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# Socio-Economic Impact of Ebola Virus Disease in West African Countries

A call for national and regional containment, recovery and prevention



United Nations Development Group (UNDG) – Western and Central Africa



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DEVELOPMENT GROUP**

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Cover photo: A school official takes a pupil's temperature using an infrared digital laser thermometer in Lagos, Nigeria. Photo by Reuters/Akintunde Akinleye.

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# Executive summary

***This report is unique.*** It is the first report to undertake an assessment of the Ebola virus disease (EVD) for each of the 15 West African countries, breaking away from the tradition of focusing on the three epicentre countries. It is also the first to assess the impact of EVD on poverty incidence and food security in both the three epicentre countries and other non-West African countries. The estimation approach of the socio-economic impact, which allows for consistency checks, is also different from that of other studies.

***The report emphasizes the imperatives of a regional dimension.*** With the intensity of the pandemic in Guinea, Liberia and Sierra Leone, and even if it is restricted to these three most affected countries, a long-term propagation of EVD in these countries will have a substantial impact on all West African economies. The disease is unprecedented in scale and virulence. The intensity and complexity of the outbreak in the three countries makes it difficult for individual countries to handle, requiring a coordinated approach. The relatively free movement of goods and people in the region and close community ties, which make it very difficult to contain the outbreak as well as the limited internal capacity to cope with the outbreak in terms of human, financial, operational and logistics capacity calls for a regional dimension. If the outbreak of EVD is not addressed collectively, the start of the domestication and implementation of the Sustainable Development Goals (SDGs) in these countries and their neighbours will be put at risk. A regional approach provides an opportunity to raise awareness on the socio-economic impacts of Ebola at the regional level and in each of the 15 countries in West Africa. Analysis of the short- and medium-term costs of the Ebola epidemic should spur governments of non-affected countries to act quickly to put in place preventive measures.

***The 2014 Ebola virus disease (EVD) outbreak in West Africa is the longest, largest, deadliest, and the most complex in history.*** Unlike past outbreaks, which lasted for a very short time, this outbreak has lasted for more than a year – and has not yet fully abated. As of 11 February 2015, there were 22,859 EVD cases and a total of 9,162 deaths. Compared to the cumulative sum of past episodes in 32 years (1976-2012) – 2,232 infected people and 1,503 deaths – there are now over ten times the total number infection cases and over six times the total number of fatalities. In less than six months, what started as a public health crisis in Guinea had degenerated into development crises (i.e. economic, social, humanitarian and security threats) in Guinea, Liberia and Sierra Leone. In contrast with past outbreaks, which were mostly restricted to remote areas, the West African case is complex and geographically widespread, and involves small rural and large urban centres including Conakry, Monrovia, and Freetown. Due to the multi-country outbreaks occurring simultaneously, this pandemic is very difficult to contain. The infection of 830 health workers, of whom 488 died, further complicated its containment. This is the first time that the EVD has been transmitted to other countries through air travel.

***Several factors make the containment of the pandemic very difficult.*** The health systems in Guinea, Liberia and Sierra Leone were unprepared for Ebola at the onset of the epidemic. They lacked sufficient amounts of all that is required to contain the epidemic: drugs, ambulances, facilities, trained health personnel, and many other items. Moreover, impoverished rural areas have more limited access to services than relatively well-off urban areas. The protracted civil wars in Liberia and Sierra Leone, and the intense political instability compounded the weak health and physical

infrastructure. The inequitable distribution of human and financial resources has hampered the response to the epidemic. Due to ignorance or lack of knowledge and preparedness, health professionals misdiagnosed the EVD because its early symptoms resembled those of other diseases endemic to the region such as malaria, cholera and Lassa fever. In addition, some people thought that the disease was being spread by the government resulting in underreporting and thus contributed to the silent spread of the virus, which remained hidden and eluded containment measures. Fear spreads as fast and wide as a virus. The high mortality rate associated with Ebola threatens the performance of many interventions that could help contain the epidemic. Indeed, due to fear of infection, the public was reluctant to engage in contact tracing; infected persons were hesitant to present themselves for treatment; and health workers were frightened to provide care. This was further complicated by the loose migratory pattern in the region and risky cultural practices. The longstanding cultural practices that people were understandably reluctant to abandon contributed to the further spread of infection. Due to the culture of burying the dead near their ancestors, corpses were transferred long distances, which thereby fuelled new outbreaks. When people thought that their social, cultural and economic rights were being violated, they often resorted to physically assaulting health workers. The difficulty of coordinating Ebola-related aid and of treating infected patients using existing infrastructures is another impediment to stopping the epidemic.

***Most other countries are in the same health sector conditions as those in Guinea, Liberia and Sierra Leone.*** The countries are not prepared for any serious public health crisis like the EVD outbreak; this calls for a regional approach to preventing EVD in the future.

***EVD does not respect age.*** All age groups are affected, but the heaviest toll is on the most active segment of the population (15-44 years) – the labour force. This has serious negative implications on the labour market and national productivity.

***The toll is also heavy on children.*** Around 20 percent of the infected cases are children. Over 16,600 children either lost one or both parents to EVD, which makes them more vulnerable to poverty. They lost school hours, ranging from 486 hours in Guinea and 780 hours in Sierra Leone.

***There is a feminization of the EVD, and the disease's impact is more on women than men in the three epicentre countries. As of 7 January 2015, the number of EVD cases was higher among women (50.8%) than among men (49.2%) in the three epicentre countries.*** On per 100,000 population, women are more affected than men (118 against 115). The gender disparity is more pronounced in Guinea and Sierra Leone. As care providers, women are more likely to be exposed to the disease transmission vectors such as vomit or other bodily fluids of an infected family member. Furthermore, certain traditional practices and rituals performed on the deceased mostly by women can also pose an increased risk. Women's access to non-Ebola-related services has been constrained. For instance, in Sierra Leone, the number of women giving birth in hospitals and health clinics has dropped by 30 percent. In addition to being physically affected by the epidemic, women have suffered reversals in economic activities and empowerment, due to EVD control measures that restrict the movement of people and goods. Women in the three countries are disproportionately clustered in the least productive sectors, with 90 percent employed in the informal services and agricultural sectors. The EVD has increased their vulnerability to the

loss of livelihoods and incomes. The financial capital of women's savings and loans groups in these countries, especially in Liberia and Guinea, has also been reduced.

***The pandemic has threatened the social fabric that glues society together.*** The pandemic and the associated hardships have changed people's consumption habits; many have had to eat less than before the EVD outbreak. There is evidence that the EVD is eroding the age-long communal behaviours of the people including attendance at ceremonies, adjustment in burial rights and less caregiving to family and community members. Feelings of distrust between communities and between the people and their governments are still strong. The health system had been weakened in terms of access to health services including non-Ebola-related services such as family planning, pre- and post-natal services, antiretroviral therapies and treatment of endemic diseases in the region such as malaria and cholera. Most people in the epicentre countries expressed a fear for the future of their family, community and for the whole country. The recovery and future preventive measures must take cognizance of people's feelings and expectations. Building an enviable social contract between citizens and their governments should be a priority in the recovery interventions. An effective management of the recovery process will help build people's trust and confidence and also boost their expectations for the future.

***EVD is pushing people into poverty and making them more vulnerable.*** With the brilliant economic outlook of the past few years, and given the growth elasticity of poverty for Guinea, Liberia and Sierra Leone, the incidence of poverty should be 49.78 percent in Guinea, against 31.20 percent

in Sierra Leone and 63.47 percent in Liberia in 2016. However, EVD seems to have reversed this trend. Compared to baseline, incidence of poverty is expected to worsen. For Guinea, the rise in poverty could range from 2.25 percent in 2014 to 7.9 percent in 2015; between 13.8 percent and 14.1 percent for Sierra Leone; and between 5.5 percent and 17.6 percent during 2014-2015.

The outlook for 2016 is worse for the three countries. The poverty impact of EVD on non-EVD affected countries is also high, especially in Mali, Senegal, Côte d'Ivoire and Niger. Stigmatization, which reduces international trade and foreign investments between these countries and their main trading and investment partners, as well as the loss of jobs and livelihoods due to closure of borders to neighbouring countries to Guinea, Liberia and Sierra Leone made the poverty impact high.

***Food security impact of EVD is high in affected and some non-affected countries.*** The restriction of movements of goods and services, the quarantine of communities that are food baskets of the affected countries, the fear of trading with affected areas, the closure of borders and international stigmatization that has raised premiums on ships berthing in West Africa have affected access to food. There is a strong correlation between EVD outbreaks and the prevalence of undernutrition. In this report, the food security impact is evaluated by the prevalence of undernourishment measured by the proportion of the population estimated to be at risk of caloric inadequacy. Relative to the observed trends during 1992 and 2012, the prevalence of undernourishment during 2014-2016 could increase by 2.8 to 5.3 percent in Liberia; 1.30 to 1.39 percent in Sierra Leone, and 0.49 to 1.72 percent in Guinea. The EVD has reversed the previous trend

in the projected improvement in food security in Liberia and Sierra Leone. Among the non-heavily affected countries, the impact on Guinea Bissau and Côte d'Ivoire is relatively higher than on other countries in the region. Increasing access to food and nutrition, and restoring agricultural production capacity are essential parts of the recovery interventions.

***The cost of the pandemic on GDP is very high, and Ebola-free West African countries are not immune from the devastating effects.***

The findings reveal earlier results on the three epicentre countries, but are more pronounced given the intensified EVD cases and fatalities. In the medium term (2014-2017), the gains in economic growth of the past decade seem to have been reversed. The loss ranges an annual average of 4.9 percent (low Ebola scenario) to 9.6 percent (high Ebola scenario) for Guinea, 13.7 to 18.7 percent for Liberia, 6.0 to 8.0 percent for Sierra Leone. The actual loss in GDP for the low Ebola scenario is highest in Sierra Leone (US\$219 million), followed by Liberia (US\$188 million) and Guinea (US\$184 million). For the high scenario, it ranges from US\$315 million (Guinea) to US\$245 million (Liberia), while Sierra Leone could lose as much as an annual average of around 7.1 percent between 2014 and 2017. The loss in per capita income is highest in Liberia. The toll on the GDP is considerable in the three countries lightly affected by the EVD. On annual average during 2014-2017 for the low scenario, the loss ranges from US\$81.6 million (Mali) to US\$145.2 million (Senegal) and US\$1.4 billion (Nigeria). For the remaining West African countries that are EVD-free, the loss in the GDP growth varies from 0.1 to 4 percentage points. The loss of GDP for the whole region for the low scenario will be US\$3.6 billion on average per year (i.e. 1.2% of the average GDP of the region). It

could also lose around US\$18 per capita per year. This is a substantial economic loss to a region that is struggling to catch up with other sub-regions of the world to translate past growth into improved living conditions for its people.

The loss in GDP and per capita income of this magnitude has substantial implications on the jobs and livelihoods, with a serious negative impact on households' survival. Rejuvenating lost livelihoods through appropriate social protection to farmers in the upcoming planting season and boosting microfinance to small-scale enterprises are vital. Given the fiscal stress associated with the EVD, priority should be given to efforts to boost the fiscal capacity of the Governments of Guinea, Liberia and Sierra Leone, such as providing debt reliefs and concessional loans. Addressing international stigmatization that weakens international trade and foreign investment in West African also deserves urgent attention.

***Ebola is not only a threat to national security, but also an impediment to sub-regional, regional and global security, which therefore requires supranational and global attention.***

The role of regional and continental organizations in fighting the pandemic is yielding some results. The Mano River Union's concerted efforts in calling on the international community to support their capacity building for surveillance, contact tracing, case management and laboratory testing as well as facilitating sharing of information, expertise and resources among member states are commendable. The unparalleled efforts of the Economic Community of West African States (ECOWAS) Authority in establishing the Ebola Solidarity Fund, mobilizing experts for the epicentre countries, and creating the Regional Centre for Disease Control and Prevention are

epochal. The African Union's Support to Ebola Outbreak in West Africa (ASEOWA), which has deployed a considerable number of Ebola volunteer workers (launched by the African Union in collaboration with Nigeria and Ethiopia), forged partnerships with the private sectors, especially telephone service providers, mobilized resources and mandated the establishment of Africa's Centre for Disease Control and Prevention, is laudable. The United Nations Development Group for West and Central Africa (UNDG-WCA) calls for synergy between the regional and continental disease control centres and commits its support to their operationalization. Strategies to make them functionally effective should be put in place.

***The international community must fulfil their pledges and support the establishment of a mechanism that allows for rapid disbursement.***

As of 31 December 2015, only one third of the pledges was disbursed, and a substantial part of the disbursement came in October when the pandemic had already devastated lives and livelihoods. The slow pace of converting pledges to commitment calls for immediate correction. Fulfilling the pledges is vital to ending the pandemic and accelerating early recovery. The international community should establish a mechanism that would allow rapid disbursement of funds during public health threats like Ebola. To ensure sustainability, ownership and capacity strengthening, the international organizations should work with governments to mobilize resources for the recovery process.

***The global community is ill-prepared for a devastating pandemic like Ebola, and the next outbreak should not take the world by surprise.***

An important lesson emerging from the pandemic is that the global community is not ready to

address virulent pandemics like Ebola. The global health governance structures are inadequate, the international commitment to bolster pandemic preparedness and response capacity in poor countries is tardy, and the global support for strengthening health systems is still weak. This, therefore, points to the urgent need to reform the global health management system in order that it will be able to cope with such pandemics when they occur. Current partnerships with research institutions and pharmaceutical companies should be translated into strategic actions that will lead to the invention of the requisite vaccine for the disease within a very short time.

***The strategic engagement of the UN System on the EVD response has enhanced its relevance in the region, and UN agencies still have a major role to play in overcoming the outbreak.***

While most partners withdrew at the peak of the crisis, UN agencies not only remained, but also increased their presence in the epicentre countries and the corridor countries (Senegal and Ghana). This helps mobilize partnerships and action as well as resources for the Ebola response. Consequently, the UN System became a trusted partner in the region. Its available resources have been reprogrammed for Ebola containment and the associated early recovery efforts. Working with national and regional institutions to strengthen coordination mechanisms further aided the response actions in the region. The United Nations Development Assistance Framework (UNDAF) for the region should be concerned with strengthening the health services' capacity to cope with future epidemics without compromising the fight against other priority diseases, and ensuring the provision of quality care.



Community Health Center in Freetown, Sierra Leone. The National Ebola Response Centre (NERC) started in Freetown a special operation in the Western Area to control the current rate of infection and stop the spread of the disease in the region. Photo by UNMEER /Martine Perret

***Combined national and regional preventive mechanisms are imperatives.*** The containment of the outbreak is beyond the capacity of a single country. Complementary actions from sub-regional, regional, continental and global bodies are important for maximum success. Both national and regional preventive measures for the entire region, especially in countries with a high probability of EVD occurrence as predicted in this report (e.g. The Gambia, Ghana and Côte d'Ivoire) are needed for enhanced results. This includes developing early warning plans based on multidisciplinary approaches and strengthening the capacity for early reaction and disaster management system at the national and regional levels.

***A combined strategy works best.*** Intensifying contact tracing to remove infected individuals from the general population, placing them in a setting that can provide both isolation and dedicated care, and dealing with associated psychological factors have proved effective. A densely populated country like Nigeria used this approach to bring EVD under control in a very short time. Cross-border contact tracing is more effective than a single country contact tracing when EVD occurs in multi-countries simultaneously.

***Learning from the experiences of countries that succeeded in containing the epidemic is key.*** The rapid responses from Senegal and Nigeria are positive lessons learned. In these countries, there were competent and relatively adequate health personnel, decentralized health systems, community engagement and strong leadership commitment.

***A regional approach to containing EVD will be more effective than just focusing on national preventive actions.*** When there are simultaneous outbreaks in multiple countries that are contiguous to each other, joint cross-border contact tracing, joint treatment and holding centres should become more effective. National actions then become complementary. The outbreak in Guinea, Liberia and Sierra Leone is a warning to others in the region because the health systems and their vulnerabilities are the same. EVD does not know boundaries, and not a single country is immune from the outbreak. This report calls for a combined national and regional preventive and early response mechanisms for West Africa. The region cannot afford to be unprepared.

# Foreword

This report is a part of the support provided by the Regional United Nations Development Group (UNDG) to help contain the Ebola Virus Disease (EVD) in West and Central Africa and assist the countries of the region in recovering from it. This support complements the efforts of national governments, non-state actors and regional organizations to stamp out the disease. Each of the United Nations agencies involved in the preparation of the report has contributed its own research and reporting, which has been enriched by recent recovery assessments conducted by the UN and other partners.

This is the first report to carry out an assessment of the EVD for each of the 15 West African countries, as well as the first to provide in-depth evidence of the impact of EVD on poverty and food security on the region.

The fight against Ebola in West Africa is showing the limitations of national containment responses, especially when several outbreaks are taking place in contiguous countries at the same time. Health systems in West Africa exhibit similar weaknesses to the ones in Guinea, Liberia and Sierra Leone, and the factors that aided the spread of the disease in the epicentre countries are also present in the wider sub-region. These include the free movement of goods and people across countries, close ties among border towns, low levels of education, and limited internal capacity to respond to the outbreak. Tackling Ebola in such circumstances requires cross-border contact tracing, the creation of joint treatment and other actions to complement national efforts. Since no country is immune from Ebola, the outbreak in Guinea, Liberia and Sierra Leone should serve as a warning and a call to action for the wider region. This report calls for combined national and regional preventive and early response mechanisms for West Africa.

The 2014 Ebola outbreak in West Africa is the longest, largest, deadliest, and the most complex ever witnessed. As of 11 February 2015, there were 22,859 EVD cases and 9,162 cumulative deaths: this is more than ten times the total numbers of infected people and over six times the total number of deaths from all previous outbreaks combined. Unlike past occurrences, which affected remote locations, the current outbreak is geographically spread out, involving both countryside and cities, and occurring simultaneously in different areas and countries.

Several factors complicate the containment of the pandemic. The health systems in Guinea, Liberia and Sierra Leone, and in most other countries in the region were unprepared for the Ebola outbreak, lacking trained personnel, equipment and financing. Impoverished rural areas have specifically suffered, because they have more limited access to services than relatively well-off urban areas. This inequitable distribution of human and financial resources has hampered the response to the epidemic. Ignorance, lack of preparedness and fear have also played an important role. Health professionals have misdiagnosed EVD cases because the early symptoms of the disease resemble those of malaria, cholera and Lassa fever. Many people have denied the existence of Ebola or believe it was spread by the government to raise international funds that they will never see. All these factors have caused the virus to spread silently. Fear spreads as fast and wide as a virus. Due to fear of infection, members of the public have been reluctant to engage in contact tracing; infected persons are hesitant to present themselves for treatment; women are giving birth without modern medical attendants; and health workers are frightened to provide care. This is further complicated by intense migration flows and risky cultural practices. For instance, many communities insist on burying the dead near their ancestors, moving corpses over long distances and creating additional risks of infection. In addition, overly centralized health systems have impaired the engagement of local communities, which is so critical to fighting epidemics such as this one.

Ebola also takes a higher toll on women and children. Around one fifth of the infected cases are children; over 16,600 boys and girls have lost either one or both parents to the pandemic, and were unable to go to school for months. As of January, 2015, around 51 percent of the infected cases were women, representing 118 per 100,000 population against 115 for men. Women's role as caregivers and their participation in traditional practices and rituals such as burials make them more vulnerable to contracting Ebola. In addition, fewer births have been attended by trained medical personnel, and women have suffered reversals in economic activities due to their large presence in informal activities. To this end, the role of women and girls in the post-crisis recovery will be essential to facilitate an expedited normalization of the social and economic landscape.

The pandemic has threatened the social fabric that glues society together in all affected countries – trust between the people and their governments, and between communities has weakened, and the traditional social capita of caring family and community members has declined. Most people in the epicentre countries expressed a fear for the future of their families, communities and countries. The EVD is pushing people into poverty and making them more food insecure and vulnerable to shocks. The cost of the pandemic on the economy has been very high, with indications that economies in West Africa have also suffered from its consequences. Recovery interventions must give priority to addressing these challenges, especially the creation of jobs, livelihoods and incomes.

Ebola is not only a threat to national security, but also an impediment to sub-regional, regional and global security. It therefore requires global attention. The Mano River Union (MRU), the Economic Community of West African States (ECOWAS) and the African Union have taken a regional approach to tackling Ebola in West Africa. Such an approach will be more effective than just focusing on national preventive actions. A healthy population is a necessary condition for rapid and sustained growth and development. West African governments should increase investments in health to accelerate recovery efforts. Strengthening health systems and addressing the structural vulnerabilities that allowed Ebola to take hold in the first place will help to ensure that such a crisis will never happen again.

Finally, the strategic engagement of the UN System in the Ebola response has enhanced its relevance in the region. UN agencies should work with national and regional institutions to strengthen coordination mechanisms for recovery. The United Nations Development Assistance Framework (UNDAF) for each country in the region should be concerned with strengthening the capacity of health services to cope with future epidemics without compromising the fight against other priority diseases, ensuring the provision of quality care, and providing well-targeted and effective social protection mechanisms that could accelerate recovery.



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# Acronyms and abbreviations

<b>AfDB</b>	African Development Bank
<b>CERF</b>	Central Emergency Response Fund
<b>CGE</b>	Computable General Equilibrium
<b>CMC</b>	Case Management Centre
<b>DPT</b>	Diphtheria pertussis and tetanus
<b>DRC</b>	Democratic Republic of the Congo
<b>ECA</b>	Economic Commission for Africa
<b>ECOWAS</b>	Economic Community of West African States
<b>EU</b>	European Union
<b>EVD</b>	Ebola virus disease
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>GDP</b>	Gross domestic product
<b>HIV</b>	Human Immunodeficiency Virus
<b>HoS&amp;G</b>	Heads of State and Government
<b>IFAD</b>	International Fund for Agricultural Development
<b>ILO</b>	International Labour Organization
<b>MDG</b>	Millennium Development Goal
<b>MRU</b>	Mano River Union
<b>MSF</b>	<i>Médecins Sans Frontières</i> /Doctors Without Borders
<b>MSWGCA</b>	Ministry of Social Welfare Gender and Children's Affairs
<b>NGO</b>	Non-governmental organization
<b>OCHA</b>	United Nations Office for the Coordination of Humanitarian Affairs
<b>OHCHR</b>	United Nations Office of High Commissioner for Human Rights

<b>RO</b>	Reproductive rate
<b>SDG</b>	Sustainable Development Goal
<b>UN</b>	United Nations
<b>UNDG</b>	United Nations Development Group
<b>UNDP</b>	United Nations Development Programme
<b>UNECA</b>	United Nations Economic Commission for Africa
<b>UNFPA</b>	United Nations Population Fund
<b>UNHCR</b>	United Nations High Commissioner for Refugees
<b>UNICEF</b>	United Nations Children’s Fund
<b>UNIDO</b>	United Nation Industrial Development Organization
<b>UNMEER</b>	UN Mission for Ebola Emergency Response
<b>US\$</b>	United States dollar
<b>WCA</b>	West and Central Africa
<b>WAEMU</b>	West African Economic and Monetary Union
<b>WFP</b>	World Food Programme
<b>WHO</b>	World Health Organization



A family harvesting rice in Gueckedou area. Photo by Julien Gavelle/FAO Guinea (Nov. 2014)

# Introduction

# 1. Introduction

## 1.1 Context

The Ebola virus disease (EVD) epidemic in Guinea, Liberia and Sierra Leone is the longest, largest, deadliest, and the most complex and challenging Ebola outbreak in history. It is unprecedented in terms of its duration, size of infections and fatality, and geographical spread. Unlike the past outbreaks, which lasted for a very short time, the West African case has lasted for more than one year – and has not yet fully abated. As of 11 February 2015, there were 22,859 EVD cases in total: 3,044 in Guinea, 8,881 in Liberia, and 10,934 in Sierra Leone – with a cumulative death of 9,162. In fact, in only around six months, there were 3,774 cases of people infected by EVD and 1,888 deaths in Guinea, Liberia and Sierra Leone, which surpassed the cumulative sum in 32 years (1976-2008) of 2,232 infected and 1,503 deaths. As of December 2014, the number of Ebola cases in this outbreak is four times higher than the combined total of all prior outbreaks.<sup>1</sup>

What started as a public health crisis in Guinea on 26 December 2013 degenerated into development crises (economic, social, humanitarian and security threats) in the three epicentre countries in less than six months. The deadly disease's knock-on effects are huge – loss of lives, stifled growth rates, reversed recent socio-economic gains, aggravated poverty and food insecurity, and destroyed livelihoods, particularly affecting women and children.

Unlike the past outbreaks, which were mostly restricted to remote areas, the West African case is complex; it is geographically widespread, involving small rural and large urban centres

(including Conakry, Monrovia, and Freetown). The multi-country outbreaks occurring simultaneously make this pandemic unique. Due to the high transmission rate and limited capacity to manage the epidemic at the outset, as of 7 January 2015, the fatality rate is also high, from 35.3 percent in Sierra Leone to 64.1 percent in Guinea. Its spread has been complicated by health workers becoming infected (830, of whom 488 died). The loose migratory pattern in the region, fear, ignorance and risky cultural practices make the containment of the epidemic challenging. In addition to spreading to several West African countries (Senegal, Nigeria and Mali), the EVD has also been detected in other parts of the world, including Spain, Italy, Germany and the United States of America. This is the first time that EVD is transmitted to other countries via air travels. It was first transmitted to Nigeria by a traveller from Liberia. Within a very short period, it has been transported to Europe and America. This led to a pronounced international stigmatization against West Africa, a development that triggered risk aversion behaviours, which wreaks havoc on the region's economy.

The spreading rate of this outbreak and the grave need to control the epidemic resulted in the governments of the hardest-hit countries to declare a national emergency and the World Health Organization (WHO) “a public health emergency of international concern”. Also, in September 2014, the United Nations Security Council declared the crisis a “threat to international peace and security” and unanimously called for a coordinated approach in dealing with the outbreak.

<sup>1</sup> For the current situation on the epidemic, see <http://apps.who.int/ebola/en/ebola-situation-report/situation-reports/ebola-situation-report-11-february-2015>) and for a comparison between past and recent episodes of EVD, see Salaam-Blyther (2014) and UNDP (2014d).

Instead of looking at the issue through the lens of the three epicentre countries, this report takes a new approach to assessing the impacts of EVD through a regional perspective. Why the regional focus? The epidemic is ravaging the economic and social fabric of the three epicentre countries (Guinea, Liberia and Sierra Leone), and the human toll is historically the worst ever. In addition to these three heavily affected countries, smaller outbreaks also occurred in Senegal, Nigeria and Mali. These countries were declared Ebola-free following drastic measures taken by governments to contain the disease. This situation holds considerable uncertainty for the countries across the region, which is already feeling the socio-economic repercussions of the epidemic. The disease is wide in scale and virulent. Without fast, well-adapted and coordinated responses, the EVD epidemic rapidly snowballed into an unprecedented development crisis, with significant consequences in a region whose population already has one of the world's highest poverty rates and lowest human development indicators, and is extremely vulnerable to shocks. Even if the epidemic is contained in the three most affected countries, a long-term propagation of EVD in Guinea, Liberia and Sierra Leone will have a substantial impact on all West African economies.

The relatively free movement of goods and people in the region makes it very difficult to contain the outbreak. For instance, people in Guinea, Sierra Leone and Liberia, and across borders are able to move freely due to the long-term communal relationship, the exceptional porous borders, and the possibility of using a common Economic Community of West African States (ECOWAS) passport in official designated ports of entry.

Fluid cross-border movement aided the spread in two ways. First, it has made cross-border contact tracing very difficult. Second, as the situation in one country begins to improve, it attracts patients from neighbouring countries seeking better health care, which has re-ignited the transmission chains.

The close community ties and movement within and across borders of West African states and the limited internal capacity to cope with the outbreak in terms of human, financial, operational and logistics capacity call for a regional approach. An individual country study would only show the intensity of the outbreak; a regional approach would provide a holistic dimension to the issues, which could provide guidance in preventing a future occurrence in the affected and unaffected countries. The health and sanitation infrastructure in Guinea, Liberia and Sierra Leone is well below the average for Africa, especially in rural areas.<sup>2</sup>

The intensity of the outbreak in Guinea, Liberia and Sierra Leone makes it difficult for individual countries to cope, even if there is a strong internal capacity. The sporadic spread of the EVD could be likened to the past civil wars in these countries, which were effectively countered by regional and international efforts. The incidence of Ebola has weakened the highly promising economic recovery witnessed over the past decade. The emerging loss of confidence in governments and their capacity to provide basic services could threaten social cohesion, which could relapse into the protracted social and economic abyss of the past with serious implications on regional stability. The past conflicts in Liberia and Sierra Leone

<sup>2</sup> This was acknowledged during a two-day emergency meeting convened by the WHO of Ministers of Health of the affected countries and other selected countries and partners, in Accra, Ghana, from 2 to 3 July 2014. A common strategy was adopted outlining priority actions to halt the spread of Ebola virus in the region.

are important factors in explaining the limited progress on the Millennium Development Goals (MDGs) in these countries. If the outbreak of EVD is not addressed collectively, the start of the domestication and implementation of the Sustainable Development Goals (SDGs) in these countries and their neighbours will be put at risk. This, to a large extent, weakens the initial conditions for these countries to roll-out the implementation of the post-2015 Development Agenda.

A regional report provides an opportunity to raise awareness on the socio-economic impacts of Ebola at the regional level and on each of the 15 countries in West Africa. Analysis of the short- and medium-term costs of the Ebola epidemic should spur governments of non-affected countries to act quickly in setting up preventive measures. This would also raise advocacy on improved coordination as an important strategy to resolve the health and economic crises associated with the spread of EVD in West Africa.

This report is innovative for three reasons. First, it carries out an assessment of the EVD for each of the 15 West African countries. According to the United Nations Development Group for West and Central Africa (UNDG-WCA), the recent studies on this topic, for example, those carried out by the World Bank, the United Economic Commission for Africa (UNECA), the United Nations Development Programme (UNDP) and the WHO, assessed the impact of the EVD on the three epicentre countries and to an extent provided a rough estimate of the impact on the region as a group. This report assesses the impact. Second, the

report is the first in assessing the impacts of the EVD on poverty incidence and food security in all West African countries. Finally, it uses a macro-economic model that has not previously been used to assess the impact of the EVD. Hence, it confirms some of the results of previous studies (e.g. World Bank 2014; UNECA 2014; and UNDP-RBA, 2014a). This report uses a different estimation method and model from recent reports from World Bank and UNECA. Its approach is similar to some extent to that used in UNDP-RBA (2014a). The results from UNDG-WCA report are broadly similar, in particular in terms of GDP growth for the three main affected countries. In addition to assessing the poverty incidence and the food security situation in these countries, this report extends the scope and covers the 15 West African countries for the 2014-2017 period. Moreover, epidemiological and economic forecasts continuously change since the epidemic is still not contained; hence, it is important to examine potential responses based on the most recent situation, which further enhances the contribution of this report.

## 1.2 Objectives

The main objective of this report is to evaluate the macro-and socio-economic impact of the EVD on each of the 15 West African countries and for the West African region as a whole. The specific objectives are as follows:

- Identify the magnitude and dimensions of the outbreak in the region.
- Assess the economic and social issues that make the containment of the outbreak challenging and difficult to manage, including the overall health system governance structure and capacity, as well as other policy and institutional factors that affect the response and coping mechanisms.
- Assess the immediate and medium-term effects on economic growth and strategic sectors.
- Examine the socio-economic impact of the EVD outbreak, including loss in productivity and jobs, or disruptions of rural and urban livelihoods, as well as gender dimensions.
- Discuss how the EVD outbreak will impact the UN agencies' programmatic engagements in the affected countries.
- Make necessary policy recommendations to address the established gaps, losses and weaknesses at national and regional levels.

The next section of the report provides an overview of the magnitude and dimension of the EVD in West Africa and also presents the response of UN agencies. Section 3 presents the macro-economic impacts of the EVD for each of the 15 West African countries, while Section 4 presents the socio-economic impacts. The final section presents the main conclusions and recommendations.



The construction site of the Kaka bridge (in the Coyah District) was stopped and abandoned by DAI Nippon Constructing, who also repatriated workers due to Ebola.  
Photo by UN RCO Guinea/Communication Office



One of the annual festivals, held at the national stadium in Bamako, Mali, January 2015. Photo by UNMEER/Pierre Perron

# Overview of the magnitude and dimensions of Ebola virus disease in West Africa

## 2. Overview of the magnitude and dimensions of Ebola virus disease in West Africa

This section provides an overview of the magnitude of EVD and examines key drivers that make it difficult to contain the crisis. It also provides the health system and gender dimensions of the EVD and the UN response to the crisis.

West Africa is experiencing the most important epidemic of Ebola since the beginning of 2014. This epidemic that began in the Guékédou region in Guinea became a sub-regional health problem whose complexity has undermined the basis for development in the West African sub-region. Since the appearance of the disease in the former Zaire in 1976, this is the first time that it has reached such proportions, both in geographic scope and number of victims.

