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Assessing the socio-economic impacts of Ebola Virus Disease in Guinea, Liberia and Sierra Leone

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The Road to Recovery

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United Nations Development Programme (UNDP)
Regional Bureau for Africa
One UN Plaza, Manhattan, New York

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Foreword

This synthesis report is based on three national studies on the evolution of the Ebola epidemic and its impact on Guinea, Liberia and Sierra Leone. It builds on a series of Policy Notes issued by the United Nations Development Programme (UNDP) since the beginning of the Ebola virus disease (EVD) outbreak, and will inform another study by the United Nations Development Group for West and Central Africa on the socio-economic impact of Ebola in West Africa as a whole.

Using computable general equilibrium (CGE) models, this report provides a more comprehensive assessment of the socio-economic impact of the epidemic and offers a more solid base to plan for recovery and medium-term development efforts.

The epidemic is disrupting the development progress achieved since the restoration of peace and democracy in the three most-affected countries. As of 10 December 2014, almost 18,000 people had been infected and more than 6,400 had already died. Health services in Guinea, Liberia and Sierra Leone were not well equipped to fight the disease and the crisis is now completely outstripping their ability to stem its spread.

Some specific features in the three countries have made Ebola particularly difficult to control. Lack of medical personnel and beds in Ebola Treatment Units, the complexity of identifying active cases and contacts, and the slowness of the response have all contributed to the seriousness of this health crisis. Doctors were unfamiliar with the disease, and because its symptoms resemble those of other ailments, early diagnosis and effective prevention were slow to begin. Common practices, including communal hand washing, the tradition of caring for sick relatives, and the washing and dressing of dead bodies in preparation for burials, also contributed to the spread of the virus.

Overly centralized health systems impaired the engagement of local communities, which is so critical to fighting epidemics such as this one. A lack of trust in government, resulting from protracted crisis, further impeded cooperation, leading people to question the very existence of the virus.

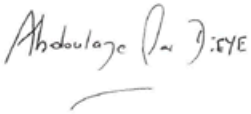
The international community is now mobilized to help the affected countries stop the epidemic, treat the sick and prevent further outbreaks. There has been a noticeable change in perceptions and behaviors, and many communities have assumed the responsibility to cope with it, contributing to a significant decrease in new cases in some areas. Large sums, equipment and personnel have been rushed to these epicentre countries by the international community.

Yet, the battle is far from over, and more resources will be required to bring it to an end. Communities have to own the struggle at the local level. Governments must lead effective, well-coordinated programmes to stop the epidemic all the way down to the district level, with support from the international community, including bilateral partners, multilateral agencies led by the United Nations Mission for Ebola Emergency Response (UNMEER), and other stakeholders.

Fear has compounded this crisis. Women are giving birth without modern medical attendants because they fear going to clinics; use of birth control has plummeted; HIV testing has practically stopped, and routine checkups and immunizations have ground to a halt. An increase in avoidable deaths and a resurgence in numerous different types of ailments may follow. Fear also is eroding social ties, since family and communal celebrations are postponed; even cured Ebola patients are shunned by their families and communities.

Fear is also exacerbating the impact of the epidemic, leading to the closure of schools and businesses, and slowing down planting and harvesting. The closure of borders and efforts by shipping companies to limit exposure to the disease are reducing external trade. Some workers are dying, others are fleeing infected areas, and quarantines and travel restrictions are preventing people from going to work. Official estimates, which are roughly consistent with simulations based on econometric modelling, indicate that the epidemic may be reducing growth in the three countries by between 3 to 6 percent this year. Moreover, uncertainty over the epidemic's duration and economic impact has brought investment to a halt, reducing the prospects for growth in future years even if the virus is rapidly contained.

Finally, in the midst of the crisis, we must not lose sight of these countries' desperate need to re-set development, but on a more sustainable path. Evidence from this report shows that an increase in quality spending in health and development projects is a critical path to recovery. Governments and donors are understandably eager to devote as many resources as possible to containing the epidemic. But attention must still be given to how these economies can best recover and again achieve improvements in human welfare once the disease has been contained. UNDP, in collaboration with UNMEER, is working with national and international partners to contain the disease and help the affected countries recover. Strengthening health systems, and addressing the structural vulnerabilities that allowed Ebola to take hold in the first place will help to ensure such a crisis may never happen again.



Abdoulaye Mar Dieye
UNDP Regional Director for Africa

Acknowledgments

This report is one of the contributions of UNDP Regional Bureau for Africa to addressing the root causes of EVD and to setting the pace for quick and rapid recovery process. It was prepared under the strategic guidance of the Regional Director, Abdoulaye Mar Dieye. The leadership support from the Deputy Director, Ruby Sandhu-Rojon, is deeply appreciated.

It was prepared by a core team led by Ayodele Odusola, Chief Economist and Head, Strategy and Analysis Team at the UNDP Regional Bureau for Africa. The technical support Idrissa Diagne, Moses Sichei, Janice James, Stanley Kamara, Milton Korseh-Hindowa and Mamadou Bobo Sow from the three epicentre countries provided by the real time cases for the country experiences. They facilitated the national surveys in Guinea, Liberia and Sierra Leone in the affected and non-affected communities. The valuable contribution from William Shaw who synthesized the three national reports into a logically consistent one is deeply appreciated. The inputs from Babatunde Abidoye and Youssouf Kone on the macroeconomic modeling added substantial value to the report.

The excellent editorial work of Barbara Hall is deeply appreciated. The immense support from Nicolas Douillet on language and style, and the logistical support from Jonas Mantey and Yechi Bekele are also acknowledged. Many thanks go to the leadership of the Guinea, Liberia and Sierra Leone's country offices, their United Nations Country Teams and their national counterparts, without which this report would not have been possible.

A sensitization campaign on the preventive measures of EVD. Photo by Institute of Governance Reform (IGR) who carried out the Economic & Social Impact of EVD on behalf of UNDP Sierra Leone.

Acronyms and Abbreviations

AfDB	African Development Bank
AIDS	Acquired Immune Deficiency Syndrome
CGE	Computable General Equilibrium
CPW	Construction and public works
CWIQ	Core Welfare Indicator Questionnaire
DHS	Demographic and Health Survey
EPA	Environmental Protection Agency
ETU	Emergency Treatment Centre
EVD	Ebola virus disease
FAO	Food and Agricultural Organization of the United Nations
FAPS	Food and Agricultural Policy and Strategy
FDI	Foreign Direct Investment
GDP	Gross domestic product
GNF	Guinean Franc
GoSL	Government of Sierra Leone
HIPC	Heavily Indebted Poor Countries Initiative
HIV	Human Immunodeficiency Virus
IFAD	International Fund for Agricultural Development
IMCI	Integrated Management of Childhood Illnesses
IMF	International Monetary Fund
IUD	Intrauterine device
MDG	Millennium Development Goal
MFDP	Ministry of Finance and Development Planning
MoFED	Ministry of Finance and Economic Development
MOHS	Ministry of Health and Sanitation
NERC	National Ebola Response Centre
NGO	Non-governmental organization
PPE	Personal Protective Equipment
R/UNDP-WACA	Regional UN Development Group for West and Central Africa
TBA	Traditional birth attendant
UN	United Nations
UNCT	United Nations Country Team
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNMEER	United Nations Mission for Ebola Emergency Response
VHF	Very high frequency
WASH	Water, sanitation and hygiene
WFP	World Food Programme
WHO	World Health Organization

Executive Summary

This report presents the principal findings of three studies undertaken by UNDP on the impact of the Ebola epidemic on Guinea, Liberia and Sierra Leone. The main objectives of these studies were to: review the evolution of the epidemic; examine the economic and social context, including the state of health systems; discuss the economic and social impact of the epidemic; examine the responses by local communities, governments and donors; and consider the reorientation of UN programmes that will be necessary to assist governments in fighting the epidemic.

The studies relied on a range of sources, including secondary data available on the Internet and from government and international agencies, and in-country interviews of representatives of affected communities, public and private agencies. Information from primary and secondary sources were complemented by results from the macro-econometric and computable general equilibrium models. Several important conclusions emerged from these analyses.

Guinea, Liberia and Sierra Leone have high rates of poverty and are ranked near the bottom on the UN's Human Development Index. Prior to the onset of the epidemic and after civil wars or political turmoil that had effectively destroyed much of the existing social and economic infrastructure, restoration of peace and democracy were supporting economic recovery and some improvements in social indicators. The epidemic has essentially robbed these countries of much of the progress made in the past 5-10 years.

The health systems in Guinea, Liberia, and Sierra Leone were unprepared for Ebola at the outset of the epidemic. They lacked sufficient amounts of everything 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, further spreading the disease and leading people to avoid treatment for fear of being infected. Moreover, impoverished rural areas have much 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 health workers.

Contagious diseases are difficult to control, while some aspects of Ebola greatly exacerbated the challenge, given these countries' contexts. Control measures, for example the closure of businesses, quarantine and destruction of property, are costly to the individuals involved and may be resisted, while in the absence of local community and or government commitment, these measures may be difficult to enforce. Sick people who flee infected areas transmit the virus to new areas while restrictions on travel are only sporadically effective. The symptoms of Ebola resemble other endemic diseases in the area, delaying knowledge of the epidemic until after it had spread considerably is common practices in the three countries, including personal care for the sick by relatives and friends (who largely are unfamiliar with, and in any event do not have, the equipment necessary to treat Ebola patients without being infected themselves), the washing and dressing of dead bodies in preparation for burial, and communal hand washing tend to spread the virus. Lack of familiarity with the disease at the initial stages of the epidemic, combined with distrust of government advice, limited the use of simple preventative measures by individuals that could have saved lives.

At times, public policy and institutional arrangements impaired efforts to control the epidemic. The failure to keep important commitments eroded trust in government, impeding cooperation in fighting the disease. Centralized control over health systems failed to engage local communities, essentially undermining many programmes at the local level, and tended to be inefficient. In Sierra Leone, for example, a single institution was designated to bury all

people who died of Ebola. However, this institution rapidly became overwhelmed by the caseload, which severely delayed burials and increased the risks of disease. While governments have established agencies to coordinate their efforts in fighting against the epidemic, bureaucratic competition has nevertheless led to duplication and increased cynicism about government commitment.

Strong government leadership and effective coordination, however, did get results. Where the Government supported local community engagement in programmes involving effective testing, contact tracing, quarantine, and safe treatment, the virus could be stopped. For example, in Télimélé, a village in Guinea, an effective, locally managed programme stopped the infection; the last confirmed case was in June.

Ebola has spread rapidly, but unevenly. Since the first cases appeared in December 2013, the number of new infections has varied by country, by region, and over time. The epidemic appears to have begun in rural areas along the borders. With the exception of Monrovia and Freetown, where the virus has spread due to the influx of victims seeking treatment, rural areas continue to be the most affected by the epidemic. The latest data show a decline in new cases in Liberia, but a continued rise in Guinea and Sierra Leone; the virus is not under control in any of these countries. All in all, there had been almost 18,000 cases, and more than 6,400 deaths, as at 10 December 2014.

The epidemic is reducing growth and its impact will take 5 to 10 years to overcome. The economic disruptions from increasing illnesses and deaths have been exacerbated by people's efforts and governments' edicts designed to avoid the spread of infection. Workers' fear of engaging in collective activities has severely reduced agricultural production and office work. Government restrictions on travel and public gatherings, together with the closure of markets and schools, have severely impeded many economic activities. Production of goods that had formerly been traded with neighbouring countries, that came from areas highly affected by the epidemic, or that involved in-person cooperation experienced the largest declines.

External transactions have plummeted. Exports are falling due to supply interruptions in areas heavily affected by the epidemic, declining availability of shipping due to fears of contracting the disease at ports in countries affected by the epidemic, and a decline in the international prices of minerals. Tourism has virtually disappeared. Imports also are declining with the fall in economic activity and constraints on trade.

Overall, official forecasts for GDP growth in 2014 have been revised downwards since the onset of the epidemic, by 3.2 percentage points in Guinea, 4.8 percentage points in Liberia, and 6.4 percentage points in Sierra Leone. The likely decline in growth is confirmed by the results of economic modelling exercises. However, the CGE models' predictions of the impact of the epidemic on growth are significantly different from the revisions to the official forecasts. This is largely because the model is designed to capture the interactions among economic variables. For example, a decline in earnings in one sector will reduce expenditures by workers in that sector, which will, in turn, reduce earnings in other sectors. All of these interactions may not be captured in the official estimates. Further, the revision in the official estimates reflects the impact on growth of all recent economic events, while changes between scenarios in the modelling exercise is designed to reflect only the impact of Ebola.

The devotion of increased expenditures to fighting the epidemic, coupled with declining revenues as economic activity fades, are expanding fiscal deficits and reducing expenditures on activities that are not directly related to Ebola. Inflation is rising due to supply bottlenecks, driven by the reduced labour supply, lower trade domestically and across land borders, and unavailability of shipping. To date, the rise in fiscal deficits has been manageable, in part due to increased budgetary support from the international community, while the uptick in inflation has been limited.

Nevertheless, a continuation of these trends will threaten long-term development. The great uncertainty concerning the ability of these countries to control the epidemic is sharply reducing private investment, which is likely to reduce output in future years, particularly in the mining sector. The decline in expenditures not related to fighting the epidemic will further reduce public sector investment and impair the government's ability to provide a range of services, which will continue to be felt even after the epidemic is controlled. All of this underlines the importance of the immediate provision of budgetary support to help these countries through this critical time.

The epidemic is also reducing welfare. Health status is seriously endangered by cuts in expenditures on non-Ebola related health services and a dramatic fall in the use of services (health agency visits, assisted childbirths, antiretroviral therapy drugs, home visits) owing to fears of infection. As a result, more people will die from childbirth, malaria and AIDS, as well diseases that are relatively easy to cure. Children are seeing their education delayed, which increases the risk of their dropping out. Perhaps the single positive impact of the epidemic is the greater attention to hygiene; as a result, despite conditions favourable to the spread of cholera, so far the disease has failed to appear.

Women are suffering disproportionately from the epidemic, because they care for the sick, which makes them more vulnerable to infection, and they rely on economic activities (for example market trading and exports of fruits and vegetables to neighbouring countries) that have been hit hard by the epidemic. Further, social disruption increases their vulnerability. Reports of teenage pregnancies are on the rise, likely because girls are no longer protected by being in school much of the day.

The epidemic is also breaking down social ties. Longstanding traditions of community support and care-giving have been disrupted, Ebola victims are being stigmatized, and social gatherings have been cancelled. People have come to fear contact with strangers, and sometimes even with their own family.

The findings help to chart a pathway to recovery. Improved coordination between non-governmental organizations (NGOs) and local officials, and among government agencies is critical to effective programmes. Governments should step up their communications activities to combat ignorance that stigmatizes victims and impedes efforts at prevention. It's high time to start thinking about how governments and private sectors can cooperate in launching the recovery. Efforts should focus on restarting activities that were abandoned during the epidemic, for example through strengthening social protection mechanisms including cash transfers, concession-based credit facilities, the provision of inputs necessary for the next planting season, and support for re-opening local markets.

Strengthening the health management system must be a priority. Meeting the African Union's goal of spending 15 percent of the total budget on health, and WHO's goal of $34 health expenditure per capita, is key. Effective decentralization of health governance is also important to managing the health crisis. Institutionalizing monitoring and health surveillance is another.

International donors and development partners can help. These countries desperately need money and technical support to cope with the virus. Donors are redirecting their programmes to help control the epidemic, but should not abandon all their efforts to support long-term development. The international community should not be overly engaged with humanitarian and early recovery actions at the expense of tackling the root causes of EVD.

More debt relief, grants and concessional credits will help these countries to rapidly recover from the crisis. Better coordination among donors, and greater emphasis on the provision of technical experts could improve the efficiency, effectiveness and coherence of project assistance. A joint approach between national governments and development partners to early recovery is the best way to avoid fragmentation.

PART I: INTRODUCTION

Boh Fanta Kourouma and Namsira Kourouma sell soap and inform the public about how to prevent Ebola in Kankan's main market. Photo by UNDP Guinea.

Chapter I: Background

OBJECTIVES

The spread of the Ebola Virus Disease (EVD) has had devastating consequences for health status, economic growth, social indicators, and the very fabric of societies in Guinea, Liberia and Sierra Leone. Using three national studies on the evolution and impact of the epidemic, this synthesis studies highlights their key findings, with a view to examining the key drivers of the epidemic, its economic and social effects, the ability of their health systems and other government services to cope, and the implications for United Nations programmes. Recommendations are provided for government and donors to address the immediate emergency and strengthen resilience to the Ebola epidemic over time.

The report's key objectives are to:

i. examine factors that led to the rapid spread of the disease and the economic and social issues that make the containment of the outbreak quite challenging and difficult to manage;

ii. discuss the overall health system governance structure and capacity to cope with the EVD outbreak, and other institutional factors that affect the responses and coping mechanisms at the community and national levels;

iii. examine the gender dimension of the outbreak, particularly the extent to which women are more affected than men and the impact on their socio-economic conditions;

iv. assess the immediate effects on economic growth and strategic sectors such as agriculture, mining, construction, and services (including tourism, transport and trade);

v. measure the socio-economic impact of the epidemic, including loss of employment and disruptions of livelihoods;

vi. evaluate the impact of the epidemic on UN agencies' projects and programmes, and using this to inform a reorientation of their programmatic interventions during the recovery period; and

vii. recommend policies and strategies to address all of these issues.

METHODOLOGY

The background studies are based on an analysis of economic and social indicators in the three countries, focusing on the most affected areas. Secondary data were collected from available sources on the Internet, various books and publications, and desk reviews of the relevant studies by sectoral ministries, multilateral development banks, and donor organizations. In addition, researchers conducted in-country personal interviews of residents of the affected communities (in Guinea, Liberia and Sierra Leone), officials from government agencies directly involved in fighting the epidemic, organizations representing local communities, civil society organizations, educational institutions, private sector firms and donor agencies (e.g. Doctors Without Borders, the World Health Organization, and World Food Programme).

Interviews and data collection focused, to the extent possible, on the areas most severely affected by the epidemic. In some cases, data on less-affected areas were based on secondary sources. Structured questionnaires were used to measure changes in social and economic variables as a result of the epidemic. These were complemented by group discussions and interviews with key informants, such as technical specialists, government officials, and representatives of community organizations. The report made extensive use of UNDP Regional Bureau's six Policy Notes devoted to the impact of the crisis in the three epicentre countries.

The study also used two different modelling approaches: an econometrically-estimated macroeconomic model and a computable general equilibrium (CGE) model. These models are useful to capture the several, interacting effects of the epidemic on economic activity, which can supplement the estimates provided by government experts. The structure of these models, together with tables presenting some of the scenario results, are described in Annex 1.

Chapter 2: Development context and health system capacity before the Ebola crisis

2.1 The three countries are recovering from either civil war or political instability, but remain poor

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. 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. Nevertheless, Guinea, Liberia and Sierra Leone still have high poverty rates, high rates of maternal and child mortality, limited educational attainment, weak infrastructure, and inadequate public services. Moreover, the horrific impact of the Ebola epidemic on human welfare and economic growth threatens to seriously derail the progress made since the restoration of peace.

Since 2011, **Guinea** has been emerging from a profound political, economic and social crisis. The deterioration of democratic institutions and of the social fabric, compounded by poor management of resources and the 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.

The restoration of peace helped Guinea make significant progress in development until the outbreak of the epidemic. The completion point under the Heavily Indebted Poor Countries (HIPC) initiative was reached in September 2012, which helped cut outstanding external debt from $3.2 billion in 2011 to $1.3 billion in 2012, and sharply reduced future debt service payments (by an anticipated 2.1 percent of GDP per annum from 2012-21 and 1.1 percent from 2022-31). In addition, the business environment improved and agreement was reached on mining investment projects, public investment in priority sectors (including energy, transport and agriculture) revived, and the political transition was successfully concluded with the 2013 legislative elections. GDP rose by 3.4 percent per year from 2010 to 2013, and inflation fell from 20.8 percent in 2010 to 10.5 percent in 2013 (table 1). The fiscal deficit improved from 12.6 percent of GDP in 2010 to 2.8 percent in 2013. A deterioration of the trade balance largely reflected the recovery in investment, and was offset by a strong increase in official development assistance (ODA) and foreign direct investment (FDI).

TABLE 1: MAIN MACRO-ECONOMIC INDICATORS, GUINEA, 2010-2013 (PERCENT)

	2010	2011	2012	2014
Growth	1.9	3.9	3.9	2.3
Inflation	20.8	19	12.8	10.5
Budget revenue / GDP	15.3	16.8	20.1	18.4
Current public expenditure / GDP	20.5	15.6	15.9	16.2
Public investment / GDP	9.1	5.2	10.2	8.9
Basic fiscal balance / GDP	-12.6	-1.6	-2.5	-2.8

Despite this progress, poverty remained high prior to the outbreak of the epidemic. According to available statistics, in 2012, 55 percent of Guineans lived below the absolute poverty line (table 2). The unemployment rate in Conakry was 19 percent in 2012, with particularly high rates of unemployment among the young. Moreover, the improvement in social indicators since 2010 has been limited. The Human Development Index for Guinea (in the most recent UNDP Global Report) was ranked 179th out of 187 countries, well below the average for Africa. Practically every Millennium Development Goal (MDG) remains out of reach for the target year of 2015.[1] Despite some progress, basic public services faced severe shortcomings. In 2012, the maternal mortality rate was among the highest in the sub-region, almost seven infants died out of every 100 live births, the net enrolment rate in primary education was only 58 percent, and water and electricity shortages were common.

