. The mandates and outlook of the participants are too diverse. They compete for public funding even when their field perspectives are mutually supporting. In addition, the present state of Zaire is too prohibitive for broad cooperative ventures to be considered. Garrett (1994: 604) hints at rivalry between WHO and CDC that helped frustrate a joint plan to entrust surveillance to a 'series of fifteen tightly networked tropical outpost laboratories, staffed by CDC scientists, colleagues from local public health institutions in the host country and academic researchers drawn from some fifty US universities'. The CDC estimated that the entire system would cost US\$150 million per year to operate. The proposal was formally endorsed by WHO in April 1994, but has not yet been financed by the donor community (Henderson 1993; Garrett, 1994: 607).

Conflicts occur at other levels, too. The Zairean authorities, to the extent that they are still pursuing an active health-care policy, as well as many of the NGOs, give priority to fighting the great killer diseases such as malaria and childhood diarrhoeas.

They may take the new viral diseases into account chiefly in deference to donor governments. Inside Zaire, hospitals are unhappy with the training that the national Red Cross gives to volunteers, who subsequently go around dispensing injections or opening unlicensed dispensaries. Ironically, the Kikwit Hospital had, since 1994, neutralized a number of Red Cross first-aiders by co-opting them into low-paid usher positions. During the epidemic, most of the dead bodies were collected by these ushers wearing Red Cross emblems. With a glance at donors, hospitals and the Red Cross advanced different claims as to who had effectively organized the volunteers.

That will not rule out that all or several of the organizations will band together again when similar threats arise. In the meantime, each of these organizations will selectively preserve connections with the Kikwit event and weave them into their principal agendas. The WHO rarely has a strong operational presence beyond the capitals of the various countries and concentrates on the exchange of experience and facilitation in the international arena. The CDC (1995b:) has defined, as one of its priorities

to provide reliable information about the diagnosis, clinical management and control of rare or unusual infectious diseases (for example, botulism; amoebic meningoencephalitis; neurocysticercosis; plague; leptospirosis; and Ebola, Marburg, and Lassa viral haemorrhagic fevers). To meet this public obligation, CDC must maintain expertise for such diseases in the event of their possible re-emergence or introduction into new niches in the United States and elsewhere.

This demands a heavy investment in research on the natural reservoir of the agent and an emphasis on natural science approaches. The Red Cross and the church groups have mandates that are more community-oriented and require the patient and painstaking building of grassroots organizations in a politically and economically hostile environment. The

Doctors Without Borders (MSF) have their strength in frontiersmanship and in media mobilization during humanitarian crises and do not often invest in long-term development work. Realistically, few organizations will want to invest in the long-term development of Zaire before a stable post-Mobutu regime is in place.

The presence of a 'virtual' organization waiting to be called up for duty cannot be deduced from the mandates of organizations alone. Resource interdependency, mutual acquaintance both at task and personal levels and the confidence that the recent success inspired, make it more likely to see several of the 1995 players meet again at future Ebola rallies. The threat that Ebola and other new diseases pose to the West increases the chance that these same organizations with proven effectiveness will obtain resources in future crises, with few new organizations being coopted to the managing alliance. Remarkably, the large number of small foreign NGOs, typical of prominent refugee crises⁶ was never paralleled during the Ebola outbreak. The perceived threat from Kikwit was such that the Zairian, US and UN authorities favoured speed, tight coordination and competence over experimentation with a multitude of low-cost providers.

The unpredictability of outbreaks is another factor working for the maintenance of a virtual organization. But it may also lead to potentially dramatic role changes during future outbreaks. The next epidemic could be part of a complex emergency during a time when the affected country is in political turmoil. What will happen if health authorities can no longer get to the outbreak area in a country engulfed in widespread civil strife? The impact of military strife on such issues as security and logistics, negotiating access, respect for life and dignity and limits for disease surveillance could require a departure from the public health perspective. The flight of members of the country's elite and the movements of international peace-keepers could transmit the disease to other countries. Many complications are conceivable.

Ironically, Ebola is part of the threat potential that the impoverished countries of the South possess in their dialogue with the richer world. The dereliction of the health-care infrastructure and the cost of containing new diseases are in a similar relation as refugee crisis and migratory pressures, or terms of trade and delinquency on debt. Individually, such crises seem containable. Third World dictators blackmailing the world with unattended epidemics threatening global disaster may supply material for Hollywood, but are not likely to happen in the real world. The costs of containment do, however, add up across the various types of disasters. The CDC's contribution to the Kikwit operation alone has cost close to \$1,000,000 and a good part of that sum was financed out of USAID funds otherwise available for development and humanitarian work elsewhere.

Investing in people who can fulfil useful roles in a

variety of disaster situations may mitigate that risk, as exemplified by the Red Cross volunteers, nuns and health workers in Kikwit, without whom the specialists would have been lost. The contrast between the government hospital in Kikwit and the mission hospital in Vanga, 130 kilometres north of Kikwit, is particularly telling. Vanga cared for six Ebola fever patients during the recent outbreak. More than 30 workers were in contact with them during the illness; none of them became infected. The mission hospital has enjoyed consistent support from overseas donors. The 400-bed hospital and the 52 associated rural health centres not only were adequately equipped; for many years their staff had been receiving training and supervision preparing them to handle infectious patients.