### 2.1. The Ebola virus disease in West Africa: Trends, magnitude and dimensions

The EVD outbreak was first reported in 1976 in Yambuku, a village in the Democratic Republic of the Congo).<sup>3</sup> Since then, more than 20 Ebola outbreaks have occurred mainly in East and Central African countries, including in Gabon in 1996, where 21 of the 31 cases resulted in death. According to the WHO, the first-known infection concerned an 18-month-old-boy who died on 26 December 2013 in Méliandou, a remote village located in Guékédou, not far from the Sierra Leonean and Liberian borders. On 1 February 2014, the virus was carried to Conakry by an infected member of boy's extended family. Between January and March, the epidemic

spread to neighbouring areas of Kissidougou and Macenta, but was formally confirmed only on 21 March 2014.

In the beginning of March 2014, the WHO reported 29 deaths in 49 cases in Guinea, revised to 59 deaths per 86 cases two days later. In less than six months, what appeared to be a contained crisis in the Guinée Forestière Region spread across the borders of Sierra Leone and Liberia. Liberia recorded its first case in Foya District (Lofa County) on 30 March, and by 2 April, the virus was transmitted to people in Monrovia. By late March 2014, the epidemic had spread to neighbouring Liberia, where 209 confirmed cases and 131 deaths were recorded on 17 April. The spread of the EVD outbreak was also observed on 27 May in Sierra Leone, where it spread more rapidly than in the other countries. The neighbouring countries of Senegal and Mali were also not spared. The virus also spread as far as Lagos, Port Harcourt and Enugu in Nigeria – the first transmission via air travel. The EVD was not limited to the shores of West Africa; it had also been detected in other parts of the world including Spain, Italy, Germany and the United States of America. While the world is grappling with the current wave of EVD in West Africa, a different strain of the virus was also discovered in Jeera County of the Democratic Republic of the Congo (DRC) in August 2014. But unlike the West African situation, all the cases are localized in Jeera County in Watsi Kengo, Lokolia, Boende, and Boende Muke villages.

<sup>2</sup> As pointed out by Quammen (2014), 280 deaths were recorded out of the 318 cases, i.e. 88 percent.

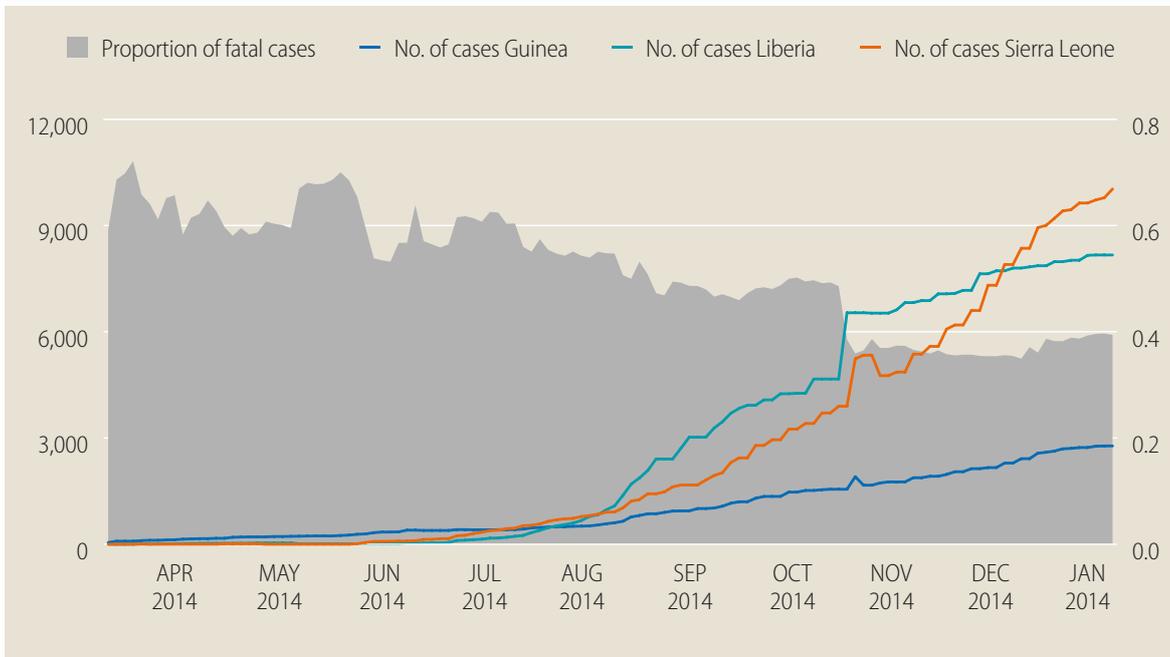
The rate of increase of the disease has varied considerably among countries and regions within individual countries, as well as over time. A single case of EVD that occurred on 26 December 2013 in a remote village (Meliandou) in Guinée Forestière led to the infections of 2,599 people in the three main affected countries (of whom 1,422 died) as at 20 August 2014: 1,082 cases in Liberia, 910 cases in Sierra Leone and 607 cases in Guinea. In less than two months (between 20 August and 1 October 2014), the total number of identified patients more than doubled to 6,553 cases in the three countries: 3,458 cases in Liberia, 2,021 patients and 1,074 in Guinea. During this period, the infection rate more than doubled in Sierra Leone and more than tripled in Liberia. Subsequently, the situation worsened considerably in Sierra Leone. For instance, the infection rate in Sierra Leone as of 20 December 2014 was more than ten times the cases recorded on 20 August thereby surpassing the rate of infection in Liberia. By 11 February 2015, a total of 22,859 infected cases and 9,162 deaths had been recorded (WHO, 2015). Sierra Leone had the largest number of infected people per 100,000 population, 208 people, followed by 148 in Liberia and 32 in Guinea. Figures 1 and 2 provide the trends and the total number of cases and fatalities in the three countries.

Those most vulnerable to EVD include: people in the border regions where infections can be transmitted easily through porous borders; people in capital cities where infected people may go for treatment, particularly those in the slums of these cities; and poor rural areas with inadequate clean water and sanitation facilities, and where the tradition for caring for the sick and

burial rights are well entrenched. Access to health services is limited in remote rural and slum urban areas in these countries, which has hindered the containment of the outbreak.

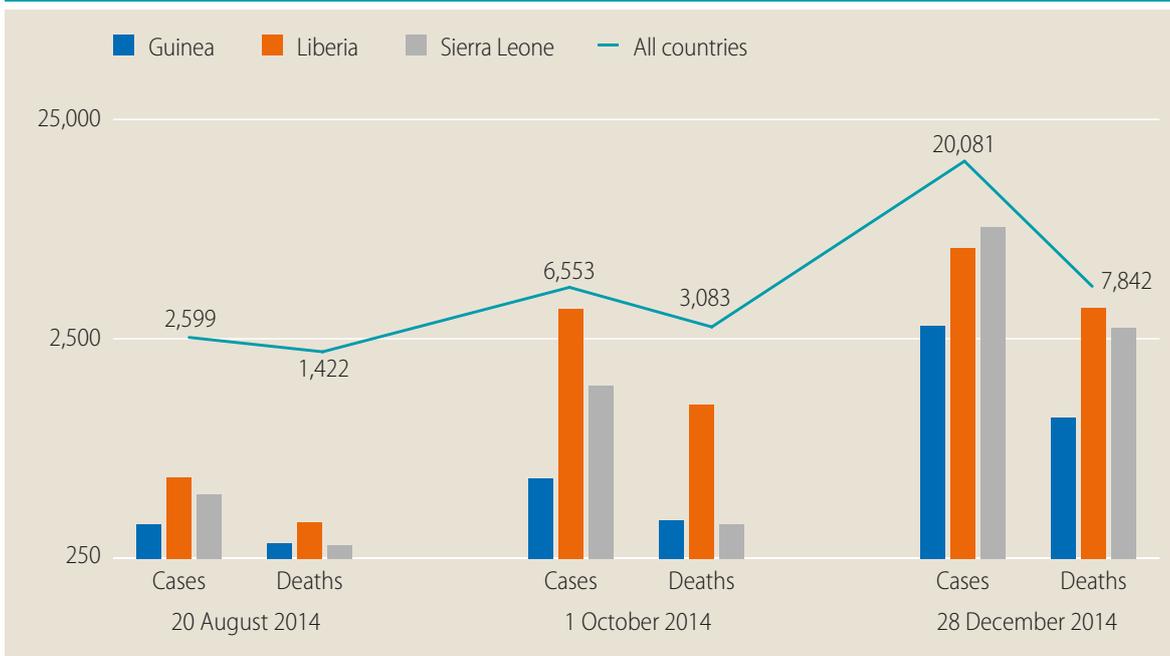
The contiguity of the three most affected countries and loose migratory patterns make containment challenging and further fuels the pace of transmission. Ebola is spreading at an unprecedented rate in the affected countries. In Liberia, reported cases are doubling every 15-20 days, and in Sierra Leone, every 30-40 days (Meltzer et al., 2014). The stability in one country attracts patients looking for treatment from another. Guinea experienced some relatively high infected cases between May and June 2014. As some glimmer of hope appeared in July in Guinea, Liberia's crisis peaked between July and October. As respite began to emerge in Liberia, Sierra Leone witnessed a very protracted crisis (September 2014 to January 2015), while another phase of intense crisis re-emerged in Guinea (October 2014 to January 2015). (See Figure 3 for the dynamics.) Of the 367 new cases recorded over the past 21 days (as of 11 February 2015), 60.2 percent (221 cases) were from Sierra Leone and 36.5 percent (134 cases) from Guinea (figure 4). There is an improved control of the disease in Liberia, and it is hoped that the crisis will end due to the relatively high number of new cases in Sierra Leone and Guinea.

**Figure 1: Ebola virus disease epidemic – No. of cases and deaths**



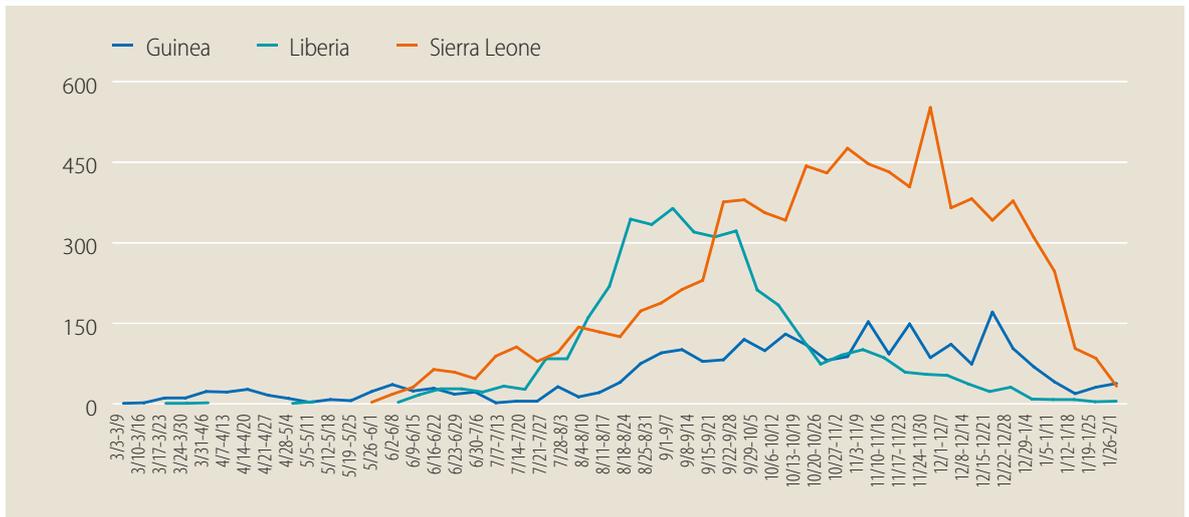
Source: Authors' computation and compilation from Github (2015) and WHO (2015).

**Figure 2: Evolution of the epidemic in Guinea, Liberia and Sierra Leone**



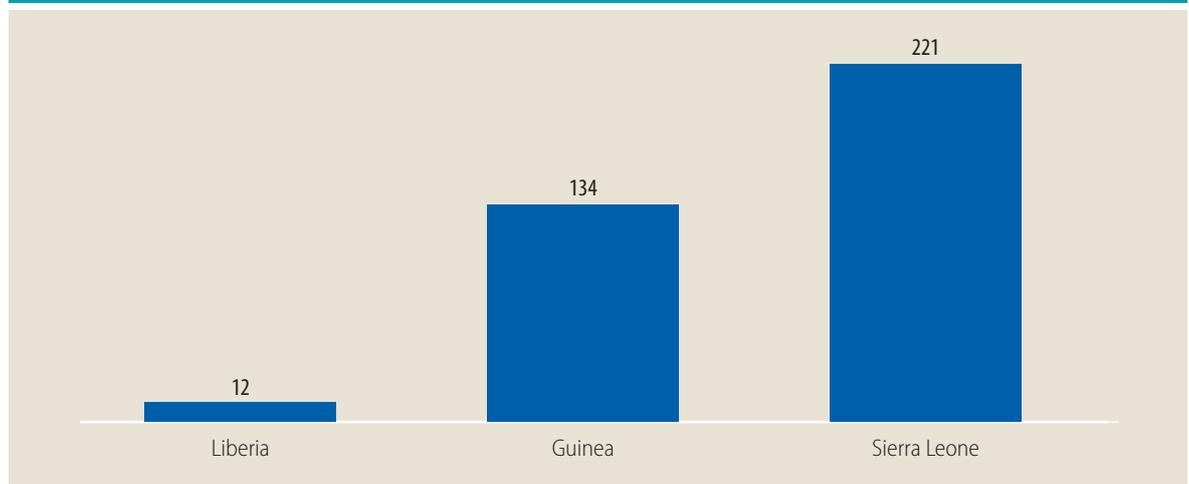
Source: Authors' compilation from WHO data.

**Figure 3: The Patients Database – Confirmed weekly EVD cases reported nationally, 24 February 2014 to 1 February 2015**



Source: Authors' compilation from WHO data.

**Figure 4: New cases over the past 21 days, as of 11 February 2015**



Source: UNDP-RBA (2015b).

As indicated in figure 1, the containment of EVD is yet to be achieved. However, efforts of the different governments and the international community, non-governmental organizations (NGOs) and local communities have started yielding results by helping to reduce the fatality rate, which decreased from around 70 percent in May 2014 to 54.7 percent in August, and to 39.1

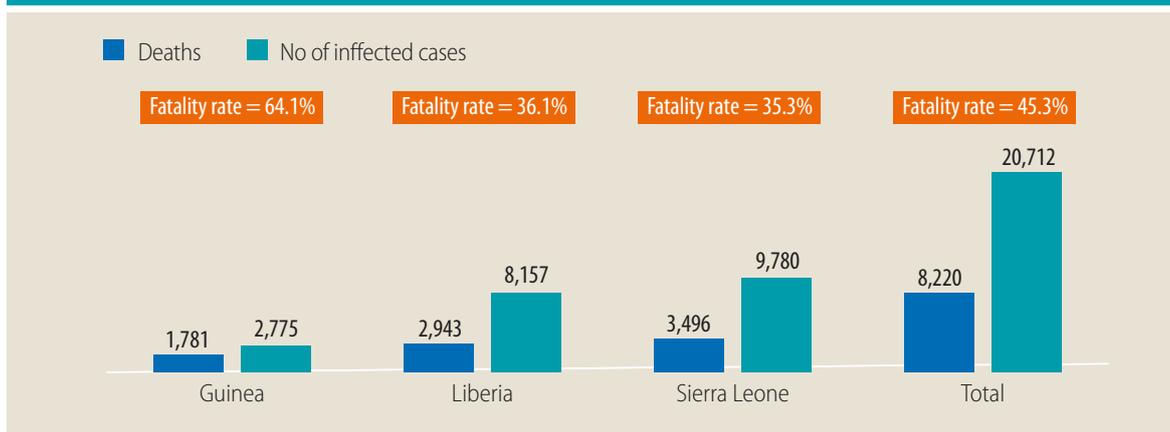
percent in December 2014. Figure 1 also shows the cumulative and the dynamics of the fatality rate for the three countries. Guinea registered the highest mortality rates, almost stabilizing between August and December 2014; from 66.9 percent in August, it declined by only 4 percentage points to 62.9 percent in December. By contrast, efforts seem to be more effective in the other

two countries; the mortality rate decreased from 57.67 to 42.79 percent in Sierra Leone. Figure 5 provides the actual cases and fatality rates in each of the three epicentre countries. Guinea has the highest fatality rate in spite of having the lowest number of infection cases, which suggests a very weak treatment capacity compared to that Liberia and Sierra Leone.

One of the complexities created by EVD in West Africa is the high level of infection and deaths among healthcare workers, particularly those working with

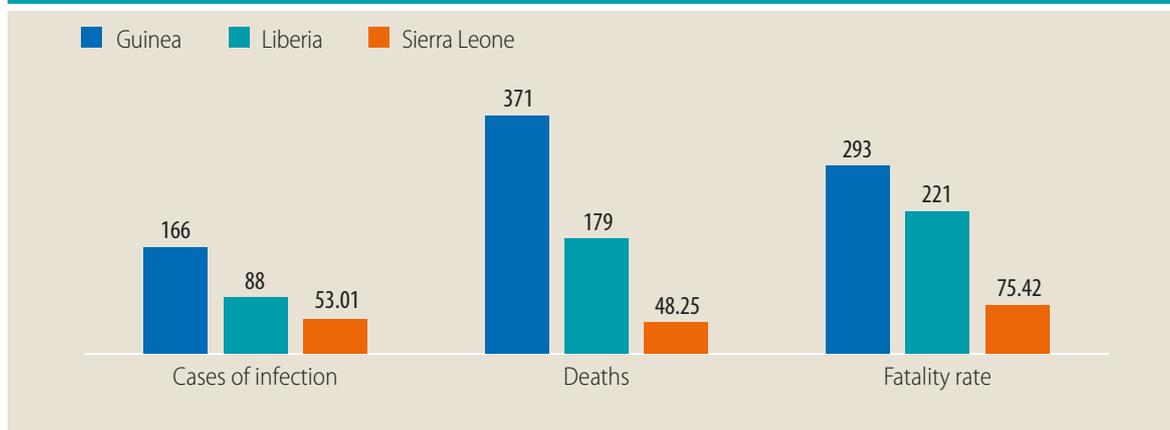
Ebola patients. The level of infection ranges from 166 health workers in Guinea to 371 in Liberia. Sierra Leone, however, presents the highest level of fatality among health workers (figure 6). This current EVD, therefore, has the highest infection cases and deaths among health professionals, which has further depleted inadequate trained health personnel in these epicentre countries. The high incidence on health workers has led people to believe that the health centres are the main source of infection. This accounted for the low patronage of health services for both Ebola and non-Ebola-related illnesses.

**Figure 5: Ebola virus disease: Number of cases, deaths and fatality rates, as of 7 January 2015**



Source: UNDP-RBA (2015b).

**Figure 6: No. of cases of Ebola virus disease, deaths and fatality rates among health workers, as of 11 February 2015**



Source: Authors' computation from the WHO database.

EVD does not respect age; all age groups are affected. The most active segment of the population (15-44 years), the labour force, is heavily affected, accounting for around 57 percent of total infections. This is followed by those in the age group of 45 years and above (23%). Children are also not spared (figure 7). The people who contribute most to national productivity have been also those mostly affected by EVD. This may explain why the impact of EVD on economic activity, poverty and food security could be very high. (See figure 7 for the demographic breakdown of the infected cases in Guinea, Liberia and Sierra Leone.) In terms of numbers affected per 100,000 population, those in the age group of

45 years and above are mostly affected, followed by the age group of 15-44 years (table 1).

In addition to these three countries, three other countries have officially reported cases of Ebola in their territory: Senegal, with an imported case from Guinea; Nigeria, which recorded 20 cases including eight deaths; and Mali with eight cases, including six deaths (figure 8). The three countries have been declared free of Ebola as a result of the proactive measures for containing the EVD, such as the use of volunteers trained in epidemiological issues (Mali), and the involvement of the private sector and the decentralization of the health management system (Nigeria and Senegal).<sup>4</sup>

**Figure 7: Demographics of those affected by the Ebola virus disease, as of 11 February 2015**



Source: Authors' computation from WHO Database on Ebola.

**Table 1: Total number of confirmed and probable cases, by gender and age group, in Guinea, Liberia and Sierra Leone**

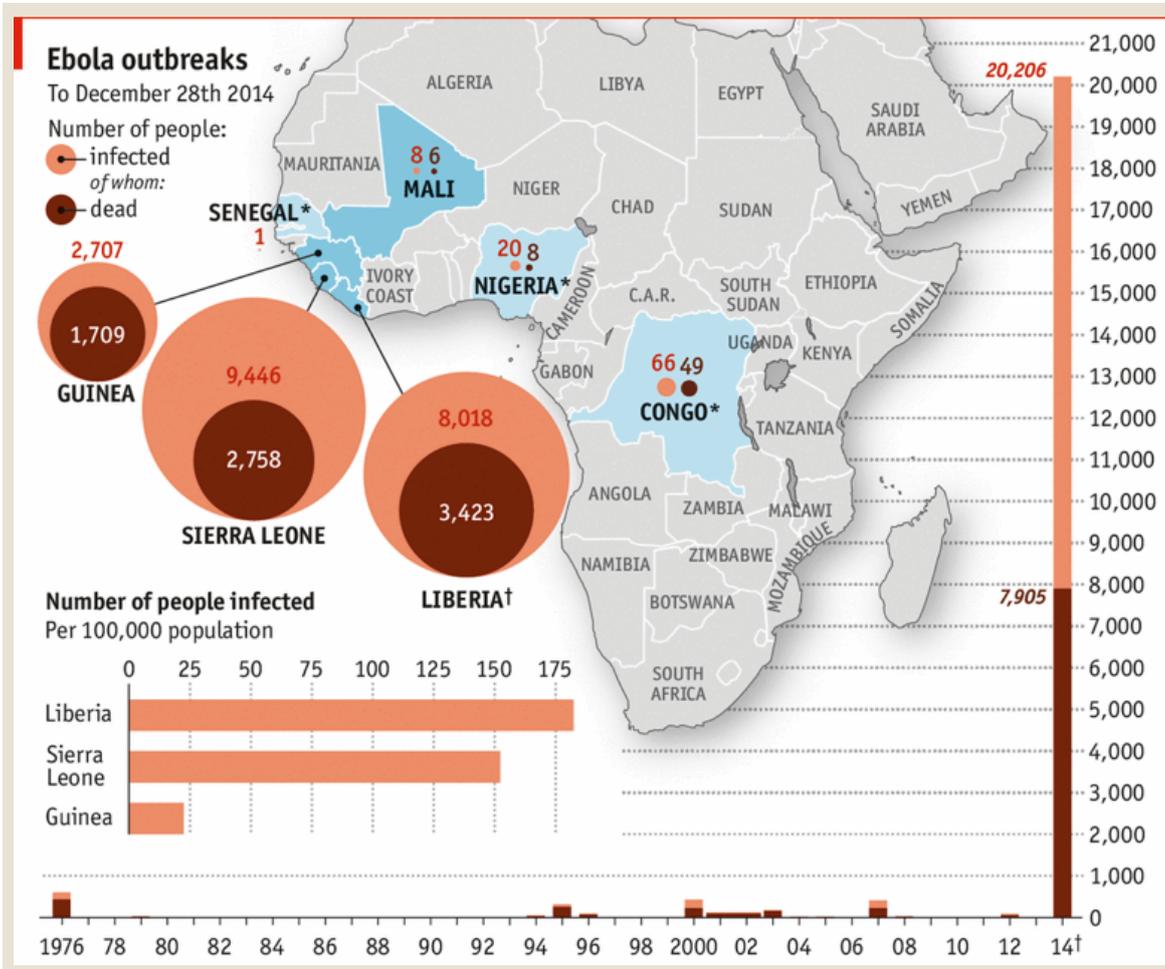
Country	Total number of cases				
	By group* (per 100,000 population)		By age group† (per 100,000 population)		
	Male	Female	0-14 years	15-44 years	45+ years
Guinea	1,413 (26)	1,508 (28)	460 (10)	1,648 (35)	791 (51)
Liberia	2,801 (141)	2,746 (140)	943 (55)	2,981 (175)	1,145 (214)
Sierra Leone	5,037 (177)	5,400 (186)	2,201 (91)	5,751 (222)	2,298 (311)

Source: WHO (2015).

Note: \* Excludes cases for which data on gender are not available. † Excludes cases for which data on age are not available.

<sup>4</sup> The three countries were declared Ebola-free: Senegal (17 October 2014), Nigeria (19 October 2014) and Mali (18 January 2015).

Figure 8: Mapping of the Ebola virus disease in Africa

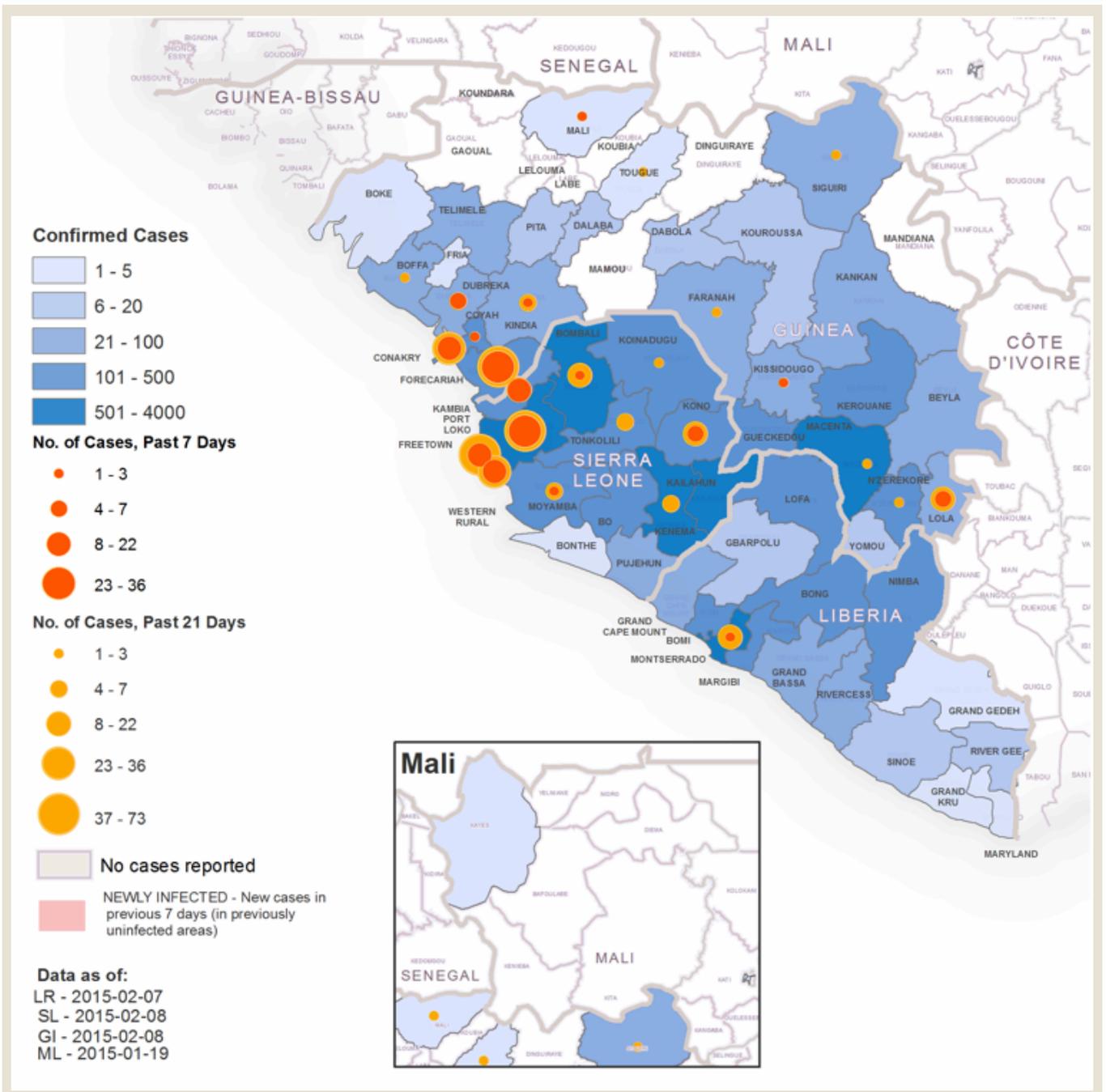


Source: WHO, UN; The Economist. [www.Economist.com/graphicdetail](http://www.Economist.com/graphicdetail)  
 Note: \* Declared Ebola-free. † Excluding Congo

As at October 2014, although no secondary EVD cases had occurred outside Africa, a new dimension was introduced to the evolution of EVD – its globalization. Health workers in Spain and the United States contracted EVD while providing care for Ebola patients. This further reinforces the global threat poses by this pandemic and the urgent need for global action against the virulent disease.

In contrast to the past outbreaks in Sudan, Gabon, DRC and Uganda, which were localized and mostly restricted to remote areas where they were detected, the West African case is geographically widespread. It spread from remote places such as Macenta and Guékédou to Conakry in Guinea, and from Kailahun and Bombali to Freetown in Sierra Leone, as well as from Lofa and Nimbia to Monrovia in Liberia. The age-long communal ties, the fluid cross-border movement and cultural practices facilitated this geographical spread.

Figure 9: Geographical spread of the Ebola virus disease, as of 11 February 2015



Source: WHO (2015).

The Ebola epidemic is virulent, particularly in West Africa. Lewnard et al. (2014) estimated a basic reproductive rate (i.e. the average number of secondary infections produced by a primary infection) for EVD at 2.5, compared to 1.8 for Congo in 1995 and 1.3 for Uganda in 2000 (Chowell, 2004).<sup>5,6</sup>

Why is the basic reproductive rate highest in West Africa? Several factors drive the spread of EVD in the region. First, health professionals often misdiagnosed the EVD since its early symptoms resemble those of other diseases endemic to the region (e.g. malaria, cholera and Lassa fever). EVD presents many similar symptoms to other viral infections, with non-specific signs such as fever, asthenia and body aches. After a few days, the predominant clinical syndrome becomes a severe gastrointestinal illness with vomiting and diarrhea. These symptoms can also result from a number of other diseases that are prevalent in the region, thus contributing to the silent spread of the virus, which remains hidden and eludes containment measures. The first case was recorded on 26 December 2013, but the virus was not officially declared as Ebola until 21 March 2014 (WHO, 2015a).

***Fear spreads as fast and as wide as a virus.*** The high mortality rate associated with Ebola threatens the ability to perform many interventions that could help contain the epidemic. Indeed, due to fear of infection, the public is reluctant to engage in contact tracing; infected persons are hesitant to present for treatment; and clinicians are frightened to provide care.<sup>7</sup> In this context,

medical staff have felt a certain unease about treating a highly transmissible infection for which there is no vaccine, no specific therapy, and a high mortality rate. As a result, a paucity of knowledge on the disease, combined with the fear produced by the epidemic, may have delayed the implementation of simple interventions to prevent deaths (Lamontagne et al., 2014). High mortality rates, in turn, have fuelled fears surrounding the disease among both medical staff and the population at large. This awareness of the existence and magnitude of the epidemic came months too late and the virus had spread considerably.

A humanitarian crisis loomed, economic activities and livelihoods were destroyed, communal ties and trust were weakened, and security was threatened. What appeared as a public health crisis had transformed into a development crisis of significant proportion. It is imperative that this vicious and virulent virus be stopped, not only because the human toll is already very heavy, but also due to the medium- to long-term consequences for human development in the region, which are extremely worrisome. Moreover, some observers consider that, in addition to the deaths directly attributable to Ebola, many more deaths will have resulted from indirect repercussions, such as the failure to treat patients who do not have Ebola, but rather other diseases with similar symptoms.

All three countries have recently emerged from civil conflicts or political instability that resulted in countless deaths, economic crises, and a severe deterioration in social conditions.

<sup>5</sup> Previous EVD outbreaks were reported in Zaire in 1976 (first outbreaks), Sudan (1979, 2004), Côte d'Ivoire (1994), Gabon (1994, 1996, 1997 and 2001–2002), Republic of the Congo (2001–2002, 2003 and 2005), DRC (1995, 2007–2008, 2008–2009) and Uganda (2000, 2007, 2011).

<sup>6</sup> Fisman (2014) estimates a weaker basic reproductive number of 1.6 to 2.0.

<sup>7</sup> Between 20 October and 9 November, 72.0 percent of all reported patients with EVD were isolated in Guinea, compared to 20.0 percent in Liberia and 13.0 percent in Sierra Leone (UNDP, 2014a).

The re-establishment of peace in the context of democratically elected governments has launched economic recoveries that have been accompanied, to varying extents, by improved social indicators. This is highlighted by evidence from the three national studies from Guinea, Liberia and Sierra Leone (UNDP, 2014 a-b; UN, 2014):

- Since 2011, **Guinea** has been emerging from a profound political, economic and social crisis. The deterioration of democratic institutions and the social fabric, compounded by poor management of resources and unmet social expectations of the population, had serious consequences for peace and internal stability. These forces were accentuated by the impact of the civil wars in Liberia and Sierra Leone, with disastrous consequences for Guinée Forestière, which borders both countries. The crisis was reflected in a decline in per capita income of 0.6 percent per year from 2000 to 2010, and a rise in the share of the population in poverty from 49 percent in 2002 to 58 percent in 2010 (UN, 2014).
- After 14 years of civil conflict, **Liberia** was in shambles. Health facilities were destroyed, food insecurity was rampant, poverty rates were high, and huge numbers of people were displaced. The democratically elected government since 2006 has sought to re-establish stability in the context of rapid development and access to humanitarian assistance (UNDP, 2014a). Despite various programmes undertaken to address Liberia's severe developmental challenges, most families cannot afford a single meal a day or fees for basic health services. Liberia remains a very poor country.