After 14 years of civil conflict, **Liberia** was in shambles. Health facilities had been destroyed, food insecurity was rampant, poverty rates were high, and huge numbers of people had been displaced. The democratically elected government since 2006 has sought to re-establish stability in the context of rapid development and access to humanitarian assistance. Despite various programmes undertaken to address Liberia's severe developmental challenges, most families cannot afford one meal per day or fees for basic health services. Liberia remains a very poor country.

The restoration of peace initiated a substantial period of rapid economic growth, as per capita GDP rose by 7.6 percent per year from 2005-12. The resumption of iron ore production encouraged increased construction and service sector activities. Foreign direct investment inflows have provided a significant boost for the Liberian economy, because natural resource rents are an important share of government revenues. While rapid growth driven by natural resources has resulted in a significant improvement in UNDP's Human Development Indicators (from a very low base), the level of this index remains well below the average for sub-Saharan Africa.

The major challenges facing Liberia's post-conflict development concern infrastructure, human capital and institutional capacity. Power supply is extraordinarily limited, as the grid serves only Monrovia, where the access rate is below 10 percent, while the average cost of electricity is among the highest in the world. Businesses, health agencies and educational institutions rely on generators at a prohibitively high cost, limiting manufacturing, private sector diversification and industrial development. Lack of paved roads cuts off much of the

TABLE 2: OVERVIEW OF MDG INDICATORS, GUINEA, 1990s TO 2012

Indicator	Reference	2012	2014
Headcount poverty (%)	62.5 (1994)	53 (2007)	55.2
Underweight children (%)	19.3 (1994)	26.1 (2007)	18
Net primary enrolment rate (%)	28.8 (1990)	57.1 (2007)	57.8
Literacy rate of 15-24 year-olds (%)	22.5 (1994)	57.3 (2007)	54.6
Primary education gender parity index	0.46 (1991)	0.82 (2007)	0.85
Under-five mortality rate (per 1000 live births)	229 (1992)	163 (2005)	123
Maternal deaths (per 100,000 live births)	666 (1992)	980 (2005)	724
Share of the population using a source of safe drinking water (%)	51.2 (1994)	73.8 (2007)	67.8
Share of the population with access to improved sanitation facilities (%)	20.3 (2002)	31.8 (2007)	30.7

[1] See National MDG Report 2014.

country from Monrovia during the long rainy season. About 55 percent of the population cannot access an all-season road within 5 km, and 27 percent cannot reach one within 30 km.[2] This increases perceptions of exclusion and constrains some of the most promising sectors for growth and employment – agriculture, tree crops, and forestry – and regional trade. Heavy rains also lead to high road construction and maintenance costs (AfDB, 2013).

Weak human and institutional capacity is considered by most Liberians as the greatest challenge the country faces. The lengthy conflict deprived many people of the opportunity to gain an education and limited their work experience. The educational system remains weak. Severe human and institutional capacity constraints continue to challenge public service delivery and combined with private sector constraints, have slowed the implementation of public investment projects.

Despite the abundance of natural resources, Liberia ranks 175 out of 187 countries on the 2014 UNDP Human Development Index.[3] As many as 84 percent of Liberia's 4.2 million people earned less than US$1.25 per day. Life expectancy is only around 60 years (CIA 2014). According to the 2013 Demographic and Health Survey (DHS), 89 percent of Liberian households obtained water from sources outside of their premises, and 45 percent lack toilet facilities. Although approximately 70 percent of Liberia's population is engaged in agricultural activities,[4] Liberia imports most of its food, and most of these imports are crops that can easily be grown locally. Health conditions have improved in recent years, although the infant mortality rate is 54 deaths per 1,000 births, the maternal mortality rate is a very high, at 1,072 deaths per live births, and the supply of physicians is extremely low, and worse in the remote areas. Gross secondary school enrolment was 45 percent, constraining the supply of human capital essential for development.

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 (World Bank 2009). The health system was almost completely destroyed. The first elections after the civil war were held in 2002, and a smooth transfer of power to the opposition took place in 2007. The restoration of peace and democratic rule 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.

The country has achieved some improvement in social indicators, although severe challenges remain. While impressive progress has been made over the past decade in increasing access to primary education, three quarters of children do not enrol in primary school at the correct age, which can result in reduced completion and retention rates. Gender equity in access to primary education is nearing parity, although large disparities continue at the secondary level. Poor and rural residents are much less likely to attend school and complete a full cycle of education than well-off and urban residents. Progress was also underway to revamp and extend water and sanitation services, for example improved disposal of wastes along the streets of Freetown, better coordination of water, sanitation and hygiene (WASH) sector activities, the devolution of control over services to local councils, and steps towards the construction of dams to increase the supply of safe drinking water.

[2] See the Liberia's Core Welfare Indicator Questionnaire (CWIQ) 2010.

[3] UNDP (2014). Liberia is above Guinea (179) and Sierra Leone (183).

[4] The damage to the food production sector ismanifested by low productivity of agricultural and horticultural systems; disruption of production due to the displacement of farming and growing communities; erosion of marketing systems due to degradation of roads, transport, and processing infrastructure; absence of extension services; lack of food production inputs in the areas of displacement; and socio-economic dislocation. As a result, Liberia has remained among the most food-insecure countries, with less than 10 percent of the arable land being cultivated.

2.2 *Health systems were unprepared to meet the challenges of Ebola*

The devastation wrought by the history of civil war or political instability, limited human and financial resources, and organizational defects severely constrained the provision of health services. Moreover, available services were often inequitably distributed, penalizing rural areas. Health systems could therefore do little to contain the epidemic, at least at initial stages.

The centralization of the health management system reduced the efficiency and effectiveness of health systems. Excessive centralization stifled local initiative, delayed the provision of resources to meet bureaucratic requirements, and imposed activities that were not always appropriate to local conditions. This defect had particularly adverse consequences for efforts to fight the epidemic, which, due to the lack of resources, relied on innovation and flexibility, and critically required local engagement to carry out the numerous and very detailed tasks involved (e.g. contact tracing, enforcing quarantines).

According to the 2012 Poverty Survey in **Guinea**, approximately one third of households were not satisfied with the available health services, which suffer from the legacy of the long socio-political crisis. Thus, several structural factors limit the sector's capacity to respond to the population's health needs. Public health infrastructure is inadequate. According to standards[5] laid down in the National Health Policy, health posts, health centres and prefectural hospitals only cover 27 percent, 75 percent and 59 percent, respectively, of the level required to meet the population's needs. Lack of maintenance has impaired operations; half of the prefectural hospitals and two thirds of the national hospitals are in poor condition. Human resources devoted to the health sector are insufficient, with only 89 health workers per 100,000 inhabitants. Moreover, human resources are inequitably distributed. Conakry, which is home to just 15 percent of the population, has 75 percent of the country's 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 health workers.

Many of these shortcomings reflect limited financial resources. Health expenditures (from all funding sources) amount to around $32 per person in Guinea, compared with $42 in Mali, $51 in Senegal and $52 in Mauritania.[6] Health sector spending averaged below 2 percent of state expenditures from 2005 to 2012, well below the African Heads of State commitment of 15 percent. In addition, weaknesses in the institutional management capacity at every level of the health care system, coupled with a weak epidemiological surveillance system, which had particularly sombre consequences, severely compromised efforts to control the epidemic. Efforts to improve efficiency by transferring control of primary health care facilities to local authorities have been ineffective, because local communities still lack control over funding and human resources, and have little involvement in the planning, implementation and monitoring of health programmes.

Liberia's health sector is centralized, with 60 percent of personnel in Monrovia, which has about a third of the population, and the rest unevenly distributed in the other 14 political subdivisions.[7] Excessive centralization meant that even sound planning documents such as the 2007 National Health Policy and Plan, were poorly implemented. For example, since drug supplies are scarce outside of Monrovia, ambulances periodically commute to Monrovia to pick up drugs, which is costly in terms of fuel and maintenance, and subjects the drugs to pilfering. Repeated suggestions to the National Drugs Service to establish drug depots in each county and a revolving fund have fallen on deaf ears.

[5] The standards provide for one health post per 3,000 people, one health centre per 20,000 people, one prefectural hospital per 250,000 people, and one national hospital per 2,400,000 people.

[6] See World Bank Health Portal: http://datatopics.worldbank.org/hnp/HNPDash.aspx.

[7] Efforts to decentralize health services were underway just before the outbreak of the disease.

Health services suffer from inadequate resources, as represented by low salaries for health workers, outdated technologies, poor infrastructure, inadequate medical facilities and equipment, and limited supplies. Poor sanitary conditions and inadequate access to quality care in rural and remote areas (including a shortage of midwives) have greatly increased the incidence of disease and death. Health services are distributed inequitably: 73 percent of births by urban mothers were attended to by a skilled provider and 66 percent were delivered in a health facility, compared with 50 percent and 40 percent, respectively, of births by rural women (DHS, 2013: 123-127). The top two causes of death in medical facilities are malaria and respiratory infections.

In **Sierra Leone**, the public sector, religious missions, local and international NGOs, traditional healers, and the private sector all provide health services. Private sector health provision is underdeveloped compared to countries in the sub-region such as Ghana, Nigeria and Senegal, and involves mainly curative care for inpatients and outpatients on a fee-for-service basis, mostly for the relatively well-off. Traditional healers and traditional birth attendants (TBAs) are reported to be providing a significant amount of health care, with TBAs attending to almost 90 percent of deliveries at the community level.

The public health delivery system comprises three levels: (i) peripheral health units (community health centres, community health posts, and maternal and child health posts) for first line primary health care; (ii) district hospitals for secondary care; and (iii) regional/national hospitals for tertiary care. Efforts have been made to improve the effectiveness of health care by decentralizing responsibility for health services to local levels and by increasing sectoral expenditures. The share of government spending on health rose from 7 percent of total expenditures in 2008 to 11 percent in 2014, with the increase largely devoted to higher compensation. However, services remain woefully under-funded relative to need, and well below the WHO's health spending target of $34 per capita and the 2000 Abuja Declaration target of 15 percent of a government's total budget.

The health system confronts many challenges. While political and technical leadership remains strong and committed, financial accountability is poor, organizational structure is plagued by the duplication of roles and responsibilities, public-private partnerships are limited, and regulatory oversight is weak. Health service infrastructure, particularly laboratory capacity, is extremely limited, the quality and availability of human resources and supplies is severely constrained by funding shortages, and service delivery at the community level remains particularly weak. A coordinated approach has improved the efficiency of procurement, but logistics management and information system remain substandard. Finally, health information systems are impaired by weak management, frequent server breakdowns, and the unavailability of data managers at many sites.

PART II: THE MAIN FINDINGS

An enumerator administering a questionnaire on the Economic and Social Impact of EVD. Photo by UNDP Sierra Leone.

Chapter 3: Magnitude, dimensions and drivers of the epidemic

3.1 The severity of the epidemic varies by country and region

While there were reports of suspected Ebola cases in the sub-region in December 2013, the Ebola fever epidemic was officially declared in March 2014. The rate of increase and incidence of the disease has varied considerably among countries and regions within individual countries, as well as over time. As of December 10, there have been 17,942 cases of infection and 6,388 deaths in the three countries (WHO 2014). Liberia has suffered the highest infection rate (0.18 percent of the population), followed by Sierra Leone (0.13 percent) and Guinea (0.02 percent). Particularly vulnerable areas include border regions where infections can be transmitted from neighbouring countries, capital cities where infected people may go for treatment (and particularly slums of these cities), and poor rural areas with inadequate clean water and sanitation facilities.

According to the WHO, the first cases of Ebola in **Guinea** occurred in December 2013, in a remote village in Guinée Forestière. This region has suffered more than any other in Guinea from the virus (accounting for 61 percent of confirmed infections by the end of November), in part because repercussions from the conflicts in neighbouring regions of Liberia and Sierra Leone had damaged social infrastructure (in particular health facilities) and had driven impoverished families across borders in search of some means of support. More generally, the porosity of the borders with Liberia and Sierra Leone has helped spread the virus, since infected Guineans returned home to be close to their families and foreign sufferers came in hope of finding better treatment in Guinea. Northern Guinea (Moyenne Guinée and Haute Guinea), the location of important agricultural and mining activities, is the least affected area at present, with 1 percent and 13 percent, respectively, of confirmed cases of infection as of October. A quarter of confirmed cases are in Guinée Maritime, with Conakry alone accounting for 14 percent, in part due to the arrival of sick people from other areas. Excluding the specific case of Conakry, the most affected communities are in the poorest regions in the country.

The number of infections in Guinea rose to almost 2,300 by 10 December 2014, over a thousand people have died. The increase in infections levelled off in June, but infections rose again from mid-August until November. A detailed analysis by locality indicates some areas of the country that have not had a new infection since August, while new cases have increased rapidly in other areas.

The first two cases of Ebola in **Liberia** were reported by the Government in March 2014, and the disease spread quickly thereafter. As of 10 December 2014, the WHO reported that the total cumulative cases of EVD in Liberia exceeded 7,700. The most affected county is Montserrado, where Monrovia is located. The city has several slum communities that are very congested, with poor sanitary facilities and a lack of running water and electricity, conditions that contributed to the rapid rate of disease transmission. The second most affected county is densely populated Margibi, which is close to Monrovia. By contrast, several counties far from Monrovia have not been greatly affected. The deplorable road networks in these areas, which are difficult to traverse in the rainy system, have limited the spread of the contagion there.

Sierra Leone recorded its first case of EVD on 25 May 2014, and subsequently the epidemic spread to all regions of the country. However, the incidence of the disease varies considerably by location, with the most confirmed cases and deaths in the Western Area and the least in Bonthe District, where the first confirmed case was in August. As of 10 December, the country had recorded almost 8,000 cases. The share of confirmed infections did not differ by gender, with women and men both accounting for half. The probability of dying from Ebola differed sharply according to the age of the person infected. Children and the elderly tend to have weaker immune systems, and when contracting the disease are more likely to die (table 3). The most productively active age group (35 to 60 years) had the highest incidence of infection and the highest mortality rate (calculated as the share of the total population in that age group that died of Ebola). Case fatality was, however, highest among children under five years of age.

TABLE 3: SEVERITY OF EBOLA BY AGE			
Age bracket	**Clinical attack rate**	**Case fatality ratio**	**Mortality rate**
Under 5 years	0.03	27.0	0.8
5-17 years	0.04	21.3	0.9
18-34 years	0.10	22.8	2.4
35-60 years	0.15	23.7	3.5
61+ years	0.10	25.0	2.6
Total	**0.08**	**23.1**	**1.9**

Note: Data refer to confirmed cases.

Source: MOHS Weekly Report, November 2014.

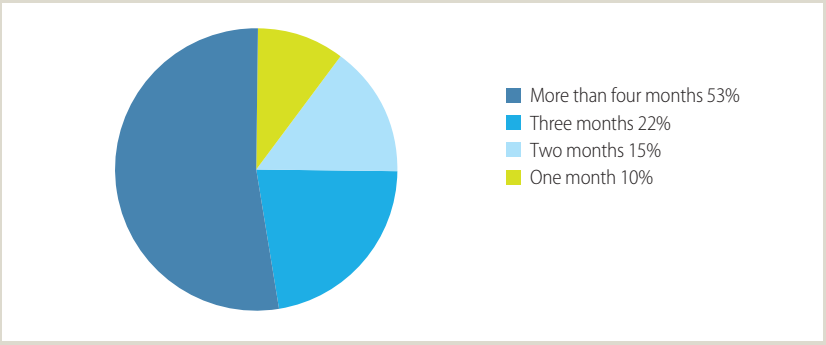
3.2 Fear, distrust and ignorance encourage the spread of Ebola

Ebola was a new phenomenon for most everyone. Health professionals unfamiliar with the disease had difficulties in diagnosing it, particularly as the symptoms resemble other diseases endemic in the region. This delayed appreciation of the existence and magnitude of the epidemic until after it had already spread considerably. Moreover, common practices in the sub-region, including the tradition of friends and relatives providing physical care for the ill, the washing and clothing of dead bodies in preparation for burial, and communal hand washing, were prone to spread Ebola. High levels of poverty also limited individuals' ability to take steps to protect themselves from the virus.

Possibly the greatest impediments to controlling the disease were the real disadvantages and risks involved in diagnosis and treatment, in combination with 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, requiring the use of security personnel for protection. At the early stage of the epidemic in Sierra Leone, there was a conspiracy theory based on a widespread belief that deaths from Ebola resulted from infection through, or murder by, health care workers.

Ignorance of the nature of the disease and how it is transmitted have delayed the changes in behaviour (e.g. not touching ill people and washing privately) that are essential to avoid contacting the disease, thus encouraging its spread. Understanding and accepting the nature of the disease can take an extended period: 55 percent of stakeholders interviewed for the Liberia report indicated that it took more than four months (an eternity in terms of fighting the epidemic) for people to understand the dangers of Ebola (figure 1). At the same time, poor communications render it difficult to disseminate accurate information about the disease, while distrust of the Government has made people reluctant to believe information that could have saved lives.

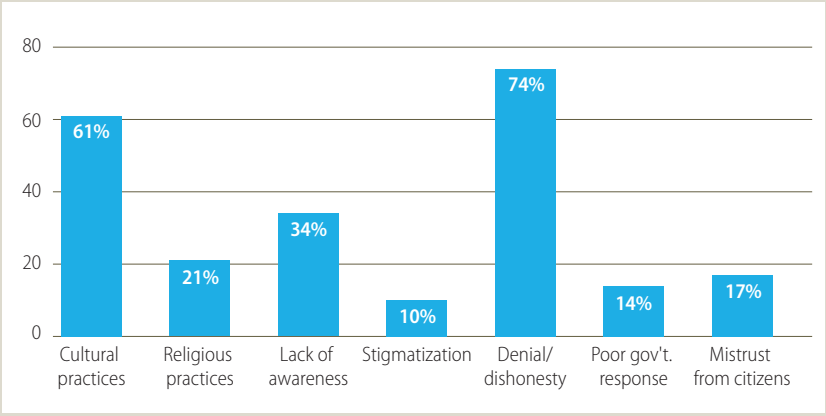
FIGURE 1: **PERIOD OF TIME REQUIRED TO UNDERSTAND THE DANGERS OF EBOLA, LIBERIA**
(PERCENTAGE OF RESPONDENTS ACCORDING TO EACH CATEGORY)



Comprehending the threat took a long time

It is difficult to measure the contribution of each of these factors to the spread of the disease. Among survey respondents in Liberia, the most frequently mentioned social problems that made the epidemic difficult to manage were cultural practices and denial/dishonesty (figure 2).

FIGURE 2: **SOCIAL PROBLEMS THAT MADE THE EPIDEMIC DIFFICULT TO MANAGE**
(PERCENTAGE OF RESPONDENTS MENTIONING REASON)



Culture, ignorance and attitudes drove the epidemic

3.3 *Health systems were unprepared to meet the challenges of Ebola*

Governments have established emergency bodies to manage efforts against the epidemic and coordinate the activities of the many ministries, agencies and institutions involved. However, a fundamental distrust of government and competition for government and donor resources have impeded an effective, unified programme. For example, in Liberia, concerned ministries wasted time arguing over who should play a lead role in the programme to contain the epidemic, rather than immediately addressing the problem. A key lesson of recent experience is that community engagement is critical to both efficiency and acceptance by beneficiaries, and thus essential for the effectiveness of programmes. However, an emphasis on top-down, centralized control has limited community engagement in, and slowed implementation of, efforts to combat Ebola. Governments have had some success in the enforcement of travel restrictions and prohibitions against community gatherings. However, quarantines and contact tracing generally require more local cooperation, and progress in achieving this has been uneven.

While the international community is responding to the Ebola outbreak, coordination could be improved, and support has not always been effective. Nevertheless, several programmes have addressed key challenges facing government efforts against the disease, and the provision of financing and technical support has increased in recent months.

The Government of **Guinea** established an Inter-ministerial Crisis Committee to coordinate efforts against the Ebola epidemic, and a National Coordination Unit responsible for developing effective strategies for breaking the chain of infection and improving effective management of the sick. This mechanism has been complemented at the local level by committees led by prefectural and regional coordinators. At the community level, Health Committees have been reactivated, or set up where they did not previously exist. An appeal has been made to religious and community leaders to contribute to the fight against the epidemic. To date, however, the Government has had only limited success in encouraging the community engagement that is essential to stopping the epidemic.

Télimélé provides an inspiring example of what can be accomplished with full community participation in efforts to fight the epidemic. After the presence of infections was confirmed in May 2014, the community took steps to disseminate information and raise awareness of the epidemic, established a local isolation area and treatment centre, and mobilized religious and traditional leaders to correct inaccurate rumours about the origin of the disease. Engagement by local leaders was critical in gaining the confidence of the community and facilitating the work of health care teams. Effective treatment of the sick and monitoring of all contacts stopped the chain of infection; the last confirmed case was on 10 June.

The Government of **Liberia** took a very bold action to declare a state of emergency. However, preventative measures were not sufficient, even as the disease was reported in neighbouring Guinea and Sierra Leone. Once the epidemic hit, the Government failed to engage communities in the struggle against the disease, hampering local cooperation with control efforts, for example quarantines. The Ebola outbreak initially exacerbated the lack of coordination among government institutions as various ministries competed for resources and authority over the programme. Similarly, the competition for donor funding impaired collaboration between civil society organizations, international NGOs and the Government.

The declaration of a 90-day state of emergency in August was made in conjunction with preventative measures, including instructions for non-essential government staff to remain at home for 30 days, the closure of schools, the closure of markets in affected areas, and restrictions on social gatherings and movements between counties. Although necessary, these measures severely limited social interactions and destroyed the livelihoods of service providers, for example, teachers in private schools and local traders (UNDP/RBA 2014 e).