Eventually, development and preparedness for new diseases may need to find some middle ground. It is barely conceivable that Africa's health-care needs and the requirements of systematic surveillance can be met through highly integrated systems centred on general reference hospitals in every province. But less demanding solutions, through schools, village clinics, small hospitals and other intermediate institutions, can be expanded. Such institutional structures are useful beyond their formal aims. In disasters of a complex kind, these structures become flexible resources on which the action of specialist organizations can be grafted for effective response. As part of the solution, poor countries, whose population outgrows formal employment, count on volunteers, particularly among the youth, to bridge the gap between institutions and community. Volunteers come cheap, but in order to be effective for disaster preparedness and response they need supervision and support for productive activity, even in normal times. This calls for outside investment:

Given the diverse nature of threats from infectious diseases, it is not adequate merely to face each crisis as it emerges, as this may provide a strategy which proves to be too little and too late. Instead, a more holistic approach is required. This must include a global perspective as well as the need to address the issue of infectious disease within the context of shared environmental responsibility. Improved health care derived from socio-economic betterment is crucial, as are long term policies involving systems thinking as opposed to the limiting nature of long term over-specialization (Jacobson, 1995).

This statement, by a biologist, melds with the central thesis of Perrow and Guillén (1990). Although principally concerned with AIDS, they contend that the ecology for new diseases was created to a substantial degree by the uses that society made of its powerful organizations. They believe that intensive scientific work on viruses will serve us when the next epidemics appear. They see, more pessimistically, in the struggle with each outbreak the occasion to rebuild social structures in such a way that future epidemics will find less fertile ground in which to grow (Perrow and Guillén, 1990: 178-179).

This battle against the Ebola virus was won largely because of the optimism and *sang-froid* of the WHO, CDC and other experts, who, understanding the dynamics of the disease, never doubted that it could be controlled. The parallel outbreak of heroic acts by hundreds of local volunteers also inspires optimism. But optimism should lead to action for the future. Considering the complexity of disasters, resources must be balanced between scientific progress and the progress of the people who suffer the disasters. Socio-economic development on the other side of the *limes* may eventually be the strongest barrier to the virus.

Notes

1. In addition to Internet sources, the authors received a number of printed documents from the CDC. This organization also answered specific questions in writing. A telephone interview was done with the Africa desk of Catholic Relief Services, another agency involved in the crisis. Drafts of this article were circulated among organizations named herein and other groups and individuals with first-hand knowledge of what transpired in Kikwit. The CRS country representatives made several useful remarks. A physician from Vanga Mission Hospital sent written comments and was subsequently available for several telephone conversations. These supplementary sources were most valuable in providing a sharper perspective on the contributions of the various international actors. They also pointed out that the 1995 outbreak did reach the capital Kinshasa, whereas the media and the self-presentations on the World Wide Web had consistently left the public with impressions that the epidemic never spread out of the greater Kikwit area. The revisions and corrections suggested are gratefully acknowledged and incorporated.
2. The United Nations usually speak of a complex emergency and define it as a humanitarian crisis in a country, region, or society where there is a total or considerable breakdown of authority resulting from internal or external conflict and which requires an international response that goes beyond the mandate or capacity of any single agency and/or the on-going UN country programme (Department of Humanitarian Affairs). The terms disaster and emergency are used somewhat interchangeably, here, assuming that in any complex emergency situation a disaster of one or the other kind has already occurred.
3. According to both the CDC and CRS, there was at least one confirmed positive case in Kinshasa. Rumours abounded to the effect that more cases had reached the capital.
4. For example, Catholic Relief Services have chosen to concentrate on the Kasai Regions, with their recent history of ethnic conflict, and on Kinshasa, with its rampant malnutrition problems. UNICEF, the United Nations fund for children, declined a request to help Kikwit as late as 28 April because priority was given to the Rwandese refugees in other regions.
5. Lexis-Nexis search for 'Garrett' AND 'Coming Plague' AND dated before 5 September 1995.
6. An instance of this occurred not far from Kikwit, in Goma, Zaire where some 80 organizations assisted over

a million Rwandese refugees in 1994–1995. The cholera epidemic that took a heavy toll among the refugees in 1994 – some 14,000 died – was poorly handled also because the multitude of aid agencies involved would not follow uniform medical policies and treatment protocols (IFRC, 1995a).

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World Wide Web Sites

- The David Ornstein Ebola page signs as:
<http://ichiban.objarts.com:80/ebola/ebola.html>

- Ornstein also has a project on other emergent diseases:
<http://ichiban.objarts.com:80/outbreak-plan/>
- The World Health Organization (WHO) placed the information at:
<http://www.who.ch/ebola/ebolahome.html>
- The Centers for Disease Control and Prevention (CDC) in Atlanta created:
<http://www.cdc.gov/ncidod/ebola.htm>
- The International Federation of Red Cross and Red Crescent Societies (IFRC) can be reached at:
<http://www.ifrc.org>

Abbreviations

CDC	Centers for Disease Control and Prevention, Atlanta, USA
CRS	Catholic Relief Services, Baltimore, USA
IFRC	International Federation of Red Cross and Red Crescent Societies, Geneva, Switzerland
MSF	Médecins Sans Frontières (Doctors Without Borders), Brussels, Belgium
NGO	Non-governmental organization (generic; in the USA often called PVO – Private Voluntary Organization)
WHO	World Health Organization, Geneva, Switzerland
WWW	World Wide Web