- **Sierra Leone** suffered a devastating civil war from 1991 to 2002, which left 50,000 dead, an average income of around 38 cents a day, and 2 million displaced persons, or almost a third of the total population. The health system was almost completely destroyed. The restoration of peace and democratic rule since 2002 encouraged very rapid growth. GDP rose by 9.5 percent per year in real terms from 2002-2013, and per capita income in current dollars quintupled. The share of the population living on less than a dollar a day declined only marginally, however, from 59 percent in 2003 to 57 percent in 2012 (UNDP, 2014b). A large proportion of Sierra Leoneans are still too poor to afford basic necessities of life including health services.

The health systems in Guinea, Liberia and Sierra Leone were unprepared for Ebola at the outset. They lacked sufficient amounts of all that is required to contain the epidemic: drugs, ambulances, facilities, trained health personnel, and many other items. This is not surprising since these countries had few resources and suffered from many serious health issues that generated competing demands for resources, even prior to the onset of Ebola. Tragically, the shortage of protective equipment resulted in multiple infections and deaths among medical personnel and further spread the disease. Also, rumours led people to avoid treatment for fear of being infected. Table 2 provides an overview of how the deficiencies in the health system hindered EVD containment in West Africa, focusing on human resources, governance and leadership, funding, commodities and supply chain networkers, service delivery and information.

Moreover, impoverished rural areas have more limited access to services than relatively well-off urban areas. This inequitable distribution of human and financial resources has hampered the response to the epidemic, which originated in, and continues to heavily affect, many rural areas. Human resources are inequitably distributed. Conakry, which is home to just 15 percent of the population, has 75 percent of the health workers. By contrast, Guinée Forestière, which has been hardest hit by the Ebola epidemic and is home to 22 percent of the Guinean population, has 9 percent of healthcare workers (UNDP-RBA, 2014a). This shows that the affected countries' health systems were not ready for the outbreak because they were not equipped to cope with the epidemic. Indeed, before the EVD epidemic, Liberia had only 2.8 healthcare workers

per 10,000 people and 51 medical doctors serving its population of 4.29 million (UNDP, 2014a; Lewnard et al., 2014). The situation is the same in Sierra Leone and very similar in Guinea. Table 3 shows the poor state of the health systems in these countries with respect to inputs and outcomes in terms of number of physicians per 1,000 people, hospital beds, mortality rates, risk of maternal deaths, access to water, etc. Table 4 also shows that most countries in the region are not better-off than the three epicentre countries. For instance, only Cape Verde and Nigeria have a greater number of physicians per 1,000 population. Most other countries are in the same health sector conditions as those in Guinea, Liberia and Sierra Leone. They are not prepared for any serious public health crisis such as the EVD outbreak.

**Table 2: Impact of health system deficiencies on Ebola outbreak containment**

	Governance	Financing	Human Resources	Commodities	Service Delivery	Information
<i>Description</i>	Policies, strategies, and plans that inform the course of action that a country will take to meet the health needs of its people.	Mechanisms used to fund health efforts and allocate resources.	The people who provide health care and support health delivery.	Goods that are used to provide healthcare.	The management and delivery of healthcare.	The collection, analysis, and dissemination of health statistics for planning and allocating health resources.
<i>Impact of Health System Component Deficiency in Ebola Context</i>	Slow initial government response to the Ebola outbreak and incapacity to implement national Ebola plans has diminished public confidence in political authorities and limited efforts to dispel rumors and fears about Ebola.	Insufficient financial resources to fund local responses and pay health personnel contribute to human resource and commodity shortages.	Shortages of not only health personnel, but also support staff such as grave diggers and statisticians limit the ability to detect, prevent, and treat EVD cases.	Insufficient supply of protective equipment threatens the safety of healthcare workers (including community volunteers) and is associated with hospital- and clinic-based infections.	Many health facilities in Liberia and Sierra Leone remain closed due to staff shortages and other factors.	Limited capacity to conduct contact tracing and diagnosis calls into question the actual EVD cases and impedes efforts to detect, treat, and control the virus.

Source: Salaam-Blyther (2014).

**Table 3: Infrastructures and development indicators in the epicentre countries**

Indicators	Guinea		Sierra Leone		Liberia	
	Year	Value	Year	Value	Year	Value
Literacy rate, youth total (% of people ages 15-24)	2010	31.4	2012	62.7	2007	49.1
Literacy rate, adult total (% of people ages 15 and above)	2010	25.3	2012	44.5	2007	42.9
School enrolment, primary (% net)	2012	74.4	–	–	2011	40.6
School enrolment, secondary (% net)	2011	30.4	–	–	–	–
Prevalence of anaemia among children (% of children under 5)	2011	75.7	2011	74.1	2011	71.5
Prevalence of HIV, total (% of population ages 15-49)	2013	1.7	2013	1.6	2013	1.1
Mortality rate, neonatal (per 1,000 live births)	2013	32.8	2013	44.3	2013	25.6
Mortality rate, under-five (per 1,000 live births)	2013	100.7	2013	160.6	2013	71.1
Immunization, DPT (% of children ages 12-23 months)	2013	63.0	2013	92.0	2013	89.0
Immunization, measles (% of children ages 12-23 months)	2013	62.0	2013	83.0	2013	74.0
Hospital beds (per 1,000 people)	2011	0.3	2006	0.4	2010	0.8
Physicians (per 1,000 people)	2010	0.1	2010	0.0	2010	0.0
Lifetime risk of maternal death (%)	2013	3.3	2013	4.7	2013	3.2
Improved sanitation facilities (% of population with access)	2012	18.9	2012	13.0	2012	16.8
Newborns protected against tetanus (%)	2013	80.0	2013	87.0	2013	91.0
Prevalence of undernourishment (% of population)	2012	15.2	2012	29.4	2012	28.6
Life expectancy at birth, female (years)	2012	56.6	2012	45.5	2012	61.2
Life expectancy at birth, male (years)	2012	55.1	2012	45.2	2012	59.3
Life expectancy at birth, total (years)	2012	55.8	2012	45.3	2012	60.2
Health expenditure per capita (current US\$)	2012	32.0	2012	95.7	2012	65.5
Health expenditure, public (% of GDP)	2012	1.8	2012	2.5	2012	4.6
Improved water source (% of population with access)	2012	74.8	2012	60.1	2012	74.6

Sources: World Development Indicators Database 2014.

Among the greatest impediments to controlling the disease were the real disadvantages that underpin the countries' development contexts – a combination of fear, distrust and ignorance. Fear of being quarantined or being infected at health centres has discouraged both testing and treatment. Widespread stigmatization of persons who are infected with, or have survived, the disease has also limited willingness to be tested and treated. Relatives have been unwilling to bring bodies for safe disposal because standard protection against the spread of the infection

involves the burning of bedding, mattresses and clothes of the person infected. Communities have been unwilling to cooperate with medical teams or with those responsible for monitoring contacts. At the extreme, health workers and people involved in tracing contacts have been threatened or physically assaulted (WHO, 2015a), requiring the use of security personnel for protection.

Control efforts in the epicentre countries have been hindered by community resistance. Several factors account for this. First, fear and misconception

about the unfamiliar disease play an important role. Second, the inability of ambulances and burial teams to respond quickly provoked confrontation from the affected communities. Third, little or no information about patients' conditions, outcomes of their treatment and places of burial also created misgivings. Fourth, ignorance fuels resistance. The perception that spraying chlorine was actually

spreading the disease created fear that degenerated into physical assault of EVD workers. And finally, anger was sparked among caregivers who had not been for weeks or months. Sometimes, they were asked to work under unsafe conditions, in contrast to their right to work under equitable and satisfactory environments while receiving equal pay for equal work.

**Table 4: Infrastructures and development indicators in non-epicentre West African countries**

	Benin	Burkina Faso	Cape Verde	Côte d'Ivoire	The Gambia	Ghana	Guinea-Bissau	Mali	Niger	Nigeria	Senegal	Togo
Literacy rate, youth total (% of people ages 15-24)	42.4	39.3	98.1	48.3	69.4	85.7	74.3	47.1	23.5	66.4	66.0	79.9
Literacy rate, adult total (% of people ages 15 and above)	28.7	28.7	85.3	41.0	52.0	71.5	56.7	33.6	15.5	51.1	52.1	60.4
School enrolment, primary (% net)	94.9	66.4	97.2	61.9	70.9	87.1	69.8	68.7	62.8	63.9	73.3	90.4
School enrolment, secondary (% net)	–	19.7	69.1	–	–	51.5	–	34.5	12.2	–	–	–
Prevalence of anemia among children (% of children under 5)	65.4	86.1	60.5	74.5	65.4	76.1	71.3	80.1	75.6	71.0	20.8	71.1
Prevalence of HIV, total (% of population ages 15-49)	1.1	0.9	0.5	2.7	3.2	1.3	3.7	0.9	0.4	3.2	0.5	2.3
Mortality rate, neonatal (per 1,000 live births)	26.9	26.9	11.4	37.5	37.4	29.3	44.0	40.2	27.5	37.4	23.0	30.4
Mortality rate, under-5 (per 1,000 live births)	85.3	97.6	26.0	100.0	117.4	78.4	123.9	122.7	104.2	117.4	55.3	84.7
Immunization, DPT (% of children ages 12-23 months)	69.0	88.0	93.0	88.0	58.0	90.0	80.0	74.0	70.0	58.0	92.0	84.0
Immunization, measles (% of children ages 12-23 months)	63.0	82.0	91.0	74.0	59.0	89.0	69.0	72.0	67.0	59.0	84.0	72.0
Hospital beds (per 1,000 people)	0.5	0.4	2.1	0.4	1.1	0.9	1.0	0.1	0.3	0.5	0.3	0.7
Physicians (per 1,000 people)	0.1	0.0	0.3	0.1	0.0	0.1	0.0	0.1	0.0	0.4	0.1	0.1
Lifetime risk of maternal death (%)	1.7	2.3	0.1	3.4	3.2	1.5	2.8	3.9	5.0	3.2	1.7	2.2
Improved sanitation facilities (% of population with access)	14.3	18.6	64.9	21.9	27.8	14.4	19.7	21.9	9.0	27.8	51.9	11.3
Newborns protected against tetanus (%)	93.0	88.0	92.0	82.0	60.0	88.0	80.0	85.0	81.0	60.0	91.0	77.0
Prevalence of undernourishment (% of population)	6.1	25.0	9.6	20.5	7.3	5.0	10.1	7.3	13.9	7.3	21.6	15.5
Life expectancy at birth, female (years)	60.5	56.5	78.5	51.2	52.4	61.9	55.6	54.5	58.1	52.4	64.7	57.0
Life expectancy at birth, male (years)	57.8	55.3	70.8	49.6	51.8	60.0	52.5	54.7	57.8	51.8	61.8	55.3
Life expectancy at birth, total (years)	59.1	55.9	74.5	50.4	52.1	60.9	54.0	54.6	58.0	52.1	63.2	56.2
Health expenditure per capita (current US\$)	33.1	37.8	144.2	87.9	94.3	83.0	29.8	42.1	25.5	94.3	51.2	40.8
Health expenditure, public (% of GDP)	2.3	3.4	3.0	1.9	1.9	3.0	1.3	2.3	2.8	1.9	2.8	4.4
Improved water source (% of population with access)	76.1	81.7	89.3	80.2	64.0	87.2	73.6	67.2	52.3	64.0	74.1	60.0

Sources: World Development Indicators Database 2014.

The long-standing cultural practices that people were understandably reluctant to abandon contributed to further spreading the infection. Due to the culture of burying the dead near their ancestors, corpses had to be moved long distances, therefore contributing to a resurgence. Caring for the sick by friends and relatives, who are predominantly women, is an important duty in these societies, but the provision of care by untrained and unequipped people accounts for the further spread of EVD. Moreover, the washing and dressing of the deceased is a show of respect in some of the cultures in the area, but again, further transmitted the disease. For this reason, the cremation of corpses of the victims was heavily resisted in these countries. Funeral and burial practices in these countries are exceptionally high risks. Evidence from Guinea shows that around 60 percent of the infections were caused by burial and funeral practices (WHO, 2015a).

Evidence from the three epicentre countries also underscores the human rights dimension of EVD as an important source of anxiety and fear that renders people more vulnerable to the disease. The social, cultural, economic and other rights of the affected populations have been violated since the outbreak. The lack of respect for the right to information, participation and education, which created a culture of fear and mistrust, complicated the containment process and its effectiveness. Some of the measures taken by affected governments to stop the spread of the disease inadvertently and negatively affected the human rights to freedom of movement and assembly, the right to culture, and the freedom of religion. This is, to a large extent, one of the sources of strong resistance that made containment difficult in many communities. Even at the community level, the stigmatization of survivors of the EVD violates their right to equality and non-discrimination (OHCHR, 2015).

The wide geographical dispersion of the EVD overwhelmed the capacity of the health personnel. This sometimes caused exhaustion among health workers, another source of exposure. The high number of infections and fatalities among health personnel encouraged the perception that “hospitals were places of contagion and death”. In Guinea, for instance, 90 of the 153 infected health workers died, and in Liberia 79 of 152 died. Most of infections between October and December in Guinea, for instance, occurred in non-EVD centres. As a result, the patronage of traditional healers and self-medication became the preferred options in these countries.

The difficulty of coordinating aid (medical, food-related, etc.) and of treating infected patients using existing infrastructures is another impediment. Instead of working with national authorities to ensure effective coordination of the response action, many development partners and donors engaged in duplicative and competitive activities, including the establishment of the cluster systems in Liberia and Sierra Leone. This, to some extent, weakened government leadership. This poses some questions. How, in the context of an acute health crisis, can government authorities be enabled to assert their leadership? What role should UN agencies play in order to allow national governments to express greater leadership in managing the crisis? Should UN agencies rethink their role in the context of a crisis that widely exceeds a national context? Is it conceivable and desirable for regional and sub-regional authorities to assume greater responsibility in carrying out related actions? Indeed, how can other countries in the region, which are not directly affected by the epidemic but face its looming risks and consequences, contribute to solving the problem? What would their mandate be? The answers to these questions would ensure effective coordination.

The United Nations aims to address these issues through the formation of the UN Mission for Ebola Emergency Response (UNMEER) and the recent directive of the UN Secretary-General on coordination of the early recovery response actions.

The fact that the average number of daily cases is falling in countries such as Guinea and Liberia does not imply that the international community should relax. It fell in Guinea between June and August but became intense between September 2014 and January 2015. Any unattended new case could spur a localized epidemic. Enhanced awareness campaigns are still needed in all countries. Stigmatization is still an issue. Findings from the recent exploratory mission of *Médecins Sans Frontières* (MSF, Doctors Without Borders) to Bong county (Liberia) prove illuminating: “MSF found that people who had been in contact with the sick were fleeing into the bush so as not to be traced as a contact or taken to a case management facility, fearful of what may happen” (MSF, 2014b).

Addressing the key factors propagating the spread of this disease should be given priority attention; however, it is important to note that there is no panacea. A combined strategy of intensifying contact tracing to remove infected individuals from the general population and placing them in a setting that can provide both isolation and dedicated care has proved effective. It requires that holding or treatment centres have the necessary supplies, basic facilities and trained personnel.

The successful containment in DRC, Mali, Nigeria and Senegal is positive, showing that the disease can be stopped if a country is adequately prepared from the outset. The fact that a densely populated country such as Nigeria could bring EVD under

control in a very short time offers encouragement to other developing countries. Some innovations in these countries offer some good lessons to other countries. In these countries, the high-level of alert is a major feature of the response action. Providing means of transportation such as motorcycles, canoes, communications equipment such as satellite phones for EVD investigations and contact tracing, as well as leadership that demonstrates a high level of concern for the affected population have contributed significantly to the success in containing the disease in the DRC. The use of medical students trained in epidemiology to rapidly increase the number of contact tracers is one of the drivers of success in Mali. Unique lessons learned can be drawn from Nigerian and Senegal experiences. Collaboration among stakeholders, coordination between government and development partners, high-quality laboratories, the setting up of separate emergency centres outside the health facilities, massive public information campaigns and effective contact tracing made it possible for Nigeria and Senegal to tame EVD. (See box 1 for key drivers of success in Nigeria.)

Key lessons drawn from the field underscore the importance of:

- dealing with the psychological factors that must be combated through better communication and improved trust between populations and care organizations;
- improving coordination between government and non-governmental organizations (NGOs), development partners and the private sector;
- improving the quantity, coverage and quality of the health systems;

- learning from the experiences of countries that succeeded in containing the epidemic. The rapid responses from Senegal and Nigeria are positive lessons learned. In these countries, there were competent and relatively adequate health personnel, decentralized health systems, community engagement and strong leadership commitment. Box 1 presents some of the success factors for Nigeria's containment of the EVD;
- developing a long-term plan of how to address some of the behavioural and cultural issues that aided the spread of the disease;
- revealing that the international community lacks the capacity to respond to a severe, sustained and geographically dispersed public health crisis;
- showing that community engagement, acceptance and ownership of the response matter;
- revealing that failure to respect peoples' tradition is a recipe for failure;
- promoting the strong commitment of political leaders elicits citizens' engagement;
- communicating Ebola protocols to the people. In fact, the West African EVD rekindled dynamism in the preparation, renewal and communication of Ebola protocols.

## 2.2. The Ebola virus disease in West Africa: Gender and children dimensions

### 2.2.1 Gender dimension

Analysis of the gender dimension of the EVD is not only vital to examining the social aspect of the outbreak, but it also adds value to recovery efforts and programmatic interventions. Although not all officially available epidemiological data are disaggregated by gender and age in all the affected countries,<sup>8</sup> it is evident that women are heavily affected by EVD, both directly, by infection, and indirectly, by the associated social and economic impact.

The number of EVD cases is higher among women than men in the three epicentre countries - 50.8 percent have been women, as of 7 January 2015. On per 100,000 population, women are more affected - 118 per 100,000 population against 115 for men. The gender disparity is more pronounced in Guinea and Sierra Leone; it is relatively lower in Liberia (figure 10).<sup>9</sup> However, evidence from a UNICEF report, at the early stage of the outbreak in Liberia, shows that men account for 25 percent, and women for more than 50 percent.<sup>10</sup> Table 1 also provide gender dimension of the infection cases.

Guinea provides a good example of the gender dimension of EVD epidemiology. The epidemic affects more women (53%) than men (47%), a disparity that could be explained by the role of women within the family as the primary carers of the sick and thus more exposed to infection (UN, 2014). The situation is even worse at the sub-national level.

<sup>8</sup> In Liberia and Sierra Leone, data collection tools for the gap analysis using a gender lens have been designed and adopted by UN Women and are in use for data collection at the community and household levels. Evidence from WHO databases has shown some significant improvement in this regard.

<sup>9</sup> Disaggregation by gender and age group is challenging. The statistics in figure 10 do not reflect the total gender disaggregation; it only captures where where gender disaggregated information is known for Liberia, Sierra Leone and Guinea. See [apps.who.int/gho/data/view ebola-sitrep ebola-summary-age-sex-20150107?lang=en](https://apps.who.int/gho/data/view ebola-sitrep ebola-summary-age-sex-20150107?lang=en)

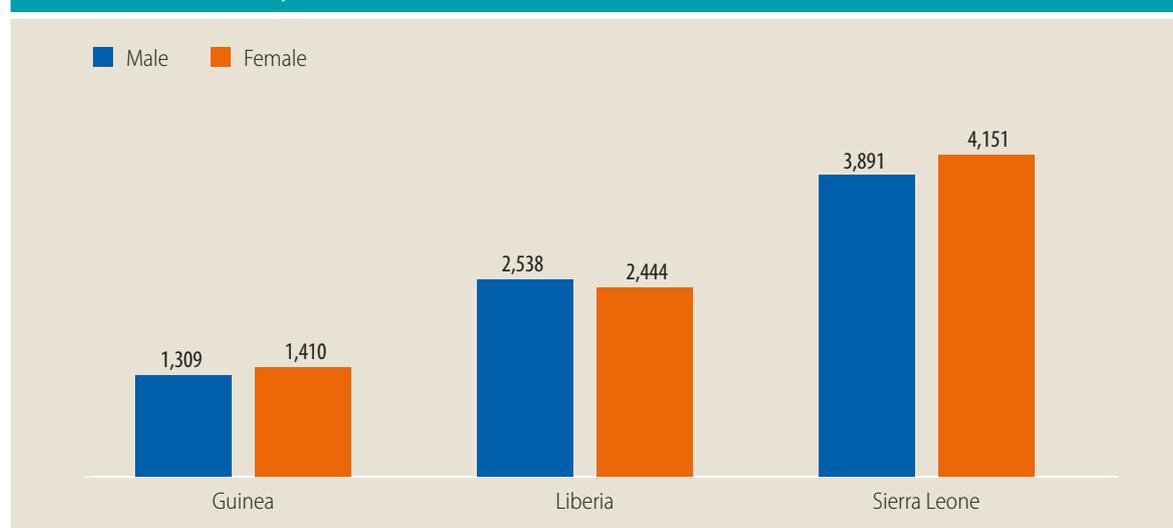
<sup>10</sup> For more information, see [www.voanews.com/content/ebola-has-devastating-impact-on-children-in-liberia/2448520.html](http://www.voanews.com/content/ebola-has-devastating-impact-on-children-in-liberia/2448520.html)

For instance, a high percentage of infected people are women in Gueckédou (62%) and Téliémilé (74%). In Liberia, there are more fatality cases among women (55.2%) than among men (44.2%). In Sierra Leone, men and women are almost equally affected; as at 7 October 2014, around 50.6 percent of all confirmed cases were males and 49.4 percent, females. Figure 10 provides the total number of cases by gender.

Several factors explain the predominance of women among the victims. The first factor explains that the gender difference in the death rate is related to sociological aspects of affected communities. As care providers, women are more likely to be exposed to the disease transmission vectors such as vomit or other bodily fluids of an infected family member. Furthermore, certain traditional practices and rituals for honouring the deceased that women typically perform also pose an increased risk. The national study from Liberia on the socio-economic impact of the EVD highlights the reasons that more women were infected than men (UNDP 2014a). For instance, 70 percent of the respondents interviewed

said that it was because women were natural caregivers; it was their role to take care of their husbands, children and relatives should they fall ill. This traditional role of caring for the elderly, children and the sick put women at a direct risk of contracting the virus. In addition, medical professionals are highly exposed; on the front lines of the disease, regardless of gender, many of them have fallen victim to the EVD. As of 18 September 2014, in Guinea, Sierra Leone and Liberia, non-disaggregated data records cases of a total of 318 healthcare workers, of whom 144 died, i.e. a mortality rate of 47 percent. The female exposure to the disease is intensified by the fact that, in most of cases, hospital settings in West Africa involves more female nurses, cleaning ladies and laundry workers than male orderlies and cleaners. A female working in a local hospital with Ebola patients has more frequent contact with patients and the objects they come in contact with. In addition, women dominate the trading activities in most West Africa. Cross-border trading was a major source of contracting EVD, which further exposes them.

**Figure 10: Cumulative number of cases of the Ebola virus disease in Guinea, Liberia and Sierra Leone, by gender, as of 7 January 2015**



Source: WHO (2015b).

With most medical facilities and personnel devoted to Ebola, women needing non-EVD medical attention cannot access health services. Indeed, the limited health resources with Ebola particularly affect expecting mothers. The demands caused by Ebola have left very few resources for pregnant women, who already face limited access to adequate healthcare. For example, in Bong, one of the most populous counties in Liberia, the ambulance for obstetric emergencies was used for the Ebola response. In addition, the Surgical and Emergency Departments at JFK Hospital, one of the country's major referral hospitals, closed (UNFPA, 2014). In 2014, approximately 800,000 women in Guinea, Liberia and Sierra Leone gave birth, of whom 120,000 faced life-threatening complications.

These risks are compounded by the fear of contracting Ebola at hospitals and treatment centres, which deters women from seeking care during delivery. Many women are giving birth at home rather than at health centres. When Ebola struck Liberia in August, the proportion of births supervised by a health professional dropped from 52 to 38 percent. In Sierra Leone, the number of women giving birth in hospitals and health clinics dropped by 30 percent. Evidence from the national assessment study reveals a drastic reduction in the number of pregnant women seeking care between May and September 2014: from 164 to 31 (Bombali districts); from 333 to 26 (Kenema districts); and from 33 to 22 (Koinadugu district) (UNDP, 2014b). This therefore worsens the initial condition for rolling out and implementing the SDGs.

Before the onset of the epidemic, expectant mothers in Guinea were at high risk of maternal death (724 maternal deaths per 100,000 live births).

With the epidemic, there has been a breakdown in health services. Of the approximately 200,000 expected pregnant women in the last quarter of 2014, nearly 40,000 may not be monitored or may not have their babies delivered by a qualified person (UNDP-RBA, 2015b).

The EVD's knock-on effects are huge. It has caused many deaths, stifled growth rates, reversed recent socio-economic gains, aggravated poverty and food insecurity, and destroyed livelihoods. Hidden in the aggregated impact is the plight of Ebola's voiceless victims and agents of change – women (UNDP-RBA, 2015b). Beyond being physically affected by the epidemic, women have suffered reversals in economic empowerment, because of reduced economic activity related to EVD control measures that restrict the movement of people and goods. In their role as economic providers for their families, women have experienced sharper economic impacts than men. Women in the three countries are disproportionately clustered in the least productive sectors, with 90 percent employed in the informal services and agricultural sectors.<sup>11</sup>

EVD has increased women's vulnerability a loss of livelihoods and incomes. For instance, as of October, in Sierra Leone, 54 percent of smallholder farmers, who make up one fifth of infections, were women. The reduction in trade and the closing of borders as well as in farming activities have had a negative impact on these women, their incomes and livelihoods. Furthermore, due to the epidemic, women's two main sources of funding have dried up. For instance, in Guinea, the *tontine*<sup>12</sup> gathering is no longer held, and microfinance institutions have substantially reduced loans to the women due to a lack of clarity about the future. According to a FAO and WFP reports (2014), the financial capital

<sup>11</sup> See UNDP (2015) on how EVD increased women's vulnerability to loss livelihoods and incomes in the three countries.

<sup>12</sup> A tontine is an informal savings/credit scheme, known in most Anglophone West Africa as 'Esusu'. Under this scheme, participants agree to contribute a predetermined amount at a given frequency. In each round of contribution, one of the participants is designated the recipient of funds from other participants. When each of the contributing participants have received the group fund once, the cycle of tontine is complete. At the end of a cycle, a new cycle is usually initiated. For the first beneficiary, the tontine is similar to a credit, and for the last participant, the tontine is like a saving.



After being kept closed for three months due to the Ebola outbreak, schools across Guinea reopened on 19 January 2015. Photo by UNMEER/Martine Perret

of women's savings and loans groups in Liberia had been drastically affected since members were not able to pay back their loans. In addition, rural women in Melekie, Bong County, who specialized in poultry farming, could not restock due to border closure, since Côte d'Ivoire is a major source of feed and chicks.

In Liberia, as community Ebola task forces were being established in most communities to monitor the movements of inhabitants and people from neighbouring villages, the movement of people between communities for trade was severely curtailed. For example, businesswomen were prevented from going to neighbouring towns and villages where they normally buy agricultural products to resell in urban areas (UNDP, 2014a).

Finally, the impact of the epidemic on attendance at reproductive health services (antenatal clinics, attended deliveries, caesareans, etc.) is exposing women to risks associated with pregnancy and childbirth. They also suffer from the slowdown observed in the fight against HIV/AIDS. This is the situation in the three epicentre countries – Guinea, Liberia and Sierra Leone. There is the likelihood of increased child pregnancy due to the closure of schools for more than six months.<sup>13</sup>

### 2.2.2 The Ebola virus disease and children

Children are not spared the psychological trauma created by the EVD. As of January 2015, there is evidence that 16,600 children had lost one or both parents or primary caregivers to Ebola.<sup>14</sup> One out of four children affected by the EVD survived and most children who survived became orphans.<sup>15</sup> Many children in Guinea, Liberia and Sierra Leone have lost one or both parents to Ebola since the start of the outbreak in West Africa. Orphans are usually taken in by a member of the extended family, but in some communities, the fear that surrounded Ebola has become stronger than family ties to the extent that some of the affected children feel unwanted and even abandoned. Ensuring that this group of people is not excluded from the recovery process is an important challenge that must be overcome. It also calls for the need to rekindle the fabric of lives and kinship ties that were functioning before Ebola in order to sustain the social capital of extended families and support to relatives and neighbours. This extraordinary resilience of communities at a time of great hardship must persevere.

<sup>13</sup> The feedback from UN Women from Sierra Leone and Liberia tends to support an increase in child pregnancy.

<sup>14</sup> For more information on this and the implications on Guinea, Liberia and Sierra Leone, see [www.unicef.org/emergencies/ebola/75941\\_76129.html](http://www.unicef.org/emergencies/ebola/75941_76129.html). WHO (2015a), however, reports that, as at December 2014, there were about 30,000 orphans in the three epicentre countries.

<sup>15</sup> The story of Moses, a child-survivor from Liberia, reported by Save the Children, provides a vivid illustration of how children were affected by the EVD. [www.savethechildren.org/site/c.8rKLIXMGlp4E/b.9208417/k.32AA/Left\\_Behind\\_by\\_Ebola\\_Moses\\_Story.htm?msource=wexgpebo0914&gclid=CJeZuMaJ3MMCFUkR7Aodl3sA0Q](http://www.savethechildren.org/site/c.8rKLIXMGlp4E/b.9208417/k.32AA/Left_Behind_by_Ebola_Moses_Story.htm?msource=wexgpebo0914&gclid=CJeZuMaJ3MMCFUkR7Aodl3sA0Q).

The EVD is reversing the gains made on the MDGs in the epicentre countries. Liberia provides a vivid example of this. When Liberia emerged from decades of civil war in 2003, the under-five child mortality rate stood at 110 per 1,000 live births. Due to efforts of the Government and its partners, it fell to 75 per 1,000 live births by 2012. The total disruption of the country's health system has made children more vulnerable. Children are once again dying from measles and other vaccine-preventable diseases. In addition to the endemic disease in the region that kills children, about 20 percent of the total EVD classified into age groups are children (figure 10). Sierra Leone had the highest number of children EVD cases (21.4 percent), followed by Liberia (18.6 percent) and Guinea (15.9 percent).

The closure of schools is a great loss to children in terms of cognitive learning. All the schools in the three epicentre countries have been closed since June 2014. Guinea re-opened all its schools on 19 January 2015, while Liberia reopened its primary and secondary schools on 16 February 2015 and tertiary institutions on 4 March 2015. In Sierra Leone, all schools will be reopened in March 2015. The total number of learning hours lost to school closures range from 486 in Guinea to 780 in Sierra Leone (figure 11). The closure of schools might also have exposed children to several types of child abuse (including sexual exploitation and violence against young girls) with a long-term impact. The re-opening of schools should be complemented with back-to-school programmes that focus on teacher training on school safety, hygiene education and school sanitation as well as psychosocial care.

**Figure 11: No. of learning hours lost due to school closures due to the Ebola virus disease**



Source: Authors' compilation.

### 2.3 Regional and continental responses

The containment of the epidemic is beyond the capacity of a single country. Complementary actions from sub-regional, regional, continental and global bodies are important for maximum success. It is in recognition of this that the Mano River Union (MRU) and ECOWAS initiated collaborative and solidarity approaches to dealing with the outbreak. The cross-border meetings of Ministers of Health of the MRU (20 June 2014, in Conakry), the Ministers of Health of West Africa on the Ebola epidemic (2-3 July 2014, in Accra) and the Heads of State and Government (HoS&G) of the MRU (1 August 2014, in Conakry) mobilized political leadership and partnerships to fight the disease. These meetings underpinned the insufficient capacity of each country to stop Ebola and highlighted the urgent need for regional efforts. It also provided some political backing to cross-border treatment, testing and contact tracing, and joint response actions. At the meeting, it was collectively deduced that it was imperative to scale up resources to protect health workers and to ensure security of national and international Ebola workers. It was also acknowledged that the pandemic was not only a threat to national security, but also an impediment to sub-regional, regional and global security. Therefore, the international community was called on for support to capacity building for surveillance, contact tracing, case management and laboratory testing. Sharing of information, expertise and resources among Member States was also emphasized.<sup>16</sup> The MRU stakeholders' meeting of 4 February 2015, focusing on cross-border

vigilance, and attended by traditional rulers, communicators, women and youth from the border communities, provided an opportunity to share experiences and ideas on how to end the deadly disease and support recovery efforts.

In addition to donating US\$1.0 million to each of the three most affected countries through the multi-sectoral coordinated response, the ECOWAS Authority also established a Regional Solidarity Fund to fight Ebola, which, as of 6 November 2014, had US\$9.2 million as contributions and pledges.<sup>17</sup> It also reaffirmed the commitment to the Abuja Declaration, which requires the allocation of 15 percent of the total budget to the health sector, and directed its Commission to initiate the creation of the Regional Centre for Disease Prevention and Control for West Africa.<sup>18</sup> The ECOWAS Commission, through the West African Health Organization (WAHO), trained and deployed around 114 volunteer medical personnel – 49 to Guinea, on 3 December 2014; 27 to Sierra Leone on 4 December 2014; and 39 to Liberia on 5 December 2014 in the first instance. ECOWAS provided US\$400,000 to Guinea, Liberia and Sierra Leone to strengthen their epidemiological surveillance and response capacity. ECOWAS HoS&G enjoined Member States to provide military personnel and logistics to enhance response capacities, support the medical staff on the field and participate in the construction of additional treatment and isolation centres as well as ensure their security.