Cooperation by local communities was also limited, in part because of the Government's failure to engage local leaders and a perception of rampant corruption, boosted by the failure of the Ebola Task Force to account for the Government's initial $5 million contribution. For example, the youth of King Gray Community resisted the construction of a treatment facility in their community, leading to three weeks of negotiations while the disease raged.

The Government of **Sierra Leone**'s response to the epidemic has been uneven. Quarantines have achieved better results in communities where treatment centres are available (so that patients need not be transported to distant and unfamiliar locations) and where local communities participate in managing the quarantine. Compensating community contact tracers and providing special remuneration to security personnel responsible for enforcement could improve the effectiveness of quarantines in some areas. Other government efforts have involved: the deployment of police and military officers to support health service workers; restrictions on public gatherings (except those related to Ebola awareness raising and education); active surveillance and house-to-house searches to trace and quarantine Ebola victims and suspects; support for local disease control efforts; new protocols for arriving and departing passengers at the Lungi International Airport; and efforts to inform and mobilize the public.

The Government has engaged local councillors and Ward Committees in promoting health education and the establishment of Neighbourhood Watch Groups aimed at early detection and notification of EVD suspected cases. Some local systems established to alert responders of suspected Ebola cases, transport suspected cases to isolation units, bury the dead in demarcated sites, and disinfect homes of the deceased have been successful in limiting the spread of the disease, in some areas and at some times resulting in no new cases being reported for almost a week.

However, lack of coordination and centralization of decisions under government control have frequently undermined local programmes. Containing the Ebola epidemic will require strong coordination within the Government, and between the central administration and key sectors (e.g. transportation and communications), donors and local institutions. Enabling local councils and chiefdom administrations to take ownership of the process is critical to ensure active community participation and compliance with recommended public health interventions. One example of the ills of centralization is the National Ebola Response Centre's (NERC) mandate to perform all Ebola-related funerals. This has resulted in significant delays in burials, because NERC has been overwhelmed by the number of deaths.[8] A more effective strategy would be for the national response team to train local burial teams, who would be in a better position than government officials to reconcile cultural burial practices and the safe burial practices required to limit spread of the disease. In addition, the cumbersome national bureaucracy has limited the provision of discharge packages for survivors. As a result, relatives have little incentive to comply with critical disease control measures (the burning of bedding, mattresses, and clothing of Ebola victims), and they often remove corpses to other locations. In some communities (Chiefdoms), efforts to monitor compliance with rules aimed at preventing the spread of the disease and to trace contacts have been undermined by the lack of clearly defined remuneration

Unlike previous outbreaks of the Ebola virus in the Democratic Republic of the Congo (1976), Sudan (1979) and Uganda (2000)[9], the **international community** has responded positively to the outbreak in the three West African countries. The WHO has played a critical role in helping to monitor the outbreak of the disease and in disseminating information. However, coordination among donors could be improved, and many of the organizations providing assistance have little experience with Ebola. There have been some examples of inefficient

[8] This mandate has now been assigned to NGOs, including Concern World Wide, World Vision, and Red Cross Sierra Leone.

[9] In these countries, the outbreaks were restricted or localized, unlike in Liberia, Guinea and Sierra Leone where the outbreaks have hit main provincial cities and the capitols.

expenditures, for example, the devotion of resources in Liberia to the construction Emergency Treatment Centres (ETCs) are not needed at this time. Moreover, international assistance was delayed until galvanized by the infection or death of U.S. and European nationals providing health services in affected areas, and it is unclear how much of the millions pledged will ultimately be disbursed and efficiently spent. Nevertheless, funds from the international community are increasing.

Guinea's international partners are mobilizing additional assistance to support the Government's efforts against the epidemic. As of early November, project commitments for this year reached $324 million, with the major sources from the UN system, the World Bank, the European Union, the African Development Bank (AfDB), and bilateral donors, principally France, Japan and the United States of America. Donors also are providing $128 million in budget support to counter the impact of the epidemic on public finances (see below). These amounts are substantial in comparison to the development assistance received by Guinea in recent years (total of $340 million in 2012), but remain far below the resources required to confront the epidemic and rebuild the national health system equired (estimated by WHO) of over $1.3 billion.

Much of the aid already received is being devoted to fighting the epidemic, including some project assistance that has been redirected from other uses. Only about 13 percent of this amount is on the Government's budget, which makes the coordination of aid- and government-financed expenditures problematic. This contributes to the slow rate of disbursement of funds, only 15 percent as of early November. Even budget support has a disbursement rate of only 32 percent, except International Monetary Fund (IMF) funding which is disbursed immediately. The Government's limited absorptive capacity is often cited as one of the reasons for low disbursement. The fact that these countries were rated low by rating agencies on public service delivery and accountability tends to underpin the need for improved absorptive capacity.[10] This calls for scaling up government capacity to be able utilize the resources efficiently and effectively.

In **Liberia**, donors are helping to improve logistics and assist with coordination, surveillance and safe burials. Other activities include social mobilization, case management, and construction of ETUs. WHO, the lead UN agency, has mobilized over 180 personnel.[11] Although there are funding gaps,[12] the international community is also working with the Ministry of Health to restore basic health services.

The United Nations Mission for Ebola Emergency Response (UNMEER) was established with its headquarters in Accra, Ghana to respond to the EVD outbreak. UNMEER adopted the 70-70-60 goal, which aims to isolate and treat 70 percent of all infected persons, and to provide safe burials for 70 percent of all deceased, within 60 days (beginning October 1 to December 1). The United Nations Children's Fund (UNICEF) has delivered nearly 250 metric tonnes of EVD supplies, including personal protective equipment (PPE), chlorine disinfectant, oral rehydration solution, ready-to-use therapeutic food, emergency health kits, soap, and hygiene supplies. World Food Programme (WFP) has provided logistical support. Several countries, including, among others, the United Kingdom, Cuba, China, South Africa, Nigeria and Sweden, also have sent medical personnel and equipment. Samaritan Purse and Doctors Without Borders are among the first NGOs to provide assistance.

[10] The 2014 Fund for Peace Fragile State Index and the 2014 Ibrahim Index of African Governance provide some illumination on how these countries were rated on state legitimacy (including corruption, government effectiveness and political participation) and public service delivery (including policing, provision of quality health and education services).

[11] The current contract is for three months; the problem of fast turnover is being addressed.

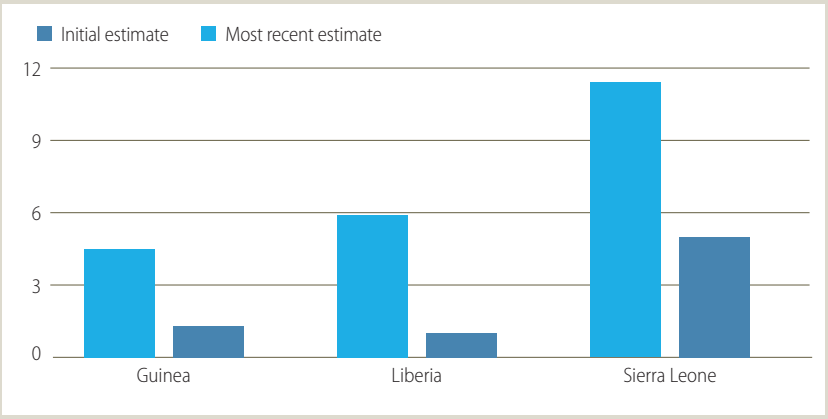
[12] According to WHO, one set of PPE cost $200, is worn once and then disposed.

Chapter 4: The economic impact

4.1 Ebola is reducing growth and increasing inflation

The epidemic and ensuing panic is simultaneously reducing demand (as personal income, investment and exports fall) and supply (as agriculture production falls and some businesses in other sectors are closed). The supply of labour is falling due to the following: deaths; the departure of expatriates; the burden of care on households; the migration of workers to escape the disease; and the unwillingness to engage in collective activities since farmers refuse to participate in the harvest and office workers stay home from many private firms and public sector institutions. The huge rise in uncertainty is discouraging investment. Governments are imposing various restrictions on trade (e.g. closure of markets and regional borders), travel (e.g. quarantines, restrictions on movements to some areas) and on public gatherings (e.g. bars, restaurants and entertainment). Over time, declines in income, rising unemployment, and price rises due to supply disruptions will further depress household consumption, thus compounding the problem. Governments in all three countries have sharply reduced their estimates for growth in 2014 (figure 3).

FIGURE 3: **GOVERNMENT GROWTH ESTIMATES FOR 2014 ARE BEING DOWNGRADED** (PERCENT)



Ebola is driving growth down

Background papers prepared for this study provide another perspective on the likely impact of the epidemic on growth. Economic modelling exercise can be useful to capture the several, interacting effects of the epidemic on economic activity, which can supplement the estimates provided by government experts. Two different modelling approaches were used: an econometrically-estimated macroeconomic model and a computable general equilibrium (CGE) model.

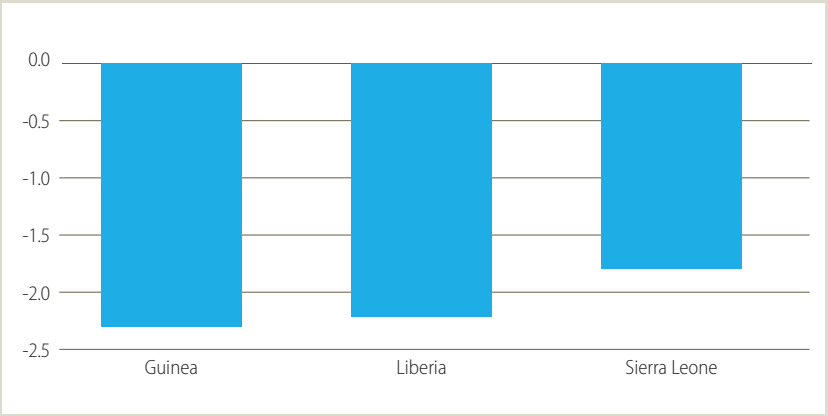
The macro-economic model investigates how the epidemic affects labour, capital, and productivity, which are the major components of growth. Accordingly, an econometric estimation was undertaken of the relationship between growth and exports, FDI, population, the mortality rate, life expectancy, and education (see Annex 1). Assumptions are then made about how the epidemic may affect these variables, and use the estimated model to calculate the change in GDP that results. The major assumptions include:

- a decline in exports of 10 percent for Guinea, 38 percent for Liberia, and 20 percent for Sierra Leone (the different assumptions reflect information on how the epidemic is affecting the commodity composition of trade);
- a fall in net FDI flows in all countries to zero;
- a rise in the EVD fatality rate of 66 percent in Guinea, 50 percent in Liberia, and 30 percent in Sierra Leone (based on recent information on the incidence and case mortality rate of the epidemic); and
- a reduction of population growth to zero.

The epidemic is estimated to reduce GDP growth by 2.3 percent in Guinea, 2.2 percent in Liberia, and 1.7 percent in Sierra Leone (figure 4).[13] The increase in the population mortality rate has the largest impact in the simulations, reducing GDP growth by 2.1 percentage points in Guinea, one percentage point in Liberia, and 1.3 percentage points in Sierra Leone (figure 5). The decline in trade also has a substantial impact, but the fall in FDI flows and stagnation in population do not. It should be noted, however, that a prolonged depression of FDI flows could have serious implications for long-term growth, given the need for both increased capital and foreign expertise and technology. Since the equations also include the mortality rate, the population variable may capture the influence of emigration, which is relatively small in the sample of countries used for the estimation.

In all three cases, the decline is less than the revision in official estimates of GDP growth from before the epidemic until now. One reason for this is that all of these countries have substantial exports of minerals, and minerals prices on international markets have fallen recently. For example, the reduction in growth in Sierra Leone in the macro simulation is 1.7 percentage points, considerably less

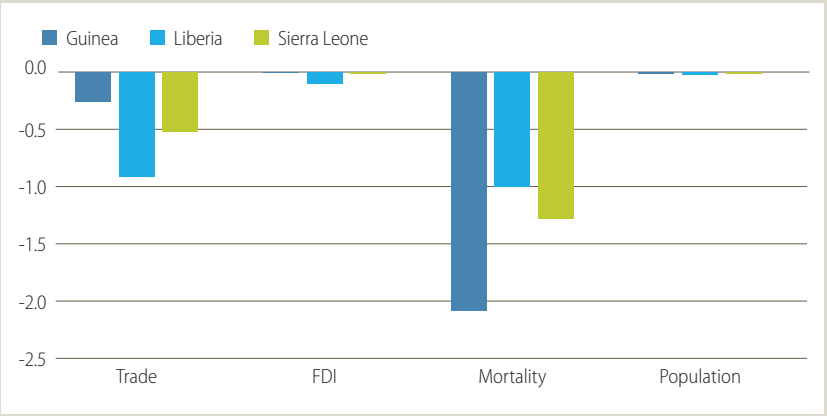
FIGURE 4: **IMPACT OF EBOLA ON GDP GROWTH ACCORDING TO MACRO SIMULATIONS** (PERCENTAGE POINTS)



The macro model simulations illustrate the impact of the epidemic on growth

[10] This is based on the econometric model using some key variables but with limited interactions with the rest of the economy.

FIGURE 5: **IMPACT OF KEY VARIABLES IN MACRO MODEL ON GDP GROWTH**
(PERCENTAGE POINTS)



The macro model shows the epidemic is having a large impact on GDP through exports and fatalities

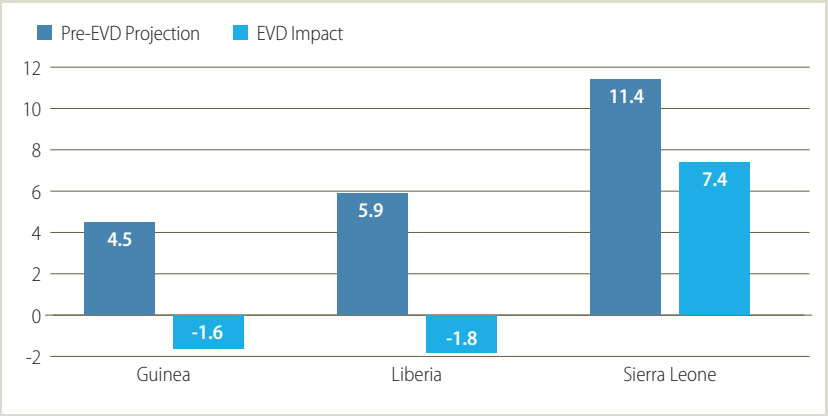
than the 6.4 percentage points revision of the official GDP forecast for 2014. However, the prices of Sierra Leone's iron ore exports, which account for almost half of total exports, fell by 39.6 percent from October 2013 to October 2014. This change is reflected in the official estimates, which are intended to capture all recent economic events, while the modelling exercise is designed to isolate the impact of the epidemic.

A computable general equilibrium (CGE) model was also used to simulate the impact of the epidemic on growth in the three countries. The CGE model involves a framework that traces how changes in the supply and demand for factors (labour, capital) and for products affect output and prices in different sectors of the economy (see Annex 1 for a description of the model). The major assumptions of the CGE simulations include:

- a reduction in labour supply in the first year of the simulation of 5.3 percent in Guinea, 2.9 percent in Liberia, and 1.7 percent in Sierra Leone, based on a .08 percent population infection rate from the virus, and case mortality rates calculated from the experience of the epidemic;
- a decline in key export prices in the first year of the simulation by 20 percent in all three countries (15 percent for Sierra Leone partly due to increase in price of cocoa);
- a rise in government expenditures in the first year of the simulation by 13 percent in Guinea, 6.5 percent in Sierra Leone, and 15 percent in Liberia; and
- the closure of business and government offices for five days;

In the moderate scenario, which represents our most likely case, the CGE model calculates that the cumulative loss in output due to the epidemic will equal 6.1 percent in Guinea, almost 7.7 percent in Liberia, and 4 percent in Sierra Leone. When compared with the earlier official projections before the EVD outbreak, estimated economic growth in 2014 is -1.6 percent (Guinea), -1.8 percent (Liberia) and 7.4 percent (Sierra Leone) (figure 6).

FIGURE 6: **LOSS OF OUTPUT IN CGE SIMULATIONS** (PERCENT)



The CGE simulations show a sharp decline in output from the epidemic

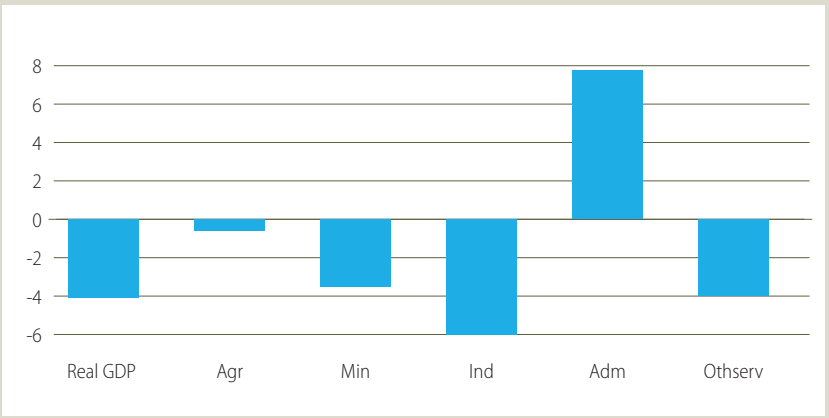
The declines in output in the CGE simulations due to the epidemic are significantly greater than in the macro model simulations, in all three countries. For example, our moderate scenario for Liberia envisions a loss in GDP of 7.7 percent, compared to a decline of 2.2 percent produced by the macro model. In addition to some differences in assumptions, there is also a substantial difference in approach between the two exercises. It is possible that the CGE model, which takes account of the interaction among economic sectors, may represent a more realistic view of how the epidemic may affect the economy. For example, the CGE model may better capture how declines in the labour force affect each of the various sectors, and how this impact in each sector can then affect other sectors.

Inflation is increasing despite the fall in demand. Travel restrictions, mandated market closings, and fears of contagion are disrupting internal markets and limiting productive activities that require collective involvement, for example, farming practices. The closing of land borders and the reluctance of foreign shippers to service ports, which is reducing the number of ships and driving up marine insurance premiums (UNDP/RBA 2014d), is in interrupting external trade. All in all, these supply interruptions are raising prices, particularly of agricultural commodities in areas distant from producing regions.[14]

The three economies are similar in terms of sectoral composition and the supply issues that the epidemic has raised in each sector. Smallholder agriculture accounts for a significant share of output and a larger share of employment. Production of foodstuffs destined for the local market and surrounding countries, as well as preparations for next year's harvest, have been hit hard by the epidemic and measures to contain it. Export crops destined for international markets may have been less affected (although producers face difficulties in shipping), depending on whether their production occurs in regions heavily affected by the epidemic. Mining output has suffered moderately from the rise in the cost of exporting, slowing investment, and the departure of expatriates. Manufacturing accounts for only a very small share of these economies' GDP, although reduced activity at some large firms has had an impact on employment. Construction has declined sharply as investment and infrastructure projects (many related to mining) have

[14] The CGE simulations show a decline in inflation as a result of the epidemic. Essentially, the reduction in the demand from the epidemic, driven by falling incomes and fewer people, outweighs domestic supply interruptions, which may not be entirely reflected in the CGE modelling framework, and limits on imports.

FIGURE 7: **LOST OF OUTPUT DUE TO EVD IN SIERRA LEONE, BY SECTOR (CGE MODEL)** (PERCENT)



The sectoral impact of the epidemic varies

Note: Agr. is Agriculture; Min. is Mining; Ind. is Industry; Adm. is Administration; and Othserv is Other services.

been delayed or cancelled. Services is the largest sector in all three economies, and has been severely affected by the epidemic. Food and entertainment providers (e.g. bars, music venues, restaurants) have seen their businesses shut down by government edict. The departure of expatriates, reductions in business travel, and the lack of tourists have sharply reduced travel and tourism revenues, although the influx of medical workers has provided some compensation for hotels and some service establishments.

In the CGE simulations, the epidemic has the largest sectoral impact on mining (except for in Guinea), manufacturing and services (figure 7 provides the sectoral effects for Sierra Leone). The impact on total output in the agricultural sector is less than the other sectors (again, with the exception of Guinea), although still significant owing to the decline in the labour force. This calls for a well-targeted social safety nets for seriously affected people and enterprises during the recovery process. However, in the case of many basic commodities, the fact that production has held up has been of small comfort, given that the closure of markets and of borders made it difficult, in some cases impossible, to sell the products. The rise in administration reflects the assumed increase in government expenditures, especially recurrent spending.

The country results from the CGE modelling exercise emphasize two other aspects of the epidemic's impact on development. First, shifts in prices may be exacerbating inequality. In the agricultural sector, the epidemic has had a substantial role in interrupting trade of basic commodities, resulting in a rise in their prices in non-producing areas. For example, in the Guinea CGE simulation, the prices of basic agricultural commodities that form a large portion of the diets of the poor (e.g. cassava, corn, fonio, and rice) rise, while the prices of goods that form a larger share of the diets of the relatively well-off (e.g. beef and poultry) fall.

Second, the adverse impact of the epidemic on growth may be extended over time, even if the epidemic were to be rapidly contained. For example, the mining sector in Liberia, which is critical to generating the resources required for development, is severely affected by the epidemic in the second and third year of the simulation, most likely owing to the lagged impact of lower investment and reduced human capital (as expatriates leave the country). Output in the mining sector does not return to trend after five years.

The Government of **Guinea** lowered the initial GDP growth forecast for 2014 from 4.5 percent to 3.5 percent in June, before the acceleration of the number of

confirmed infections in August, and then to 1.3 percent in September.[15] The sectoral impact of the epidemic has varied, because of varying effects on regions that specialize in different products, and because some sectors have been particularly affected by the interruption in trade. The overall reduction in the estimate of growth for 2014 was largely driven by the now-anticipated collapse in services (a decline of 4.5 percentage points in Guinea's largest sector), with the revision in the primary and secondary sectors about 2 percentage points each (table 4).

TABLE 4: REVISIONS TO GOVERNMENT ESTIMATES OF GDP FOR 2014, GUINEA (PERCENT)

	2011-13	2014 Nov 2013 est.	Nov 2014 est.
Primary	4.5	5.1	3.3
Secondary	3	5.1	3.1
Services	3	3.7	-0.8
GDP	3.4	4.5	1.3

The primary sector (agriculture, livestock and fisheries) accounts for 20 percent of GDP and occupies 70 percent of the population. To date, Northern Guinea, where a great part of agricultural production is located, has been relatively untouched by the epidemic, so its impact on agricultural production has been moderate. Nevertheless, production in Northern Guinea has been affected by the fall in agricultural exports. And production of foodstuffs has dropped sharply, as the most affected region, Guinée Forestière, is an important supplier. (Box 1 describes the impact of the closing of borders on potato farming in Moyenne Guinée.) Local production of rice, which covers 80 percent of national consumption, will fall 10 percent in 2014. Other foodstuffs (manioc, maize, fonio and groundnut) have been less affected by the epidemic.

The secondary sector accounts for 32 percent of GDP and is dominated by mines (15 percent of GDP) and construction and public works (CPW) (10 percent). Mining production is undertaken in parts of the country currently little affected by the epidemic. Thus, bauxite and gold production in the period from March to June 2014 increased by 4 and 20 percent, respectively, from the level in the same period in 2013. Diamond production, on the other hand, fell by one third, and the number of diamond miners fell from 210 to 15, for fear of catching the disease. Nevertheless, mining investments are being delayed by the refusal of many ship owners to service Guinean ports after the declaration of the medical state of emergency in August, which boosted freight costs by 25 to 35 percent. The epidemic has severely reduced construction and public works, owing to delays in mining, mining-related infrastructure, and tourism projects. Manufacturing, which only accounts for 6 percent of GDP, has not been significantly affected by the epidemic according to the latest data. However, cement production has plummeted with the delays in infrastructure projects and the freeze on exports to neighbouring countries. The CGE modelling exercise anticipates that the manufacturing sector could suffer a loss of production of about 5 percent due to the epidemic.

The tertiary sector (trade, transport, entertainment and administration, etc.) accounts for 41 percent of GDP. The epidemic has reduced air, sea and road activity. Many countries, including Guinea's main economic partners, are advising their nationals against travel to countries affected by the epidemic, and the average occupancy rate in hotels fell from 80 percent before the outbreak to 40 percent currently. The suspension of flights in August reduced traffic at Conakry International Airport by nearly 60 percent, and container and shipping traffic at Conakry port has dropped by 32 percent and 9 percent, respectively. According to the CGE modelling simulation, the fall in services value added due to the epidemic is estimated at 2 percent.

The forecast for growth in 2015 is being revised downwards, given the substantial risks involved in the continued impact of the epidemic on economic activity. Even if the epidemic were to be brought under control in early 2015 (in line with the national response plan), the losses to GDP for 2015 could be between $230 million and $300 million. If the epidemic is not brought under control,

[15] The CGE simulations show a decline in inflation as a result of the epidemic. Essentially, the reduction in the demand from the epidemic, driven by falling incomes and fewer people, outweighs domestic supply interruptions, which may not be entirely reflected in the CGE modelling framework, and limits on imports.

BOX 1: THE IMPACT OF BORDER CLOSINGS ON POTATO FARMING IN MOYENNE GUINÉE

Since the early 1990s, Moyenne Guinée has seen the emergence of a new economic dynamic around the potato sector. As a result of the use of technical methods and the use of quality inputs, there are three crops per year (rainy season crop, inter-season crop and off-season crop), with average yields varying between 15 and 20 tonnes/ha, or even 25 tonnes/ha for the off-season crop (in the lowlands). This is excluding foodstuff production (rice and maize) and other vegetables (several thousand tonnes of cabbage, carrot, tomato, aubergine, etc.), which can be cropped after the potato harvest without any additional fertilizer. The populations benefiting from the sector are, above all, the producers (30,000* affiliated to the Guinean National Confederation of Rural Residents' Organizations, or CNOPG) and their families, agricultural workers, traders, carriers and handlers.

The Ebola epidemic is hitting the development of these sectors hard. More than half of this production is exported to Senegal, Gambia, Guinea-Bissau, Mali, Sierra Leone and Liberia. For example, potato exports to Senegal fell 91 percent from August 2013 to August 2014. The number of trucks (each with 30 tonnes of potatoes) leaving Timbi Madina (Pita sub-prefecture) for Diaoubé regional market (the market supplying Senegal, Gambia, Guinea-Bissau and others) has fallen from 20 each week to one or two. Similarly, 20-25 trucks per week used to ship potatoes from Dalaba market, mainly to Conakry, Siguiri and Sierra Leone; now there are only three to five per week.

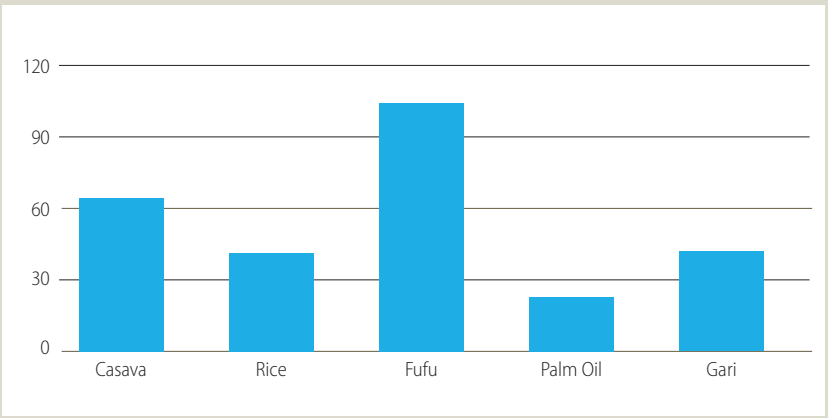
For the potato sector in particular, the closure of borders has resulted in: (i) difficulties in moving products on, particularly in the main harvest season from August to September 2014; (ii) oversupply on the local market, leading to a dramatic fall in sales prices; and (iii) considerable post-harvest losses, sometimes reaching 40-50 percent of production. The impact on the sector has been magnified by the perishable nature of the products, excessive production in the rainy season for the local market, and insufficient infrastructure for the preservation and/or processing of products. The current situation also increases uncertainty over investments for the next season, since it is not yet clear whether producers will be able to reach their traditional markets.

* *Note: This number doubles during the rainy season, with other producers providing CNOPG members with second generation seed potatoes (from the inter-season crop in the lowlands).*

the losses could become much greater, involving a more pronounced fall in agricultural production and potentially a surge in inflation. The banking system could face severe problems if the current situation damages their loan portfolios. The 2015 election season, if turbulent, could also have a significantly negative impact on growth.

The forecast for inflation in 2014 has been increased only modestly, from 8.5 to 9.4 percent. The general consumer price index rose 4.1 percent from March to September, and 1.1 percent from August to September, a level consistent with seasonal patterns. According to information collected monthly, the sale price of imported rice in the main urban markets (Conakry, Kankan, Kindia, Labé and Nzérékoré) did not move between March and September 2014, in comparison with the same period in 2013. The rise in the prices of essential commodities in Conakry from September 2013 to September 2014 varied considerably, but was overall limited (1.1 percent for local rice, 10.6 percent for maize, and 3.8 percent for groundnut oil). At the same time, prices in rural producing areas are not increasing much either. For example, in Guinée Forestière, the market remains relatively stable, as the availability of foodstuffs has been supported by the reduction in trade with the rest of the country, restrictions on trade with countries in the sub-region, and the distribution by the WFP of large quantities of food to affected communities and households.

FIGURE 8: **RISE IN PRICES OF ESSENTIAL COMMODITIES AFTER OUTBREAK OF EBOLA, LIBERIA** (PERCENT)



Ebola is driving up key food prices

Note: Based on data from 7 of Liberia's 15 counties.

The epidemic has severely depressed economic activity in **Liberia**, Most notably, domestic food production, mining activities, the hospitality industry, and transport services have suffered sharp declines. The Government's latest economic assessment anticipates that GDP will increase by only 1 percent in 2014, compared to an initial forecast of 5.9 percent, and stagnate in 2015. Growth is anticipated to fall, from the initial forecast, in all major economic sectors (table 5).

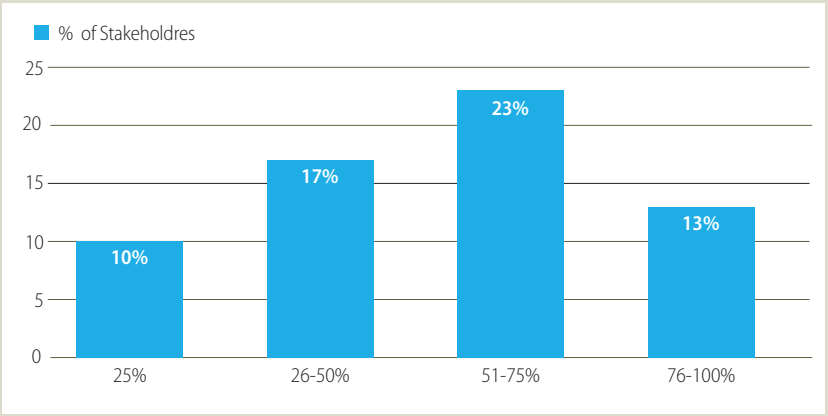
TABLE 5: IMPACT OF EBOLA EPIDEMIC ON GDP FORECAST FOR 2014, LIBERIA (PERCENT)

Sector	Pre-Ebola projection	Revised growth projection
Agriculture	3.5	0.8
Forestry	6.5	-3.0
Mining	4.4	-5.9
Manufacturing	10.1	0.0
Services	7.7	2.2
Total GDP	**5.9**	**1.0**

Inflation is now expected to rise to almost 15 percent for 2014, compared to 8 percent in the forecast made in January. The disruption of agricultural activity, which particularly affected Nimba, Bong, Grand Bassa and Lofa, reduced the supply of agricultural commodities and substantially increased their prices (UNDP 2014b). Despite the decline in demand, the interruption of trade increased the price of rice by 41 percent (on average over 7 of Liberia's 15 counties), since 80 to 85 percent of the rice consumed in Liberia is imported. Demand thus shifted to local commodities, which together with the disruption of domestic travel, boosted the prices of cassava by 63 percent; the price of fufu more than doubled (figure 8).

Given the difficulties in obtaining aggregate estimates of the changes in price indices for the most recent months, interviews were conducted to measure stakeholders' perception of changes in prices as a result of the epidemic. More than 60 percent of respondents reported that the prices of agricultural commodities in general had risen by one quarter or more, with

FIGURE 9: **CHANGE IN THE PRICES OF AGRICULTURE COMMODITIES AS A RESULT OF THE EPIDEMIC, LIBERIA** (PERCENTAGE OF RESPONDENTS ESTIMATING EACH CATEGORY)



Ebola is driving up agriculture prices

Source: Data from field work compiled by authors.

13 percent of respondents reporting price increases exceeding three quarters (figure 9). Although it does not clearly emerge from available data, it is likely that the rise in price in producing regions was moderated by the increased difficulty in shipping commodities to distant markets.

The epidemic has severely depressed growth in the agriculture and forestry sector, which accounts for about one quarter of GDP and half of the workforce (three quarters of the rural workforce). The production of export crops is declining (see below). Commercial agricultural activity (e.g. Sime Darby, one of the world's largest agriculture concession companies in the palm oil sector) has suffered from the evacuation of essential foreign staff. Smallholder agricultural also has been heavily affected, especially in the local food growing areas such as Lofa County situated in north western Liberia, which was initially the epicentre of the epidemic. Labour shortages disrupted both harvesting and replanting, with serious implications for next year's harvest. Almost two thirds of survey respondents estimated that the drop in the production of agricultural commodities exceeded one quarter (figure 10).

More than 60 percent of respondents reported that people's livelihoods fell as a result of the decline in agricultural production, accentuated by the rise in uncertainty and restrictions on movements. Forty percent of respondents estimated that the decline exceeded 50 percent of pre-Ebola levels (figure 11).

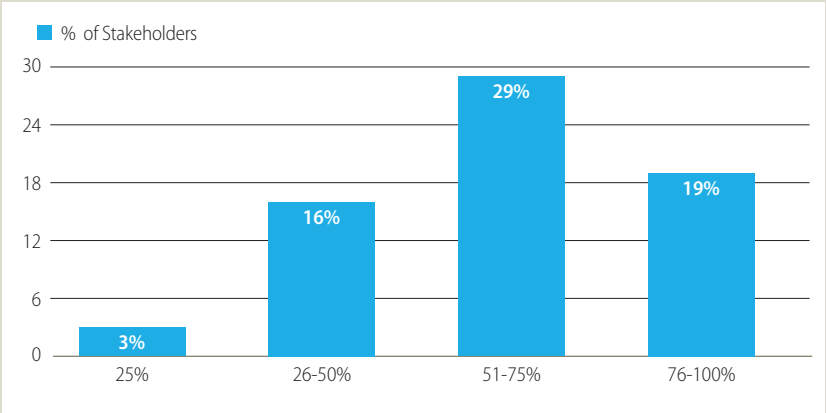
Some people in rural communities shifted their work to activities less affected by the epidemic, for example sand mining, fishing, production of dirt bricks, arts and crafts, and hunting. Marketers in Monrovia who could not get access to agricultural goods switched to the sale of imported goods. However, respondents pointed out that their involvement in such activities was not as lucrative as the sale of agriculture products.

Production in the mining sector, which accounts for 17 percent of GDP and 56 percent of total exports, is now expected to decline by almost 6 percent in 2014, and perhaps fall further in 2015. The sector is dominated by two large iron ore mining companies. Production at the largest mining company (Arcelor Mittal) is on track to meet its target of 5.2 million tonnes in 2014, although investments to expand capacity to 15 million tonnes per year have been put on hold. The second largest mining

company (China Union), which had been expected to produce approximately 2.4 million tonnes in 2014, has closed its operation in August, perhaps because its mines were close to the epicentre of the outbreak. In addition, restrictions on the movement of people have severely curtailed artisanal mining, including that of gold and diamonds.

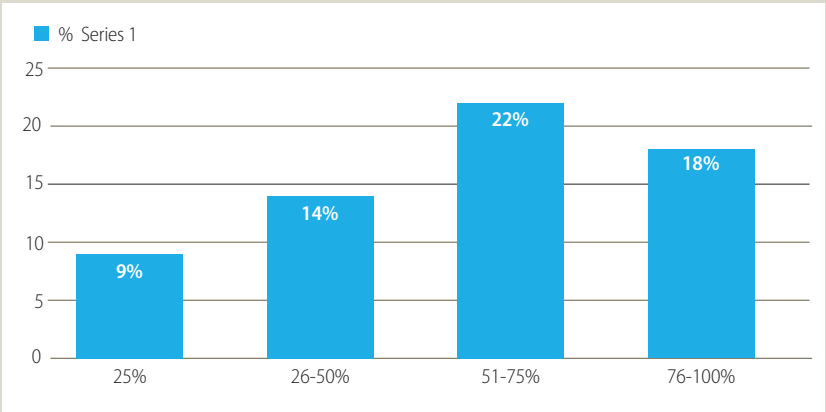
Liberia's manufacturing sector, mostly cement and beverages production, accounts for only 4 percent of GDP. Value added is now expected to stagnate in 2014, owing to the general decline in demand (particularly for cement due to the fall off in construction) and disruptions to the availability of workers.

FIGURE 10: **IMPACT OF THE EPIDEMIC ON THE PRODUCTION OF AGRICULTURAL COMMODITIES**
(PERCENTAGE OF RESPONDENTS ESTIMATING EACH CATEGORY)



Ebola is depressing agricultural production

FIGURE 11: **DECLINE IN LIVELIHOOD AS A RESULT OF THE EPIDEMIC, LIBERIA**
(PERCENTAGE OF RESPONDENTS ESTIMATING EACH CATEGORY)



Ebola is reducing welfare

Both commercial and residential construction activities, which were booming before the crisis, appear to be on hold. Government construction activities in the energy and transport sectors have also come to a halt, as contractors have declared force majeure and evacuated key personnel (World Bank, 2014a).

Liberia's service sector, which accounts for half of GDP and nearly 45 percent of the labour force, was the hardest hit by the EVD outbreak. Wholesale and retail traders have reported a 50 to 75 percent fall in turnover compared to the normal amount for the trading period, with particularly sharp declines in markets that formerly served expatriates. Interview data reveal that the number of trucks serving city markets, and the number of taxis travelling between Monrovia to other locations fell sharply between the second and the third quarter (when the epidemic intensified).

The banking system is heavily exposed to trade, construction, and personal services, sectors that have been negatively affected by the epidemic. Thus borrowers are confronting substantial difficulties in servicing their accounts as the crisis continues, and the share of nonperforming loans has increased. Moreover, profits have fallen with the drop in deposits (as clients have drawn down cash balances to cope with the crisis) and in the demand for loans. However, as a result of the central bank's prudent supervisory oversight, the domestic banking sector remains relatively stable. All nine banks maintain strong liquidity positions and capital adequacy ratios.

The economy of Sierra Leone was initially projected to grow by 11 percent in 2014, due mainly to increased iron ore and other mining activities, increased agricultural production, continued construction activities, expansion in the services sector, and recovery of the tourism sector (GoSL 2014a). However, the Government has reduced the forecast of GDP growth in 2014 to 5 percent, which reflects strong growth in the first half of the year. GDP is estimated to be falling by 2.8 percent at an annual rate in the second half (World Bank 2014b). The revision to the Government's forecast is in line with the simulation from our CGE model, where the total output loss due to the epidemic is estimated at 4 percent.

Inflation appears to be easing slightly. From September to October 2014, the rate of increase in the price of food products at the national level fell from 8.5 to 8.3 percent, and in Freetown from 12.6 to 11.8 percent. This decline is due to the advent of the harvest season, when the supply of food on the market increases significantly.

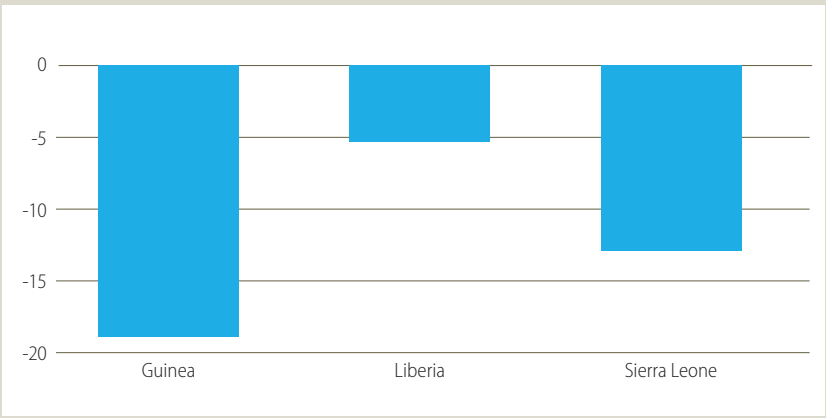
The agricultural sector, which accounts for around 41 percent of GDP, is dominated by subsistence farming. Smallholder farmers make up one fifth of infections (as of October), of whom 54 percent are women. This gender bias may indicate that the epidemic has a greater impact on vegetables and grains than on cash crops.[16] The low incomes earned in this season may reduce the availability of seeds for planting, potentially depressing production over the next few years. The evacuation of expatriates has undermined production at the few commercial agricultural companies, which are mainly engaged in bioenergy production and rice processing. Plans to expand palm oil production have been scaled back due to restrictions on movement.

The mining sector was the principal driving force behind the initial forecast of 11.3 percent GDP growth in 2014. While some companies have maintained recent levels of output, overall mineral production has dropped. Construction of major trunk roads has been suspended, because contractors are afraid of contracting the disease through gathering and interaction at work. The neglect of road construction is damaging trunk and feeder roads, thereby hindering the movement of Ebola cases to treatment centres (especially in Kailahun and Kono Districts). Cement sales, a good proxy for the construction sector, fell by 43 percent from May to August.[17]

[16] Yamano and Jayne (2004) find that female mortality in smallholder agriculture in Kenya tends to depress production of vegetables and grain crops, while male mortality has a greater impact on cash crops such as coffee and cocoa. This is also likely to occur in Sierra Leone, as women are predominantly involved in annual crops and vegetables, while cash crop production is the domain of men.

[17] According to the joint GoSL and United Nations Country Team report on the socio-economic impact of Ebola outbreak.

FIGURE 12: **CHANGE IN INDIRECT TAXES, CGE SIMULATIONS**
(PERCENT)



The CGE simulations show that the epidemic is reducing government revenues

The demand for locally produced manufactures, which account for only 2 percent of GDP, has dropped significantly.[18] The decline in production has reduced the incomes of women farmers that supply raw materials (e.g. sorghum to the Sierra Leone Brewery Company). Further, the scaling down of operation by bars, restaurants and breweries due to the state of the health emergency has led to a loss of jobs for 24,000 people (GoSL 2014b).