<sup>16</sup> For more information on the Declaration of the Mano River Union HoS&G on the eradication of Ebola in the region and related issues, see [www.emansion.gov.lr/doc/MRU\\_EBOLA\\_JOINT.pdf](http://www.emansion.gov.lr/doc/MRU_EBOLA_JOINT.pdf)

<sup>17</sup> This contribution is made up of the following. In addition to the earlier contribution of US\$3.5 million by Nigeria to the fund, the country also pledged an additional US\$1 million and made 500 health volunteers available to fight the disease. Côte d'Ivoire and Senegal also contributed US\$1 million each, while the West African Economic Monetary Union (UEMOA) contributed US\$1.5 million. Countries that have also made pledges include: Benin (US\$400,000), Sierra Leone (US\$250,000), Niger and Mali (US\$200,000 each), and Burkina Faso (US\$150,000). See [www.reliefweb.int/report/iberia/ebola-regional-solidarity-fund-boosted-ecowas-member-states-contributions](http://www.reliefweb.int/report/iberia/ebola-regional-solidarity-fund-boosted-ecowas-member-states-contributions)

<sup>18</sup> For more information on the main elements of the final communique of the Extraordinary Session of the Authority of ECOWAS Heads of State and Government, see [www.wahooas.org/spip.php?article786&lang=en](http://www.wahooas.org/spip.php?article786&lang=en)

The African Union promoted innovative ideas on the containment of the epidemic. For instance, on 3 December 2014, the African Union Commission launched several initiatives aimed at containing the epidemic (*Femmes d'Afrique*, 2015). The mobilization of about 1,000 health personnel across African countries – the African Union Support to Ebola Outbreak in West Africa (ASEOWA). The batch consisted in about 200 volunteers from Nigeria and the second batch, around 187 medical volunteers from Ethiopia (a partnership between the African Union and the governments of Nigeria and Ethiopia). Other countries that pledged support for the initiative include Burundi, DRC, Kenya, Rwanda and Uganda. This initiative aims to bridge the capacity gaps in the three most affected countries.

The second initiative is the partnership with the private sector through the mobilization of telephone operators across the continent (e.g. Airtel, Etisalat and MTN). It aims at raising funds for the containment of EVD through sms campaigns. By sending 'Stop Ebola' sms messages to 7979, US\$1.0 is transferred to a dedicated account that will be used to train, equip and maintain the volunteers in the affected countries. This is in addition to US\$31.5 million already contributed to the fight against the disease by the African private sector operators.

During the January 2015 African Union Summit, the African leaders resolved to achieve the primary objective of enhancing disaster preparedness and response, and reducing avoidable loss of life and the burden of disease and disability. The African Centre for Disease Control and Prevention (ACDCP) was launched with an innovative

mandate to effectively detect and respond to emergencies, obtain technical support to address complex health challenges, including surveillance and research, and build the needed capacity (African Union and WHO, 2014). The ACDCP should be empowered to deliver its mandates effectively and efficiently.

## 2.4 The international communities' response to the Ebola virus disease

The role of the international community has been helpful. Many bilateral and multilateral agencies and private sector organizations have responded to the crisis. Figure 12 highlights financial support to the UN Ebola Plan as of October 2014. This is in addition to resources to the three countries and other organizations working on the pandemic.

The size and length of the outbreak render estimation of financial needs for the containment of the pandemic challenging. Based on the estimated number of cases in early April 2014, the WHO made an initial appeal of US\$4.8 million, which generated pledges of US\$7.0 million from the international community.<sup>19</sup> As a result of the intensity of the pandemic, the financial estimate for dealing with the outbreak has been dynamic. On 1 August, an estimate of US\$71.0 million was announced, which later changed to US\$600 million in late August, US\$1.0 billion on 16 September and \$1.5 billion by mid-November 2014 (Grepin, 2015). By 31 December 2014, the total pledges had reached US\$2.89 billion with only \$1.09 billion actually disbursed or committed – just a little above one third of the pledges.<sup>20</sup> A substantial part of the resources did not reach the countries until the end of October – more than six months after

<sup>19</sup> The donations came from the European Commission Humanitarian Aid and Civil Protection Department, Italy, Republic of Korea, the United States of America, Canada, Germany, Japan, the United Kingdom, the World Bank, the African Development Bank (AfDB), and some private companies (Grepin, 2015).

<sup>20</sup> The rate at which the pledges have been disbursed or committed vary. Some of the examples pointed out in Grepin (2015) show that the United States had disbursed or committed around 95 percent and the World Bank, around 50 percent. It should, however, be noted that the World Bank and other multilateral organizations have extended loans to the affected countries.

the epidemic has destroyed lives and livelihoods. The slow pace of converting pledges to commitment has been mentioned as one of the factors militating early containment. Fulfilling the pledges is vital to ending the pandemic and accelerating early recovery. An important lesson is the urgent need to establish a mechanism that allows rapid disbursement of funds during public health crises.

The pandemic has created groups of heroes. The first is the group that stayed with the epicentre countries at the most challenging period – the UN agencies and the international NGOs such as MSF. The second group relates to countries and organizations that made appreciable financial resources available. The largest donors as of 17 February 2015 include the United States of America (US\$937 million), the United Kingdom (US\$330 million), Germany (US\$172 million), the World Bank (US\$137 million) and France (US\$108 million). Bilateral donors (e.g. USA, UK and Germany) accounted for about 60 percent of the donations, followed by multilateral organizations (e.g. the World Bank and AfDB) (11.5%), private individuals and organizations (10.0%), foundations (8.3%) and companies (6.6%). The third is the group of several countries (e.g. Cuba, China, Uganda, Nigeria and Ethiopia) that sent health workers to the affected countries.

The destination of the pledges is not restricted to the three epicentre countries. Some of the donations have been targeted at the West African region (around 40 percent), while several are not country-specific because of the multi-countries presence of donors and NGOs. A substantial part of the pledges has been sent to the three epicentre countries, with Liberia receiving the largest (US\$882.0 million), followed by Sierra Leone (about \$500 million) and Guinea (about

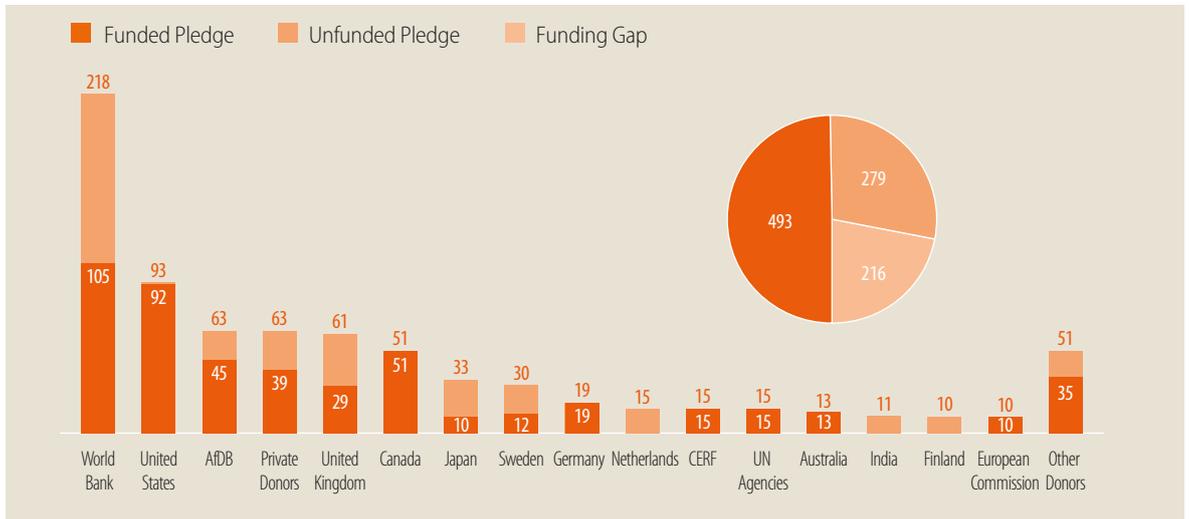
\$250 million). Financial support was also pledged to non-epicentre countries to handle preparedness activities.<sup>21</sup>

Many recipients benefitted from these resources: UN agencies (especially WHO and UNICEF) (42.6%), NGOs (18.9%), governments (11.5%), Red Cross/Red Crescent (9.9%), private organizations and foundations (4.4%), and other actors received the balance (Grepin 2015). The multiplicity of recipients could be explained by the intensity and complexity of the pandemic, which make it extremely difficult for actors to deal with effectively. However, for the recovery process, government and local actors will have to play a very strong role. The international organizations should work with governments to mobilize resources for the recovery process. The coordination and lead of governments are vital in the implementation of the recovery process for sustainability, ownership and capacity building.

The coordination between the national and regional levels has been strengthened, the provision of case management centres has improved, and support to field hospitals for healthcare workers in the epicentre countries has also been enhanced. Nevertheless, and in spite of enhanced coordination from the United Nations, there is much room for improvement from the international community. To date, the response to this rapidly changing epidemic has been inadequate, delayed and sparse, with uncoordinated efforts, limited interventions by experts and numerous unfulfilled promises. Most supports in the provision of case management centres and related facilities are concentrated in urban areas, especially in Liberia, and many part of remote and heavily affected communities lack case management centres even ten months after EVD was confirmed in the country.

<sup>21</sup> They include Côte d'Ivoire (US\$22million), Ghana (US\$14.0 million), Mali (US\$11.0 million), Nigeria (US\$4.0 million) and Senegal (US\$3.0 million). See Grepin (2015) for more information on the beneficiaries of the pledges.

**Figure 12: Pledges, commitments and disbursements for the UN Ebola Plan, as of 27 October 2014**



Sources: Salaam-Blyther (2014) and UNOCHA (2014a).

The situation on the ground shows a case of the ‘double failure’ phenomenon. The slow response at the initial stage of the epidemic is now being compounded with partners’ inability to adapt to the current needs based on reality in the field. As highlighted by MSF (2014a), some international agencies are allocating resources to activities that are no longer appropriate to the current situation. The allocation of case management facilities by many international organizations when there is strong evidence of adequate isolation capacities and a drop in EVD cases in Monrovia is a good example. Such resources could have been taken to remote areas where they are mostly needed (such as Bong, Margibi, Gbarpolu, Grand Cape Mount and River Cess counties)<sup>22</sup> or be used to train personnel managing the Case Management Centres (CMCs) who had not been adequately trained. This could also be used to kick-start the socio-economic recovery process. It is therefore important to adapt quickly enough to this rapidly changing situation and allocate resources to where they are needed the most.

The international responses to the Ebola outbreak have raised several questions regarding global health governance structures, international commitment to bolstering pandemic preparedness and response capacity in poor countries, and global support for strengthening health systems. This development shows that the global community is not ready to address a virulent pandemic like Ebola. It therefore calls for the urgent need to rethink the global health management system.

## 2.5 UN System response to the Ebola virus disease

While most partners withdrew at the peak of the crisis, United Nations agencies not only stayed, but also increased their presence in the epicentre centres (Guinea, Liberia and Sierra Leone) and the corridor countries (Senegal and Ghana). This further rendered the United Nations System a trusted partner in West Africa. Prior to the emergence of EVD, the United Nations agencies operating in the West African region

<sup>22</sup> A good example of this is the construction of a 100-bed CMC in Monrovia, where there were already 580 operational beds in four existing CMCs compared to only 178 operational beds in CMCs in the rest of the country. There was a plan to open another two in the same neighbourhood (MSF, 2014a).

were preoccupied with the overarching goal of addressing poverty and inequality in all its manifestations and promoting sustainable human development. Due to the spread of Ebola, different the United Nations agencies are confronted with extremely difficult trade-offs between the overriding need to stop the epidemic as soon as possible, the urgent need to prevent affected communities from sinking further into poverty, and the obligation to maintain efforts to achieve long-term development. Thus, programmes need to be modified to find the right balance between these goals and avoid focusing all interventions on the fight against the epidemic. Indeed, a relaxation of development effort could be highly detrimental to recovery once the epidemic has been brought under control.

Since the discovery of the first EVD case in Guinea in December 2013, the United Nations System has responded strongly to support the affected countries to fight the disease. Moreover, the declaration by the WHO that the EVD was “a public health emergency of international concern” and the United Nations Security Council’s declaration that EVD in West Africa was a “threat to international peace and security” substantially reinforced the global partnership on the crisis.

The UN agencies have helped in estimating the direct and indirect costs of the pandemic, which has provided some operational guidance to countries. For instance, in August 2014, the WHO estimated that it would cost roughly US\$500 million to contain the outbreak by January 2015. It also estimated the unit cost of testing one person for Ebola at US\$244. For every reported case, health workers need to trace at least ten people whom the patient may have contacted, which costs around US\$225 per person. When infected individuals

die, their bodies must be safely buried and their households sanitized without workers risking infection, which costs US\$404. Hence, given the reported 20,381 cases and 7,889 deaths in early January 2015 across the three affected countries, the estimated, partial direct cost of the epidemic is currently around US\$50 million. However, as the cost of treating patients is difficult to ascertain and varied, the total direct cost is difficult to estimate.

The United Nations Mission for Ebola Emergency Response (UNMEER), established to utilize the assets of all relevant UN agencies in addressing the health and broader social impacts of the outbreak, also estimated that the UN response would cost around US\$1.0 billion (see Table 5), around half of which would be aimed at addressing health impacts. OCHA, using the Inter-Agency Response Plan for Ebola Virus Outbreak, specified the overall needs and requirements (ONR) of US\$1.5 billion. As of December 8, nearly two thirds of this amount had been met through response plan funding. The revised ONR, covering October 2014 to June 2015, is estimated at US\$2.27 billion.<sup>23</sup>

According to ECA (2014), the contributions of multilateral organizations and bilateral partners may far exceed the initial financial requirement, even if only a small amount of the pledged amount has been disbursed.

Most UN agencies have reprogrammed their interventions in the epicentre countries because of the outbreak. Their new prioritization includes: communicable diseases, non-communicable diseases, and issues dealing with women’s health, polio and emergency response (WHO); using school meals programmes to support quarantine households, relief and recovery operations, emergency food assistance and support for

<sup>23</sup> This includes US\$1.5 billion from October 2014 to March 2015 (initial ONR requirements) and \$0.768 billion for April to June 2015 of the US\$1.536 billion. See OCHA (2015), available at: <http://fts.unocha.org/pageloader.aspx?page=emerg-emergencyDetails&emergID=16506>.

farmers' income as well as food assistance to the affected people (WFP); a joint provision of 65,000 tonnes of food assistance to approximately 1.3 million of the most affected people (WFP and FAO); and building capacity in the government, supporting fund management capacity, supporting the hazard payroll system for the Ebola workers, the deployment of SURGE capacities, decentralization of sectoral governance and coordination of Ebola recovery support as mandated by the UN Secretary-General (UNDP), among other areas being handled by other UN agencies (UNICEF, 2014; UNDP-RBA, 2014a). UN Women is working with the Ministry of Social Welfare, Gender and Children's Affairs (MSWGCA) to mainstream gender into a number of key EVD interventions, providing psychosocial support to affected families and communities in de-stigmatizing and reintegrating the survivors of EVD back into the communities, and supporting affected women and girls in both treatment and isolation centres with basic hygiene materials and awareness raising through intensive radio programmes. The United Nations Children's Fund (UNICEF) is exploring traditional and new ways to help provide children with the physical and emotional healing they need. It is working with local authorities in the most affected counties to help strengthen family and community support to children affected by Ebola and to provide care to those who have been rejected by their communities or whose families have died. In Sierra Leone, it has trained about 2,500 survivors to provide care and support to quarantined children in treatment centres and works with partners to reunite separated children with their families through an extensive family tracing network across the country.<sup>24</sup> United Nations Office of High Commissioner for Human Rights (OHCHR, 2015) conducted an analysis of

the human rights dimension, including in terms of responses to the epidemic. It also monitored the human rights impact of the outbreak and promoted integrating human rights into responses in the most affected countries.

Building on strengthened coordination to fight the EVD, the UN agencies should work with national and international partners to address the root causes of the epidemic, rather than focusing all efforts on the present crisis. One key goal of United Nations programmes should be to help the governments of these countries to strengthen health management coordination and help build strategic partnerships around the health system development.

The United Nations Development Assistance Framework (UNDAF) for West African countries should be concerned with strengthening the health services' capacity to cope with future epidemics without compromising the fight against other priority diseases, and ensuring the provision of quality care. Emphasis should be placed on the establishment of a National Health Development Plan that takes into account the lessons learned from the Ebola epidemic and guides the reconstruction of a system capable of resisting similar shocks. Specific interventions from UN agencies such as WHO, UNICEF, United Nations Population Fund (UNFPA) and the World Bank, among others, should give priority attention to the implementation of this strategic action. This also calls for preventive measures, especially in countries with a high probability of EVD occurrence, as predicted in this report, for example, The Gambia, Ghana and Côte d'Ivoire. These measures include developing early warning plans and strategies.

<sup>24</sup> Some of the UNICEF response actions are discussed in [www.unicef.org/media/media\\_76085.html](http://www.unicef.org/media/media_76085.html)

**Table 5: United Nations Ebola Response Plan (US\$ million)**

	Comon Services	Guinea	Liberia	Sierra Leone	Total
<b>(1) STOP THE OUTBREAK</b>					
Case identification and contact tracing	7.0	26.8	116.5	39.2	189.5
Safe and dignified burials	0.8	4.3	14.2	4.4	23.8
<b>(2) TREAT THE INFECTION</b>					
Ebola care and infection control	7.0	52.5	212.6	59.2	331.2
Medical care for responders	10.0	1.0	2.0	1.0	14.0
<b>(3) ENSURE ESSENTIAL SERVICES</b>					
Food aid	2.5	28.4	36.3	40.4	107.7
Basic health care	1.0	47.1	12.9	36.1	97.1
Cash incentives for health workers	0.0	2.5	0.0	0.0	2.5
Recovery and economy	0.3	9.5	43.1	11.7	64.8
<b>(4) PRESERVE STABILITY</b>					
Supply chain management	3.9	3.1	20.7	14.8	42.6
Transport and fuel	22.9	0.0	0.5	0.0	23.4
Social mobilization	0.6	18.6	13.2	13.3	45.8
Messaging	1.5	0.3	1.1	0.3	3.2
Regional support for Points 1-4	11.9	0.0	0.0	0.0	0.0
<b>(5) PREVENT OUTBREAKS IN UNAFFECTED COUNTRIES</b>					
Multi-faceted/preparedness (regional)	30.5	0.0	0.0	0.0	30.5
<b>Total</b>	<b>88.0</b>	<b>194.1</b>	<b>473.1</b>	<b>220.4</b>	<b>987.8</b>

Source: UNOCHA (2014b).

Concerted and urgent efforts should focus on resuscitating livelihoods that were destroyed by the EVD. Transitional support to purchase inputs is essential to prepare for the next crop, while adding cash transfers to food aid (for a limited period) would help communities facing food insecurity to reconstitute their means of sustainable livelihoods. This also includes the opening of trade corridors in the continent. The early recovery plan and strategy<sup>25</sup> being developed by the UN System should give priority attention to this. The United Nations Industrial Development Organization (UNIDO) and UNDP should work on the industrial component of the agricultural value chain including supporting the strengthening

of the microcredit schemes and empowering small-scale businesses. Giving priority attention to addressing the structural causes of the fragility at the national and regional levels, especially for the MRU, is also pivotal.

Although the epicentre countries have initiated some recovery plans, and the UN agencies are also consolidating their efforts, partnerships with the national governments and ECOWAS on the long-term approach to addressing the crisis is critical. The UN system could help the governments and ECOWAS design national and regional recovery plans, in conjunction with sources of financing and partnership building. Based on

<sup>25</sup> Many United Nations agencies are involved, including: World Bank, Food and Agricultural Organization of the United Nations (FAO), International Fund for Agricultural Development (IFAD), World Food Programme (WFP), UNDP, UNIDO, International Labour Organization (ILO), United Nations Economic Commission for Africa (UNECA), WHO and UNICEF.

the UN Secretary-General's Memorandum of 12 December 2014 on the 'Recovery initiative in Ebola-Affected Countries', UNDP has been mandated to lead the UN recovery process in close consultation with other agencies. Effective coordination of the recovery programme is central to accelerating progress.

The United Nations also has a role to play with national and regional governments to follow up on the pledges made to alleviate the crisis. As of January 2015, more than 983 pledges (international development agencies, donors, NGOs and private sector organizations) have been made, 433 of which to the UN agencies. As of January 2015, only about 111 agencies have fulfilled their pledges. Indeed, of US\$2.27 billion needed for the Ebola Response Plan, as indicated by United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), only US\$1.25 billion, around 55 percent, has been covered. Substantial resources are still needed to fill the gap. Resource mobilization is key to moving forward on the Ebola response interventions.

In terms of organization, the number of agencies represents an important challenge. Coordination failure and competition between them are causes of concern that should be addressed so that the United Nations can continue to enjoy the trust of the West African governments. The Regional Directors' Team provides a good opportunity for coordination. The outbreak of the disease created a great organizational challenge, to which the United Nations responded by setting up the first-ever UN mission for a public health emergency, UNMEER.

The primary task of the new agency is to coordinate the UN agencies' vast resources to combat the epidemic under the technical leadership of the WHO. The new coordination agency has been based in Accra, Ghana. However, its main challenge is to ensure implementation coordination. UNMEER is working with the WHO to develop indicators, based on the availability of human resources and treatment centres, for monitoring Ebola response efforts. Irrespective of the role assigned to each organization, UN agencies should work as a team in helping these countries to recover. The synergy of UN efforts is key to accelerating progress.

To solve the coordination failure of UN agencies, UNMEER should design a strong division of labour matrix and ensure its implementation. A committee should be set up to receive and redirect any pledge. In addition, this committee should ensure that duplication and unhealthy competition on the ground by United Nations agencies is avoided.



Women vegetable farmers and traders in Sierra Leone have faced important losses due to restrictions on the transportation of goods and periodic markets bans in the context of the Ebola outbreak. Photo by FAO Guinea/K. Jawad FAO/Keifa Jaward – Communication officer in Sierra Leone



A Malian woman packaging mangoes for export. The Malian economy has felt the impact of the Ebola crisis. Photo by UNDP/Mali

# The macro-economic impact of the Ebola virus disease

# 3. The macro-economic impact of the Ebola virus disease

## 3.1. Overview of relevant pandemic modelling approaches

With the deadly spread of the EVD, the global interest in the disease has increased since 2014. While it is understood that most of the focus is on public health systems, it is instrumental to think about what the affected countries will do to recover after the epidemic is contained. Hence, the analysis of the macro-economic impact becomes the next step. However, such an estimation is not an easy task. Few studies have assumed the economic impact of pandemics such as Severe Acute Respiratory Syndrome (SARS), influenza, malaria or HIV/AIDS.

Kennedy, Thomson and Vujanovic (2006) assessed the macro-economic effects of an influenza pandemic of the Australian economy using the Treasury Macro-economic (TRYM) model. The scenario modelled in their study is of a nationwide outbreak of a highly contagious influenza virus with a mortality rate of 0.2 per cent of the population, or 40,000 deaths nationwide. The model allowed the estimation of the growth rate at the national level for only the first year. Cuddington and Hancock (1993a and b) used a modified Solow Growth Model to stimulate the impact of the AIDS epidemic on the growth path of the Malawian economy. They found a 0.2-0.3 decrease of GDP growth over the 1985-2010 period.

The high death rate and the contamination speed have elicited several evidence-based studies on the EVD in West Africa. In 2014, there were four major contributions to the assessment of the macro-economic impact of the EVD in West Africa (World Bank, 2014; UNECA, 2014; and

UNDP-RBA, 2014a and 2015).<sup>26</sup> In October 2014, World Bank published a study on the economic impact of the 2014 EVD. Using a dynamic computable general equilibrium (CGE) model for Liberia, the study provided a medium-term estimation of the impacts of the EVD in growth rates. For Guinea and Sierra Leone that have no computable general equilibrium (CGE) model, the World Bank study used available data to estimate the change in projected growth rates by sector in order to calculate the updated change in the growth rate. To estimate the impact for the West African region, this study used CGE modelling, more specifically the LINKAGE model, which draws on the Global Trade Analysis Project (GTAP) database of economic transactions within and across economies for 2013.

In December 2014, UNECA published a comprehensive study on the impacts of the EVD on the economies of the three affected countries (UNECA, 2014). The study used four approaches for this assessment: (i) a descriptive quantitative analysis; (ii) a survey on non-affected countries' preparedness and on indirect effects of the EVD; (iii) an analysis of the continental impact of the EVD; and (iv) a perceptions analysis by statistical text mining. Based on these methodologies, UNECA study found impacts of the EVD in various sectors on the countries' economies. This study is one of the first to assess the impact in various sectors of these economies.

UNDP published two different studies on the three epicentre countries using a multi-dimensional approach (UNDP-RBA, 2014a and 2015a). It undertook field surveys in the three most affected

<sup>26</sup> A major constraint to such studies is the availability and quality of data.

countries to provide evidence for building assumptions for the macro-models using both macro-econometrics and CGE models. It provided a medium-term (2014-2017) estimation for key macro-economic and social variables. The endogenous growth and dynamic CGE model was employed for the study. The two approaches provide complementary results.

While these studies provided some estimations of GDP reduction for each of the three most affected countries, the estimation for the West African region is carried out at the aggregate level. In addition, the impact on poverty is not analysed, not even by calculating the GDP per capita.

The UNDG-WCA report, building on earlier studies, is an attempt to provide further insight into the impact of the EVD. It is the first report that will model the socio-economic impact of EVD for the 15 West African countries. The earlier studies either modelled the three epicentre countries or provided a rough estimate for the region. Also, this report discusses the EVD incidence and food security at the country level. In addition, this report uses a macro-economic model that has not previously been used to assess the impact of the EVD, except for UNDP-RBA (2014a and 2015a), but only for the three epicentre countries. Hence, this report confirms some of the results of previous studies. Finally, it uses the latest epidemiological results from the field for the model, which are more accurate than those based on relatively dated assumptions and data.

### 3.2. Methodology

In general, the epidemic will impact the economy through three channels: direct, indirect and deferred indirect costs. The direct costs are mostly medical expenditures linked to the EVD at the

macro level. At the household level, the most direct cost is the use of family savings to take care of an EVD-infected family member. Indirect costs mainly consist in a reduction of productivity (or labour participation) for those who survived, or lack of productivity for those who did not survive. The deferred indirect cost is the cost that the household will have to pay in the absence of external aid. The epidemic may destroy the fragile economic structure. Children have not been able to attend school, and the long-term impacts will be devastating.

The model used in this report will capture these three effects at the aggregate level. This section summarizes the main model used to assess the impact of the EVD in West Africa and presents the results of the empirical estimations.

#### **The macro-economic impact model for the Ebola virus disease**

To assess the macro-economic impact of the EVD, two different modelling schemes were used, derived from previous studies on HIV/AIDS. The first model considered is the dual macro-Ebola model. It allows to analyse, in the context of the Solow-Swan growth model, the macro-economic impact of a temporarily shock on the labour force and capital accumulation caused by the Ebola epidemic. The macro-Ebola model is designed as in Cuddington and Hancock (1993a and b). In this scheme, the path of economic indicators is simulated under a scenario of no Ebola and then under a scenario with presence of EVD cases. The former represents a no-EVD benchmark against which any EVD scenario might be compared. Although different parameters are assumed, the simulation mainly focuses on the impact of lost labour productivity per EVD case.

A cross-sectional empirical model was used for the estimation. The aim is to estimate the coefficient of a variable that captures the potential impact of EVD prevalence on an economy. To this extent, a non-linear model similar to the one designed in Bloom and Mahal (1995) is used. The transmission of an epidemic disease is determined by different factors, including economic conditions. Having realized that this might create issues with simultaneity bias, the models use non-linear two-stage least square techniques.

This model is different from most of the epidemiologic models found in the literature. Indeed, for the EVD, the first symptoms appear about 21 days after being infected, and infected workers may be completely or partially unable to work, which affects their families and communities. In the meantime, they may have contaminated other workers and family members. To avoid further contagion, workers are isolated at the appearance of the first symptoms. With the high fatality rate, the chances of returning to work are minimal. Hence, one of the main impacts of the EVD is the huge reduction of labour supply. In our model, we estimate the production per capita for the case with and without EVD, to enable the estimation of the cost of the EVD on the economy (see Annexes 1 and 2 for the detailed methodology).

### 3.3. Key findings from empirical results

#### 3.3.1 Results of the probability distribution of Ebola virus disease prevalence

This report simulates the probability of having Ebola cases under low and high scenarios for each of the 15 West African countries between 2013 and 2017. Annex 1b provides the assumptions and equations for estimating the probabilities.

Based on the results, countries are grouped into four categories of probability of EVD prevalence. The first category is the high probability of EVD prevalence in the three epicentre countries, which is expected according to the current local situation. Second, Ghana and The Gambia also have a relatively high probability of EVD prevalence – 0.4 and 0.6, respectively. This calls for the governments in these countries to initiate pro-active preventive measures, including early warning mechanisms. Third, there are countries whose probability of prevalence ranges between 0.1 and 0.2 (Côte d'Ivoire, Benin, Togo, Burkina Faso and Nigeria). And finally, countries such as Cape Verde, Niger, Guinea Bissau, Senegal and Mali have very low probability. The results for Mali, Guinea Bissau and Senegal contradict the general expectation given the contiguity of these countries to the epicentre countries. This may be as a result of strong preventive measures against the EVD. (See Annex 3 for the specific results for each of the countries.)

#### 3.3.2 Trade impacts of Ebola virus disease

Due to the restriction of the epidemic to certain countries, trade appears to be the most important variable for examining the effects of the disease in West Africa. The sub-regional trade indicates that Guinea, Liberia and Sierra Leone contribute only marginally to intra-ECOWAS trade. The share of the three countries in the sub-regional trade is very low. Thus, the border closures and the isolation do not significantly affect the volume of trade in the West African region.<sup>27</sup> Indeed, over the 2010-2013 period, the three countries account only for 1.73 percent of imports and 1.39 percent of intra-EU exports annually.

<sup>27</sup> While this may be the case at the macro and formal levels, the situation for people who depend on informal cross-border trade may be different. It is important, therefore, to undertake some micro-assessments on this issue to further examine the detailed impact on people whose livelihoods depend on cross-border trade.

Over the same period, Guinea contributed an annual average of 1.25 percent in to intra-ECOWAS imports against 1.23 percent for exports. Its share in total intra-ECOWAS imports varies from 1.56 percent in 2010 to 1.34 percent in 2013, against 2.25 percent and 0.16 percent for exports,

respectively. These rates are even lower for Liberia and Sierra, remaining below the 0.3 percent of total intra-ECOWAS imports and exports. For this reason, a drastic reduction of trade within the region is not expected. Tables 6 and 7 provide the trade statistics for other countries.

**Table 6: Share of countries in intra-ECOWAS trade**

Country	Intra-ECOWAS Imports				Intra-ECOWAS Exports			
	2010	2011 prev	2012 prev	2013 prev	2010	2011 prev	2012 prev	2013 prev
Benin	0.40	0.17	0.20	0.39	3.42	0.44	0.65	0.83
Burkina Faso	1.17	1.33	1.18	1.77	1.70	0.83	0.99	1.22
Cape Verde	0.20	0.17	0.18	0.25	0.02	0.04	0.01	0.04
Côte d'Ivoire	9.14	6.30	5.88	10.31	35.39	14.89	21.82	29.10
Gambia, The	0.06	0.05	0.06	0.08	0.51	0.52	0.79	0.65
Ghana	5.74	13.53	9.99	12.00	9.20	42.07	14.35	9.50
Guinea	1.56	1.04	1.08	1.34	2.25	1.08	1.45	0.16
Guinea Bissau	0.06	0.04	0.04	0.08	0.01	0.01	0.02	0.00
Liberia	0.20	0.21	0.25	0.42	0.04	0.02	0.03	0.02
Mali	1.77	1.36	1.42	1.88	3.04	2.32	2.42	1.94
Niger	0.36	0.21	0.22	0.38	2.70	1.17	2.84	3.00
Nigeria	77.00	73.58	77.46	68.10	28.32	27.95	43.53	41.95
Senegal	1.76	1.37	1.34	1.89	11.73	5.34	6.72	6.52
Sierra Leone	0.09	0.23	0.18	0.35	0.10	0.16	0.03	0.22
Togo	0.50	0.40	0.49	0.75	1.58	3.15	4.36	4.85
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: ECOWAS Commission.