The services sector has been severely affected by the epidemic. Tourist arrivals at the international airport fell by 30 percent in January to August 2014, compared with the same period in 2013.[19] However, the impact of reduced arrivals on tourism sales has been cushioned by the influx of medical workers, and hotel occupancy rates have risen close to their usual levels. The epidemic has severely disrupted cross-border trading (e.g. weekly Lumas[20] have been disrupted or suspended), boosting the prices of food and other commodities in areas distant from production centres and reducing returns to producers and intermediaries. Finally, banking activities have been impaired by a reduction in working hours.

4.2 Fiscal balances are deteriorating

The epidemic is estimated to increase budget deficits in the three countries by $500 million in 2014 (World Bank 2014b). The drop in business activity and in imports, combined with declines in employment, have reduced taxes on incomes, sales and external trade. Government revenues are taking a big hit. In the CGE model simulations, indirect taxes decline by 18.9 percent in Guinea in the first year of the simulation, 5.3 percent in Liberia and 12.9 percent in Sierra Leone (figure 12). Income taxes also fall with the decline in demand and interruptions in business operations for example, in Guinea income taxes on business have fallen by over one fifth.

With government expenditures rising by necessity to control the epidemic, the fiscal deficit is widening. To date, the rise in foreign assistance has limited the increase in domestic borrowing. However, efforts to restrain the increase in the deficit have reduced expenditures not related to Ebola, which is jeopardizing both immediate welfare and long-term development.

[18] Data are from GoSL. Production figures for Leocem, Sierra Leone Brewery and Sierra Leone Bottling Company are not readily available, so the domestic excise tax on sales was used as a proxy.

[19] Information from the Government of Sierra Leone and the UN Country Team.

[20] Lumas are periodic markets where goods are sold from different parts of the country and across borders..

As of September, the Government of **Guinea** forecasts that revenues in 2014 will be only 56 percent of the level anticipated in the initial Finance Act, driven by the sharp decline in tax withholdings (in part due to the departure of expatriate workers in mining and infrastructure projects) and weaker than anticipated customs revenues (largely due to the reduction in traffic through Conakry airport and port). The epidemic is forcing a reduction in spending unrelated to the epidemic. In the first nine months of 2014, public investment expenditures were only 45 percent of the level planned for the year.

If current trends continue until the end of the year, the fiscal deficit will rise to 6.3 percent of GDP, almost triple the initial forecast of 2.2 percent. Budget support mobilized from the IMF, the World Bank and the AfDB since September has not been sufficient to fill the financing gap anticipated for 2014, and the Government has proposed a Correctional Finance Act for 2014. The need to further cut expenditures not related to fighting Ebola is likely to deepen the recession.

The fiscal accounts in **Liberia** have deteriorated significantly as a result of the epidemic. The depression of economic activity reduced tax revenues by 18 percent and non-tax revenues (such as fees) by 15 percent from the original estimate (table 6). Revenues from nearly all tax categories are likely to fall below original estimates. For example, taxes on incomes and profits are expected to be down 11 percent and property taxes 3 percent. Customs receipts have plummeted, reflecting the decline in imports and a huge rise in exemptions (as imports related to fighting the epidemic are exempt from tax).

The shortfall in revenues has been financed by a sharp rise in borrowings. After accounting for cuts in response to fiscal pressures and increases due to the epidemic, expenditures are set to rise by $46 billion compared to earlier estimates, further increasing the financing gap. In the absence of positive economic news, the epidemic is expected to have an even greater effect on the Government's fiscal position in fiscal year (FY) 2015/16, which will seriously delay implementation of the public sector investment programme.[21]

The epidemic is reducing government revenues in **Sierra Leone**. Based on a lower than expected revenue outturn for the first half of the year 2014 and on performance in the first two months of the third quarter, IMF projected a revenue short fall of SLL271 billion at the end of 2014. The shortfall in revenues compared to their target level improved from 16 percent in the second quarter to 2 percent in the third quarter, in part because of the reduction in the target. The epidemic has reduced revenues principally by affecting mining royalties (see above), sales taxes (largely from the closure of service establishments, lower consumption of domestic goods, and lower imports),[22] and a general weakening in tax compliance due to increased uncertainty, the closure of businesses, and loss of jobs. By contrast, the epidemic is increasing estimated government expenditures for 2014 by SLL55.8 billion compared to initial estimates (2015 Budget speech). Nevertheless, the rise in expenditures is accompanied by severe declines in non-Ebola related activities, including other health services, recurrent expenditures, and infrastructure investments.

TABLE 6: CHANGE IN REVENUE ESTIMATES FOR 2014 AS A RESULT OF EBOLA OUTBREAK, LIBERIA

Indicator	$ mil, before epidemic	$ mil, most recent	Percent change
Total revenue	559	521	-7
Total tax revenue	415	339	-18
Other non-tax revenue	66	56	-15
Borrowings	28	76	171
Contingent revenue	24	15	-36

[21] Information from the Ministry of Finance and Development Planning, Government of Liberia.

[22] The substitution of medical workers for tourists and businessmen in hotel occupancy has reduced government revenues, because of the exemptions the former enjoy on goods and services taxes.

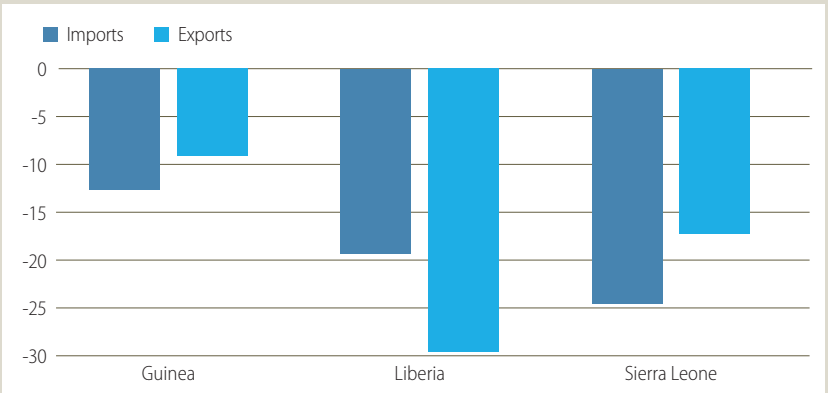
The shortfall in revenues and rise in expenditures has led the Government to increase domestic borrowing, although a portion of the rise in the deficit will be met by increased budgetary support.[23] Due to pressure on public spending caused by the epidemic, the monetary sector has continued to face challenges in all its operations.

4.3 Exports and imports are falling

Exports from the three countries are declining due to to supply interruptions in areas heavily affected by the epidemic, some shortages of shipping as owners are reluctant to service ports, and decreasing minerals prices on international markets. Imports are also dropping, and the net impact on the trade balance is difficult to judge. In the CGE simulations, the loss in exports due to the epidemic is estimated at 30 percent in Guinea, 14 percent in Liberia, and 10 percent in Sierra Leone (figure 13). The percentage decline in imports is less, except for Sierra Leone. The rise in official finance may balance the fall in FDI. To date, the countries do not appear to be facing serious difficulties in foreign exchange markets.

The epidemic is exacting a heavy toll on **Guinea**'s balance of payments. Exports of agricultural products (11.7 percent of the total) are declining. Fruits and vegetables exports largely disappeared with the closing of borders with neighbouring countries, while exports of coffee were down 59 percent, and cocoa down 9 percent, in April to July, 2014 compared to the same period in 2013.[24] In addition, the international prices of Guinea's mining exports (45.1 percent of the total) are falling. The value of imports also will drop in 2014 compared with 2013, reflecting a fall in domestic economic activity, including the postponement of major infrastructure projects linked to the development of new mines. (Imports of cement were down 57 percent by volume in April to July 2014 compared with the same period in 2013.) The decline in imports also reflects logistical hurdles linked to the sharp reduction in air traffic and reduced shipping. The estimate for the current account deficit for 2014 has deteriorated by more than 1 percent of GDP.

FIGURE 13: DECLINE IN TRADE FROM CGE SIMULATIONS
(PERCENT)



The epidemic is reducing both exports and imports

[22] The substitution of medical workers for tourists and businessmen in hotel occupancy has reduced government revenues, because of the exemptions the former enjoy on goods and services taxes.

[23] $40 million, according to GoSL (2014).

[24] Source: Monthly dashboard of the Guinean economy (July 2014), National Directorate of Economic Studies and Forecasting.

A storage facility for Cocoa & Coffee exporters in Kailahun town, eastern region of Sierra Leone. Photo by UNDP Sierra Leone.

Capital flows are also declining, as FDI inflows were only $16 million in the first six months of the year, compared to $134 million for all of 2013. Overall, the deterioration of the trade balance, in conjunction with lower financing, has increased the financing gap for 2014 from $29 million (0.4 percent of GDP) before the epidemic to $129 million (1.9 percent). Therefore, the increase in IMF support by $41 million in September is not sufficient to meet all of Guinea's financing needs for the year. Without some further internal adjustment or additional external finance, Guinea's international reserves holdings are likely to fall below three months of imports.

To date, the central bank intervention in the foreign exchange market in **Liberia** has maintained rough stability in the exchange rate. Exports of rubber, Liberia's most important agricultural export, have been disrupted by workers' reduced mobility and difficulties in getting products to the ports due to quarantines. Export revenues from rubber could be around one fifth lower than anticipated earlier in the year (World Bank 2014a). As exports continue to decline (particularly due to reduced production in the mining sector) while imports rise to support efforts to contain the epidemic and provide emergency assistance to affected households, the trade balance is expected to deteriorate.

It appears that **Sierra Leone**'s export revenues are easing, owing to some interruptions in mining sector operations and lower mineral prices on international markets. At the same time, imports are falling, as can be seen by the shortfalls in import taxes in the second and third quarters due to lower demand and trade bottlenecks. Capital inflows are declining, as FDI in both mining and agriculture is drying up. However, official Ebola-related transfers are expected to compensate for a portion of the external financing gap,[25] and pressures on the exchange rate remain moderate. The Leone depreciated against the dollar by 2 percent from June to November.

[25] Information from the Government of Sierra Leone and the UN country team.

Chapter 5: The social impact

The Ebola epidemic in the three countries has been a social catastrophe of vast dimensions. However, reliable measurements of how much the epidemic has halted, or even reversed, recent progress in social indicators may not be available for some time. The reduction in economic activity is reducing employment, boosting poverty rates, and increasing food insecurity. The deterioration in incomes may be exacerbated by a breakdown in social cohesion, because fear of infection impairs the cooperative networks that the poor rely on.

Households have used several strategies to cope with these events including: the sale of productive assets such as land, buildings, livestock and seed rice, which reduce future income opportunities; reducing financial savings, which increase household vulnerability to future shocks; reducing consumption of food and non-health services, which are detrimental to welfare; and migrating to other areas in search of food and other livelihoods, which can be risky.

The uptake of health services unrelated to Ebola has declined sharply. Fear of the disease has drastically reduced attendance at health clinics and acceptance of assistance from health workers for all medical issues (including pregnancy), and increased reliance on traditional healers. The result is likely to be higher infant and maternal mortality and increasing numbers of deaths from malaria and other diseases. However, the increased attention to hygiene may have improved water supplies and limited cholera.

The epidemic is postponing the completion of education for students across the three countries. Schools have closed in all three countries, and it is unclear when it will be safe to reopen them. The unavailability of schooling, coupled with the death of parents and relocation to households that may be distant in location or family ties, has increased the vulnerability of children. Around 5 million children aged 3 to 17 are out of school due to Ebola.[26] Efforts to bring them back to school should be of utmost priority for all stakeholders. Ebola's toll also includes children who have lost their parents to the disease. The fate of around 4,000 children has been thrown into uncertainty as their intellectual and psychological development, as well as their physical well-being, are at risk.

The epidemic is having a disproportionate impact on women. In two of the three countries, more women are infected than men, largely because their traditional role as caregivers exposes them to infection. Women's livelihoods are also particularly affected, since they make up the majority of local traders and producers of fruits and vegetables, activities that have been sharply reduced in the wake of the epidemic. Many women also finance economic activities through various forms of cooperative borrowing arrangements that typically require gatherings of people, which have been suspended due to fear of contagion. Finally, disruptions related to the epidemic, for example the death of one's spouse, travel to distant locations, and (for girls) school closings, may increase vulnerability to sexual exploitation. Indeed, there are already indications of a rise in teenage pregnancies.

The epidemic has surely interrupted whatever progress had been achieved in reaching the Millennium Development Goals (MDGs). Prior to the onset of the Ebola virus, while the three countries were unlikely to meet many of the MDGs, they had nevertheless achieved substantial progress. The epidemic is likely to: raise poverty rates (MDG 1) due to the decline in incomes, particularly of the rural poor; halt progress in reducing the number of underweight infants and child mortality (MDG 4) owing to the rise in the prices of foodstuffs, the disruption of agricultural production, and the sharp drop in the use of health services; and increase maternal mortality (MDG 5) and facilitate the spread of HIV/AIDS and malaria (MDG 6), again due to less use of health services. The educational targets (MDG 2) clearly have little relevance while schools are closed, although what little information is available does not indicate that the epidemic affected gender parity targets in education (MDG 3) during the past term. Examples of the impact of the epidemic on environmental sustainability (MDG 7) include the failure of efforts to protect reserves due to travel restrictions, and a potential improvement in water supplies due to greater attention to hygiene.

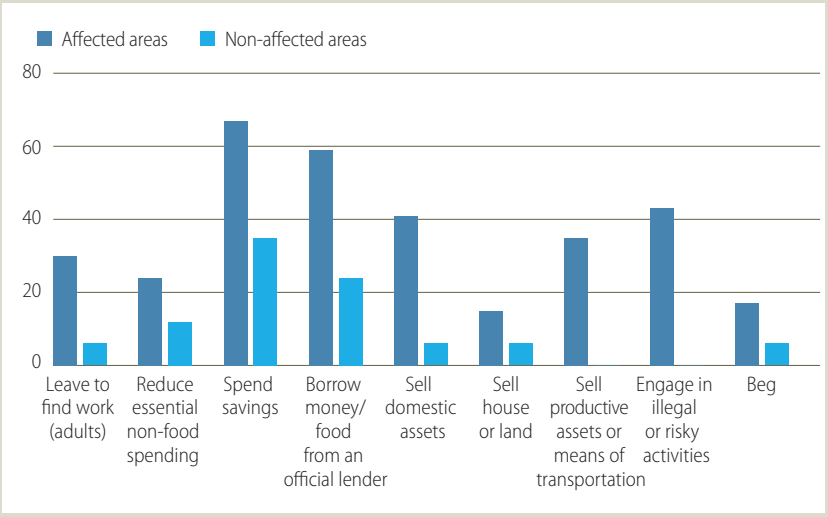
[26] This is based on UNICEF's estimates.

The expansion of the epidemic in **Guinea** from August 2014 may exacerbate poverty and reverse human development gains. The most significant social impact will be in the regions most affected by the epidemic, particularly rural communities in Guinée Forestière that are at the epicentre of the epidemic on the border. In some rural communities, the rise in mortality and the reluctance of workers to gather for collective work have led to the abandonment of farms. In addition, due to the self-imposed isolation of some communities means that farmers cannot get to fields located beyond the limits set by villagers. This situation is disrupting the operations of producer groups and greatly reducing agricultural production. Furthermore, the closure of some local and regional markets, combined with the departure or death of some key actors (traders, carriers, etc.), have drastically reduced trade with the rest of the country and bordering countries. Witness statements are unanimous that transport and commercial transactions with these localities have declined. The epidemic is having a severe impact on farmers' purchasing power in the most affected rural communities, and is increasing food insecurity.

This situation is corroborated by the findings of the rapid survey on living conditions and food security conducted in October (FAO-WFP 2014), which finds that 61 percent of agricultural communities surveyed face a poor harvest and only 15 percent think their harvest was better than that of 2013. The decline in the supply of agricultural labour is reflected in the 91 percent of persons surveyed in affected areas who report displacements of populations, compared to 47 percent in non-affected areas. The World Food Programme Coping Strategies Index, which measures the severity and frequency of consumption-related coping strategies, shows a deterioration in the food situation in Guinée Forestière in October compared to earlier months. Households in the areas affected by the epidemic were forced to adopt coping strategies that are likely to harm long-term welfare much more frequently than households in areas that were less affected (figure 14).

The epidemic has caused the erosion of social cohesion in the affected areas, including the suspicion, isolation and stigmatization of affected households, and increasing mistrust within families.[27] Three quarters of households

FIGURE 14: **SHARE OF HOUSEHOLDS IN GUINÉE FORESTIÈRE ENGAGING IN COPING STRATEGIES, AFFECTED AREAS VERSUS NON-AFFECTED AREAS**
(PERCENT)



Coping with income declines from Ebola reduces future household welfare

[27] See UNDP RBA (2014 a, e and f) Policy Notes 1, 5 and 5; and UNICEF (2014).

questioned said they were mistrustful towards all the other members of the family, 88 percent did not want to live in the same house as or share a meal with someone who had a family member infected by the virus, and 86 percent did not want to share the same workspace and the same means of transport. Only 28 percent of respondents said that those cured of Ebola were accepted by the members of their families. A breakdown can be observed in social assistance and declining participation in traditional ceremonies, such as weddings and baptisms. Social disintegration due to the epidemic is exacerbating problems in communities that are already weakened by years of political and ethnic tensions.

While up-to-date data are sparse, employment in at least some sectors appears to be falling. The drop in agricultural employment in the rural communities affected by the epidemic is discussed above. Service sector employment is likely declining; a sample of private sector enterprises in September 2014[28] showed employment falling by 8.6 percent in the hotel industry, 3 percent in transport and 23 percent in construction and public works, in comparison with the situation in 2013. Delays in infrastructure owing to the postponement of new projects have affected local workers. The mining companies present a good example of this. Rusal, a leading global aluminium and alumina producer, either repatriated or confined around 50 percent of its personnel, while *Société Aurifère de Guinée* (SAG), a subsidiary of AngloGold Ashanti, evacuated employees and sub-contractors to South Africa.

The postponement of the construction phase of the mining and processing of bauxite into aluminium by Rio Tinto (Simandou Project) was expected to generate 10,000 jobs during the development phase, and once operational, would pay over $1 billion in taxes/royalties per year to Guinea and spend $2 billion on suppliers. The Guinea Alumina Corporation is expected to generate 3,000 direct jobs during the construction phase. The foregone investment amounts to $25 billion for these two projects. Production and employment in the industrial sector also fell. Topaz, which employed 1,400 workers and exports 45 percent of its products (such as paints), reduced its workforce by two thirds, while GI Cement cut production by 40 percent, from 47,520 to 28,700 tonnes (UNDP 2014a). Finally, the epidemic has had no effect on public service employment, because public services have mostly continued to operate, and the staff in public schools continue to receive their salaries despite the delayed opening of schools.

The epidemic has seriously disrupted education in affected areas due to the death or displacement of parents and educational staff, fears of infection, and lack of community resources. School attendance in affected areas fell by 35 percent from April to June 2014, and the next school year, which had been due to start in early October 2014, has been postponed indefinitely.

By contrast, hygiene conditions have improved, due to measures to prevent the spread of Ebola. Before the onset of the epidemic, toilet facilities and water for hand washing were extremely limited in both homes and schools. Efforts to redress this situation, or simply greater consciousness of the importance of hygiene, have led to the absence of cholera cases in 2014, despite favourable conditions for water-borne diseases (heavy rainfall and the accumulation of household refuse).

The epidemic has particularly affected women, who make up 53 percent of Ebola cases. The gender distribution of cases varies across the country;[29] women account for the highest share of Ebola cases in Gueckédou (62 percent) and Télémilé (74 percent) prefectures. The epidemic has disrupted important sources of employment for women, particularly informal sector activities such as the production and exchange of agricultural and handicraft products. The epidemic has sharply curtailed the practice of paying women as mourners and discouraged the gatherings required for the operation of collective credit arrangements. Finally, declining attendance at reproductive health services is increasing the risks women face from pregnancy and childbirth.

[28] This data collection was made by the National Directorate of Economic Studies and Forecasting of the Ministry of Economy and Finance. The data were collected from a sample of companies as part of the assessment of the macro-economic and sectoral impact of the epidemic of Ebola fever.

[29] Data available by locality cover a sample of approximately 30 percent of confirmed cases of infection.

The epidemic has likely further delayed achievement of the MDGs. Despite significant improvements in some social indicators, the political and institutional crises experienced from 2000 to 2010 made it impossible to achieve any of the MDG targets by 2015 (National MDG Report 2014). The epidemic is driving a further deterioration in indicators of human development, as follows:

- The poverty rate reached 55 percent in 2012, up from 49 percent in 2002, and will no doubt rise further with the deterioration of the incomes of poor farmers and the loss of breadwinners owing to the epidemic. Employment is falling. People in the informal sector are the most affected by the fall in household disposable income as a result of EVD. The impact is projected to remain substantial in 2015 – ranging from -1.93 percent (agricultural producers) to -4.94 percent (sellers of agricultural products –informal) (figure 15).

- The reduction in agricultural production threatens recent progress in reducing the share of underweight infants.

- School attendance in the most affected areas fell by 35 percent from March to June, and the 2014-15 school year has been postponed.

- Improvements in the educational Gender Parity Index over the past two decades (e.g. from 0.5 in 1994 to 0.8 in 2012 at the primary level) do not seem affected by the epidemic, although the decline in some food crops threatens women's empowerment.

- The decline in the use of basic health services, stagnation in the Integrated Management of Childhood Illness (IMCI), and the interruption in vaccination campaigns threatens the dramatic progress in limiting child deaths over the past 20 years, when the under-five mortality rate fell from 229 to 123 deaths per 1,000 live births, and the infant mortality rate halved.

- The maternal mortality rate, which despite declines remains the highest in the sub-region (724 deaths per 100,000 live births), is set rise with the drop in antenatal clinic attendances and attended childbirths.

- HIV prevalence in the 15-24 years old group has remained unchanged since 2005, but may increase with the 90 percent drop in HIV screening and the decline in HIV monitoring, since resources are being switched to Ebola and people are more reluctant to come to health clinics.

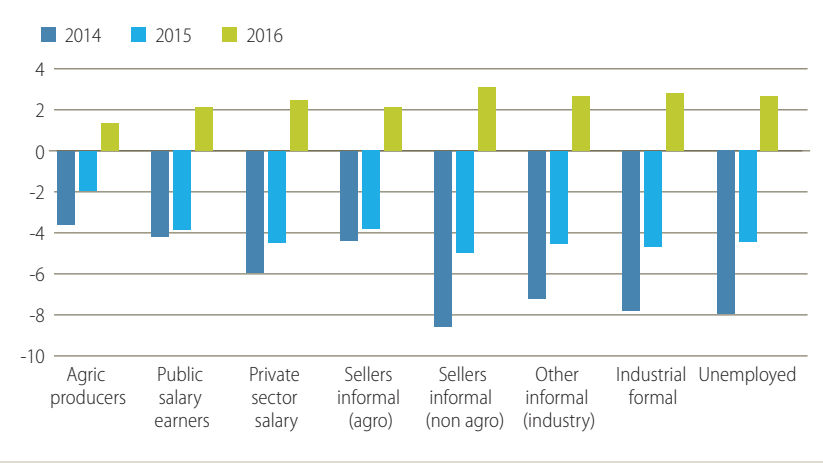
- Malaria incidence rose from 91.5 cases per 1,000 people in 2009 to 109 in 2012, and could increase sharply with the drop in home support by community workers and reduced attendance at health clinics.

- The epidemic has no discernible impact on environmental sustainability, except that improved hygiene due to fears of Ebola infection may improve water resources.

- The international community has stepped up support to countries affected by the epidemic, although most of the effort is focused on fighting the disease rather than development.

- The expansion of mobile telephony and the Internet do not appear to be affected by the disease.

FIGURE 15: EVD IS REDUCING HOUSEHOLDS' INCOMES, PARTICULARLY AMONG INFORMAL WORKERS



The decelerating impact of EVD on households' incomes cuts across occupational boundaries

While our analysis has been carried out on a national basis, there is little doubt that the greatest decline in welfare has taken place in the communities most affected by the epidemic. It is essential to support these communities before the deterioration in their productive capacities has become too great to be addressed (box 2).

Liberia has made significant progress towards meeting the MDGs. The last comprehensive report on its progress was published in 2010, which indicated that Liberia was on track to achieve MDG 3 (promote gender equality and empower women), MDG 6 (combat HIV, malaria and other infectious diseases) and MDG 8 (develop a global partnership for development). Moreover, Liberia achieved MGD 4 (reduce child mortality) by 2012, the first country in sub-Saharan Africa to do so. According to the 2013 Demographic and Health Survey (DHS), neo-natal mortality fell from 68 deaths per 1,000 live births in 1986 to 26 in 2013. Since 2004, Liberia was able to double its immunization rates for basic childhood vaccines. In contrast, the maternal mortality ratio has shown little change since the 2007 survey, while HIV prevalence rose from 1.5 percent in 2007 to 1.9 percent in 2013.

The labour market has suffered greatly from the epidemic. Many Liberians lost their jobs because they moved to escape the greater risk of infection in areas affected by the disease, were prevented from returning to work owing to quarantine measures, or their sources of employment shut down. While there has not been any full-scale assessment of the number of jobs lost due to the Ebola crisis, the Ministry of Labour continues to receive requests from firms to lay off workers. Around 710 people officially reported job losses due to EVD to the Ministry of Labour in Liberia. The agriculture sector had 175 job losses, followed by real estate and business services with 134, mining and quarrying with 130, and the communications and social health services sectors, with 66 each. To date, however, there has not been a massive increase in unemployment, in part because many people have little choice to find some work in order to survive.

The Ebola outbreak in **Sierra Leone** has destabilized poor households through: the disruption of farming and trading activities; the loss of employment in service, mining and industrial firms; quarantines and other controls that have

BOX 2: SUPPORTING RECOVERY IN THE MOST-AFFECTED COMMUNITIES

The virtual absence of social protection mechanisms to mitigate the impact of the epidemic is driving some households into poverty. Waiting until the epidemic is under control to help households restore their livelihoods risks making recovery much more difficult to achieve, because households will have lost all their productive capacity.

Communities affected by the epidemic need immediate support on several levels. Strengthening the distribution of food and nutritional supplements would mitigate the effect of the fall in agricultural production on malnutrition and limit the use of coping strategies damaging to sustainable livelihoods (the use of savings, the sale of assets, using seed for food, etc.). This nutritional support should be complemented by social safety nets such as cash transfers for households that are quarantined or shut out of markets, and food-for-work programmes to restore local infrastructure (e.g. development of wetlands and lowlands, restoring rural roads). Another priority is the supply of seeds and other inputs to support the next crop season.

Particular attention should be paid to the poorest households and those with orphan children from the Ebola epidemic. Economic support should be accompanied by strengthening the provision of basic social services, in order to rebuild confidence in institutions and strengthen social cohesion.

Short-term support for communities affected by the consequences of the epidemic should focus on the recovery of agricultural sector. Financial losses linked to the closure of borders have reduced the recovery of loans for this crop season, thus making it harder to prepare for future seasons (rainy season, inter-season and off-season). Initiatives should include the provision of targeted grants (or bridging loans) to cover part of producers' losses and facilitate the acquisition of seed and agricultural inputs, discussions with financial institutions (banks, microfinance institutions) with a view to enabling producers to spread repayment of seasonal loans, and the integration of local products into the WFP food distribution chain (food aid or school canteens).

Lastly, discussions need to be held with neighbouring countries on restarting cross-border trade via secure trading corridors. For example, Guinean trucks could stop at the border, where goods would be transshipped in a secure manner to lorries from the importing country. WFP could consider implementation of a logistics platform to support these trade corridors. United Nation's International Children's Emergency Fund (UNICEF) could also help secure these spaces (awareness, sanitizing, etc.), working with associations of economic operators from Guinea and the importing country.

In the medium term, the challenge is to reduce these sectors' vulnerability, in part through building packaging and storage capacities for perishables (potatoes, mangos, pineapples, bananas, oranges, tomatoes and other vegetables). This would include, among other things, the construction of warehouses and the provision of large capacity cold chains for the refrigeration of products, as well as pallets and packaging materials. Eventually, the installation of fruit and vegetable processing units would strengthen the resilience of the sectors. Public-private partnerships should be encouraged to participate.

separated families and prevented social gatherings; and the loss of belongings destroyed to prevent the spread of the disease.

The epidemic also has impaired workers' rights, since many employers simply abandoned their businesses without paying a retrenchment package, some staff have been forced to stay in hotels for fear of contracting Ebola and infecting guests, and the medical facilities provided staff in many industrial and mining companies are inadequate.

The epidemic has worsened the position of women. While, unlike in Guinea, there is no significant difference in the number of confirmed Ebola cases between men and women, the epidemic has reduced willingness to access maternal and reproductive health services such as antenatal care, emergency obstetric and neonatal care, outreach to adolescent women, HIV testing and treatment support, and contraceptives. In some areas, the number of pregnant women seeking care has dwindled to near zero (e.g. from 333 in May 2014 to 26 in September in Kenema District). Women make up 60 percent of cross-border traders and rely heavily on sales in community markets, and both activities have been severely disrupted by the epidemic.

United Nations Population Fund (UNFPA) reports that adolescent girls have been particularly exposed to EVD due to their role as care givers in the family and community, and that the closure of schools and the displacement of families may expose girls to sexual exploitation and sexual violence. Indeed, there are reports of a sharp rise in teenage pregnancies in some areas.

The epidemic has contributed significantly to the burden of infectious disease among children under five and to child mortality and morbidity; there have been 226 Ebola cases among 61 deaths from Ebola among children under five since the outbreak was announced. Schools have been closed indefinitely, and many children have already lost one term, increasing the likelihood that more poor children will have to spend more time in school to graduate and may therefore drop out. In addition, the incidence of child labour has risen, while the many children who have lost parents are not receiving proper care and are vulnerable to abuse and exploitation.

The epidemic also is contributing to environmental deterioration. The Environmental Protection Agency (EPA) had taken steps to control illegal logging, farming and mining in protected forest areas, and instituted a robust monitoring and evaluation mechanism with well-motivated and committed personnel. These efforts have been halted by restrictions on, and the dangers of, travelling in affected areas. The failure of this system is likely to erode the gains made in protecting water catchment areas, forest and animal reserves.[30]

One of the busiest beaches in West Point, Monrovia which has become deserted at the time the survey was conducted. Photo by UNDP Liberia.

[30] This information from the Ministry of Finance and Economic Development of Sierra Leone and the UN country team.

Chapter 6: EVD and Health System Management

Surveillance capabilities were extremely inadequate at the onset of the epidemic. While Guinea had procedures in place to monitor contagious diseases, all health districts in Sierra Leone lacked early warning systems. In general, however, the health systems lacked the laboratories, equipment and expertise to effectively detect and test for Ebola. Lengthy delays in the return of test results likely resulted in multiple infections by the subject tested before the system is aware of the infection.

The safe and effective treatment of Ebola requires the facilities necessary to isolate the patient, trained personnel, protective equipment, a stock of essential medicines (e.g. oral rehydration solutions and antibiotics) and burial of the deceased by a trained technical service with appropriate equipment. Support also should be provided to cured patients and their families to reduce stigmatization, accompanied by support for poor families that have lost their breadwinner, a hygiene kit for hand washing, and the monitoring of ostensibly healthy contacts for a period of 21 days.

The ability of the health systems in the three countries to provide these services varies, although all confront serious shortages of trained personnel, ambulances, drugs, available beds, and most everything else in the wake of the rapid expansion in Ebola cases. Clinics lacked sufficient facilities and equipment, for example, space to deal with the massive number of cases, and enough ambulances to transport patients to holding and treatment centres. One very serious issue is the limited availability of protective equipment, combined with inadequate training in its use. While steps are being taken to correct these problems, they have resulted in health agencies spreading the disease, as well as many deaths among critical health workers.

The provision of health services unrelated to Ebola has been sharply reduced, due to the diversion of human and financial resources to fighting the epidemic and the unwillingness of people to have any contact with the agencies or people providing services. Budget expenditures on health services unrelated to Ebola are constrained by budgetary allocations well below initial levels, as well as declines in cost recovery due to dramatically lower uptake of services. Services that involve biological tests, such as the detection and treatment of HIV/AIDS, have been particularly affected because patients fear infection from needles, while health staff often lack protective gear so they fear infection from clients. Vaccination campaigns have been postponed because they involve large public gatherings. The demand for reproductive health services has plummeted, with women relying on traditional healers or family members. Improvements in water and sanitation services have also declined, due to limited resources and disruptions owing to quarantines, which may ultimately undermine efforts to control infectious diseases, including Ebola.

Efforts to strengthen the health system are essential to both containing the epidemic and avoiding health disasters in the future. A decentralization of health services would promote local initiative and keep communities engaged, while facilitating more innovative and efficient solutions to current problems. An integrated programme to renovate health infrastructure and increase the quantity and technical expertise of staff is essential to upgrade services. More technical and financial resources will be required from donors, in the form of more debt relief, grant, and highly concessional loans to maintain debt sustainability. Success in these programmes will require governments to improve transparency and responsiveness to local needs in order to restore the trust in the health system that has been so badly shaken by recent events.

The epidemiological surveillance system in **Guinea** was not able to quickly detect the outbreak of the Ebola fever epidemic. The national health policy lays down a framework that divides responsibilities among the central, regional and prefectural levels for the collection and analysis of information linked to diseases, particularly for epidemiological surveillance. National guidelines lay down the guiding principles for epidemiological surveillance; they specify the list of diseases that must be monitored and the way in which information must be circulated between the different levels. Finally, they indicate what action is to be taken in the event of a suspected case, including the arrangements for test samples (preparation, storage and transportation).

The main diseases subject to surveillance are cholera, meningitis, yellow fever, measles, viral hepatitis and shigellosis. Monitoring also covers diseases requiring special investigation after notification of a case, including polio, Guinea-worm disease and neonatal tetanus. To this end, a weekly report is made on cases recorded for all diseases with epidemic potential; in the event of an epidemic, report is daily.

While several cases of Ebola were recorded from December 2013 and March 2014, it took some time for health professionals to recognize the disease, which is difficult to identify without experience of this type of virus. Doctors first suspected cholera, which is endemic in the first affected region (Guinée Forestière), and some of the victims tested positive for cholera. Thus, it was not until 23 March that the WHO published the official notification of an outbreak of Ebola fever in Guinea.

At the time of the onset of the disease, no health facility in the country could safely and effectively test for, and treat, Ebola. To address this challenge, the Government set up central facilities to diagnose, admit and manage the medical care of confirmed cases, provide psychological and nutritional follow-up for cured patients and their families, and establish secure burial procedures. Until the beginning of October, these centres were able to cope with the demands of treatment and support by constantly adapting their admission capacities. These centres reached full capacity by early October, one of which was expanded, and additional centres constructed. Training has been provided on how the disease is transmitted, the prevention of infection, and the management of cases. The provision of individual protection and hygiene kits to health facilities in affected areas, distribution of ambulances and motorcycles to some care and referral facilities, and the establishment of health monitoring teams at the border have helped cope with the disease. The positive response to the call made by the Head of State to retired doctors and other health specialists also increased the availability of personnel.

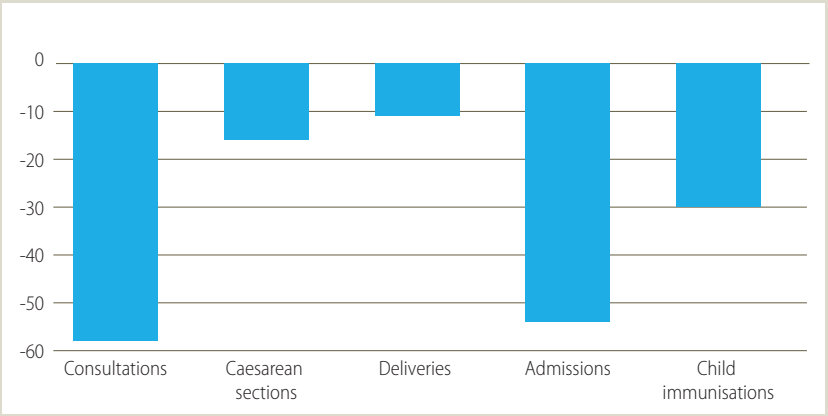
The Government has established an Inter-Ministerial Crisis Committee and a National Coordination Unit responsible for reducing infections and improving treatment. This mechanism has been complemented at the local level by committees led by prefectural and regional coordinators, as well as Health Committees at the local level. An appeal has been made to religious and community leaders to contribute to the fight against the epidemic.

Overall, the management system has been strengthened and made operational, even though some problems remain. The number of treatment and transit centres is still insufficient, forcing patients to travel long distances for assistance. Given the number and location of available laboratories, the time between testing and diagnosis is around 20 days. The staff responsible for monitoring contacts can cover less than 40 percent of the caseload. Some districts lack adequate stocks of drugs. Logistics and staff training in the centres need to be strengthened. Finally, community engagement is not adequate to re-establish confidence. More effort should be put into watch committees, rural radio stations, social mobilization, and teams tasked with burying dead victims with dignity and safety.

Expenditures on health services not related to Ebola have suffered in the wake of the epidemic. By the end of September 2014, expenditures amounted to only half of that planned in the Finance Act. For example, the subsidy to hospitals ($3.7 million in the 2014 Finance Act) had not yet been received by hospitals at the end of September 2014. Resources available for health spending not connected to Ebola have been further reduced by the 62 percent fall in cost recovery owing to the decline in the use of health facilities, together with the redirection of some donor funding for the health sector to the fight against the epidemic.

Several programmes report declines in coverage. Vaccinations have declined owing to the dedication of some funding and logistics resources to fighting the epidemic, and because some campaigns were postponed to avoid public gatherings. Vaccinations against polio and meningitis, together with pre-validation activities for the elimination of tetanus, have been postponed, and the 2015 measles control campaign may also be delayed. In response, the government plans to step up vaccinations in green areas, i.e. those areas unaffected by the epidemic or that had not recorded any new cases for the time period set by the WHO.

FIGURE 16: **CHANGE IN ATTENDANCE AT HEALTH FACILITIES, GUINEA, JAN -AUG 2013 TO JAN -AUG 2014** (PERCENT)



Fear of infection is driving people away from health services

Attendance at health facilities fell sharply from August 2013 to August 2014. For example, primary medical consultations dropped by 58 percent, hospitalizations by 54 percent, and vaccinations by 30 percent (figure 16). In some localities, women are giving birth away from health facilities, and some populations are increasingly turning to traditional medicine. According to the UNICEF study of November 2014, 49 percent of respondents in affected areas, and 32 percent in areas where the outbreak had been contained thought it dangerous to attend health facilities.

Funding delays and the redirection of staff to fighting Ebola have reduced support for the Integrated Management of Childhood Illness (IMCI) programme, which has decided to focus its efforts on raising public awareness using rural radio, continuing training in "IMCI without contact with the child", and the prevention of infections.

The appearance of the Ebola epidemic has already impaired the fight against malaria, which is the leading cause of morbidity and mortality in Guinea. Initially, health sector workers tended to ignore cases of malaria in those suffering from Ebola fever, but this has been corrected. Nevertheless, the malaria programme has seen reduced attendance at health facilities, declining home visits by community workers, the departure of some community workers to other NGOs working to combat Ebola and offering better pay, and a halt to the biological diagnosis of malaria and reduced attendance by health workers for fear of infection by the Ebola virus.

Recent data collected by UNFPA reveal a reduction in the use of reproductive health services, including a decline in 10 to 25 percent in antenatal consultations and of 7 to 20 percent in births attended by the health service practitioners, even though these services are free of charge. With the breakdown in the use of health services, of the approximately 200,000 pregnancies expected in the last quarter of 2014, nearly 40,000 pregnant women may not be monitored or have their babies delivered by a qualified person. The main consequence would be an increase in the number of premature births and miscarriages with the risk of the death of the child and the mother.

Voluntary screenings under the HIV/AIDS Programme have declined over the past two years. An assessment of the fight against HIV/AIDS is due shortly, but preliminary information indicate that the reallocation of resources to fighting the epidemic has stopped screening and activities

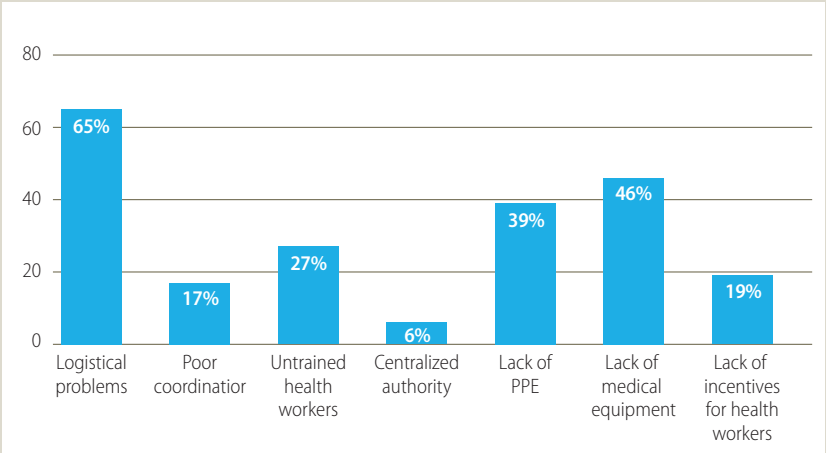
for the prevention of mother-child transmission of HIV/AIDS (PMTCT), reduced financial resources and food aid for people living with HIV/AIDS, and slowed community awareness-raising campaigns on the prevention of HIV/AIDS transmission. In conjunction with reduced resources, potential HIV/AIDS victims are reluctant to come to health centres ("it is better to live with AIDS than to die of Ebola"). The decline in outpatient clinic attendance due to Ebola also has halved the suspected cases of tuberculosis in Guinée Forestière, while resources planned for fighting tuberculosis have been redirected to fighting Ebola. Finally, it has become more difficult to obtain drugs to treat HIV/AIDS and tuberculosis, in part because of the decline in cost recovery.

The health system in **Liberia** was ill-prepared to confront the Ebola crisis. Sanitary conditions in hospitals were often poor, and protection against the virus inadequate. For example, at Star of the Sea in West Point, spraying of Ebola facilities was carried out only three times a week instead of the recommended three times a day. In rural areas, cases were not properly documented and attended to, the level of surveillance was very weak, and many health workers did not even use gloves. Laboratory testing was unavailable in some hospitals, and triage locations (where patients are screened and then referred to ETU centres or treated) had limited supplies of gloves and sanitizers. Initially, ELWA Hospital in Monrovia had only one ETU and lacked sufficient space for Ebola patients. Prior to the outbreak, the Montserrado County Health Team (CHT) had only four ambulances, and they were barely operational. In general, the lack of ambulances and the bad road network limited the transport of patients to treatment centres, although it also limited transmission to some remote areas.

Contact tracing, a critical process in controlling the virus, has suffered from a lack of coordination among field partners in the health system and inadequate cooperation by potential contacts. For example, the tags of various NGOs and UN agencies involved in contact tracing in West Point can be seen on the same houses. Friends and family members transporting patients to ETUs often did not cooperate with contact tracing, for fear of contracting the virus or being quarantined. Reliance on phone numbers given at admittance, rather than addresses made it difficult to trace contacts.