**Table 7: Member Countries' share of intra-ECOWAS imports and exports in foreign trade**

Country	Intra-ECOWAS Imports				Intra-ECOWAS exports			
	2010	2011 prev	2012 prev	2013 prev	2010	2011 prev	2012 prev	2013 prev
Benin	54.5	22.6	22.2	23.2	14.7	18.9	17.4	12.1
Burkina Faso	9.4	5.5	5.8	7.5	26.7	24.6	22.6	21.4
Cape Verde	0.6	2.2	0.4	1.8	1.4	0.8	1.2	1.1
Côte d'Ivoire	24.9	21.1	25.6	30.5	28.0	25.9	28.7	25.2
Gambia, The	54.0	86.8	84.4	88.9	23.2	26.6	33.0	29.3
Ghana	10.3	27.8	9.9	8.6	7.9	7.8	4.4	1.6
Guinea	9.3	9.3	9.3	1.3	4.0	4.0	4.0	1.3
Guinea Bissau	0.7	2.6	2.6	0.1	16.3	17.6	17.6	10.8
Liberia	1.5	1.0	0.8	0.5	0.7	0.4	1.5	2.4
Mali	11.0	15.3	11.7	11.1	30.2	40.4	44.8	33.4
Niger	48.8	50.7	87.5	84.7	11.4	14.7	19.9	20.8
Nigeria	2.4	3.4	3.9	6.7	0.4	1.4	0.4	10.2
Senegal	42.9	34.7	34.6	37.2	13.3	13.6	16.2	14.5
Sierra Leone	6.8	6.2	1.2	6.8	49.9	52.7	32.7	34.9
Togo	20.3	70.5	61.4	69.5	11.0	8.9	10.1	10.2

Source: ECOWAS Commission.

### 3.2.3 The impact on GDP growth and GDP per capita growth

The section presents the macro-economic estimation of the GDP growth. The results are presented under three scenarios: a baseline scenario (no Ebola); a high EVD scenario; and a low EVD scenario. The report presents the analysis sequentially based on the severity of the EVD. First, the results for the three countries mostly affected by Ebola (Guinea, Liberia and Sierra Leone) are presented. This is followed by a discussion of the countries that had a positive number of detected cases but are now Ebola-free (Mali, Nigeria and Senegal). Finally, the results for the other West African countries are presented as well as for the entire West African region.

**Guinea.** Guinea is the least affected of the three epicentre countries, with 2,707 cases and a total of 1,709 deaths reported. Recently, several measures implemented by the Government to contain the EVD have yielded results. Figure 13 and Table 8 summarize the macro-economic impacts for Guinea between 2014 and 2017 in terms of GDP per capita and GDP growth. In the high Ebola scenario (the current situation), the country will experience a 3.4 percent reduction in average GDP growth between 2014 and 2017 relative to the no Ebola scenario (or baseline). This reduction in GDP growth represents around US\$155.9 million in lost GDP in 2015 for the low EVD case scenario and US\$238.7 million for the high EVD scenario.

During the 2014-17 period, Guinea's average GDP loss is estimated at US\$184.4 million each year, or around 4.9 percent of the average GDP over the same period in the low Ebola scenario. In the high Ebola scenario, the average loss of GDP is US\$315.5 million, or around 8.6 percent of GDP over this timeframe. On the loss of GDP, Guinea is the least affected country among the

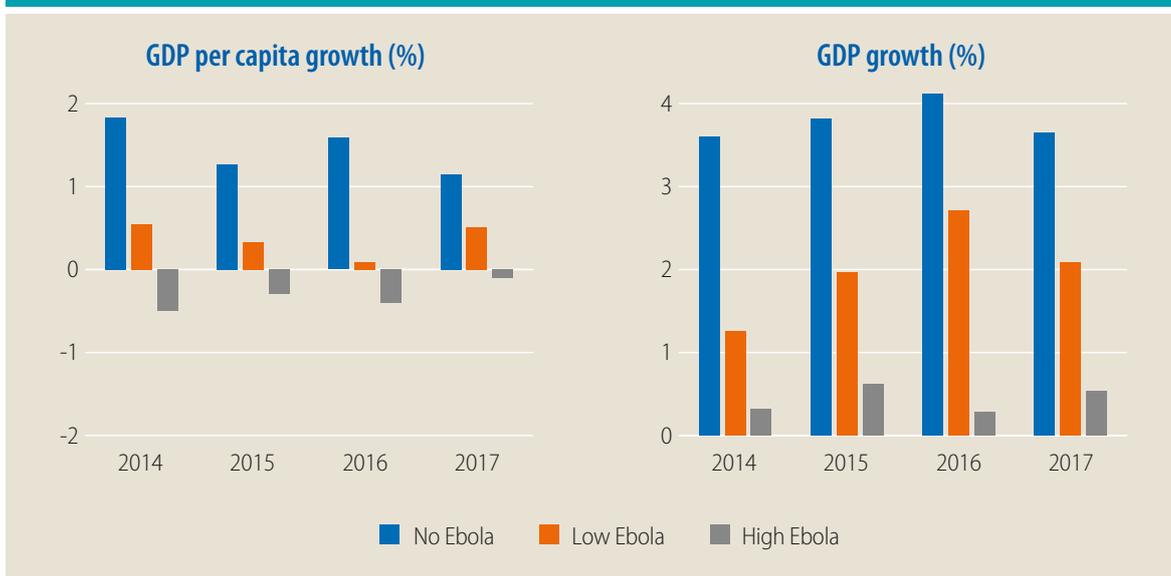
three heavily affected countries. In terms of GDP per capita, the difference between the baseline model and the low Ebola scenario is around 1.1 percent, and 1.8 percent in the high scenario. This is equivalent to a loss of US\$9 per capita between the baseline scenario and the low Ebola scenario. In the high Ebola scenario, the loss relative to the baseline is around US\$15 per capita.

**Table 8: Guinea: Macro-economic impacts of the Ebola virus disease, 2004-2017**

	2014	2015	2016	2017
(US\$ million)				
GDP change in Low Ebola scenario	-84.7	-155.9	-214.7	-282.3
GDP change in High Ebola scenario	-118.4	-238.7	-388.4	-516.3

Source: Authors' estimation.

**Figure 13: Guinea: Impact of the Ebola virus disease on GDP growth and GDP per capita growth, 2014-2017**



Source: Authors' estimation.

**Liberia.** Liberia is the second most affected country in terms of cases and fatalities. Indeed, according to the WHO, as of 7 February 2015, around 8,881 cases were reported, resulting in 3,826 deaths. The impact of the EVD in terms of GDP loss is around US\$159 million in 2015 in the low scenario and US\$214 million for the high scenario. On average, the loss of GDP is estimated at US\$187.7 million per year, or an average of 13.7 percent of GDP during the

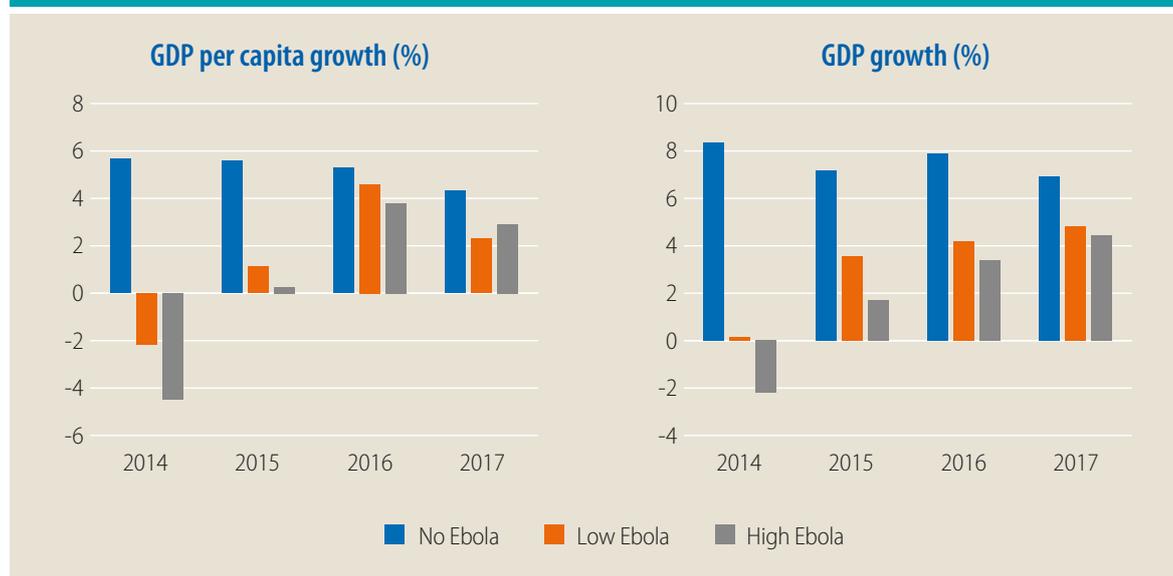
2014-2017 period. For the high scenario, the average loss is around 18.7 percent of the average GDP, or US\$245.2 million annually, over the same period. In terms of GDP per capita, the loss for Liberia is on average US\$38 per year in the low scenario and US\$48 per year for the high scenario. In the low scenario, the loss of GDP per capita growth is around 4 percent compared to around 5 percent for the high scenario (figure 14 and table 9).

**Table 9: Liberia: Macro-economic impacts of the Ebola virus disease, 2004-2017**

	2014	2015	2016	2017
(US\$ million)				
GDP change in Low EVD scenario	-105.3	-159.0	-221.1	-265.2
GDP change in High Ebola scenario	-135.7	-214.3	-289.1	-341.8

Source: Authors' estimation.

**Figure 14: Liberia: Impact of the Ebola virus disease on GDP growth and GDP per capita growth, 2014-2017**



Source: Authors' estimation.

**Sierra Leone.** Sierra Leone is the most affected country, with 10,934 cases, including 3,341 reported deaths (as of 8 February 2015). The lack of data did not allow for a forecast of the GDP of the country beyond 2015. In terms of GDP growth, according to the low scenario, there is a 6-percentage point reduction of GDP growth in 2014 and 8 percentage points for the

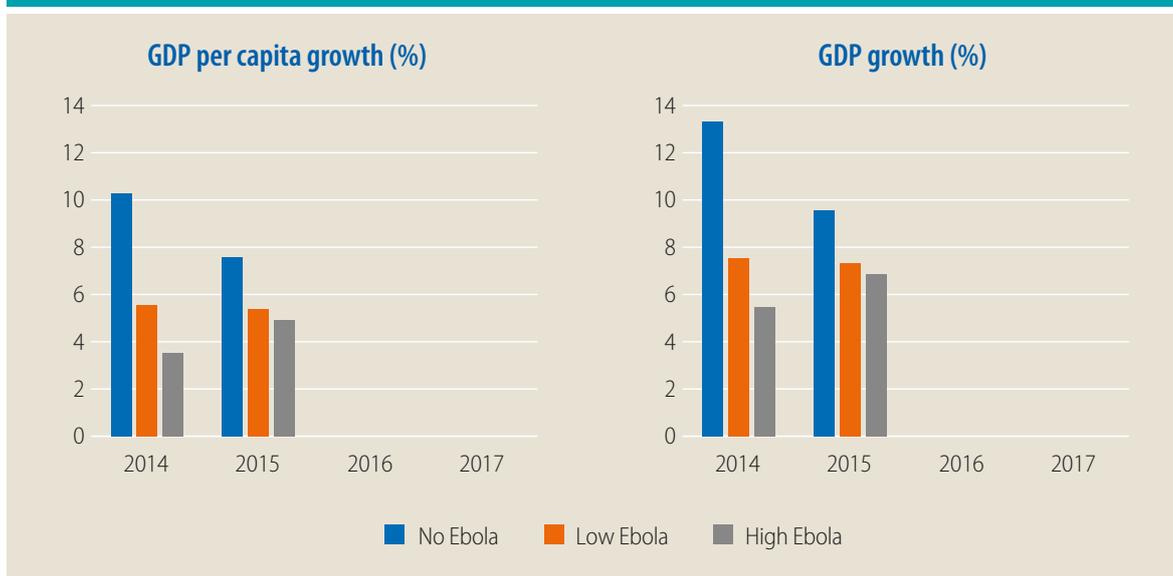
high scenario. In the low scenario, the country will lose around US\$219 million in 2015 in the low scenario and US\$286 million in the high scenario. Over the 2014-17 period, the country will lose between US\$200.7 million (7.1% of average GDP) and US\$264.3 million for the low and high scenarios, respectively (figure 15 and table 10).

**Table 10: Sierra Leone: Macro-economic impacts of the Ebola virus disease, 2004-2017**

	2014	2015	2016	2017
(US\$ million)				
GDP change in Low EVD scenario	-145.1	-219.2	-219.2	-219.2
GDP change in High EVD scenario	-196.7	-286.8	-286.8	-286.8

Source: Authors' estimation.

**Figure 15: Sierra Leone: Impact of the Ebola virus disease on GDP growth and GDP per capita growth, 2014-2017**



Source: Authors' estimation.

**Senegal.** Senegal is the only country of the region with only one case of EVD and no deaths. The impact on GDP growth in Senegal is only 0.6 percentage points in 2015 in the low scenario and 0.9 percentage points in the high scenario. The impacts are mostly due to the indirect impacts of the EVD on the country.<sup>28</sup> The country will lose 1.1 percent of the average GDP (US\$145.2 million) over the 2014-17 period in the low Ebola scenario and 1.7 percent (US\$221 million) in the high scenario (figure 16 and table 11).

**Mali.** In Mali, six cases of EVD have been reported, all of which were fatal. In the low scenario, the macro-economic impact of the outbreak in terms of GDP growth is 0.3 percentage points between 2014 and 2017. Mali will lose on average

of US\$81.6 million per year. In the high Ebola scenario, the country will lose 0.6 percentage points of GDP on average, or US\$164.6 million per year.

**Nigeria.** With 20 reported cases and eight deaths, Nigeria is the most affected country outside the epicentre countries. The impact in terms of lost GDP growth due to the EVD is 0.1 percentage points per year in the low Ebola scenario, i.e. an average loss of US\$1.4 billion (or 0.7% of the average GDP). In terms of GDP per capita, US\$22 is lost between the baseline and the low Ebola scenario. In the high Ebola scenario, GDP growth is reduced by 0.2 percentage points, and the country will lose around US\$1.6 billion. GDP per capita will be further reduced by US\$48.

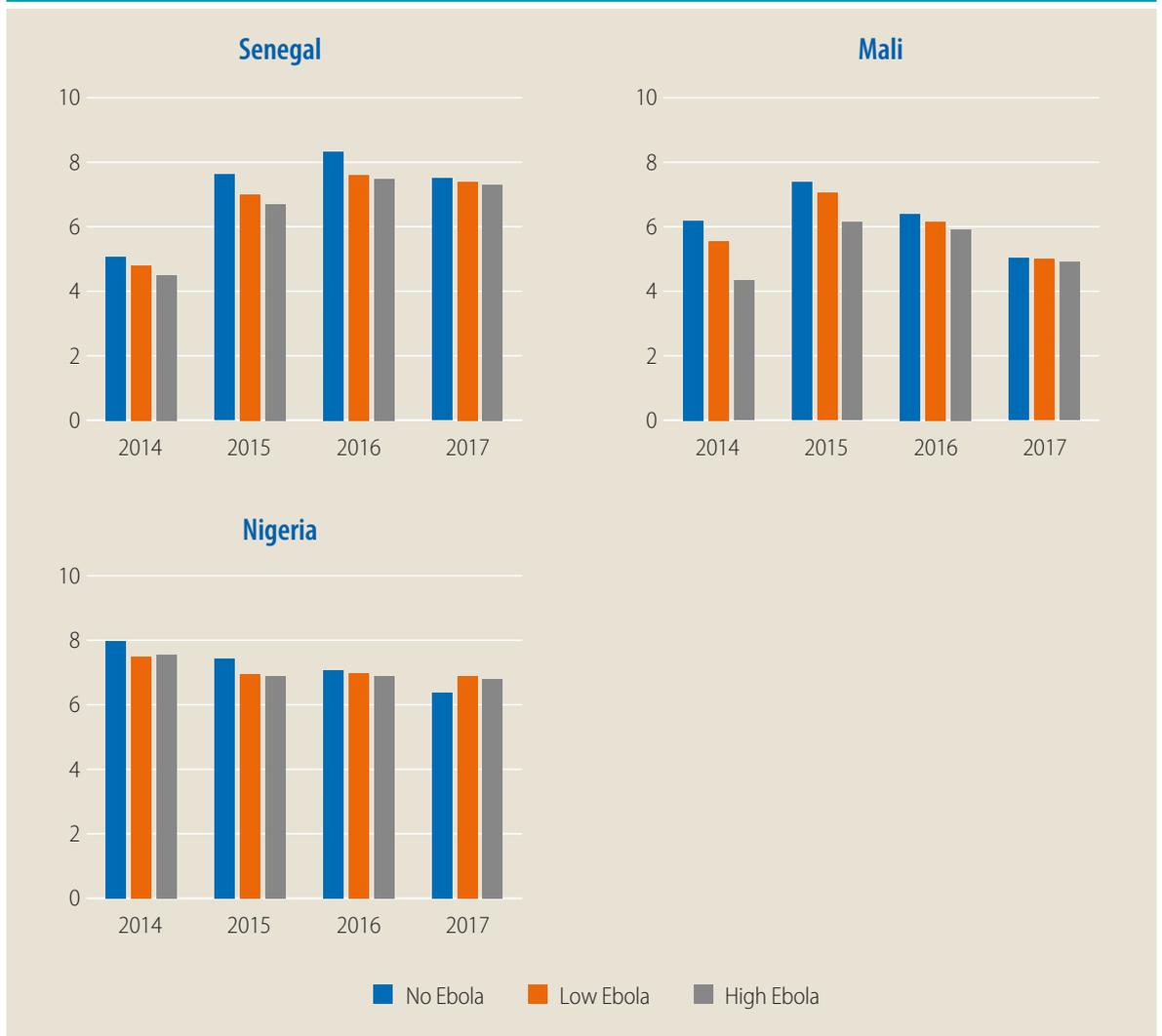
**Table 11: Senegal, Mali and Nigeria: Macro-economic impacts of the Ebola virus disease, 2004-2017**

	2014	2015	2016	2017
(US\$ million)				
<b>Senegal</b>				
GDP change in Low EVD scenario	-30.8	-106.5	-206.8	-236.7
GDP change in High EVD scenario	-64.6	-177.9	-297.9	-347.0
<b>Mali</b>				
GDP change in Low EVD scenario	-46.1	-75.1	-99.4	-105.6
GDP change in High EVD scenario	-135.4	-239.1	-293.1	-317.1
<b>Nigeria</b>				
GDP change in Low EVD scenario	-890.8	-1,898.6	-2,220.9	-1,167.1
GDP change in High EVD scenario	-801.8	-1,903.3	-2,386.8	-1,567.4

Source: Authors' estimation.

<sup>28</sup> While this may be the case at the macro and formal levels, the situation for people who depend on informal cross-border trade may be different. It is important, therefore, to undertake some micro assessments on this issue to further examine the detailed impact on people whose livelihoods depend on cross-border trade.

Figure 16: Senegal, Mali and Nigeria: Impact of the Ebola virus disease on GDP growth, 2014-2017



Source: Authors' estimation.

**Figure 17: West African countries not directly affected by the the Ebola virus disease: Impact of the Ebola virus disease on GDP growth, 2014-2017**



Source: Authors' estimation.

**Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Ghana, Guinea Bissau, The Gambia, Niger and Togo.** The remaining West African countries are EVD-free. The indirect impact of the disease is not negligible, however, because

of the interconnections among the economies of this region. The impact on the GDP growth varies between 0.1 percentage points and 4 percentage points (figure 17).

**Figure 18: West African countries not directly affected by the Ebola virus disease: Impact of the Ebola virus disease on GDP and GDP growth (%), 2014-2017**



Source: Authors' estimation.

**The West African region:** In 2015, under the low scenario, GDP growth will be 0.5 percentage points lower. The loss of GDP for the whole region will be US\$3.6 billion on average per year (i.e. 1.2% of the average GDP of the region). In impact of the EVD will reduce GDP per capita growth, by 0.8 percentage points on average

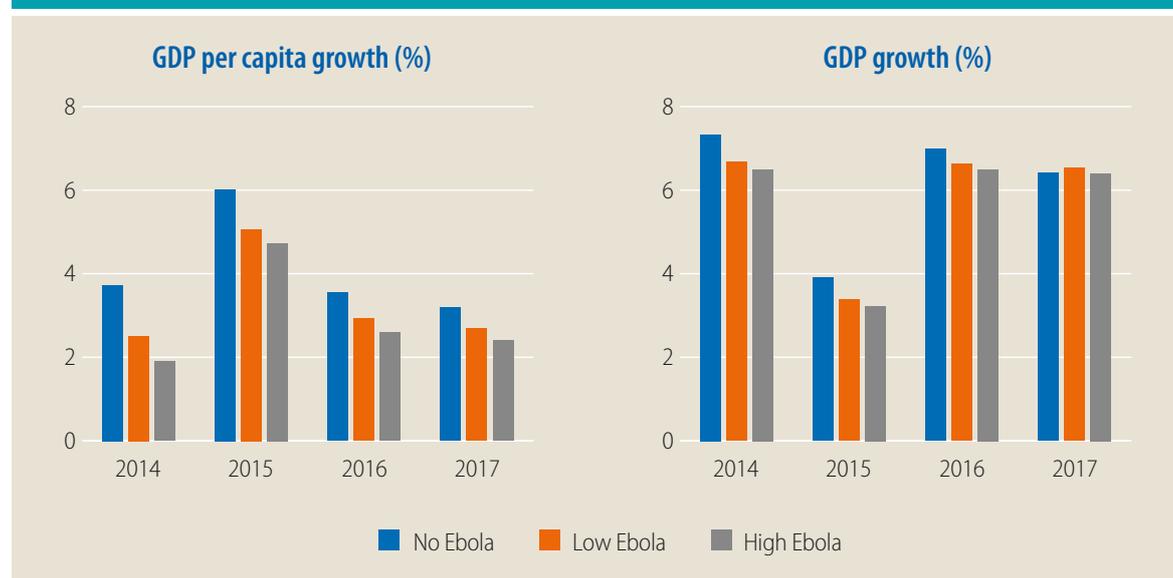
between 2014 and 2017. Hence, the region as a whole will lose about US\$18 per capita per year. In the high scenario, GDP growth decreases by 0.5 percentage point on average between 2014 and 2017, which represents a loss of GDP of around US\$4.9 billion per year (see table 12 and figure 19).

**Table 12: West Africa region: Macro-economic impacts of the Ebola virus disease, 2004-2017**

	2014	2015	2016	2017
(US\$ million)				
GDP change in Low Ebola scenario	-1,799.8	-3,411.7	-4,750.0	-4,697.0
GDP change in High Ebola scenario	-2,317.3	-4,426.4	-6,230.4	-6,691.6

Source: Authors' estimation.

**Figure 19: West African region: Impact of the Ebola virus disease on GDP growth and GDP per capita growth, 2014-2017**



Source: Authors' estimation.



Vendor Struggling with plummeting sales in West Point after the Ebola Outbreak in Liberia. Photo Credit: UNDP Liberia/Caly Learson. Photo by UNDP Liberia/Caly Learson

## The socio-economic impact of the Ebola virus disease

# 4. The socio-economic impact of the Ebola virus disease

The socio-economic impact focuses on three key issues: the anthropological dimension of the EVD using a case study from Guinea, its implication on food security, and poverty impacts. The econometric analysis was used to establish the food security and poverty impacts.<sup>29</sup> The UNDP national studies in Guinea, Liberia and Sierra Leone provided additional primary sources of information and complemented the anthropological survey from Guinea and other secondary sources of information.

## 4.1. The anthropological dimension

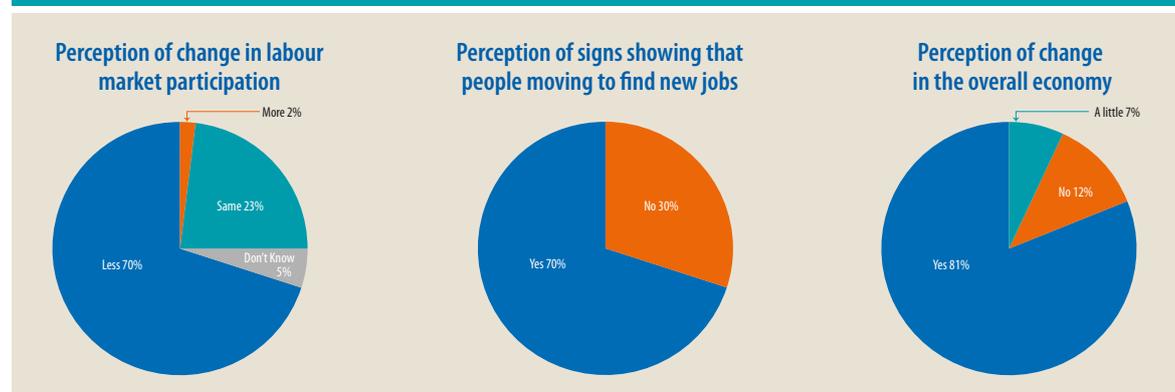
An anthropological survey was undertaken to capture people's practical experiences of the socio-economic impact of the EVD in Guinea. To achieve this, 567 individuals were interviewed, of whom 33.7 percent were female.<sup>30</sup> The sample cut across people from different age groups – ranging from 6 to 72 years old, with an average age of 36 years old: around 59 percent were 35 years old or under; and only 3.7 percent over

65 years old. The results from the survey provide additional illumination to the macro-economic modelling results.

People surveyed view the impact of EVD on the Guinean economy and households' economic activities as negative. Respondents stressed that that the outbreak had a strong negative impact on the labour market. Seven out of ten people believed that the labour market shrank. Many workers reduced their weekly hours of work and some decided to temporarily stay at home to prevent themselves from Ebola contamination. Those seeking new jobs or lacking revenues had left contaminated localities and moved to less risky areas to find new jobs (figure 20).

The EVD has slowed down the Guinean economy, as affirmed by eight out of ten respondents (figure 20). A combination of several factors such as the closing of borders, private businesses and enterprises, awareness of the need to avoid

Figure 20: Perceptions of changes in the labour market and the overall economy



Source: Authors' estimation.

<sup>29</sup> Using the results of macro-economic modelling to evaluate the impact of the epidemic on GDP per capita, this report examines the effect on food security and poverty variables. Considering the rate of economic growth in three hypothesis, namely: (i) the economic development of the countries with a no Ebola scenario; (ii) changes under a low Ebola scenario; and (iii) changes with a high Ebola scenario, the impact of the epidemic is calculated by determining the difference between the evolution of food security and poverty indexes in the baseline case and each of the low and high infection cases.

<sup>30</sup> Efforts to increase the share of women respondents did not yield maximum results due to the severe impact of the pandemic and the feeling of survey fatigue that has started to emerge in the region selected for the survey. They were adequately represented in the three national studies that were used to complement this survey.

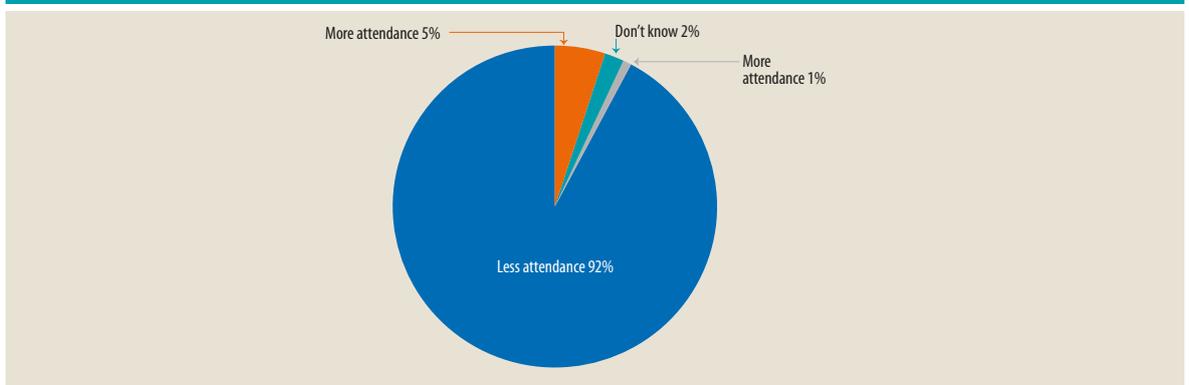
contacts with others, and fear of the disease and stigmatization have impeded households' economic activities. Few business holders that were able to open their businesses have taken advantage of the scarcity of goods by raising prices. The inability to carry out their normal businesses led to a decrease in household incomes.

The feedback on the impact of the EVD on food security overwhelmingly supports the findings from the modelling approach. It not only reduces access to food (affirmed by 90 percent of the respondents), but has also negatively affected people's food consumption habits. Many people changed their consumption habits and had to eat less than before the EVD.

*The EVD has had a significant impact on the education sector.* The impact consists in the loss of teachers and students, the closure of schools and a reduction in school attendance. Respondents to this survey have known, on average, four teachers or school staff who have died from the EVD. Nine out of ten people confirmed the reduction in school attendance as a result of the EVD (figure 21). This development confirms the issues raised in the earlier part of the report on the impact of the EVD on children.

*Communal support to the affected people still remains strong although the social life seems to be changing.* Despite the fear of contracting the disease, the majority of the respondents affirm

**Figure 21: Change in school attendance since the onset of the Ebola virus disease**



Source: Authors' estimation.

**Figure 22: Acceptance in adopting or taking care of children whose parents have died of the Ebola virus disease**



Source: Authors' estimation.

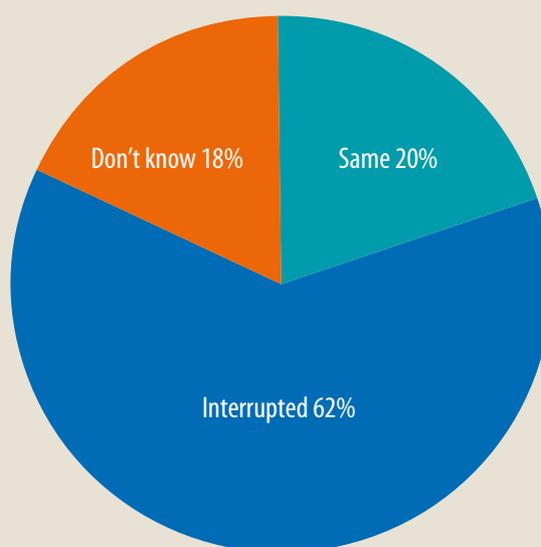
that people are ready to welcome or to take care of children who have been cured of EVD or whose parents have died of Ebola (figure 22). Yet, the fact that around one third of the respondents are ready to distance themselves from the culture of ‘be your neighbours’ keeper’ is an indication that EVD is eroding age-long communal behaviours.

The EVD has negatively affected Guinean social life, including attending ceremonies and public events; around 77 percent of the respondents stated that their social lives had changed as a result of the fear of contracting Ebola through social gatherings. The perceived fear caused resistance among the population that not only complicated containment measures, but also led to deaths of health workers. For instance, in September 2014, eight members of an anti-Ebola campaign team were assaulted and killed in Wome, a village near N’zérékoré in Guinea. They were accused by villagers of spreading the EVD by spraying chlorine in infected communities.

With better community engagement and proactive awareness raising, people have started to avoid risky cultural behaviours. Awareness was raised on the risk of transmitting Ebola through direct, close contact, body liquids and infected objects, and risky ceremonies were reduced as much as possible. Furthermore, the manner in which traditional initiation ceremonies and rites are being conducted has started to change (figure 23).

*Inter-communal relationships have been weakened.* The relationships between different communities were weakened by the EVD. According to the survey, the frequency of visits to relatives and the relationships between villages and ethnic groups were negatively affected. People expressed their regret that they were not able to visit relatives or attend burials in other villages. When they attended burials, they could not carry out traditional ceremonies as they used to do. Feelings of distrust among people

Figure 23: Changes in the practice of traditional initiation ceremonies



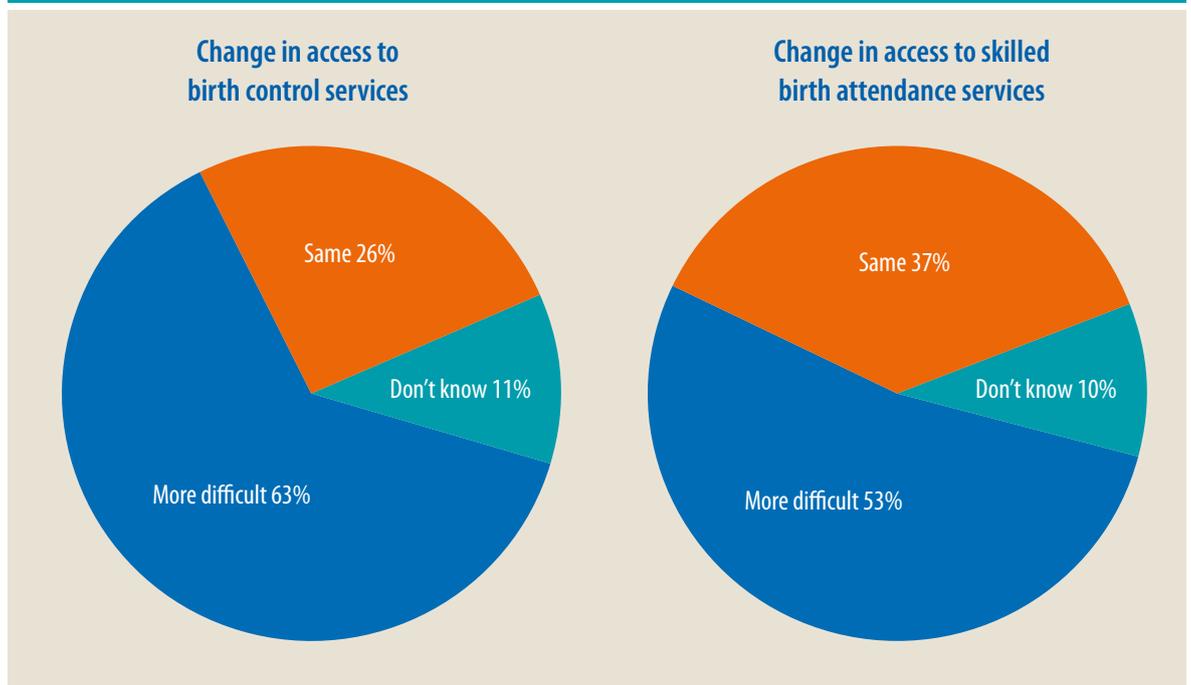
Source: Authors' estimation.

of different localities and villages are still strong (60 percent), especially towards those from localities with high rates of Ebola outbreak. Early recovery programmes should focus on strengthening these relationships.