Many health workers abandoned their jobs in the face of the epidemic, as the limited availability of protective equipment greatly exacerbated the risks of testing and treating Ebola patients. Low wages, in conjunction with

FIGURE 17: **CHALLENGES FACING THE HEALTH SYSTEM IN MANAGING THE EBOLA EPIDEMIC, LIBERIA** (PERCENTAGE OF RESPONDENTS PROVIDING EACH REASON)



Health systems face numerous problems in fighting Ebola

broken promises from the Government for increases,[31] discouraged commitment to such hazardous duty. Survey respondents most frequently mentioned logistical problems and lack of medical equipment as the main challenges facing the health system in managing the epidemic (figure 17).

Prior to declaration of the Ebola epidemic in Guinea and Liberia, no district in Sierra Leone had an early warning system or an outbreak preparedness plan. There were significant differences in the time taken to release laboratory results (average of two days), to carry out contact tracing and line listing (sometimes a week), and to quarantine affected households and supply food (another week). In many cases, these averages reflect extended delays between initial testing and actual steps to contain the virus, greatly impairing the usefulness of early warning systems.

The health system faces a severe shortage of equipment and facilities. Beds are available at holding and treatment centres for only between 12 and 17 percent of the number of new cases each day. Two hundred ambulances are needed with appropriate equipment and personnel, but the system has only 96. There are far too few laboratories and skilled personnel to provide timely results of Ebola tests. More community holding centres are necessary to minimize the transport of Ebola patients and improve the acceptance of relatives and patients to Ebola treatment. Finally, there is a lack of counselling for patients and relatives, and for health workers in isolation units to avoid burn-out and depression.[32]

There is an extreme shortage of trained medical and health care staff, and only a limited availability of specialists in emergency response management, health economics, and health policy and planning. The shortage of doctors and nurses is particularly acute: the local WHO office estimates that 24 clinicians and 130 nurses were needed to contain the virus, while only four of each were available. Inadequate training in infection control practices, coupled with the limited supply and poor quality of protective materials, have spread the disease and led to several fatalities among critical health service staff. The quality of care is further undermined by the increasing distrust in public health facilities and health workers, by community members.

The epidemic is reducing resources and impairing the functioning of health programmes devoted to other issues. Outreach services, counselling and testing programmes for HIV have been stopped. All eight districts in which rapid assessment was conducted report that HIV testing cannot be performed because of the unavailability of personal protective equipment and the fear of Ebola infection among both patients and health professionals. The number of patients receiving Highly Active Antiretroviral Therapy (HAART) has dropped, especially in facilities now functioning as Ebola treatment centres. Funding declined in the second quarter of 2014 due to the redirection of resources to the fight against Ebola, and there are also concerns about the redirection of donor funding. The lack of personal protective equipment also has limited testing for malaria, and sufficient community health workers have not been devoted to the integrated community case management of childhood disease. Major interventions promoting child survival, including recent gains made in immunizations, have been severely affected by the epidemic.

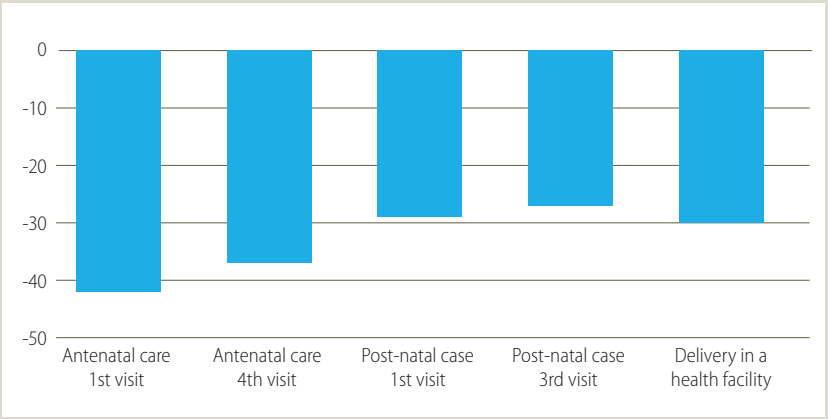
Fear of infection sharply reduced the number of visits to health facilities for reproductive health care between January to March 2014 (before the spread of the virus) and July to September (figure 18). The use of family planning methods by young men and women plummeted from May to August, with the use of intrauterine devices (IUDs) and implants falling by 90 percent,[33] and more short-term methods (injectables, pills cycles, condoms) by 95 percent. Essentially, the desire to avoid health agencies is increasing the number of unwanted pregnancies, and the number of women and infants infants at risk of dying.

[31] Workers were promised a monthly wage of US$750 for nurses and laboratory technicians, and US$500 for others; the amount received was around one-third less (Butty, 2014).

[32] These psychosocial measures proved highly successful in the Uganda outbreak (Mbonya et al. 2014).

[33] Data provided by the Aberdeen Women's Centre.

FIGURE 18: **CHANGE IN USE OF PUBLIC FACILITIES FOR REPRODUCTIVE HEALTH CARE AFTER SPREAD OF VIRUS, SIERRA LEONE**
(PERCENT)



Fear of infection is preventing women from getting reproductive care

Disruptions to improvements in water and sewage due to quarantine and isolation measures, the loss of qualified staff, and the diversion of resources to Ebola-related activities threatens to impair the promotion of hygiene necessary to control the disease and raises the risk of water-borne illnesses.

A doctor treats a pregnant woman at JFK Hospital, Monrovia. Photo by UNDP Liberia.

Chapter 7: The implications of EVD on UN programmatic interventions

The spread of Ebola places the different UN System agencies in the position of having to make extremely difficult decisions between the overriding necessity 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. Thus, 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 UN programmes should be to help the governments of these countries to strengthen health management coordination.

The UN Development Assistance Framework for **Guinea** (UNDAF 2013-2017) was designed to support good governance, the acceleration of growth, the promotion of employment and income opportunities for all, and a reduction in vulnerability and improvement of living conditions. Joint programmes among UN agencies are aimed at consolidating peace, achieving education for all, fighting food insecurity and vulnerability, and promoting maternal and child health, among other goals.

While these issues remain important, the emergence of the epidemic has highlighted several problems that merit joint discussions within the Guinea UN Country Team. The first concerns 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 rebuilding of a system capable of resisting similar shocks. WHO, UNICEF and UNFPA should work together on this priority.

Urgent steps are needed to support communities affected by the epidemic. 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 livelihood. Two recovery initiatives should be jointly set up by the Food and Agricultural Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), WFP, UNDP and UNICEF: one for Guinée Forestière and the other for Moyenne Guinée and Basse Guinée, given the different problems faced by these areas. UN political support should be provided to encourage the opening of secure trade corridors, with assistance from WFP to explore the feasibility of a logistics platform to support these trade corridors.

Recent experience has underlined the importance of structural measures to reduce the vulnerability of several sectors to shocks. The United Nations Industrial Development Organization (UNIDO) and UNDP should work on the industrial component of the agricultural value chain (establishment of agro-industrial fruit and vegetable processing units), within a public-private partnership.

UNDP should work with other UN agencies and the Government to address the structural causes of the fragility of Guinée Forestière, the epicentre of the epidemic. This requires going beyond the management of situational factors (health, humanitarian issues, and recovery) to achieve sustainable social cohesion between grassroots communities through dialogue and appropriate responses to the multiple tensions and violence of recent years. Solutions should take into account the regional dimension for stability and sustainable human development in the Manu River Union.

Finally, the Government needs to take a long view of how to achieve an acceleration of growth once the epidemic is a thing of the past. To this end, the UN system could help the governments design a global recovery plan, in conjunction with sources of financing, which could serve as a guide to government policy and donor support for the future.

With the outbreak of the Ebola virus in **Liberia**, the Government placed a moratorium on all ongoing/regular projects in order to direct all resources to fighting the epidemic. This had a significant impact on: UN programmes including communicable diseases, non-communicable

diseases, and issues dealing with women's health, polio and emergency response (WHO); school meals, school gardens, relief and recovery operations, emergency food assistance to Ivoirian refugees, and support for farmers' income (WFP); programmes related to HIV/AIDS, child survival and development, child protection, basic education and gender equality (UNICEF); and building capacity in the Government (UNDP). For the latter, support for decentralization of 12 line ministries has been hindered, and a conference to consider proposed constitutional amendments derailed.

Human and material resources have been devoted to fighting Ebola. UNDP is supporting the Ebola Task Force by providing vehicles, funds to strengthen coordination and social mobilization, and an expert in information technology to assist in processing Ebola-related information. UNDP Liberia is implementing active case finding in seven districts of Montserrado County, which involves searching for Ebola cases in selected communities through house to house monitoring. UNICEF has provided over 50,000 household protection kits and distributed emergency supplies from Luxembourg, while WFP is providing food assistance to over 422,00 people directly affected by the virus (UNICEF, 2014a).

While UN agencies are responding the Ebola crisis, a more thorough review of activities will be required to determine the resources that can be made available and the appropriate forms of support. Issues that should be considered include the reallocation of resources to address the epidemic, combined with the mobilization of further resources to address recovery and developmental needs; the design and implementation of quick impact projects; the deployment of SURGE capacities; the rolling out of a social safety net; and the establishment of fund management capacities.

UN agencies are reorienting their activities and funding to support **Sierra Leone**'s efforts to contain the epidemic. Programme WFP assesses that over one million people are likely to be in dire need of food due to Ebola. WFP has requested the use of School Feeding Programme resources for the immediate emergency response to quarantined households. FAO and WFP called for an emergency operation to provide 65,000 tonnes of food assistance to approximately 1.3 million people in Guinea, Liberia and Sierra Leone over a three-month period. Further support to the WFP for the provision of food to quarantined households has been provided by UNICEF and the World Bank. FAO intends to support the Ministry of Agriculture's plans to establish seed banks in the four regions of the country.

UNDP has conducted economic and social impact studies, and has embarked on a series of programmes, including, in collaboration with UNICEF, the provision of cash grants to discharged patients and the families of persons who have died of Ebola, support to security personnel at checkpoints/quarantine (VHF radios), and assistance to the Lakka holding centre. Based on UN Secretary-General memo of 12 December 2014 on '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.

WHO is providing technical support for surveillance activities, including the training of contact tracers, social mobilization and psychosocial support services. UNMEER is working with the WHO's Sierra Leone office to develop indicators, based on the availability of human resources and treatment centres, for monitoring Ebola response efforts.

UNICEF is focusing on social mobilization and logistics and is central to the provision of EVD pharmaceuticals. UNICEF interventions also support the Health Education Department, the social mobilization pillar, and psychosocial support services. Other areas of support to Sierra Leone, including support to child health services, have been scaled down in light of commitments to fighting Ebola.

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.

PART III: CONCLUSIONS, LESSONS LEARNED AND RECOMMENDATIONS

Children who have been quarantined after their grandfather's death from Ebola, Grand Cape Mount County. Photo by UNDP Liberia.

Chapter 8: Summary and Conclusions

The Ebola epidemic poses an enormous challenge

Guinea, Liberia, and Sierra Leone are poor countries that have suffered from violence, economic crisis and social disintegration in the recent past. They had emerged from these traumatic experiences, had established democratic governments, and were making progress in raising incomes and improving welfare before the Ebola epidemic struck. From 2010 to 2013, GDP in constant prices increased by more than 3 percent a year in Guinea, 10 percent a year in Liberia, and 13 percent a year in Sierra Leone. Significant, albeit uneven, progress had been made in addressing widespread poverty, high rates of disease and mortality, low human capital, and inadequate infrastructure and public services. Nevertheless, in the most recent estimates, the share of people living on less than $1.25 a day exceeds 40 percent in Guinea, 57 percent in Sierra Leone and 84 percent in Liberia.[34]

Just as in nearly all low-income countries, health systems in the three countries face enormous difficulties in confronting numerous health issues, and suffer from severe resource shortages and organizational defects. It is therefore not surprising that health agencies did not have on hand the stockpiles of equipment, drugs, supplies and facilities required to rapidly suppress a disease that had never before posed a comparable challenge anywhere in the world. Nor is it surprising that they lacked the trained experts required to detect a difficult to diagnose disease that was up until then relatively rare, nor the trained health professionals required to treat it safely and effectively.

Some examples of limited resources and expertise were particularly critical. The lack of protective equipment and appropriate training resulted in the death of many health care workers, leading some health workers to abandon their jobs. This problem also helped spread infections within treatment centres, thus discouraging people from being tested and treated, as well as going to health centres for any reason. The unavailability of medical experts familiar with Ebola seriously delayed awareness of the disease. Inadequate laboratory facilities delayed test results, thus giving more time for people infected with the virus to spread the infection and making it more difficult to trace contacts.

The lack of national resources is not the only reason for extreme shortages of essential supplies and personnel in all areas. Health spending and the availability of medical professionals tend to be inequitably distributed, with relatively high levels of resources in the national capital and particularly low levels devoted to rural areas. In addition to the lack of fairness, this distribution of resources may have impeded control of the epidemic, as many of the initial cases were found in rural areas. However, as the epidemic progressed and ill people flocked to the capital to seek treatment, the number of cases in the capitol also rose.

> ***Differences between public and private interests can make contagious diseases difficult to control. It is necessary to identify victims of the disease, isolate them so that they cannot transmit the disease, and effectively treat them in ways that do not spread the virus, as well as identify and test the people they were in contact with in the recent past. All these goals are critical to public welfare, but are not always perceived to be in the interest of every individual. Testing takes time and is subject to error; quarantine imposes costs and inconveniences; and treatment may involve the risk of infection from being exposed to others who have the disease and to the health staff who treat them. Thus, some individuals refuse to be tested or treated. Obviously, the delays and risks, and potentially the costs, of testing and treatment are greater in a low-income setting than in a high-income one.***

Characteristics of the Ebola virus make it particularly dangerous in these countries. The symptoms resemble those of other diseases that are endemic in the area, which makes the virus difficult to diagnose. This resulted in a few months' delay between the first cases in the sub-region and the official declaration of an epidemic. People had little experience with or information about Ebola, so they

[34] Internationally comparable poverty estimates are available for 2012 for Guinea, 2011 for Sierra Leone, but only 2007 for Liberia.

did not initially understand the cause of the rising tide of infections and high death rate. This gave rise to enormous uncertainty and outlandish rumours (e.g. that health workers are killing people) that greatly hampered efforts to address the epidemic.

Moreover, long-standing cultural practices that people were understandably reluctant to abandon helped spread the infection. Caring for the sick by friends and relatives, who are predominantly women, is an important duty in these societies, but such care by untrained and unequipped people further spread the virus. Also, the washing and dressing of dead bodies is a show of respect in some of the cultures in the area, but again was likely to transmit the disease.

In short, the lack of human and financial resources, the nature of contagious diseases, the difficulties involved in detecting Ebola, and cultural practices all gave impetus to the epidemic.

Nevertheless, the fault is not only in our stars

Other obstacles to controlling the epidemic were manmade. The legacy of the civil wars, the intensity of ethnic divisions, and concerns over corruption had eroded trust in the government. Thus, many people were not inclined to believe official explanations of what was occurring, or to follow government recommendations on steps to avoid infection. The latter was particularly tragic, since relatively simple preventative measures, such as avoiding communal hand washing, could have limited the rate of new infections.

While re-establishing trust in government takes time, some actions during the epidemic exacerbated the problem. Corruption is particularly destructive to trust in public institutions. Thus, for example, evidence from the survey shows that the disappearance of funds intended for the fight against Ebola in Liberia inevitably encouraged cynicism and impeded public commitment. The refusal to live up to commitments also impaired the success of containment efforts. For example, the failure to fulfil promises of increased wages for health workers reduced their incentive to face the enormous risks of their jobs. Similarly, the failure to provide promised grants to the bereaved discouraged relatives from bringing their dead for safe disposal, given the costs of having bedding, mattresses and clothes of the diseased burned to prevent their spreading the disease.

The specific policies pursued by communities, governments and international donors also played a critical role in determining the success or failure of control efforts. Excessive centralization is perhaps the most important example. Government management of health systems emphasized the taking of decisions at high levels of the hierarchy and the adoption of standardized approaches at the local level. This top-down approach is entirely inappropriate to fighting a contagious disease. Differences in local conditions and the lack of resources require flexibility and innovation, which are stifled by bureaucracy. In some cases, the centralization of supplies in the capital has severely impeded local programmes because poor roads have hampered distribution.

Perhaps more importantly, central control has failed to encourage commitment by local communities. Enforcing quarantines and tracing contacts involve the devotion of significant time by numerous individuals. If local communities do not support these efforts, they will not be successful. Local commitment clearly becomes all the more important when individuals are being asked to make large sacrifices and take substantial risks for the common good, in a situation of great uncertainty.

Bureaucratic competition for resources also impeded efforts at disease control. Such competition is difficult to avoid, since the anti-Ebola programmes involved the spending of enormous sums, at least compared to the normal budgets of many of the individuals and agencies involved. And it can be difficult to distinguish between those striving for power to ensure that the right decisions are made, and those wishing to control more people and money. Moreover, the competition among myriad agencies to play an important role in the fight against Ebola led to waste and duplication of efforts that these societies could ill afford.

Policies were also important at the community level. In some areas, resistance to government efforts significantly delayed important programmes, resulted in lax enforcement of quarantines, and critical steps such as contact tracing were not properly taken. In other communities, well-organized programmes that provided for identification, testing, contact tracing, isolation and effective and safe treatment eliminated new infections, at least for a time. In short, effective management at the local level makes an enormous difference to the number of deaths.

International donors can also make an important contribution to controlling the epidemic, and it is clearly in their interest to do so. These countries desperately need more money, medical expertise and logistical support to combat the disease. Donors have made progress in redirecting their resources to support national programmes. However, given the many agencies involved and the lack of widespread experience with Ebola, the process has inevitably involved some duplication of effort and wasted resources. Moreover, donors face difficult trade-offs between the urgent need to address the short-term disaster and the continued imperative of supporting long-term development.

The spread of the epidemic has been rapid, with horrific consequences

The first cases of Ebola that marked the beginning of the epidemic appear to have occurred in Guinea in December 2013. Given the difficulties in diagnosis, an epidemic was not officially declared until March 2014. Since Ebola is highly contagious, and there is considerable mobility across national and regional borders, this delay resulted in a rapid spread of the disease. The rate of increase in infections has varied throughout the year and by country, with some rise following August. There are indications that the number of new cases is declining slightly in Liberia, but there is no sign of any reduction in Sierra Leone and Guinea. The epidemic cannot be said to be under control in any of the three countries.

Although these numbers are alarming, they do not tell the full story of the impact of Ebola. First, individual reactions to the epidemic, often reinforced by government edict, have had a severe impact on the economy. The fear of infection discouraged collective activities: farmers could not gather to harvest their crops, businesses were shut down, and markets and schools were closed. Travel restrictions aimed at limiting the spread of the disease, including border closings, restrictions on movement in some severely affected areas, and quarantines, reduced trade and made it difficult for many workers to carry out their normal activities. Many people left their home districts to escape the disease, further reducing the availability of workers, while expatriates with key technical skills fled. The epidemic thus reduced demand by cutting incomes and disrupted supply; hence, economic growth is slowing and inflation rising in all three countries.

The economic impact varied considerably by country and sector. Sierra Leone had the largest percentage point revision in the forecast for GDP growth in 2014 (in comparison to the forecast made before the epidemic), and Guinea the smallest. The impact on agricultural production depended on which crops were grown in the more affected areas, although foodstuffs generally declined. Some mining operations maintained output, although investments in new capacity were put on hold. Services were hit particularly hard, particularly travel, tourism and entertainment.

The decline in incomes and in external transactions is reducing government revenues, while expenditures are rising to limit the epidemic. The rise in fiscal deficits has not created serious macro-economic problems, in part because of supplemental financing from donors. But the urgent requirement of fighting the epidemic in the context of revenue losses is reducing expenditures on most other programmes, particularly investments.

While data are scarce, there is little doubt that the epidemic is worsening social indicators: fiscal stringency is limiting non-Ebola-related health expenditure, while fear of infection has reduced the demand for services;

Treatment Centre in Sierra Leone. Photo by UNDP Sierra Leone.

visits to health agencies have fallen dramatically; people are refusing to accept visits by medical professionals; the number of childbirths attended by medical professionals has plummeted; and the demand for traditional healers has risen. The decline in the provision and take up of health services is likely to boost infections from HIV/AIDS, malaria, and other diseases, increase maternal mortality rates, and increase deaths among children from dehydration and other treatable illnesses. Women are suffering disproportionately, because their traditional role as caregivers exposes them to infection and they rely on traditional crops and market activities that have been disrupted by measures to control the epidemic. Further, social disruption has increased the risk of their sexual exploitation and abuse.

Declines in income and in welfare have been accompanied by social disintegration. Fear of infection has discouraged traditions of community support and caregiving. Those ill with, or recovering from, the disease may be abandoned by their families and communities. The loss of parents and school closings is increasing the vulnerability of children. Social gatherings that are important in cementing communal relations have been discontinued. Societies are resilient, and an early end to the epidemic should enable a rapid recovery in the social ties that bind people together. However, at the moment, the epidemic is not only making people's lives more difficult, but it is also making them more isolated.

The decline in investment, the fall in government expenditures in all areas except those immediately tied to the epidemic, and the deterioration in health status represent major threats to development over the long term. Controlling the epidemic is a necessary condition to the survival of these societies. However, both government and donors must not lose sight of the need to ensure that these countries eventually can continue their progress towards raising incomes and welfare.

Chapter 9: Lessons Learned and Key Recommendations

9.1 Lessons Learned

Some key lessons emerged from this report.

1. Ebola is not just a technical issue of organizing resources to solve a problem; it is also a social issue. Trust, local engagement and cooperative efforts are essential to the control of the epidemic.

2. How government is organized has an enormous impact on success. Decentralization facilitates effective solutions that are consistent with local values, thus galvanizing communities. Effective coordination among government agencies, between government and local communities as well as NGOs, and among international donors is critical, but difficult to achieve.

3. Governments can encourage commitment to the fight against disease by supporting the health workers on the front lines, demonstrating strong leadership and limiting corruption.

4. Protecting health workers and contact tracing teams against threats and violence is regrettably necessary at times. However, establishing trust and encouraging cooperation are more effective and cheaper means of ensuring the success of programmes.

5. Reductions in health services because clients fear infection will be a major reason for increased illness and death over time.

6. Fear and panic can help spread the disease and greatly exacerbate its economic and social effects. Thus, effective communications on the nature of the disease and the means of combating it are critical.

7. While stopping the epidemic is obviously the first priority, governments cannot entirely abandon other programmes that protect welfare and foster long-term development.

8. Controlling Ebola should be a priority for the international community. In a world of rapid, frequent intercontinental travel, no country is immune from infection. Stopping Ebola in West Africa could spare Europe, America and Asia a terrible tragedy.

Key Recommendations

These countries are at a critical period. The rapid implementation of effective programmes to halt Ebola will have an enormous impact on current and future welfare. What governments do over the next year will play a major role in determining the prospects for development for many years to come.

This impact assessment sets the tone for the shape and structure of early recovery in the three epicentre countries. The proposed recovery approach seeks to harmonize the humanitarian assistance with these countries' development aspirations, with a view to rapidly returning them to a sustainable development pathway. The following recommendations for government, donors and development partners to address the crisis and initiate recovery programmes are offered.

1. **Enhanced economic opportunities, including jobs and livelihoods are vital.** Government and its national and international partners should support such strategic actions actions such as: (i) livelihoods stabilization through emergency employment, start-up packs and grants to revitalize new and existing enterprises; (ii) support for local economic revitalization through small, micro and medium enterprise development, vocational training, socioeconomic infrastructure rehabilitation; and (iii) long-term employment creation and inclusive growth.

2. **Strengthening the capacity of microfinance institution is a pathway to recovery.** Governments, private sector and development partners should scale up their efforts towards reinvigorating microfinance institutions affected by EVD. Investment in strengthening their capacity is key to the recovery of the micro and small scale enterprises in the most affected communities.

3. **Accelerated recovery of the health sector should be given priority.** Medium-term strategic interventions that should occupy stakeholders' priority attention include: developing capacity to ensure regular, timely payments to Ebola workers;

promoting environmentally sound health care waste management, strengthening local capacities to provide improved basic services delivery; and helping to institutionalize health monitoring and evaluation. This is needed to rebuild confidence in institutions and strengthen social cohesion.

4. **Building resilient governance at the community and government levels is critical.** This is the ingredient for recovery, peace and stability. It requires supporting the restoration and strengthening of central and local governments' core functioning, including decentralized recovery planning, coordination, and public outreach, as well as inter-governmental coordination and sub-national capacity.

5. **Enhanced capacity for risk management for future outbreaks must be supported.** Governments and development partners should work together to establish a long-term risk reduction strategy that reduces vulnerability and builds the resilience of communities to future outbreaks.

6. **While difficult, there may be scope for governments to affect social attitudes.** Efforts should be made to encourage communities to accept people who have survived the virus, through disseminating information on the risks of infection from contact with survivors.

7. **Improved coordination is important at all levels of government and national actors.** Ensuring adequate communication between community heath teams and NGOs at the local level could avoid duplication and the waste of resources. Similarly, the governments should play a proactive role in improving coordination among donor programmes. The establishment of the Ebola Operation Centre in Liberia, for example, has helped improve coordination among key partners, and this approach could be replicated to address other life-threatening diseases.

8. **These countries need more debt relief, grants and concessional loans to effectively kick-start recovery.** The severe reduction in government revenues at a time when increased expenditures are critical to fight the epidemic, maintain other critical services and finance investment, underlines these countries' need for budget support through grants and concessional credits. This report also calls for debt relief for Guinea, Liberia and Sierra Leone. Given the severity of the crisis, exposing them to market-rated debt instruments (public and private) is not sustainable.

9. **Greater resources are required in virtually all aspects of Ebola control projects, which donors are beginning to address.** Within the overall resource envelope, a few areas should be highlighted that might receive relatively more of the coming increase in financing. Examples include: access to education, counselling, and secure homes for orphans; counselling of patients, survivors and their relatives, as well as the relatives of deceased victims; testing and early warning systems; research, for example establishing a medical research centre and strengthening the Liberia Biomedical Research centre in Margibi County. Research should be a high priority for donor funds, since other countries could benefit.

10. **Strong coordination among donors and development partners is key.** Also, donors should place greater emphasis on the direct provision of equipment and training, rather than only financial support. Medical personnel with experience in haemorrhagic fever are an obvious priority. Coordination among UN agencies should be improved, and each agency should specialize in its area of comparative advantage. To ensure efficient and coherent actions, the UN Secretary-General has mandated UNDP to lead the UN system's initiative on Ebola-related recovery, in consultation with the World Bank, the Economic Commission for Africa, and the African Union, among others. With effective coordination and collaboration, the task of propelling an accelerated recovery in these countries can be a reality in the short term. Development partners, and the UN agencies in particular, should focus on joint recovery initiative for synergy, coherence and effectiveness.

11. **Effective and targeted social protection mechanisms are necessary.** There should be more focus on recovery once the epidemic is stopped. The emphasis should be on proactive efforts to stimulate an early recovery, initially by helping people restart activities affected by the epidemic. Examples might include long-term credit facilities (operating through commercial banks) to increase access to credit by firms that reduced operations, the provision of inputs to farmers to compensate for losses during the last season, and support for re-establishing local markets that have been closed. Priority attention should be paid to the poorest households and those with orphan children from the Ebola epidemic.

12. **Using the crisis as an opportunity to transform the health management system is key to strengthening resilience.** Lessons drawn from the Ebola experience should be used to improve health services. Governments should move towards a real decentralization of health services. Local leaders should be empowered to take central stage in directing the Ebola response within their domain.

13. **Improved distribution of health facilities across regions is important.** Health awareness campaigns should reinforce the greater attention to hygiene as a result of the epidemic. Systems to ensure an early warning of the presence of contagious disease should be strengthened. Furthermore, a redistribution of health resources should be undertaken to improve services to impoverished rural areas.

Markets were closed for weeks in areas where there were Ebola cases. Photo by UNDP.

REFERENCES AND ANNEXES

A woman that bought a bar of soap at half the market price in Kankan, Guinea, from a cooperative society funded by UNDP. This is one of UNDP's contributions to promoting hygiene as a strategy in containing EVD. Photo by UNDP Guinea.

References

Butty, James. 2014. "Liberian Health Workers End Two-Day Ebola-Related Strike." Voice of America News. October 15. http://www.voanews.com/content/liberian-health-workers-end-two-day-ebola-related-strike/2484156.html

CIA. 2014. The World Factbook. Central Intelligence Agency. US Government. http://www.cia.gov/library/publications/the-world-factbook/geos/li.html Washington DC

CWIQ. 2010. Core Welfare Indicator Questionnaire. Liberia.

DHS. 2013. Demographic Health Survey. Liberia.

FAO-WFP. 2014. Evaluation of the impact of haemorrhagic fever caused by the Ebola virus on agriculture and food security. Ministry of Agriculture, Livestock and Animal Production. Government of Guinea. October.

Fofana, I, L. Balma, F. Traore and D. Kane. 2013. "Social Accounting Matrix for the Gambia, Liberia, Mauritania and Sierra Leone ", International Food Policy Research Institute (IFPRI) June 2013. AGRODEP Data Report No. 03, November 2014.

Government of Sierra Leone (GoSL). 2012. "Making Progress: Schools and Students in Sierra Leone." Government of Sierra Leone.

------. 2014a. "The Economic and Social Impact of Ebola Virus Disease in Sierra Leone." Government of Sierra Leone.

------. 2014b, The 2015 Budget and Statement of Economic and Financial Policies for Sierra Leone, Theme: Restoring Livelihoods for Post-Ebola Economic and Social Recovery. Ministry of Finance of Sierra Leone.

Lofgren, Hans, Rebecca L. Harris, and Sherman Robinson. 2002. "A standard computable general equilibrium (CGE) model in GAMS" with assistance from Marcelle Thomas and Moataz El-Said. FPRI Microcomputers in Policy Research #5. Washington, D.C.: IFPRI.

Mbonya, A.K., J.F. Wamala, M. Nanyunga, J. Opio, and J. R.. Aceng. 2014. "Ebola Viral Hemorrhagic Disease Outbreak in West Africa, Lessons from Uganda." *African Health Sciences.* 14(3). September.

MOHS. "Weekly Report". Ministry of Health and Sanitation. Sierra Leone. November .

National Directorate of Economic Studies and Forecasting. 2014 Monthly dashboard of the Guinean economy. July.

UNDP. 2014a. Human Development Report. www.undp.org/content/undp/en/home/presscenter/events/2014/july/HDR2014.html;Liberia

-------. 2014b, Ebola Crisis Early Recovery Strategy for Sustainable Development, November.

UNDP Regional Bureau for Africa. 2014a. "The Economic Impact of Ebola Virus Disease (EVD) in Guinea, Liberia and Sierra Leone", Africa Policy Note, *Vol. 1, No.1, 3 October.*

UNDP Regional Bureau for Africa. 2014b. "Ebola Virus Disease (EVD) imposes substantial loss in household incomes in Guinea, Liberia and Sierra Leone", United Nations Development Programme Africa Policy Note, Vol. 1, No. 2.

UNDP Regional Bureau for Africa. 2014c. "Ebola Virus Disease Outbreak (EVD) is overstressing the fiscal capacity of Governments in Guinea, Liberia and Sierra Leone", United Nations Development Programme Africa Policy Note, *Vol. 1, No. 3, 24 October 2014.*

UNDP Regional Bureau for Africa. 2014d. " Ebola Virus Disease (EVD) Outbreak and Price Dynamics in Guinea, Liberia and Sierra Leone." United Nations Development Programme Africa Policy Note, *Vol. 1, No. 4. 9 November 2014.*

UNDP Regional Bureau for Africa. 2014e. "Livelihoods are threatened in Guinea, Liberia and Sierra Leone by Ebola Virus Disease (EVD)", United Nations Development Programme Africa Policy Note, *Vol. 1, No. 5, 28 November 2014.*

UNDP Regional Bureau for Africa. 2014f. "Ebola Virus Disease Nexus: Let's not lose sight of the factors hampering its containment", United Nations Development Programme Africa Policy Note, Vol. 1, No. 6, 19 December 2014.

UNICEF. 2014a. UNICEF Ebola Response: Emergency airlift of health and nutrition supplies to reach children in Monrovia, Liberia. www.unicef.org/liberia/media_8665.html

UNICEF. 2014b. "Impact de l'épidémie de fièvre Ebola sur l'accès aux services sociaux de base." Guinea. November.

WFP. 2014. Liberia: With Seven Dead, Ebola-hit Family Hopes Worst Is Over. World Food Programme Liberia. www.wfp.org/countries/liberia/home

WHO. 2014. "Ebola Response Roadmap: Situation Report." World Health Organization. 10 December.

World Bank. 2014a. The Economic Impact of the 2014 Ebola Epidemic: short and medium term Estimates for Guinea, Liberia and Sierra Leone."

World Bank. 2014b. "Update on the Economic Impact of the 2014 Ebola Epidemic on Liberia, Sierra Leone, and Guinea."

Yamano, Takashi and Thomas S. Jayne. 2004. "Working-Age Adult Mortality and Primary School Attendance in Rural Kenya," Food Security Collaborative Working Papers 55159, Michigan State University, Department of Agricultural, Food, and Resource Economics.

Annex 1. Economic Modelling Exercises

This annex explains the modelling approaches used to estimate the likely impact of the epidemic on economic growth. Two modelling approaches were developed as background to this study.

Macroeconomic model

This annex explains the modelling approaches used to estimate the likely impact of the epidemic on economic growth. As background to this study, two modelling approaches were developed: (i) a macro-economic model where the parameters are estimated using econometrics and (ii) static and dynamic computer general equilibrium (CGE) models.

Macro-economic model

The macro-economic model is based on an econometric estimation of key determinants of growth. Economic growth is based on the supply of physical capital, human capital, and labour,[35] which are proxied in this analysis by the level of foreign direct investment, population growth, the level of trade to GDP (openness), the mortality rate, life expectancy, and primary school enrolment. Foreign direct investment (FDI) and openness have a major influence on growth in these countries, given their reliance on internationally-traded commodities (e.g. rubber in Liberia and mining in Sierra Leone) that rely on imported inputs and technology.

This model is estimated on panel data for sub-Saharan Africa.[36] While the effect of the Ebola epidemic on the three countries is the main focus, an econometric estimate of the relationship between growth and the independent variables that is limited to the three countries is unlikely to be very accurate, given the limited number of observations and the economic interactions with the broader region. Instead, a panel data approach, including all countries in the region (subject to data availability),[37] with country fixed effects[38] is more likely to accurately measure the impact of the independent variables on growth, while still accounting for issues that are limited to the countries of interest (tables A2-A4 provide the econometric estimates).

CGE models

The impact of the epidemic on growth was also measured with two versions of a computable general equilibrium (CGE) model. The first is a static, single-country CGE model implemented in the General Algebraic Modelling System (GAMS). A standard modelling framework has been developed that incorporates features of particular importance in developing countries, including household consumption of non-marketed (domestic) commodities, explicit treatment of transaction costs for commodities that enter the market sphere, and a separation between production activities and commodities that permits any activity to produce multiple commodities and any commodity to be produced by multiple activities. The model is an open-economy model, i.e. foreign trade is captured through import and export functions, and domestically produced commodities are sold both in the domestic market and abroad (export). Both demand- and supply-side effects are captured, as well as income and savings, and sectoral effects such as agriculture, mining and services. These sectoral issues are particularly important for the three countries, given their importance in economic activity and the fact that the virus was initially found in farming regions.[39]

[35] This approach is in the spirit of seminal work produced by Mankiw, Romer and Weil.

[36] Consistent with the literature on economic growth modeling (Savvides 1995), an unbalanced panel data of sub-Saharan African countries was used to model the impact of various human capital and macro variables on economic growth. The time series data used conform to the property of stationarity and/or co-integration to avoid spurious regressions. An appropriate diagnostics check will also be performed.

Data on 48 African countries are based on the World Bank's World Development Indicators database.

This refers to the inclusion of a dummy variable for each country (assigned the value of one for that country and zero for all others) that accounts for growth determinants that are idiosyncratic to that country.

[37] Data on 48 African countries are based on the World Bank's World Development Indicators database.

[38] This refers to the inclusion of a dummy variable for each country (assigned the value of one for that country and zero for all others) that accounts for growth determinants that are idiosyncratic to that country.

[39] For a complete description of the model, the underlying economic assumptions, functional forms, calibration procedures, mathematical structure and derivation, etc., see Lofgren, Harris and Robinson (2002).

The CGE model allows resource mobility and substitution through price adjustments. This study assumes a relatively limited elasticity of substitution between factors so as to adequately reflect the difficulty of finding new workers to replace the large number of workers who have died, are quarantined, or have fled to avoid the epidemic.

The second CGE model is a multi-sector, recursive dynamic CGE model designed for the study of a national economy. The model is similar to the static model described above (Decaluwé, Lemelin, Robichaud and Maisonnave), except that more than one period is assumed, with the periods linked by dynamic equations that change the closure assumptions for each market. These dynamic linkages across periods are of two kinds: one updates variables that grow at a constant rate per period, while the other controls the accumulation of capital. The model starts by assuming a balanced growth path for the economy over the period, i.e. all quantities grow at a constant percentage per unit of time and the mutual proportions in which commodities are produced remain constant (Solow and Samuelson, 1953).

The CGE model is calibrated using Social Accounting Matrices (SAMs) for the respective economies. The SAM is from the African Growth and Development Policy (AGRODEP) modelling consortium facilitated by the International Food Policy Research Institute (IFPRI), and the data sources for their construction include national accounts, government financial statistics, balance of payments, and international trade statistics (Fofana et al 2014). The SAMs provide a balanced coverage of the main sectors of economic activities. Prices are calculated endogenously and equal one in the benchmark equilibrium; productivity parameters in each sector, which are also endogenous in the model, are calibrated using the SAMs, and serve as the benchmark for setting the productivity shocks.

The data challenges of constructing the SAMs and estimating the parameters of the model are difficult to overestimate. In most of the affected countries, it is hard to find macro-economic data for many observations. Due to the civil war in Liberia and Sierra Leone in the 1990s, the annual data for most macro-economic variables cover only for the 2001-2013 period.

TABLE A1: SIMULATED PARTIAL EQUILIBRIUM IMPACT OF EBOLA ON ECONOMIC GROWTH

	(1)	(2)	(3)
	Guinea - 10% trade reduction; average FDI eliminated; 66% mortality rate; zero population growth	Liberia - 38% trade reduction; average FDI eliminated; 50% mortality rate; zero population growth	Sierra Leone - 20% trade; average FDI eliminated; 30% mortality rate; zero population growth
VARIABLES	**GDP growth**	**GDP growth**	**GDP growth**
Reduction in trade	-0.257***	-0.909***	-0.520***
	(-3.747)	(-3.491)	(-3.793)
Zero change in FDI due to Ebola panic	-0.008*	-0.097*	-0.010*
	(-1.900)	(-1.869)	(-1.859)
Increase in mortality	-2.079	-0.900	-1.163*
	(-1.494)	(-0.853)	(-1.838)
Reduction in population growth	-0.015*	-0.021**	-0.011
	(-1.875)	(-2.420)	(-1.562)
Aggregate impact	-2.359*	-2.113*	-1.703**
	(-1.662)	(-1.806)	(-2.442)
Observations	1,337	1,337	1,337
Reduction in trade	-0.257***	-0.909***	-0.520***

z-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1

TABLE A2: REGRESSION MODEL OF GDP GROWTH WITH COUNTRY FIXED EFFECTS, GUINEA				
	(1)	(2)	(3)	(4)
VARIABLES	**GDP growth**	**GDP growth**	**GDP growth**	**GDP growth**
Initial GDP	0.648***	0.252*	0.443**	0.364*
	(5.865e+10)	(1.816)	(2.151)	(1.763)
FDI		0.196***	0.174**	0.193*
		(4.134)	(2.322)	(1.868)
Population growth		1.386***	0.458**	0.323*
		(3.222)	(2.029)	(1.885)
Ln trade		1.683	2.032**	2.579***
		(1.355)	(2.356)	(3.687)
Ln mortality rate			-3.155	-3.536
			(-1.495)	(-1.642)
Life expectancy			-0.604	-1.347
			(-0.131)	(-0.285)
Primary school enrolment			0.010	0.007
			(0.688)	(0.528)
Constant	-11.597***	-14.500***	4.521	10.196
	(-4.562e+10)	(-6.951)	(0.134)	(0.294)
Observations	2,130	1,653	1,337	1,337
Number of country code	48	47	46	46

Robust z-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1.
Note: "Ln" refers to the natural logarithm.

TABLE A3: REGRESSION MODEL OF GDP GROWTH WITH COUNTRY FIXED EFFECTS, LIBERIA

	(1)	(2)	(3)	(4)
VARIABLES	**GDP growth**	**GDP growth**	**GDP growth**	**GDP growth with interaction terms for Ebola countries**
Initial GDP	0.648***	0.252*	0.443**	0.364*
	(5.865e+10)	(1.816)	(2.151)	(1.763)
FDI		0.196***	0.174**	0.193*
		(4.134)	(2.322)	(1.868)
Population growth		1.386***	0.458**	0.323*
		(3.222)	(2.029)	(1.885)
Ln trade		1.683	2.032**	2.579***
		(1.355)	(2.356)	(3.687)
Ln mortality rate			-3.155	-3.536
			(-1.495)	(-1.642)
Life expectancy			-0.604	-1.347
			(-0.131)	(-0.285)
Primary school enrolment			0.010	0.007
			(0.688)	(0.528)
Constant	-11.597***	-14.500***	4.521	10.196
	(-4.562e+10)	(-6.951)	(0.134)	(0.294)
Observations	2,130	1,653	1,337	1,337
Number of country code	48	47	46	46

Robust z-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1.
Note: "Ln" refers to the natural logarithm.

TABLE A4: REGRESSION MODEL OF GDP GROWTH WITH COUNTRY FIXED EFFECTS, SIERRA LEONE				
	(1)	(2)	(3)	(4)
VARIABLES	GDP growth	GDP growth	GDP growth	GDP growth with interaction terms for Ebola countries
Initial GDP	0.648***	0.252*	0.443**	0.364*
	(5.865e+10)	(1.816)	(2.151)	(1.763)
FDI		0.196***	0.174**	0.193*
		(4.134)	(2.322)	(1.868)
Population growth		1.386***	0.458**	0.323*
		(3.222)	(2.029)	(1.885)
Ln trade		1.683	2.032**	2.579***
		(1.355)	(2.356)	(3.687)
Ln mortality rate			-3.155	-3.536
			(-1.495)	(-1.642)
Life expectancy			-0.604	-1.347
			(-0.131)	(-0.285)
Primary School enrolment			0.010	0.007
			(0.688)	(0.528)
Constant	-11.597***	-14.500***	4.521	10.196
	(-4.562e+10)	(-6.951)	(0.134)	(0.294)
Observations	2,130	1,653	1,337	1,337
Number of country code	48	47	46	46

Robust z-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1.
Note: "Ln" refers to the natural logarithm.