**Access to health services has been sharply reduced.** Access to birth control services and to skilled birth attendants has become more difficult, according to 63 percent and 53 percent of the respondents, respectively (figure 24). This difficulty is a consequence of the Guinean Government's efforts to contain the EVD and prevent transmission to non-Ebola patients. Fears spread faster than the virus. Fear and ignorance engendered the perception that health facilities were the sources of infection, which made access

difficult. In addition, since EVD symptoms are similar to the signs of endemic diseases in the region, the patronage of health facilities is further complicated. As a result, access to some hospitals was denied to non-Ebola patients. In some cases, due to fear of the EVD and to high fatalities of health workers (90 out of 153 infected health workers died in Guinea), some medical clinics have closed down temporarily. Moreover, medical personnel, including nurses and doctors, stayed home because they felt unprotected against patients who may also have EVD. Overall, the health system was weakened. This will have a negative impact on the achievement of the MDGs, especially child and maternal health, as well as the endemic diseases in the region, such as malaria and Lassa fever.

**Figure 24: Impact of the Ebola virus disease on access to health services**



Source: Authors' estimation.

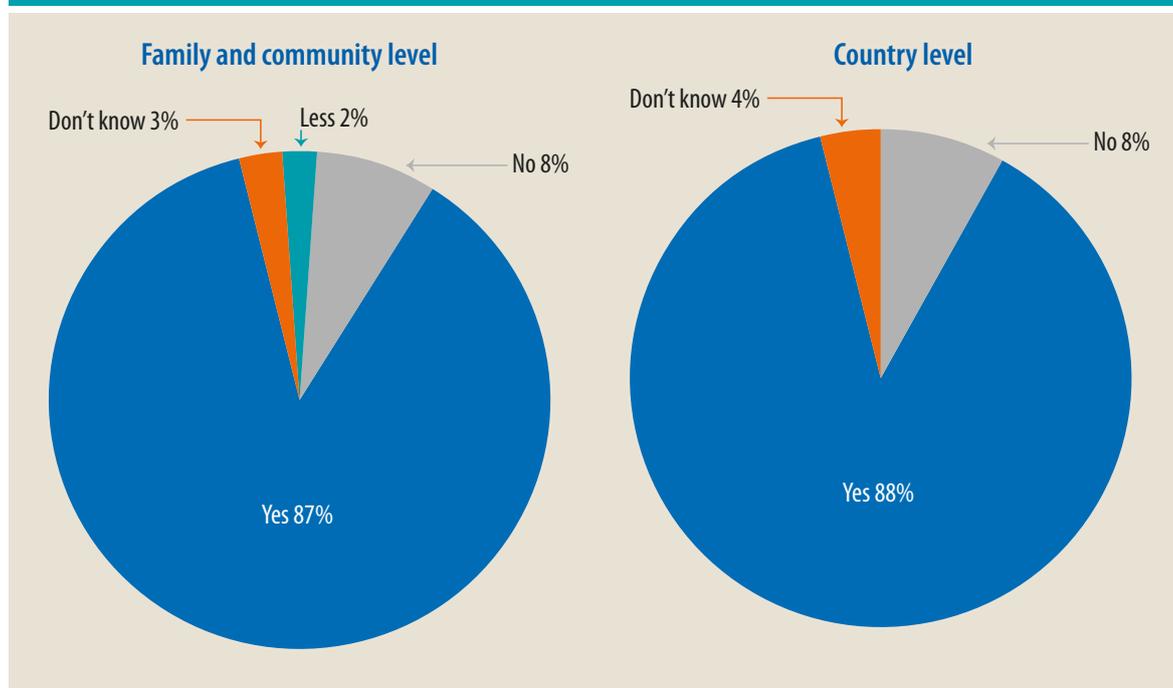
*People remain hopeful that life will return to normal in about a year, but EVD has affected their expectations about the future.* Guineans were asked about when their lives would return to what they were like before the EVD. They responded that they were optimistic about how quickly they will return to normal life: more than two thirds (68.8 percent) expected to return to a normal life within six months, and 87 percent within one year; and around 13 percent believed that it would take more than a year for normalcy to return. Very few people (around 2.2%) were sceptical about life returning to normal.

Guineans were also asked about how the EVD had affected their expectations about the future. Ebola had a negative impact on people's perception of the

future. For the majority of the respondents, Ebola diminished their hopes for the future (54%); only 46 percent stated that the future would either remain as before the EVD or would improve. The social impact of the EVD is mostly reflected by a general fear among the population. People expressed fear for the future of their family, community and for the whole country (figure 25). At the family and community levels, this fear is aggravated among people who lost relatives or community members or whose livelihoods have been destroyed (figure 16).

Based on past experience with respect to access to basic service delivery and the way that the EVD was managed at the onset, people's overall confidence in the government regarding its

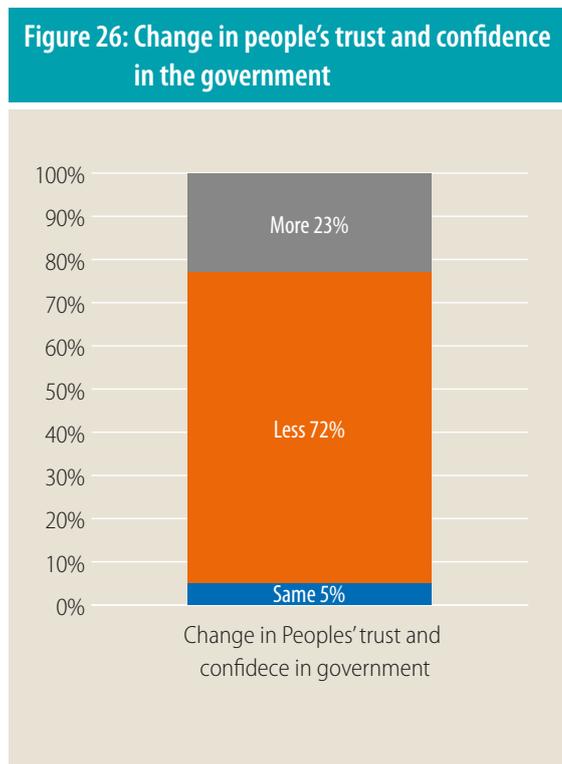
**Figure 25: Fear for the future, at the family and community, and country levels**



Source: Authors' estimation.

ability to successfully manage the EVD crisis is very poor; around 72 percent lost confidence in the government during this EVD period crisis (figure 26).

The government has an important role to play in building confidence. How early recovery is managed is key. Effective management will help build trust and confidence in the people and boost their expectations for the future.



Source: Authors' estimation.

*The national government was rated better than local administrations while international community ranked highest in responding to EVD.*

Guinean authorities' responses to the EVD were rated appropriate and the national government was rated above the local administration: around 48 percent ranked the national government excellent in its response compared to 44 percent for the local administration. The local administration was seen as impenetrable on issues relating to culture. However, the fact that some local government members or local chiefs were victim of Ebola or have lost relatives due to the Ebola has facilitated awareness raising in some localities. This boosted local government collaboration on the implementation of Ebola intervention and control measures.

Guineans commended the international community response to Ebola. The vast majority of respondents affirmed that the support and response from the international community enabled a good and efficient management of the Ebola crisis. More than 80 percent rated the response excellent. Yet, some still see room for improvement, especially on issues relating to the coordination of efforts and in helping to mitigate the negative impacts of the EVD at the community level.

## 4.2 Impact on poverty

The analysis of the impact of the EVD on poverty is presented in two stages. The first discusses the impact on poverty in the three countries affected by the disease. The second presents the results in other countries, including Nigeria, Mali and Senegal, which have recorded cases of Ebola in their territory but whose magnitude is significantly below that recorded in the three epicentre countries.

### **Poverty impact in Guinea, Liberia and Sierra Leone.**

Due to the political crisis and the disastrous economic policies over the years in Guinea, and the decade of civil war in Liberia and Sierra Leone, more than half of the population of these countries live below the national poverty line. The proportion of the poor in the population was 52.9 percent in Sierra Leone (2011), 55.2 percent in Guinea (2012) and 83.8 percent in Liberia (2011). However, with the previous economic outlook, a significant decrease in the poverty rate in the three countries was expected. Thus, with a growth elasticity of poverty estimated at -0.74, the incidence of poverty should be 49.78 percent in Guinea, against 31.20 percent in Sierra Leone and 63.47 percent in Liberia in 2016.

However, the Ebola epidemic outbreak will significantly affect the capacity of the countries to achieve their poverty reduction objectives. The available evidence indicates that the epidemic will affect production in strategic sectors such as agriculture and transportation, as well as the informal sector where employees are poorest.

Figure 27 shows that the epidemic will have a significant impact on the incidence of poverty in the three countries. The magnitude of this impact depends on the elasticity of poverty with respect to growth and economic growth rates.

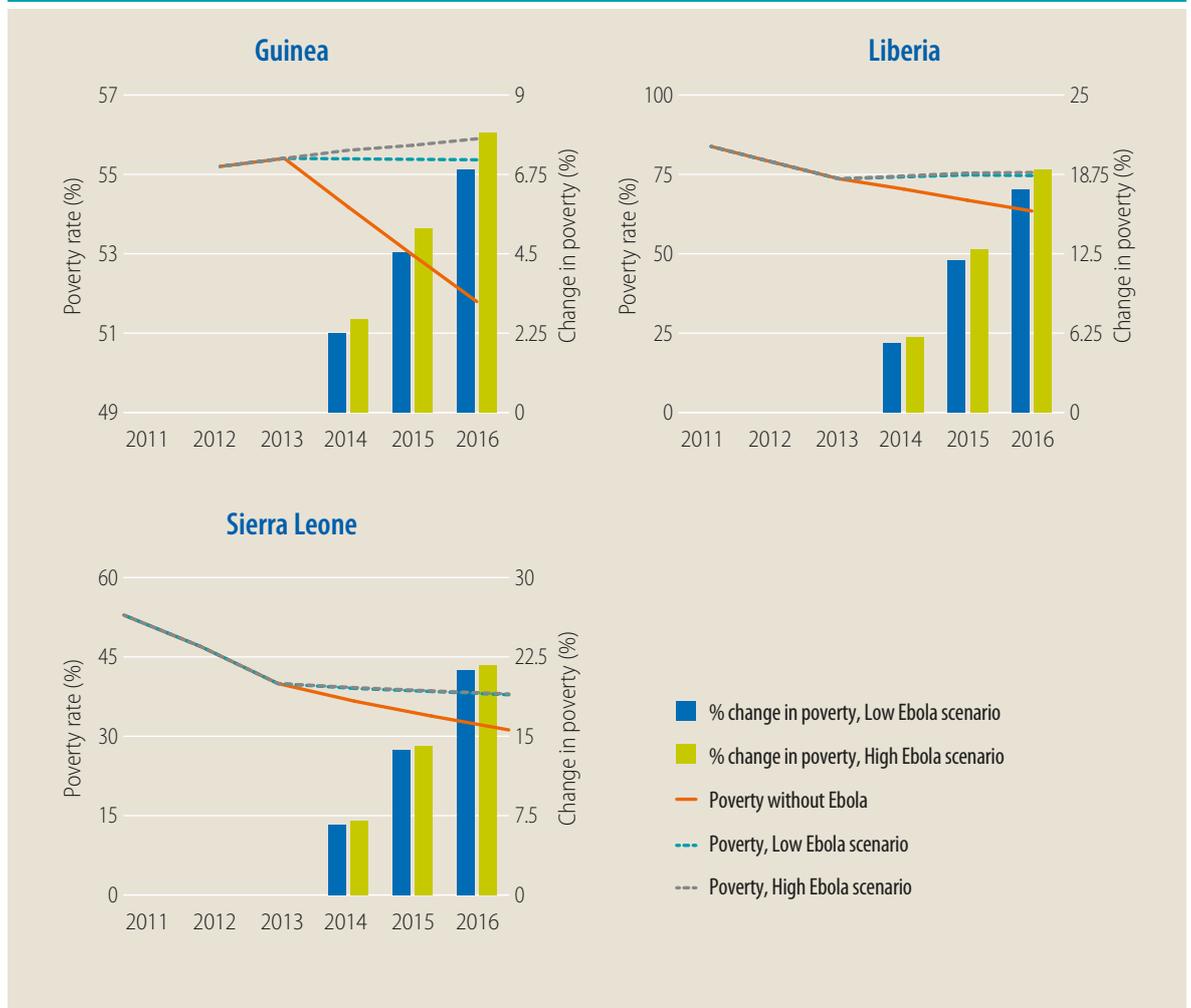
The results for **Guinea** show that, in 2014, the poverty rate increased from 2.25 to 2.65 percent relative to the baseline for the low and high Ebola scenarios, respectively. Despite the modest recovery in economic growth that will start in 2015, it remains very weak and insufficient to reduce poverty. On the contrary, the gap between the level of poverty with and without Ebola will continue to grow in 2015 and 2016. In 2015, it will reach 7 percent in the low Ebola scenario and 7.92 percent in the high Ebola scenario.

The EVD impact on poverty is high in **Sierra Leone**. With the appreciable growth rate in recent years and the bright economic outlook, poverty had started to decline significantly; however, this outlook will be greatly compromised between 2014 and 2016 due to the Ebola epidemic. Its EVD impact will lead to an increase in the poverty rate by 13.76 percent in the low Ebola scenario and 14.11 percent in the high Ebola scenario in 2015, and by 21.29 percent in the low Ebola scenario and 21.79 percent in the high Ebola scenario 2016, relative to the baseline (figure 27).

In examining the estimated results, **Liberia** is also the most affected country in terms of poverty. The poverty situation in the country prior to the outbreak was already alarming – at 83.3 percent in 2011. In 2014, the poverty rate is estimated to have been 5.46 percent higher in the low Ebola scenario and 5.89 percent higher in the high Ebola scenario, both relative to the baseline (no Ebola). The difference in the incidence of poverty between the low and high Ebola scenarios will continue to widen in 2015 (17.58 percent) and 2016 (19.2 percent) (figure 27).

**Poverty impact in the other countries.** The impact of the Ebola epidemic on poverty is also notable in the neighbouring countries of Guinea, Liberia and Sierra Leone. In contrast to Senegal, Côte d'Ivoire, Guinea Bissau and Mali have experienced serious crises, which negatively affected economic growth and exacerbated poverty between 2011 and 2013. Thus, given the economic growth of these countries, the incidence of poverty could be around 50 percent in Côte d'Ivoire in 2011, and 68 percent in Guinea Bissau and 45 percent in Mali in 2013. Although the economies of these countries have started to recover, showing strong performances, particularly in Côte d'Ivoire, the Ebola outbreak could hamper prospects for poverty reduction.

Figure 27: Poverty impact of the Ebola virus disease in Guinea, Liberia and Sierra Leone

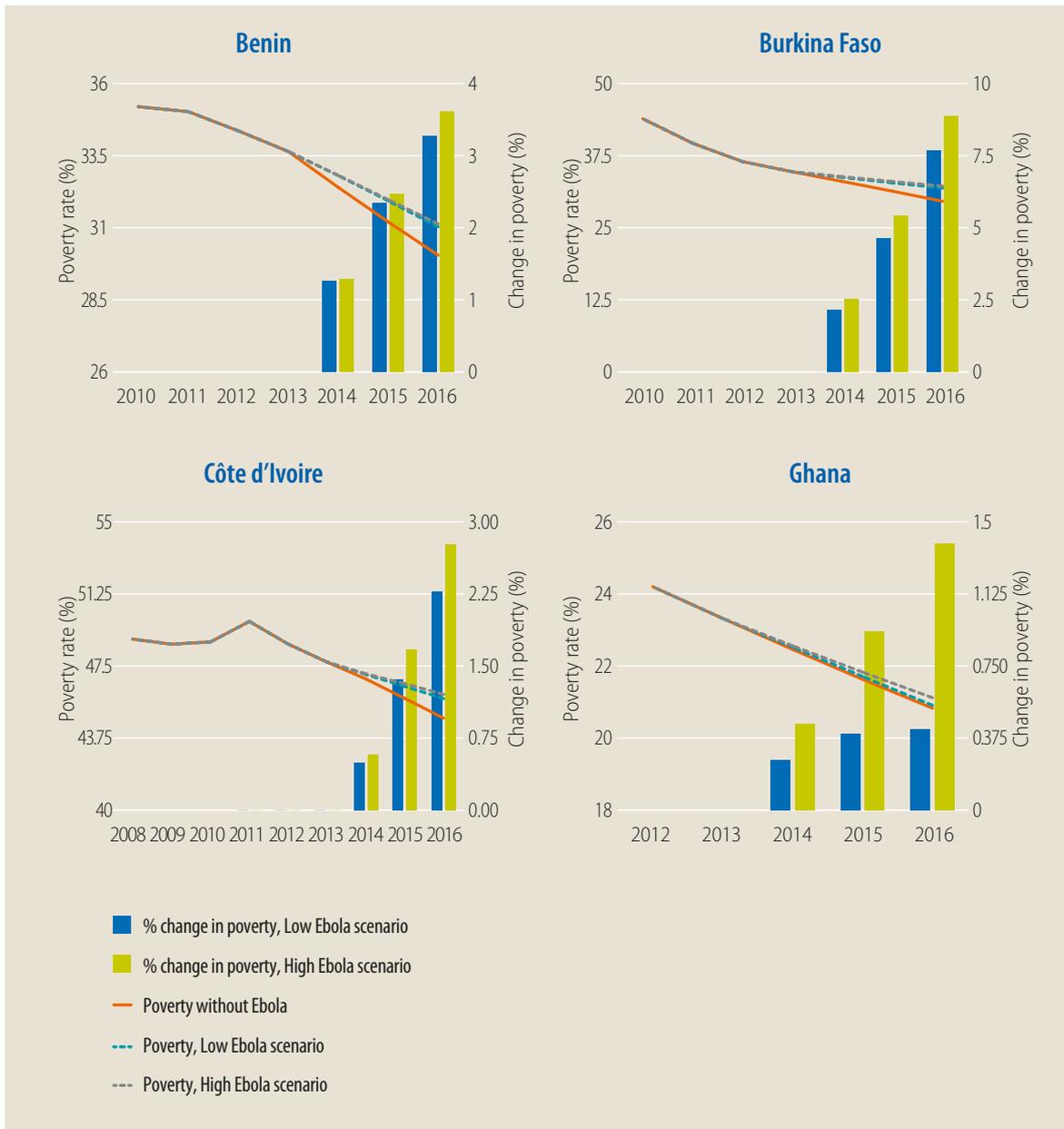


Source: Authors' estimation.

The estimated results indicate that, in 2014, in **Côte d'Ivoire**, the poverty rate has risen by between 0.5 (low Ebola scenario) and 0.58 percent (high Ebola scenario) above what it would have been without Ebola. These figures could reach

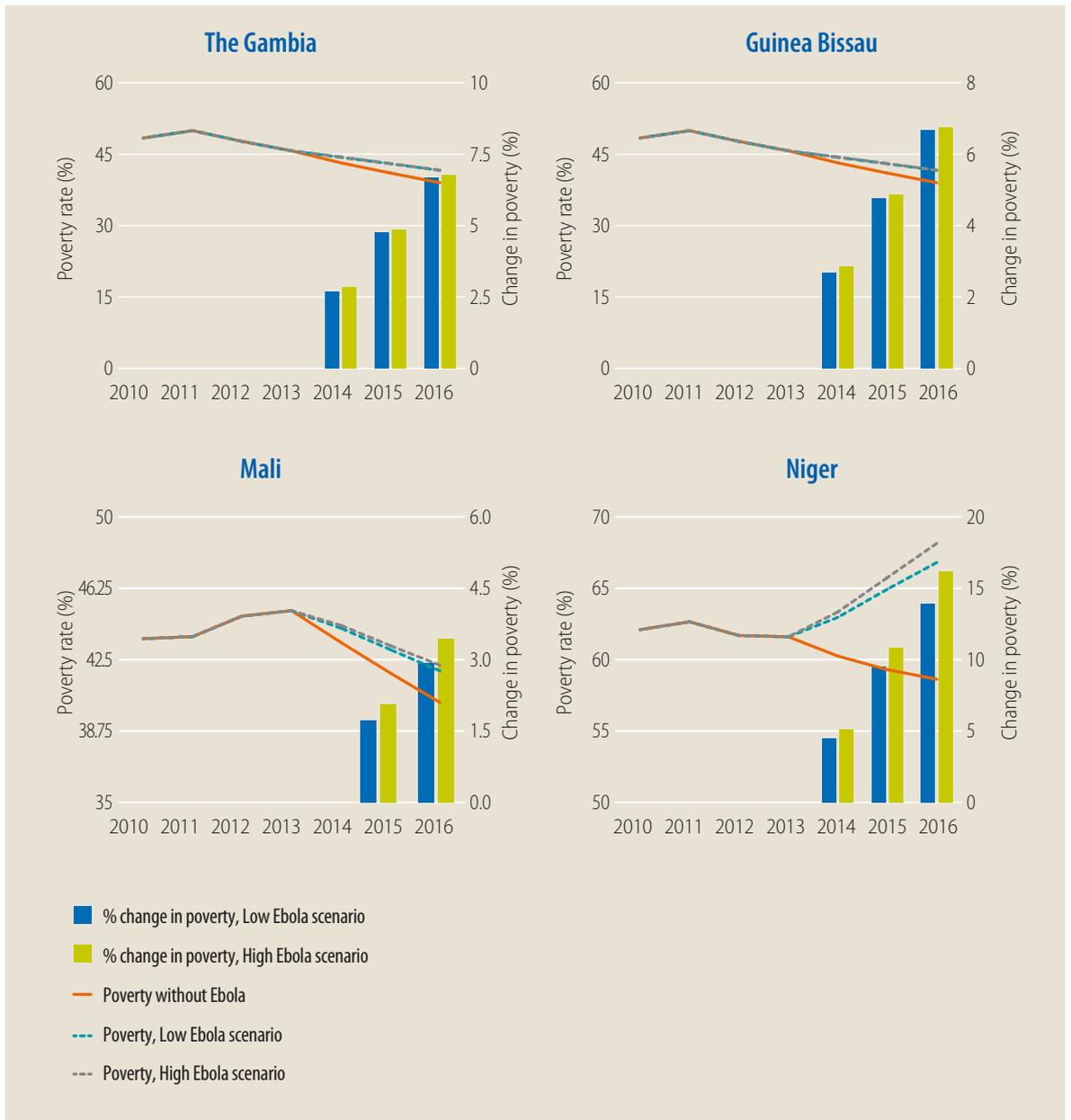
2.27 percent in 2016 (figure 28). In 2016, in **Guinea Bissau**, the poverty rate could rise by about 2.33 percent compared to what it would be without Ebola, assuming a high level of infection (figure 29).

Figure 28: Poverty impact of the Ebola virus disease in Benin, Burkina Faso, Côte d'Ivoire and Ghana



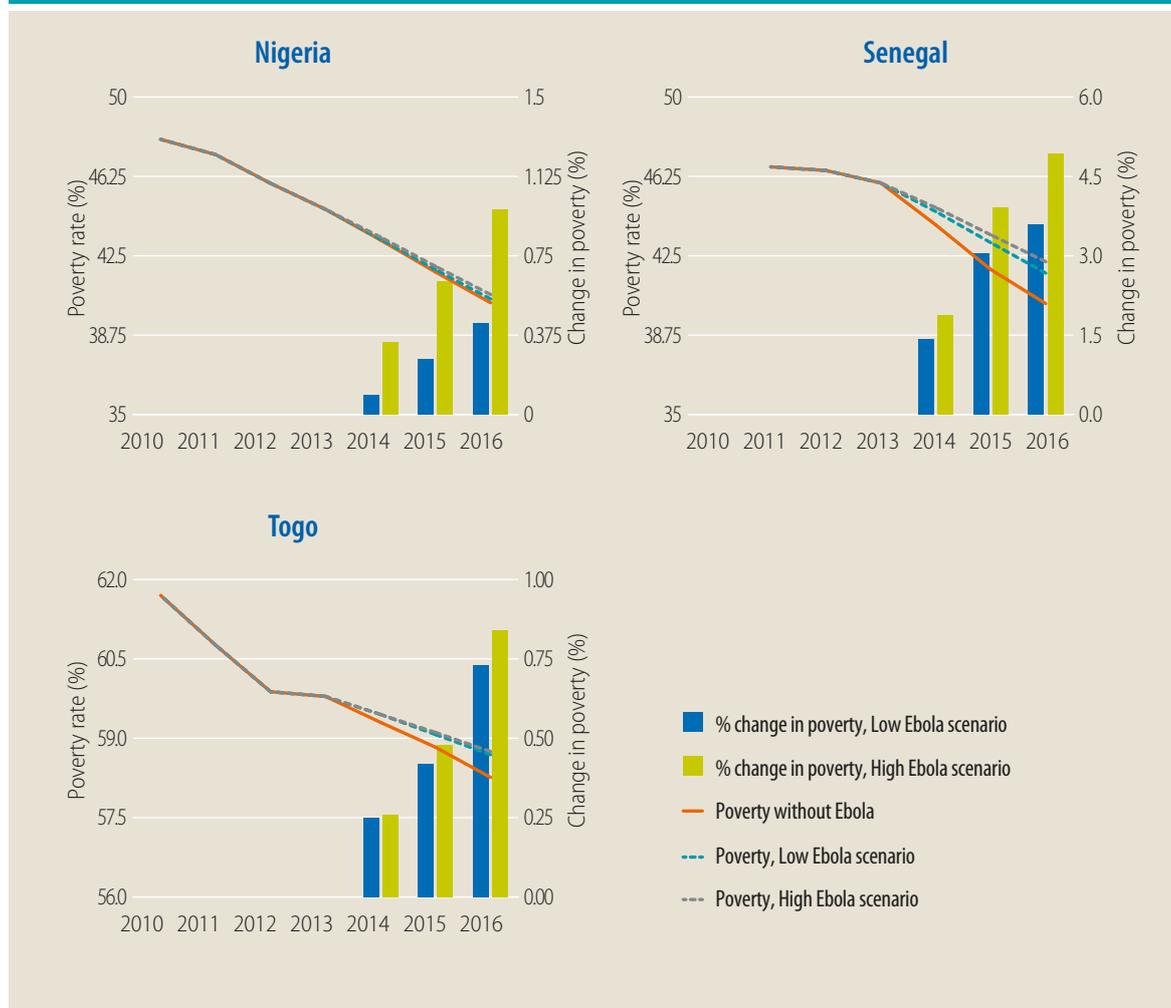
Source: Authors' estimation.

Figure 29: Poverty impact of the Ebola virus disease in The Gambia, Guinea Bissau, Mali and Niger



Source: Authors' estimation.

Figure 30: Poverty impact of the Ebola virus disease in Nigeria, Senegal and Togo



Source: Authors' estimation.

Finally, among the three countries that have experienced political crises at the beginning of the decade, **Mali** will be one of the most severely affected by changes in the incidence of poverty. In 2014, the proportion of poor in Mali's population could increase by 1.72 to 2.07 percent compared to what would be observed without Ebola. In 2016, these figures will rise to 4.12 percent in the low Ebola scenario and 4.88 percent in the high Ebola scenario.

For **Senegal**, in 2014, the proportion of people living below the national poverty line could increase by 1.4 to 1.8 percent. In 2016, these figures could reach 3.59 percent in the low Ebola scenario and 4.92 percent in the high Ebola scenario (figure 30).

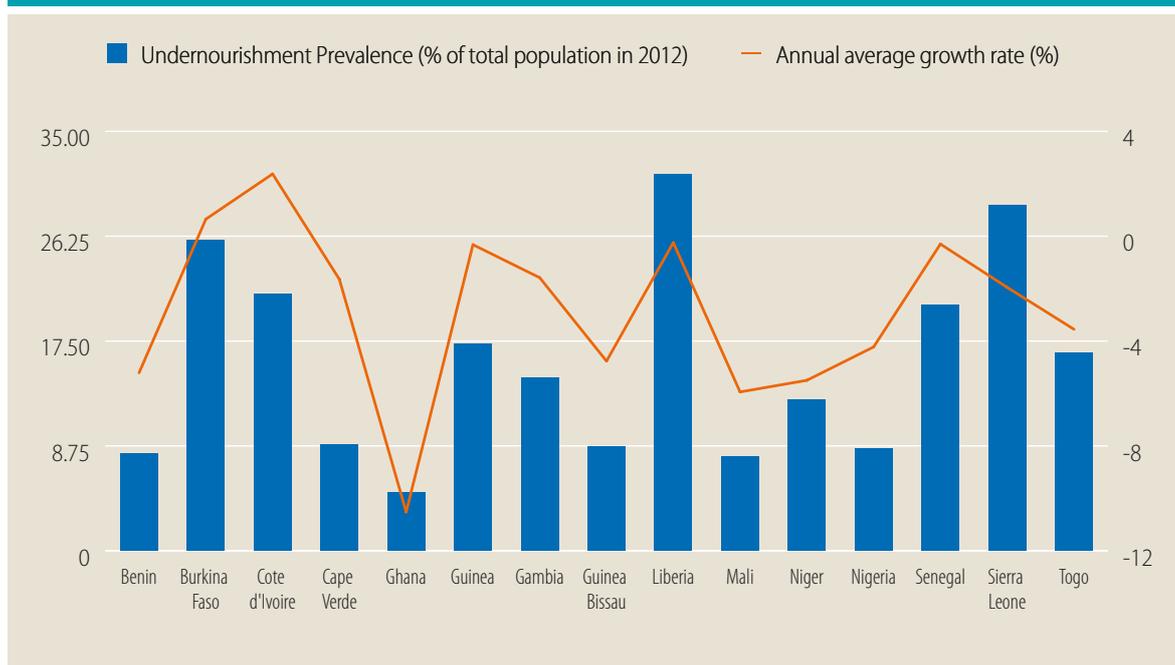
### 4.3 Food security impact of the Ebola virus disease

The food security impact is evaluated with the prevalence of undernourishment measured by the proportion of the population estimated to be at risk of caloric inadequacy. Figure 31 presents the prevalence rate of undernourishment in ECOWAS countries in 2012 and its growth rate between 1992 and 2012.

The prevalence of undernourishment is generally decreasing in the West African region. The most significant progress has been observed in Ghana,

where the prevalence of undernourishment decreased on average by around 10 percent per year between 1992 and 2012. In the same period, there were declines of around 5 percent per year in Niger, Mali and Benin against an annual fall of 4.22 percent in Nigeria. Côte d'Ivoire and Burkina Faso are the only countries where there has been an increase in the prevalence of undernourishment: from 1992 to 2012, it increased by an average of 2.38 percent in Côte d'Ivoire and 0.65 percent in Burkina Faso.

Figure 31: The prevalence of undernourishment in West African countries, 1990–2012



Note for the legend: BEN – Benin, BFA – Burkina Faso, CIV – Côte d'Ivoire, CPV – Cape Verde, GHA – Ghana, GIN – Guinea, GMB – The Gambia, GNB – Guinea Bissau, LBR – Liberia, MLI – Mali, NER – Niger, NGA – Nigeria, SEN – Senegal, SLE – Sierra Leone, and TGO – Togo.

Source: Authors' estimates from FAO food security indicators.

Despite progress, the situation remains serious in most countries, particularly Liberia and Sierra Leone, where undernourishment affected 31.4 percent and 28.8 percent of the population, respectively, in 2012. The undernourishment prevalence rate was above 20 percent in Burkina Faso, Côte d'Ivoire and Senegal in the same year.

Given the impact of the EVD on sectoral output, especially agricultural outputs, and overall economic growth, food insecurity is expected to be deeply affected in a negative way, particularly in the three epicentre countries. The results of the econometric estimation indicate that there is a negative and significant statistical relationship between the undernourishment prevalence rate and the rate of economic growth (see table 13 and figures 32-35).

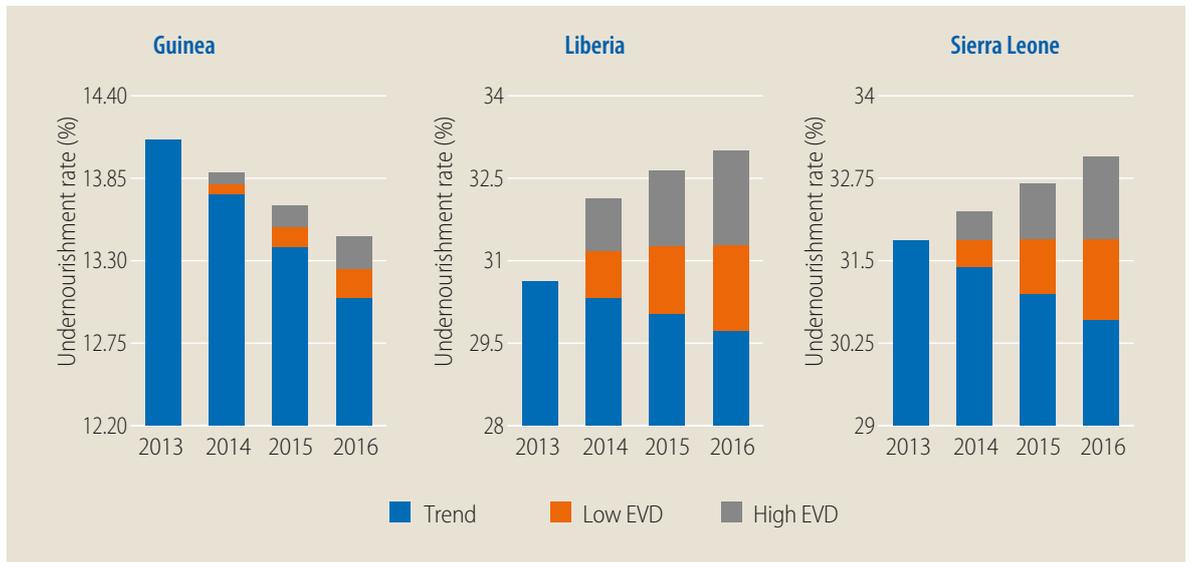
**Table 13: Food security panel data model results**

Log of undernourishment	Coefficient	Std. Err.	t	P> t	[95% Confidence - Interval]	
Log of GDP per capita	-.3901932	.0317976	-12.27	0.000	-.4527775	-.3276089
Log of labour	1.588818	.4351351	3.65	0.000	.7323824	2.445254
Trade openness ratio	.0015213	.0009085	1.67	0.095	-.0002669	.0033094
Burkina Faso	.1389659	.0958749	1.45	0.148	-.0497357	.3276674
Cote d'Ivoire	.5394639	.0850728	6.34	0.000	.3720232	.7069047
Cape Verde	.4678934	.0940117	4.98	0.000	.2828591	.6529278
Ghana	-.0304974	.0742438	-0.41	0.682	-.1766246	.1156298
Guinea	.2174014	.0690204	3.15	0.002	.081555	.3532478
Gambia	.2364316	.0736268	3.21	0.001	.0915189	.3813442
Guinea Bissau	.1271463	.0702	1.81	0.071	-.0110218	.2653144
Liberia	.5622215	.1298036	4.33	0.000	.3067412	.8177018
Mali	.5081266	.1369746	3.71	0.000	.2385324	.7777209
Niger	.477993	.0993169	4.81	0.000	.2825169	.673469
Nigeria	.0801303	.1357143	0.59	0.555	-.1869834	.347244
Senegal	.4327793	.0746103	5.80	0.000	.2859309	.5796277
Sierra Leone	.9007052	.0846185	10.64	0.000	.7341586	1.067252
Togo	.1905544	.0809944	2.35	0.019	.0311406	.3499681
Constant	-1.833065	1.915975	-0.96	0.340	-5.604099	1.937969

Number of obs = 307  
F( 17, 289) = 55.25  
Prob > F = 0.0000  
R-squared = 0.7647  
Adjusted R-squared = 0.7509  
Root MSE = .21909

Source: Authors' estimation

**Figure 32: Impact of the Ebola virus disease on food security in the main epicentre countries**



Source: Authors' estimation.

**Liberia** was the second most affected country in the three countries as of 28 December 2014. In the case of a low level of infection, the prevalence of undernourishment could increase by 2.82 percent in 2014, compared to the trend observed between 1992 and 2012. In the low Ebola scenario, this increase could reach 4.17 percent in 2015 and 5.27 percent in 2016. In the high Ebola scenario, the prevalence of undernourishment increases by 5.80 percent in 2016. These results are consistent with observations that are visible on the ground. In fact, in addition to the worsening of income poverty that reduces capacity to access food, the epidemic has left its mark on the country's agricultural production and marketing systems. The Global Information and Early Warning System on Food and Agriculture (GIEWS, 2014) observed that the areas with high incidences of the EVD are among the most productive regions of Liberia, and that the outbreak of the EVD, together with the restrictions on the movement of people and the supply of labour, has led to serious concerns with respect to food production.

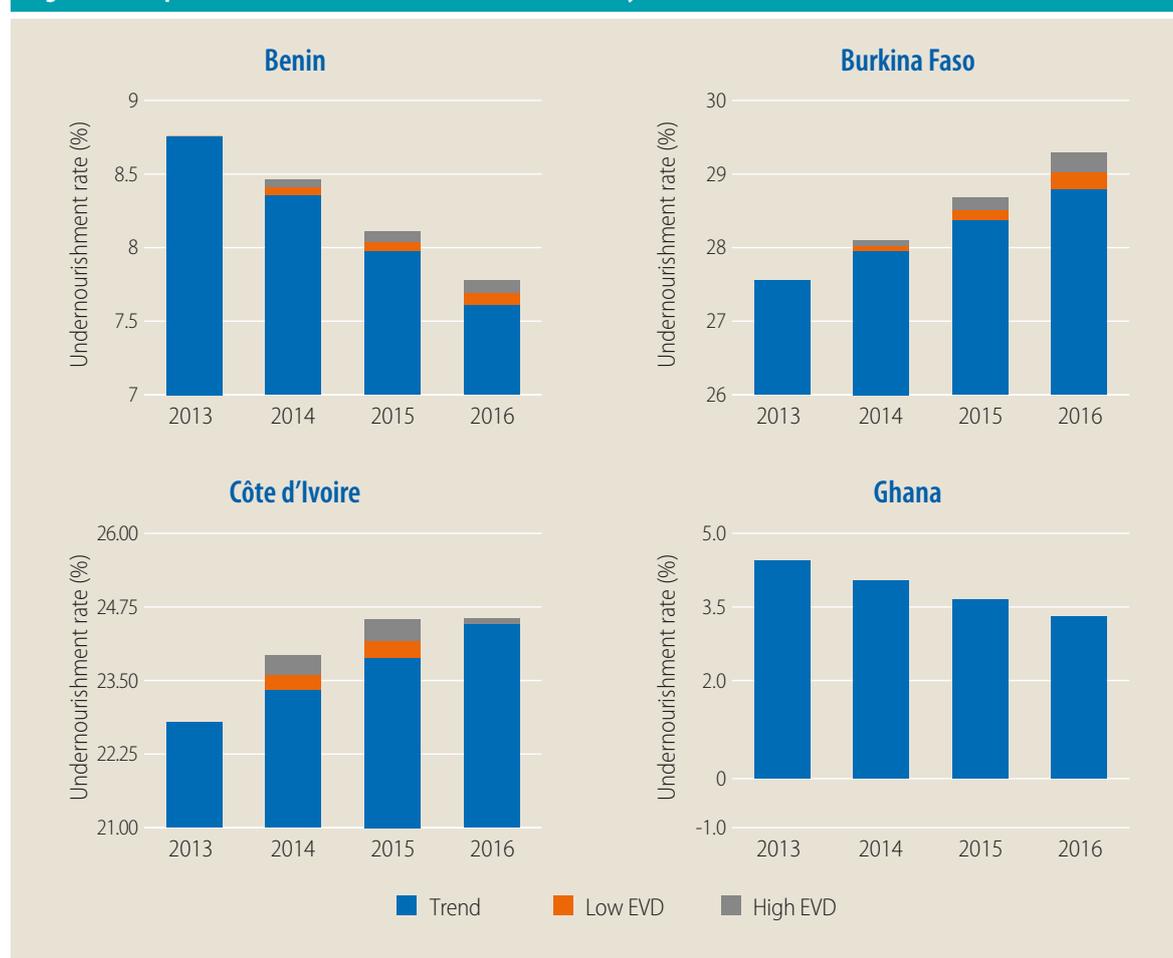
Although the results of the estimation show that the impact of the disease on food security is lower in Sierra Leone and Guinea, these two countries will not be spared from the worsening of food insecurity. In **Sierra Leone**, the epidemic will result in increased food insecurity, with the prevalence of undernourishment rising with the prevalence of infection. Assuming a moderate level of infection, the prevalence of undernourishment will increase by 1.30 percent in 2014 compared to the trend observed between 1992 and 2012; in the high scenario, this increase is by 1.39 percent. These rates will be 4.03 percent and 4.12 percent higher, for low and high scenarios, respectively, in 2016.

**Guinea** will be less affected than Liberia and Sierra Leone. The increase in the prevalence of undernourishment due to the EVD will be 0.49 percent in the low scenario and 0.57 percent in the high scenario in 2014, compared to the trend observed in recent years. These changes in food insecurity could reach 1.50 percent and

1.72 percent, in 2016. However, despite the limited impact on the food insecurity indicator measured at the national level, the most affected regions may experience more difficulties in access to food products of sufficient quality and quantities. Indeed, Guinée Forestière, where the epidemic has been mostly concentrated, experienced a greater disruption of agricultural production and agricultural marketing systems. As a result,

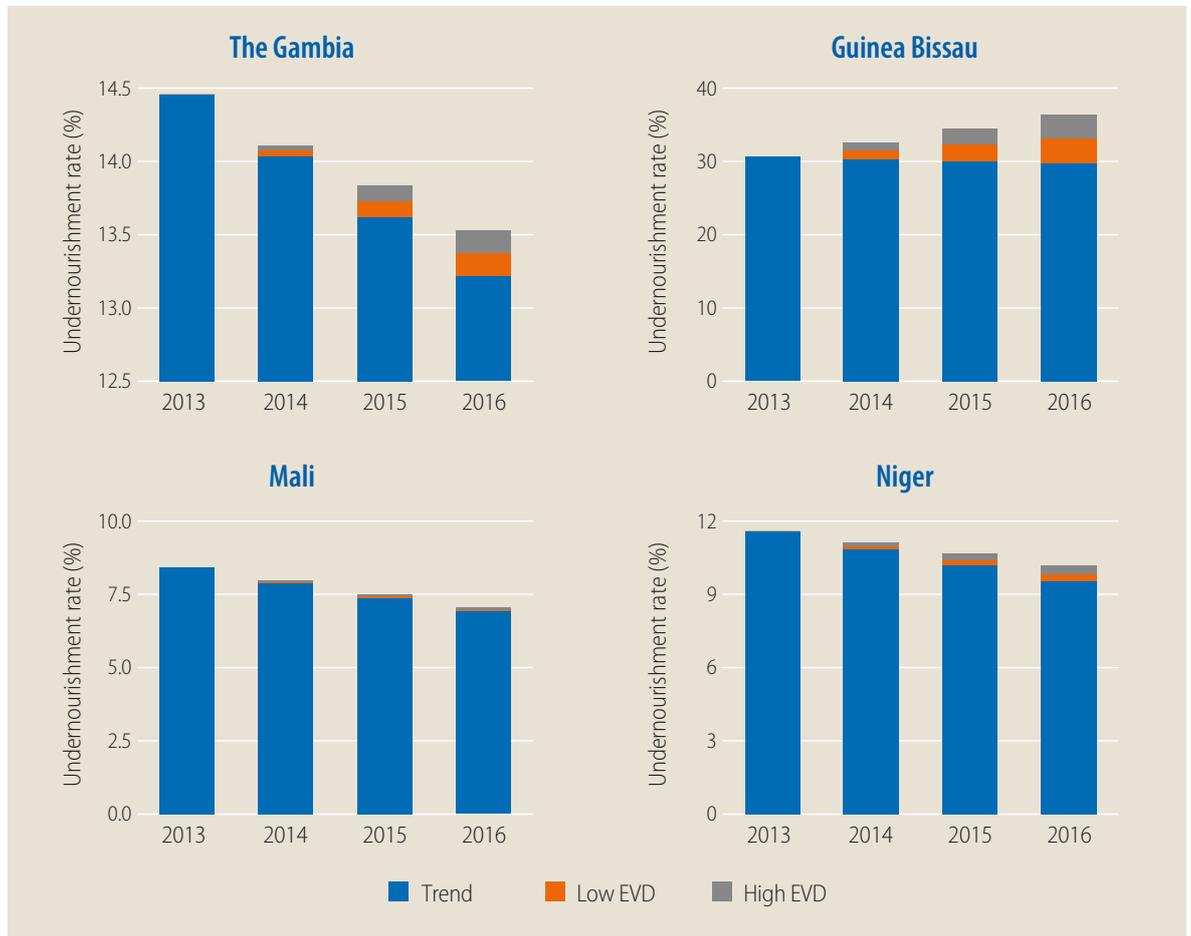
employment and income could be more greatly reduced. Furthermore, Moyenne-Guinée, which is a fruit, vegetable and potato production area, has faced the closure of its border with Senegal in particular. Indeed, much of the production of this part of the country is traditionally exported to Senegal; the border closure has reduced the export opportunities.

**Figure 33: Impact of the Ebola virus disease on food security in Benin, Burkina Faso, Côte d'Ivoire and Ghana**



Source: Authors' estimation.

**Figure 34: Impact of the Ebola virus disease on food security in The Gambia, Guinea Bissau, Mali and Niger**

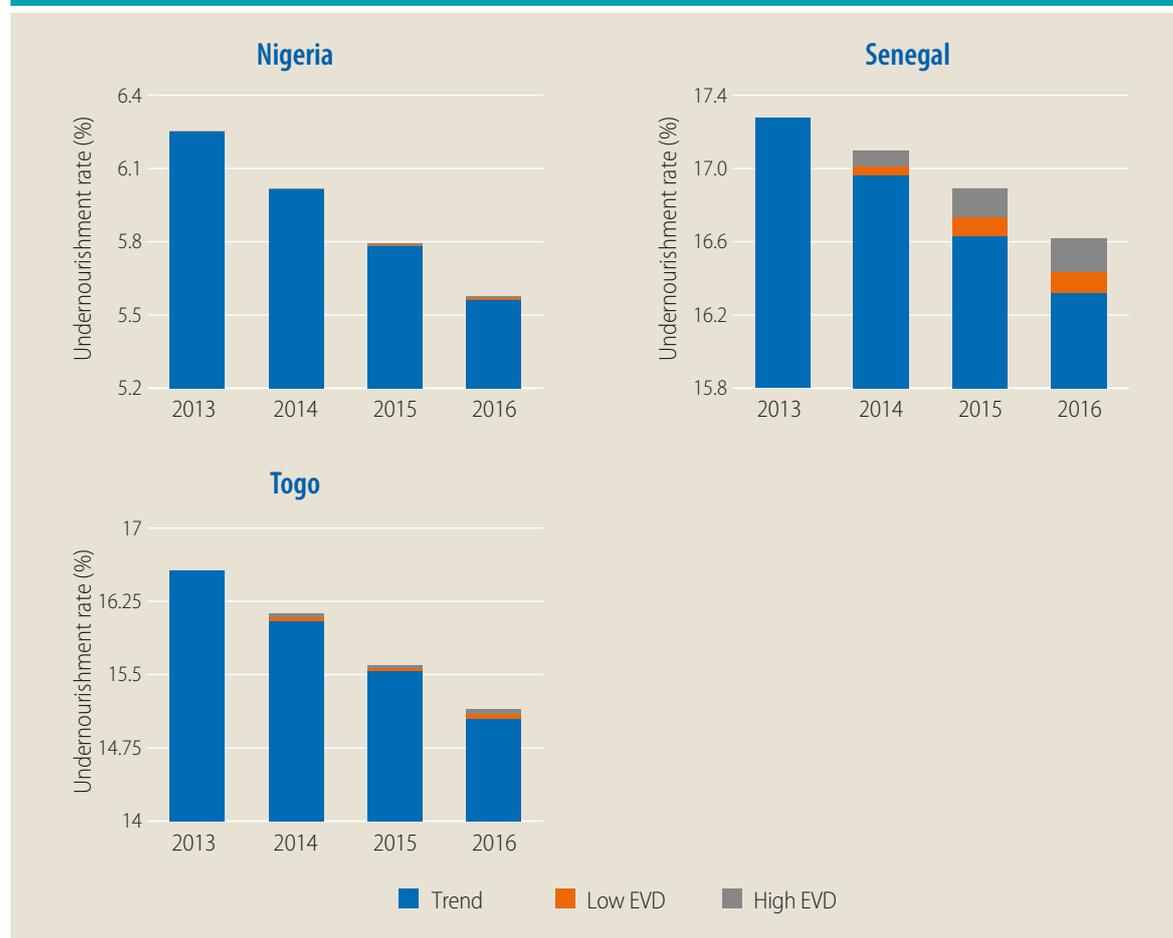


Source: Authors' estimation.

When analysing the other West African countries, it emerges that the magnitude of the impact of the epidemic on food security will be severe in the bordering countries of Guinea, Liberia and Sierra Leone. Being the most vulnerable economically among these countries, **Guinea Bissau** will be most affected by food insecurity. Indeed, the level of undernourishment is estimated to have increased by 3.64 to 3.68 percent in 2014, compared to the observed trend; this increase could reach about 11 percent in 2016.. The country has just ended a crisis that affected the entire agricultural production and food supply systems. This was further compounded by the closure of the southern and eastern borders to Guinea on 12 August 2014.

Despite the weight of its economy and the strength of the economic recovery that followed the post-election crisis of 2010-2011, **Côte d'Ivoire** is the second country where the food security impact has been estimated to be the second greatest. The estimated increase in food insecurity is 1.14-1.39 percent in 2014, compared to the trend observed between 1992 and 2012. However, the situation could improve in 2016, with a lower increase in food insecurity of around 0.45 percent in the case of a high level of infection. The case of Côte d'Ivoire could be explained by its being the largest economy within WAEMU, accounting about 50 percent of intra-WAEMU trade (Philippe and Nayo, 2011). In addition, as the only country in the region that shares borders with two of

Figure 35: Impact of the Ebola virus disease on food security in Nigeria, Senegal and Togo



Source: Authors' estimation.

the three affected countries, and given the level of the informal economy in the region, the negative impact on informal trade and production activities with Côte d'Ivoire could be large. Due to the higher likelihood of contamination by disease, Côte d'Ivoire closed its borders with Liberia and Guinea on 22 August 2014. This is all the more worrying since Côte d'Ivoire, as mentioned above, is one of the most important countries in the sub-region due to its weight in regional trade and due to the potential ripple effect on the rest of the West African economies.

In 2014, **Senegal** and **Mali** recorded a slight increase in the prevalence of undernourishment from 0.52 to 0.19 percent (Senegal) and 0.37 to 0.55 percent

(Mali). In 2016, assuming a high Ebola scenario level, these figures rise to 1.12 percent (Senegal) and 1.13 percent (Mali). However, the most severely affected by food insecurity could be the border areas of these countries, which depend more on cross-border trade.

For the remaining countries, the impact is almost marginal. Only The Gambia recorded an increase in prevalence of undernourishment, which could reach 1 percent in 2016. In Nigeria, Ghana and Togo, for example, food insecurity increased by 0.20 percent, 0.096 percent and 0.36 percent, respectively, in 2016, assuming a high Ebola scenario.



UNDP donated hygiene kits to civil society leaders in Nzérékoré, Guinea for community mobilization and engagement. Photo by UNDP Guinea

## Conclusions and policy recommendations

# 5. Conclusions and policy recommendations

## **This report is unique.**

Unlike previous studies that focused on the three epicentre countries and provided aggregate estimates, this is the first report to undertake an assessment of the EVD for each of the 15 West African countries. It is also the first to assess the socio-economic impacts of the EVD on poverty incidence and food security at the country level. In addition, the estimation approach, which allows for consistency checks, is also different from that of other studies.

**The EVD outbreak in West Africa is highly intense, virulent, complex and challenging.** As of 28 December 2014, there were 20,081 confirmed cases and 7,842 deaths as a result of this disease. The basic reproductive number of 2.5 is the highest ever in the history of EVD globally. Its dimension is more complicated by health workers becoming infected and by the occurrence of a different strain of EVD in the DRC (WHO, 2014). It also impacts on the human rights situation in the region, with significant negative effects on social, cultural, and economic rights of affected populations.

**A combination of factors – ignorance, lack of preparedness of the health system, and fear and distrust – contributed to the rapid spread of EVD.** First, all three countries have recently emerged from civil conflicts or political instability that resulted in countless deaths, economic crises, and a severe deterioration in physical infrastructure and social conditions. Second, health professionals are unfamiliar with the disease, particularly since the symptoms resemble those of other diseases that are endemic in the region. Third, the paucity of knowledge on the disease, combined with

the fear produced by the epidemic, delayed the implementation of simple interventions to prevent deaths. Fourth, the health systems in the region were unprepared for Ebola at the outset of the epidemic. They lacked sufficient amounts of all that is required to contain the epidemic: drugs, ambulances, facilities and trained health personnel, and medical facilities are inequitably distributed between rural and urban areas, thereby limiting access to basic health services in remote areas. Fifth, the fear of being quarantined or being infected at the health centres has discouraged both testing and treatment. And finally, the long-standing cultural practices that people were understandably reluctant to abandon also helped spread the infection.

**Women are heavily affected by the EVD.** In Guinea, the epidemic affects more women than men, a disparity that could be explained by their role within the family as the primary caregivers to the sick, which rendered them more vulnerable. The regional disparity is more pronounced: in Gueckédou 62 percent of the infected people are women and in Téliémilé, 74 percent. When Ebola struck Liberia in August, the proportion of births supervised by a health professional dropped from 52 to 38 percent, and the number of women giving birth in hospitals and health clinics dropped by 30 percent in Sierra Leone, in addition to other impacts on women.

**Some important lessons learned can be drawn from the EVD experience in West Africa and should be factored into its containment, recovery and preventive measures.**

First, addressing public health crisis requires trained specialists with a clear understanding of the associated protocols. Second, culture matters

in addressing emergencies – tackling risky traditional behaviours calls for better appreciation of the context among the traditional and religious leaders, and the community. Third, health is as important as the economy – without a healthy population, promoting a rapid and sustained economic growth is difficult. Fourth, addressing an epidemic like EVD underscores the important of trust between the people and their government. Fifth, leadership matters – political and community leaders must take the lead as champions in dealing with the crisis. Sixth, since Guinea, Liberia and Sierra Leone are heavily affected by the EVD, the economic and socio-economic impacts on unaffected countries are potentially high. And finally, the impact of stigmatization and risk aversion behaviours could be pronounced on the national and regional economy.

#### **Most West African countries are vulnerable to Ebola outbreak.**

The health systems and development outcomes of most of the countries in the region are similar to those in the three epicentre countries. They are therefore not immune from EVD outbreak and thus urgent that they strengthen their health systems, institutionalize preventive measures, and invest heavily in disaster risk reduction and management system. This calls for commitment to the implementation of Abuja Declaration – increasing budgetary allocation to the health sector.

#### **The toll on economic activity is huge.**

One year after the first Ebola case was detected in Guinea, the disease still remained uncontained and continues to decimate the populations of Guinea and Sierra Leone as of 11 February 2015.

The economic situation in these countries is rapidly deteriorating, and the trend is expected to continue until the disease is finally contained and recovery plan rapidly scaled up. Even containing the disease in the epicentre countries does not render other West African countries immune from the socio-economic impact; they have started to feel the impact. Even under the low Ebola scenario, the estimated loss in GDP for the 15 countries in the region is US\$1.8 billion in 2014, which is expected to rise to US\$3.4 billion in 2015 and US\$4.7 billion in 2017. The EVD will reduce GDP growth by 0.8 percentage points on average between 2015 and 2017. A loss in around 1.2 percent of the region's GDP on average poses a serious challenge. The region's per capita income is expected to fall by US\$18.00 per year during the period. Both in terms of GDP and per capita incomes, this result tends to support the need to give priority attention to regional preventive measures and to highly proactive recovery measures in the epicentre countries. The loss of a per capita income of US\$18.00 in a region where most of population live below the poverty line of US\$1.25 per day has serious consequences on the people.

#### **The impact on human development is alarming.**

Many women are now giving birth outside the modern health facilities, thereby making them vulnerable during complex situations. Children in the epicentre countries were pulled out of schools; in Nigeria, the opening of schools was also delayed. The increasing wave of orphans associated with the EVD is also a concern. When they are no longer be cared for by the community, the long-term human development impact could be more complex to address.

### **The Ebola virus disease's impact on poverty is strong in West Africa.**

The expected impact of the accelerated growth on poverty reduction in the years ahead has been wiped out. The impact of the EVD on poverty shows a very strong increase in poverty over the medium-term period in the region, which is much more pronounced in the epicentre countries. Given a low Ebola scenario, poverty is estimated to rise by between 2.3 and 2.6 percent in 2014, and could further rise by 7.1 percent in 2015. The situation is worse in Sierra Leone (13.7 percent in 2014 to 21.8 percent in 2016) and Liberia (17.5 percent in 2015 to 19.2 percent in 2016). The poverty rate in Mali has also been estimated to increase by between 1.7 and 4.1 percent (low Ebola scenario) during 2014-2016. It also affects the poverty situation of the unaffected countries in the region: 0.5 percent (Côte d'Ivoire) and 1.4 percent (Senegal) in 2014.

### **The impact on food security could be very significant.**

The impact of the EVD on undernourishment raises serious concerns over whether the SDGs in the epicentre countries and their neighbours will be smoothly rolled out. Among the epicentre countries, the impact on undernourishment could be higher in Liberia than in Guinea and Sierra Leone. The undernourishment rate will range between a 2.28 and 4.17 percent increase between 2014 and 2016 compared to between 0.5 and 1.5 percent in Guinea, and between 1.3 and 4.0 percent in Sierra Leone. The situation is similar in Guinea Bissau, Côte d'Ivoire and Mali. This calls for a very strong social protection mechanisms for heavily affected people, especially pregnant women and children. The governments, UN agencies, donors, NGOs and other stakeholders should focus more attention on this issue.

### **The anthropological findings confirm the heavy toll of the Ebola virus disease on household economic activities, living conditions and social relations.**

The closure of borders, the lull in private businesses, fear and stigmatization impede households' economic activities. Many people changed their consumption habits and had to eat less than they were doing before the EVD outbreak. Although most people still think family and societal ties remain strong, there is evidence that the EVD is eroding age-long communal behaviours including reduced attendance at ceremonies, adjustment in burial rights, and declined care of family and community members. Feelings of distrust between communities, and between citizens and government are still strong. The health system had been weakened in terms of access to health services including non-Ebola-related services such as family planning, pre- and post-natal services, antiretroviral therapies and treatment of endemic diseases in the region – malaria and cholera. Although most Guineans are optimistic that they will return to normal life in six months to one year, many of them expressed a fear for the future of their family, community and for the whole country. The recovery and future preventive measures must take cognizance of people's feelings and expectations. Effective management of the disease and recovery process will help build trust and confidence in the people and also boost expectations for the future.

### **The UN agencies' programmatic engagements in the affected countries are challenged.**

The spread of Ebola challenges the different UN agencies with extremely difficult trade-offs between the overriding need to stop the epidemic as soon as possible, the urgent need to prevent

affected communities from sinking further into poverty, and the obligation to continue efforts towards achieving long-term development.

**The international community must act very swiftly to avoid a ‘double failure’ phenomenon – the perception of national stakeholders about how the donor community responds to the crisis.**

The United Nations still remains a respected partner in West Africa, but much more is needed in upholding the trust gained from the governments of these countries. The UN agencies must be able to rapidly adapt to new epidemic contexts. This includes improving the upward flow of information related to experiences in other countries, mobilizing partnerships around the containment and early recovery of governments, strengthening coordination among the UN agencies and helping governments to effectively coordinate the global support, among others. UN agencies must also foster information sharing, namely, by making recommendations that will be followed by all communities and by all NGOs in the field. More coordinated actions at the local, national and international levels are a prerequisite for containing the epidemic.

Actions must be strengthened to improve communicating information to communities regarding the nature of the disease, and social and health-related ways to address it. It is important to consider any incentive that would encourage populations to take charge of their situation, in particular, by declaring and preventing the disease. This is needed to avoid ‘double failure’ phenomenon. Given that the international responses were slow in coming right from the

beginning, they need to be very swift and flexible in adapting to the prevailing circumstances in each country. Support must be directed to where it is mostly needed. All efforts should be dedicated for an effective early recovery to further boost people’s confidence in the relevance of the United Nations and its unparalleled support in times of need.

**It is essential to draw on lessons learned from other countries’ experiences.**

The experiences of Nigeria and Senegal have shown that a decentralized health management system can play a very important role in forestalling a repeat of this development in the future. The rapid response witnessed in Nigeria, for example, can be explained by decentralized development efforts where local authorities had the authority to act without a green light from the central government in order to enforce quarantine and other containment measures. UN agencies could also promote better governance of health systems by working toward the establishment of decentralized procedures, which proved effective in containing the Ebola outbreaks in Nigeria and Senegal in 2014.

**But learning from other countries’ experience is not as straightforward as it might first appear.**

Certain country-specific factors, both institutional and cultural, are difficult to replicate, and addressing fear and beliefs is not an easy task. Accordingly, the government can take fast action by organizing awareness campaigns and promoting the critical role of communities in addressing difficult-to-change risky practices.



A UN women beneficiary from the Cross -Border Trade Programme struggling with her business sales in Liberia. Photo by: UN women, Winston P.Daryoue

### **Improved regional and international cooperation is important.**

The experience over the past year in the three epicentre countries has shown that a single country cannot successfully manage the crisis on its own. This unprecedented situation requires exceptional regional solidarity, collaboration and collective actions to save lives, rekindle lost livelihoods, and safeguard peace and security of the region. This is not only important for developing priority actions to improve health systems and ensure access to basic health services in remote areas, but also for helping these countries to address vulnerability and build resilience to shocks. It is essential for each country to play a role in resolving the crisis.

### **The Mano River Union and ECOWAS have a very strong role to play.**

The MRU must continuously mobilize highly effective logistics, operational capability and unparalleled solidarity for early recovery actions and preventive mechanisms (including early warning system), and for building community resilience such as enhanced capacity to manage emergencies. The MRU and ECOWAS should

capitalize on the opportunity provided by the Ebola crisis to address the region's institutional and economic fragility. The Ebola experience highlights the urgent need to rebuilding medical institutions and infrastructure for the next generation. The region must take advantage of the enhanced momentum from development partners and the international community to maximize their support in strengthening the health, education, economic and governance institutions to overcome perennial and emerging development challenges.

### **It is crucial to prepare early warning mechanisms in non-affected countries.**

The health system management in Guinea, Liberia and Sierra Leone is similar to most other African countries. To this end, the Regional UNDG-WCA calls on ECOWAS and the African Union to institutionalize highly preventive mechanisms to forestall a repeat of the current situation in the near future. Current efforts of the African Union in mobilizing solidarity actions from other African countries and partnerships with the private sector should be strengthened.

**The United Nations should work with ECOWAS to ensure that closed borders are reopened and that international stigmatization is addressed.**

Early recovery cannot take root if borders are still closed. The closure of borders may have hurt growth-led investments and disrupted the regional integration process necessary for growth and development. Efforts to ensure that borders are opened should be giving a priority by Mano River Union, ECOWAS as well as UNDP and relevant UN agencies.

**There is an urgent need to move from strategy to concrete actions in the establishment of the regional Centre for Disease Control and Prevention.**

Both ECOWAS and the African Union have initiated the process of establishing these centres at the regional and continental levels. Translating these declarations into functioning centres is key. Strategic actions (short-, medium- and long-term actions) required to make these fully operational are urgently needed. Mobilizing financial resources, expertise, technical support and partnership is ineluctable. In addition, to avoid unhealthy competition, the activities of the regional and continental disease centres must be complementary. The ECOWAS Centre has been mandated to focus on the conduct life-saving research on priority health problems in Africa and to serve as a platform to share knowledge and build capacity in responding to public health emergencies and threats. The African Centre should focus on complementary and high-level mandates for synergy and unity of purpose. Medium- and long-term targets must be set for these centres and mechanisms established for monitoring performance.

**Ebola Solidarity Fund must be managed efficiently and should be transformed into a post-Ebola tropical disease control endowment fund.**

The Ebola Solidarity Fund established by ECOWAS and the 'Stop Ebola' Fund established by the African Union Commission are epochal. Efficient utilization of these resources is critical. Transparent and accountable use of these resources will attract additional funds. This initiative should not end with Ebola; it should be transformed into endowment funds for tropical disease control. The private sector, the United Nations and other international organizations should work with pan-African institutions to make this a reality.

**Widespread vulnerability calls for the implementation of effective safety nets.**

Poverty and food insecurity have increased and have rendered the population vulnerable. Children, who are key actors in development, will be the most affected, partly due to the loss of parents from the EVD. Women are also especially impacted by the epidemic because of their central role in caregiving and in production and trade activities. In addition, the non-agricultural self-employed are also particularly impacted and suffer from high unemployment. Immediate actions could be undertaken to protect these vulnerable populations through effective safety nets that supply resources and activities. However, in the specific context of the EVD epidemic, it is important to properly guide the population to ensure that very strict hygiene rules are observed and that contact between individuals is limited.

Social safety nets have the advantage of both alleviating suffering and reassuring the population by responding to their needs, thereby helping people regain confidence in the government and responding to the crisis. Safety nets could also take the form of targeted actions in certain activity sectors that are more predominantly occupied by women and rural dwellers, especially farming, trading and small-scale businesses.

**An effective social protection mechanism for women and orphans strongly affected by the Ebola virus disease is urgently needed.**

The safety net mechanism should be decentralized so that discharge packages for survivors and compensation for deceased families and orphans are promptly paid. In addition, governments and UN agencies should design a comprehensive and robust programme targeting EVD orphans. Institutional mechanisms must be provided so that women in agriculture and the informal sector can access financial services to protect their livelihoods and food security.

**A strong focus on gender and children in Ebola virus disease recovery plans is important.**

The lessons learned from this epidemic need to be analysed through a gender lens in order to translate them into adequate medical and social responses to meet the specific and differentiated needs of women and men. Children are not only heavily and directly affected; some of them have also become orphans. It is important to ensure that children are not excluded from the recovery process. Specific attention should be given to orphans in the recovery interventions. Re-establishing livelihoods and kinship ties that were functioning before Ebola is also critical to strengthening the resilience of communities.

**It is important to prepare schools for the Ebola virus disease management and regain lost learning hours.**

The total number of learning hours lost to school closures is extremely high. Programmes must be put in place to compensate for this loss. The reopening of schools should be complemented with back-to-school programmes that focus on teacher training on school safety, hygiene education and school sanitation as well as psychosocial care.

**Fear and ignorance must be overcome through better communication.**

The psychological factors, including fear, must be addressed through better communication and restored trust between populations and care organizations. Strategic and consultative awareness creation is needed to address risky practices such as burial rights. In this respect, traditional and religious leaders have a significant role to play. They must first understand the need for changes in attitudes and risky behaviours. This also requires improved coordination between non-governmental organizations (NGOs), traditional and religious leaders, and government agencies.

**Community engagement is a key factor that has contributed to the success of the control measures.**

Implementation of early and medium-term recovery must leverage community engagement. The support must be integrated into positive cultural values of society. To this end, traditional and religious leaders must be effectively consulted for such interventions to be owned, accepted and successful. Community involvement is an ethical imperative.

**Priority should be given to drawing on the lessons learned from EVD response to upgrade the quality of the health system across the region.**

Leveraging the enhanced capacity of the affected countries to deliver improved health services across the various endemic diseases affecting the region is key. The Sierra Leone experience shows how laboratory capacity could be strengthened to deliver quality services through better clinical management services. In less than six months, 11 operating laboratories were equipped and staffed to process 700 samples per day. The government-run Hastings Ebola Treatment Centre where six out of every ten treated patients fully recovered is a very good example. The rapid improvement of data quality and reporting mechanism that supported control measures is also commendable. This capacity should not be allowed to erode; it should be integrated into the health development systems in these countries. Even when the outbreak is finally contained, the EVD services and facilities should be dedicated to the region's endemic diseases such as malaria, cholera and Lassa fever. These diseases should be fought with the same vigour and commitment. It is evident, however, that the international capacity to deal with large and geographically dispersed epidemic is limited. This calls for a scaled global preparedness and an urgent need for an Ebola vaccine.

***It is imperative for governments to lead the recovery process.*** Governments and local actors have a significant role to play in the recovery process. To ensure sustainability, ownership and capacity strengthening, the international

organizations should work with them to mobilize resources for this process. They should be supported to effectively coordinate and lead the implementation of the recovery programme.

***The Ebola heroes should be acknowledged and appreciated.*** Four sets of heroes emerge from the fight against Ebola: the Ebola survivors who fought the disease with courage; the international organizations that persistently stayed with the countries when others fled (e.g. the UN agencies, MSF and Red Cross/Red Crescent); the donors that made financial contributions to the containment of the pandemic (e.g. USA, UK, Germany, World Bank and France); and countries that contributed health personnel (e.g. Cuba, China, Nigeria, Ethiopia and Uganda). The UN, the African Union, ECOWAS and the three epicentre countries should duly appreciate these actors. These heroes should also support the recovery process in the heavily affected countries and help to institutionalize preventive measures in the unaffected countries in the region.



After being kept closed for three months due to the Ebola outbreak, schools across Guinea reopened on 19 January 2015. Photo by UNMEER/Martine Perret



The Western Area Emergency Response Centre in Freetown established to control the rate of infection and stop the spread of the disease in the region. Photo by UNMEER/Martine Perret

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A woman in a soap cooperative in Kankan, Guinea. Photo by UNDP/Anne Kennedy

# Annexes

# Annexes

## Annex 1. The non-linear two-stage least square techniques

This model uses non-linear two stage least square techniques. It uses Bloom and Mahal's (1995) approach by building a model that captures the potential effect of the Ebola virus disease (EVD) on economic production. The model is specified as follows:

$$Y_{it} = \alpha + \gamma_{i1} Y_{i(t-1)} + \gamma_{i2} Y_{i(t-2)} + \beta_i X_{it} + \delta Z_{it}^j + \varepsilon_{it} \quad (1)$$

Where:

I equals 1 to 15, representing the 15 West African countries

T represents the time period

$\gamma_i$  is a vector of parameters

$Y_{it}$  is the real gross domestic product per capita (GDP)

$\alpha$  is a constant

$\beta_i$  is a vector of parameters

$X_i$  is a set of explanatory economic variables that determine  $Y_{it}$

- the total labour force
- education
- openness
- current account balance as a percentage of GDP

$\delta$  is the coefficient of the variable that captures the influence of Ebola

$P_{it}^j$  is the probability for a country to detect an Ebola case under scenario j (j= no Ebola, Low, High).<sup>31</sup>

It represents the probability of having an EVD case in the next 30 days under either a no Ebola scenario, a low or a high Ebola scenario.

The estimation of equation (1) allows to define the coefficients of GDP per capita for each country. Using forecast values of the explanatory variables, one can forecast the level of production per capita with and without EVD.

<sup>31</sup> There is a dummy variable, which is 1 for Benin, Burkina-Faso, Cape Verde, Niger and Togo; and 0 otherwise. These five countries have not been assigned probabilities for Ebola scenario in the World Bank report. We have assumed that they have the same probability distribution as similar countries. For Benin, Burkina Faso and Togo, we have used the probability distribution of Côte d'Ivoire. For Cabo Verde and Niger, the probabilities for Guinea-Bissau and Senegal have been used respectively.

## Annex 2. Methodology of the EVD Probability estimation

Using the probabilities of seeded cases in the next 30 days from the World Bank report on the economic impact of the 2014 Ebola epidemic, this report simulates probabilities of having Ebola cases under low and high Ebola scenarios for each of the 15 West African countries.

We assume that each country began to implement safety measures to prevent the transmission of Ebola just after the first seeded case occurs in this country or in neighbourhood countries. However, given the speed of spreading of Ebola, number of new cases may rise and reach a peak before decreasing. Hence, the EVD prevalence probability has increased from the date of the first case to the date the peak was reached. After the peak date, the probability of any new seeded cases is a decreasing function of the initial measured probability and the efficiency of the intervention measures set up in the country.

In each country, there were different specific and even hidden factors, which contributed to the apparition of Ebola; i.e. the actual Ebola events probably result from different pre-existing living, sanitation and medical conditions. Therefore, we assume in addition that prior to the first case, the probability of having Ebola events is not zero. Furthermore, according to epidemiologist practice, the transmission rate for an epidemic disease can be modelled as follow:

$$\beta_{it} = \beta_{0i} e^{-k_i \tau} \quad (2)$$

Where:

$k_i \geq 0$  measures the efficiency of the intervention or control measures set up to limit the spread of the epidemic disease. It represents the control factor.

$\tau$  is the duration between the time the transmission rate is measured and the initial time the intervention started:  $\tau = t - t_0$

$\beta_{it}$  represents the rate of transmission of the disease at time  $t$  in the population of country  $i$ .

$\beta_{0i}$  is a constant which represents the initial rate of transmission of the disease in country  $i$  before any intervention.

If there is no intervention to control the disease, the control factor is 0 and the rate of transmission in the population will stay constant over time. In this case, the rate of transmission of the disease at any time will be  $\beta_{it} = \beta_{0i}$

If the intervention is efficient, the control factor will be high, and the transmission rate will decrease exponentially. If a country maintains its control factor constant, the transmission rate will become zero as time increases.

Based on the discussion above, the distribution of the probability of EVD prevalence was modelled. Ebola follows an exponential function dynamics over time with a control factor, which varies from one country to another. For each scenario, either high or low Ebola scenario, the probability of a new Ebola case in country  $i$  at time  $t$  is given by:

$$P_{it} = \begin{cases} P_{i0} e^{k_i(t-t_{i0})} & \text{if } t_{i0} \leq t \leq t_{peak} \\ P_{t_{peak}} e^{-k_i(t-t_{peak})} & \text{if } t \geq t_{peak}, \\ P_{i0} e^{-k_i(t_{i0}-t)} & \text{if } t \leq t_{i0} \end{cases} \quad (3)$$

Where:

- $t_{i0}$  is the initial date. In this study it is equal to the month the first case of Ebola occurs in country  $i$ . In the case the country never experiences Ebola, we use the initial date observed in the nearest country with effective Ebola cases.
- $t_{peak}$  is the date of the highest probability. This report assumes that the Ebola situation will not worsen in the future. Therefore, the highest probability is equal to the estimated probability for November 2014 reported in the World Bank report.
- $k_i$  is the control factor set up in country  $i$  to fight Ebola.
- $P_{i0}$  is the probability at the first occurrence date  $t_{i0}$ , of having Ebola cases during the next month.

### Annex 3. Modelling food security and poverty incidence

To assess the social impact of the EVD, the model focuses on food security and poverty aspects. Two approaches are used for this purpose. The analysis of the impact of the EVD on poverty is based on the approach developed by Son and Kakwani (2004) applied to Côte d'Ivoire by Aka and Diallo (2009). Based on the results of the EVD impact on economic growth, we estimate a link with poverty indices starting from the equation below:

$$\frac{dP_{\alpha}}{P_{\alpha}} = \eta_{\alpha} \frac{d\mu}{\mu} + \varepsilon_{\alpha} \frac{dG}{G} \quad (4)$$

Where  $P_{\alpha}$  is the FGT index,  $\alpha$  is the mean income of the population and  $G$  is the Gini index. We assume that the mean income of the population grows at the same rate as the GDP per capita. We also assume that, in the short term, change in income distribution will be negligible so that the change in poverty is mainly due to the change in the average income of the population. This therefore yields:

$$\frac{dP_{\alpha}}{P_{\alpha}} = \eta_{\alpha} \frac{d\mu}{\mu} \quad (5)$$

where  $\eta_{\alpha} = \frac{dP_{\alpha}}{P_{\alpha}} \times \frac{\mu}{d\mu}$ , the growth elasticity of poverty.

It follows that:

$$P_{\alpha,t+1} = (1 + \eta_{\alpha} \frac{d\mu_t}{\mu_t}) P_{\alpha,t} \quad (6)$$

The growth elasticity is from Kouadio, Gbongué and Ouattara (2006) for Côte d'Ivoire, Boccanfuso and Kaboré (2003) for Burkina Faso and Senegal, and Chukwu (2014) for Nigeria. For the other West African countries, the estimate of Anyanwu (2013) for sub-Saharan Africa is used. Combining the growth elasticity with the results of the EVD macro-economic impact model, we can estimate the poverty effect of the epidemic.

Combining this result with that of the macro-economic model, we determine the path of food security indicators for each of the scenarios of evolution of the epidemic. Thus, we can calculate the difference between the path of food security indicators with and without Ebola.

For this purpose, we start from the assumption that without Ebola, food security indicators will follow the pre-outbreak trend. Next, we determine the relationship between the food security indicators and the growth rate of GDP per capita using an econometric model.

Following Stavvytsky and Prokopenko (2014), a panel data model is used to estimate the relationship between food security and GDP per capita. A panel data regression method gives the possibility to get robust estimates and to indicate some special features for each country. The developed fixed-effect panel data model takes the following general form:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \mu_{it} \quad (7)$$

Where:

- $\alpha_i$  ( $i = 1 \dots n$ ) is the unknown intercept for each country  $i$  ( $n$  entity-specific intercepts);
- $Y_{it}$  is the dependent variable (DV) where  $i =$  entity and  $t =$  time;
- $X_{it}$  represents one independent variable (IV);
- $\beta_1$  is the coefficient for that  $X$ ;
- $\mu_{it}$  is the error term

The estimated model is as follows:

$$Lfpundn_{it} = \beta_0 + \beta_1 Lgdper_{it} + \beta_2 Llaborilo_{it} + \beta_2 trade_{ratio\_openess}_{it} + \sum_{i=2}^{15} \gamma_i E_i + \mu_{it} \quad (8)$$

Where:

- $Lfpundn_{it}$  represents the log of the undernourishment rate in country  $i$  at time  $t$ ;
- $Lgdper_{it}$  is the log of GDP per capita in country  $i$  at time  $t$ ;
- $trade\_openess\_ratio_{it}$  is the trade openness ratio in country  $i$  at time  $t$ ;
- $E_i$  is the country  $i$ . Since they are binary (dummies),  $n-1$  countries are included in the model. In this case, we have 14 countries.
- $\gamma_i$  is the coefficient for the binary repressors (countries).

The slope coefficient on an IV is the same from one entity to the next. The entity-specific intercepts in [eq.7] and the binary regressors in [eq.8] have the same source: the unobserved variable  $Z_i$  that varies across countries but not over time.

## Annex 4. Variables and data

The main dependent variable is the real gross domestic product (GDP) per capita.

The main explanatory variables used to estimate the GDP per capita function are:

- the labour force, which is the percentage of the total population that is working;
- the savings rate, which is measured by the ratio of the public investment to GDP;
- human capital accumulation, which is measured by the rate of secondary education enrolment;
- the size of the economy, which is measured by the one-period lag level of per capita GDP;
- the openness of the country.

The prevalence probability for EVD is calculated using data of the World Health Organization (WHO) on EVD prevalence probability for each West African country.<sup>32</sup> To capture the country's ability to quickly tackle Ebola transmission, two health-related variables were used:

- improved sanitation facilities, which measures the percentage of the population using improved sanitation facilities. This variable captures the level of risk of EVD contamination;
- health expenditures per capita (or health expenditures as a percentage of GDP), which aims at measuring the health system financing; it represents an indicator of the country's ability to quickly allocate sufficient financial resources to protect the population in the case of hazard events such as EVD.

To estimate the macro-Ebola model, the main constraints are the availability of data for forecasting GDP per capita. This constraint reduces the forecast horizon. Hence, the estimation of the impact of the EVD is done over the period 2014-2017. For some countries (e.g. Sierra Leone, Guinea Bissau), it is not possible to estimate the impact through to 2017 due to a lack of data.

The data used for this estimation are from the World Development Indicators (WDI) of the World Bank, covering the period 1980-2013 for the historical data. These data allow to estimate the GDP per capita. For the forecast of 2014-2017, this report uses the data from the forecast carried out by the IMF for each of the 15 West African countries. These data allow to calibrate the GDP per capita function and then to forecast the impact of the EVD on GDP per capita. Three models are estimated. The first model is the case with no Ebola, which is the baseline model. Two models are then estimated: the low case EVD model and the high Ebola scenario model.

<sup>32</sup> Benin, Burkina-Faso, Cape Verde, Niger and Togo. These five countries have no assigned probabilities for the Ebola scenario in the World Bank report. This report has assigned the probability distribution of similar countries.

## Annex 5. The two sector model

Following Cuddington and Hancock (1993a), we assume a two-sector economy with formal and informal sectors. The formal sector is capital-intensive, whereas the informal sector is labour-intensive. Jobs in the formal sector are preferred by workers since the formal sector wage, in the short term, is higher than in the informal sector. Workers in the informal sector are mostly self-employed.

### The formal sector

We consider a Solow growth model framework where the main production factors are capital and labour.

**Labour supply.** The EVD is having a dramatic consequence on population size. We will be using population forecast by five-year age cohort  $i$ . If  $N_{it}$  is the population in age cohort  $i$  at the time  $t$ , total labour supply at time  $t$  is:

$$L_t^S = \sum_{i=15}^{64} p_i N_{it} \quad (9)$$

Where  $p_i$  is the labour participation rate for a population cohort  $i$ .

In absence of empirical estimation of the labour force participation in the countries of our interest, we assume that  $p_i = 0$  for  $i < 14$  and  $i > 64$ .

What would be the effect of the EVD on the average experience level of the labour force? In the case of EVD, the productivity of a labourer is taken to be a quadratic function of work experience. In the case of the EVD, the productivity of an individual who has contracted the disease will be low. Indeed, with the high death rate of the disease, the productivity of anyone who died from the EVD will be zero, while for survivors, the productivity will be low and there is no guarantee of a return to work. In this case,

$$\rho_i = \rho_1 + \rho_2 (i-15) + \rho_3 (i-15)^2 \quad (10)$$

with  $\rho_1 = 0.8$ ,  $\rho_2 = 0.02$  and  $\rho_3 = -0.0002$

**The production function.** The formal sector production function at time  $t$  is represented by a simple Cobb-Douglas technology function:

$$Y_{Ft} = \alpha_F \gamma_F^t E_{Ft}^{\beta F} K_{Ft}^{1-\beta F} \quad (11)$$

Where:

F denotes the formal sector,

t the time period,

$\alpha$  represents a constant scale factor that will be adjusted to calibrate the model in the first year (2000),

$\gamma^t$  is the change in technology over time,

$\beta$  is the output elasticity of the labour factor, i.e. the labour share of national output,

$E_F$  is the labour demand measured in efficiency units,

$K_F$  is the capital demand measured in efficiency units.

$$E_{Ft} = \sum_{i=1}^{64} \rho_i (1 - za_{it}) L_{Fit} \quad (12)$$

Where:

$a_{it}$  is the proportion of the labour force age  $i$  with the EVD at time  $t$ ,

$L_{Fit}$  is the number of workers of age  $i$  at time  $t$  in the formal sector,

$z$  is the fraction of an Ebola patient's work years lost due to the disease. With the characteristics of the EVD, it is natural to assume that  $z=1$  since, unlike the HIV/AIDS, anybody with the EVD may not be able to resume work.

**Labour demand.** For simplification, it is assumed that no firm discriminates with respect to age or potential EVD status. Indeed, anyone who knows they have the EVD will not apply for a job since the disease progresses rapidly. There is then no need to discriminate against the EVD. Hence, the production function can be rewritten as:

$$Y_{Ft} = \alpha_F \gamma_F^t (\bar{\rho}_t L_{Ft})^{\beta_F} K_{Ft}^{1-\beta_F} \quad (13)$$

The efficiency unit of labour at time  $t$  equals a cohort-weighted average of EVD exclusive productivity factors.

$$\bar{\rho}_t = \sum_{i=15}^{64} \rho_i (1 - za_{it}) \frac{L_{it}}{L_t} \quad (14)$$

It has to be noted that the labour efficiency factor (14) will change over time and as the composition of the labour force  $\frac{L_{it}}{L_t}$  and the EVD prevalence rate change. Both a rise in  $a_{it}$  and the shift in the labour force contribute to the decline in labour efficiency over time.

Each year, since the firm knows the unit price of labour ( $w_t$ ), it chooses the number of labour units to hire to maximize its profit. Hence, the labour demand will depend on the prevailing real wage and the existing capital stock.

$$L_{Ft} = \phi_{Ft} K_{Ft} \quad (15)$$

Where:

$$\phi_{Ft} = \left[ (\alpha_F \gamma_{Ft} \beta_F \bar{\rho}_{Ft}^{\beta_F} / w_t) \right]^{1/(1-\beta_F)}$$

It has to be noted that, given the wage and capital stock, an increase of the EVD prevalence reduces labour productivity. The output supply function for the formal sector is determined in the usual way by substituting labour demand from (15) into the production function (13).

### The informal sector

**Production function.** Production in the informal sector uses labour and capital with a Cobb-Douglas technology specification.

$$Y_{It} = \alpha_I \gamma_I^t (\bar{\rho}_t L_{It})^{\beta_I} K_{It}^{1-\beta_I} \quad (16)$$

Where:

$$\bar{\rho}_t = \sum_{i=1}^{65} \rho_i (1 - z_{a_{it}}) \frac{L_{it}}{L_t} \quad (17)$$

The informal sector is assumed to be more labour-intensive than the formal sector ( $\beta_I > \beta_F$ ).

The behaviour of informal firms is different from the formal sector. It is assumed that total income is divided among all informal sector workers. Hence, each worker receives:

$$y_{It} = \frac{Y_{It}}{L_{It}} = \alpha_I \gamma_I^t \bar{\rho}_t^{\beta_I} \left( \frac{K_{It}}{L_{It}} \right)^{1-\beta_I} \quad (18)$$

This assumption is made since a large share of informal production is produced by family enterprises whose family members share household output.

### Capital accumulation

In an epidemic situation, the government will increase medical expenditures by cutting domestic savings or by receiving other financial support. Total domestic savings in year  $t$ ,  $S_t$ , and the capital accumulation  $K_t$  have the following expressions:

$$S_t = sY_t - xH_t \quad \text{and} \quad K_t = (s + s^*)Y_t - xH_t + (1-\theta) K_{t-1} \quad (19)$$

Where:

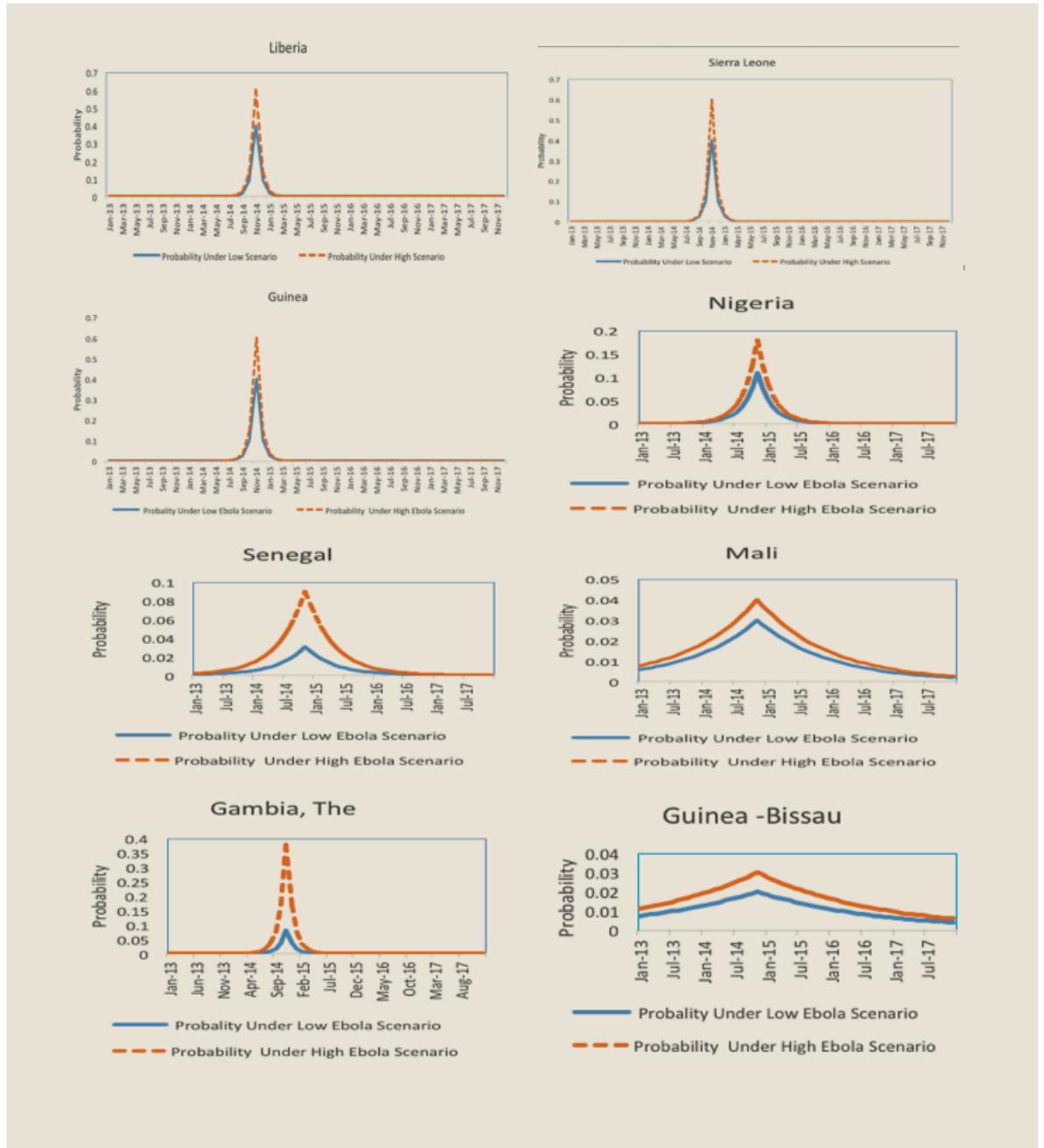
$s$  is the domestic savings rate in an Ebola-free situation,

$H_t$  is the total annual cost needed to treat Ebola,

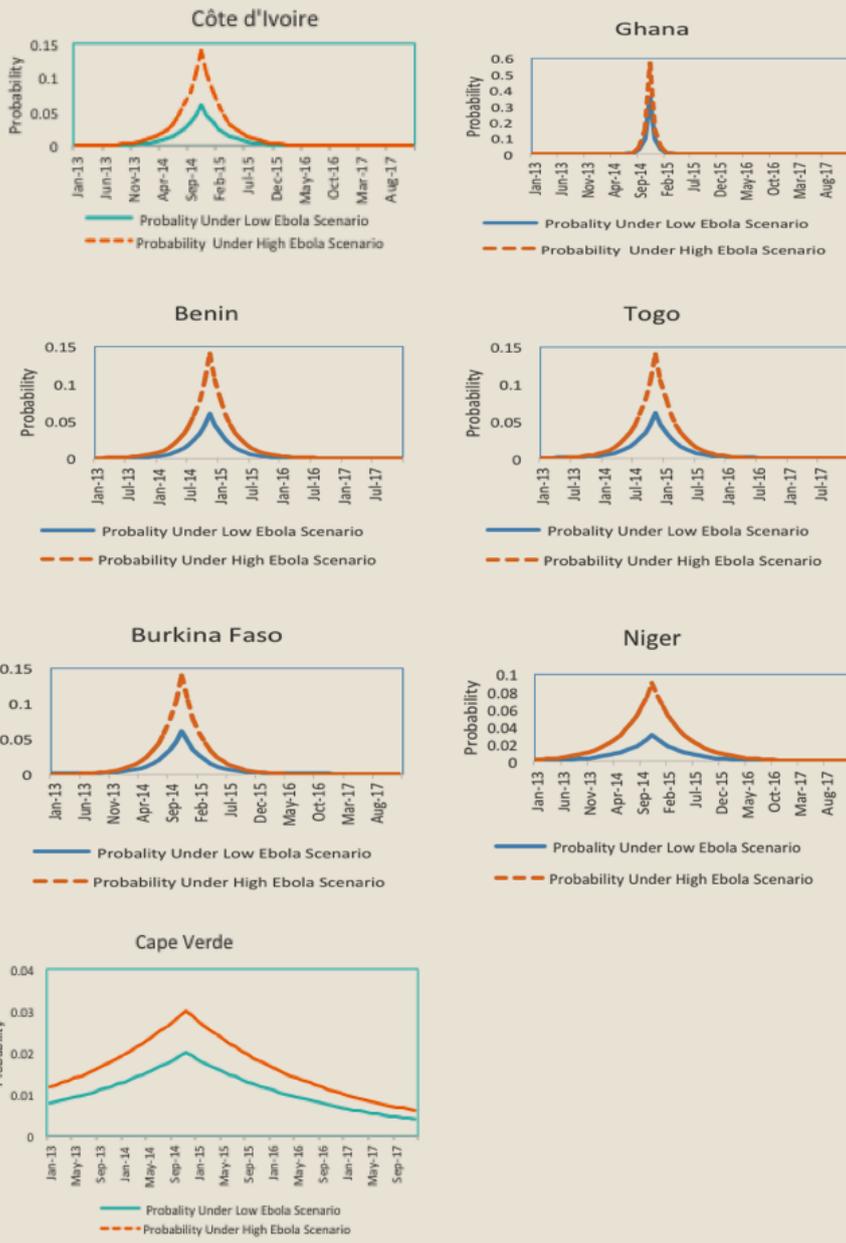
$x$  is the fraction of  $H_t$  financed out of saving and

$\theta$  is the depreciation rate.

## Annex 6: Distribution of Ebola virus disease prevalence probability for West Africa countries, 2013-2017



Annex 6: Distribution of Ebola virus disease prevalence probability for West Africa countries, 2013-2017 (cont.)



## Annex 7: Macro model estimation results

	Dependent variables: GDP per capita, US\$ constant price		
	No Ebola	Low Ebola	High Ebola
L.(GDP per capita)	<b>0.824***</b> (6.396)	<b>0.867***</b> (6.650)	<b>0.854***</b> (8.933)
L <sup>2</sup> .(GDP per capita)	0.173 (1.441)	<b>0.199*</b> (1.797)	<b>0.225***</b> (2.662)
Log (total labour force)	-19.67 (-0.738)	-18.04 (-1.234)	-14.09 (-0.980)
Education	<b>1.602*</b> (1.688)	0.0776 (0.0591)	0.122 (0.113)
Openness	0.965 (0.847)	-0.711 (-0.395)	-0.658 (-0.466)
Account balance as % of GDP	1.330 (1.078)	1.086 (1.240)	0.854 (1.166)
Low Ebola			
Log (Low Ebola probability)		-50.73 (-0.398)	
Log (Openness*(Low Ebola probability)			
Log (High Ebola probability)		51.38 (0.407)	-40.67 (-0.428)
Log (Openness*(High Ebola probability)			40.92 (0.433)
The three epicentre countries		-42.14 (-0.867)	-33.51 (-0.691)
Constant	215.5 (0.500)	120.5 (0.219)	80.58 (0.196)
Observations	33	33	33
Group minimum	1	1	1
Group maximum	6	6	6
Group average	2.538	2.538	2.538
chi2	4.051	22.773	21.430
pvalue	–	–	–
AR(1)	-1.097	-1.176	-1.285
AR(2)	0.902	0.890	0.868

z-statistics in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Annex 8: United Nations Development Group – Western and Central Africa (UNDG-WCA) Regional Directors Team (RDT)

Agency	Full Name	Title or Designation
Programme (UNDP), Chair	Abdoulaye Mar Dieye	RBA Director and RDT Chair
United Nations Population Funds (UNFPA)	Mr. Benoit Kalasa	Regional Director
United Nations Children Funds (UNICEF)	Mr. Manuel Fontaine	Regional Director
World Food Programme (WFP)	Ms. Denise Brown	Regional Director
International Labor Organization (ILO)	Mr. Aeneas Chapinga Chuma	Regional Director
	Mr. François Murangira	Director, Sahel Region & West Africa
	Vacant	Director for Central Africa
Joint United Nations Programme Against HIV/AIDS (UNAIDS)	Dr. Mamadou Diallo	Regional Director
United Nations High Commissioner for Refugees (UNHCR)		
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Ms. Ann Therese Ndong-Jatta	Regional Director
United Nations Women Organization (UNWOMEN)	Ms. Joséphine Odera	Regional Director
United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA)	Ms. Allegra Baiocchi	Head of Regional Office WCA
United Nations Office for Drugs and Crime (UNODC)	Mr. Pierre Lapaque	Regional Representative, WCA
United Nations Industrial Development Organization (UNIDO)	Mr. Patrick Kormawa	Regional Director
World Health Organization (WHO)	Dr. Matshidiso Moeti	Regional Director
	Dr. Djamila Khady Cabral	Coordinator, WHO-IST for W. Africa
Office of the High Commissioner for Human Rights (OHCHR)	Mr. Andrea Ori	Regional Representative for W. Africa
	Mr. Ahowanou Agbessi	Regional Representative for C. Africa
Food and Agriculture Organization (FAO)	Mr. Thiombiano Lamourdia	Deputy Regional Rep for Africa
	Mr. Vincent Martin	Resident Representative for Senegal & Head of regional office for resilience, urgency and rehabilitation
International Organization for Migration (IOM)	Ms. Carmela Godeau	Regional Director, WCA
United Nations Economic Commission for Africa/Sub-Regional Office) (UNECA/SRO)	Mr. Dimitri Sanga	Director for West Africa
United Nations Office for Project Services (UNOPS)	Mr. Garry Conille	Director for Africa
	Mr. Pierre Jullien	Regional Director, WCA
United Nations Environment Programme (UNEP)	Mr. Mounkaila Goumandakoye	Regional Director
United Nations Development Group for Western and Central Africa (UNDG-WCA)	Mr. Mensah Aluka	Regional Coordination Specialist, Head of UNDG-WCA Secretariat
	Ms. Alizeta (Lizet) Simboro Sawadogo	Regional Coordination Associate



Vendors struggle with plummeting sales and rising cost of transporting goods to the market in West Point after the Ebola Outbreak and quarantine took effect in Liberia. Photo by UNDP/Morgana Wingard





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Western and Central Africa