November 2014

How can we estimate the impact of Ebola on food security in Guinea, Liberia and Sierra Leone?

Special Focus
Ebola

- **Governments and humanitarian actors need estimates of how many people are food insecure due to the Ebola outbreak in Guinea, Liberia and Sierra Leone. We provide initial estimates until March 2015 based on the infection rates at province level, combined with pre-crisis data on severe food insecurity, household market dependency and livelihoods.[1]**
- **We estimate that almost 1.7 million people are currently food insecure — 200,000 are food insecure because of Ebola. This is based on information available on Ebola spread till October 2014.**
- **Low Estimate for March 2015: If the disease continues to spread at the average rate observed in the previous 42 days and then begins to slow down by January 2015, as predicted by health experts, the number of food insecure will likely reach 2.3 million. The Ebola effect accounts for 750,000 people.**
- **High Estimate for March 2015: If the disease spreads at the maximum rate observed in the previous 42 days and then begins to slow down by January 2015, the number of food insecure will likely reach 3.0 million. In this scenario, the Ebola effect accounts for 1.4 million people.**
- **This analysis shows that the disease will impact urban areas more than rural areas in all three countries — particularly the capitals. Provinces that were relatively food secure before this crisis are among the worst affected; by contrast, the most food insecure are relatively less affected, particularly in Liberia.**
- **The cost of inaction is extremely high. Even if the disease slows down as of January, the number of people rendered food insecure by Ebola is substantial. A two-pronged approach is therefore necessary: most importantly, the disease must be contained; at the same time, appropriate assistance must be provided for all those whose lives and livelihoods are being directly or indirectly affected by this unprecedented crisis.**

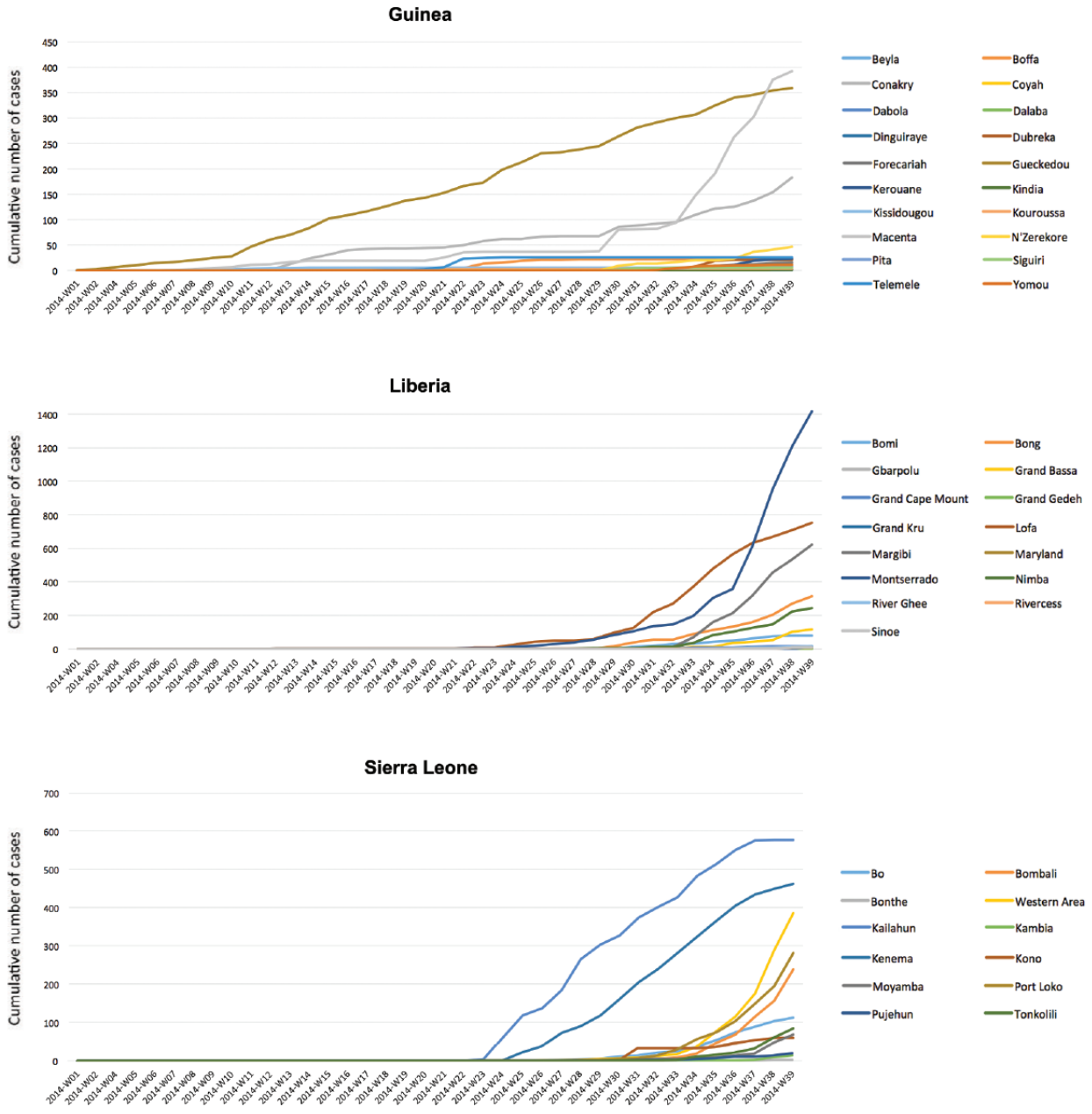
1. We gratefully acknowledge comments provided by Martien Van Nieuwkoop, World Bank; Jean Senahoun, FAO and Mark Constas, Cornell University. All errors remain ours.

Urgent need for estimates of food insecurity

Governments and humanitarian partners urgently need estimates of how many people may have become, or will become, food insecure because of the Ebola outbreak. The current environment is not conducive to undertaking regular field-based assessments, given the unpredictable situation. This means we need relatively robust methods that rely on minimum information to produce credible estimates of the food-insecure population.

This paper starts with a descriptive overview of the current Ebola spread and pre-crisis state of food insecurity in the three countries. It then presents a methodology developed by the Food Security Analysis Service of the World Food Programme (WFP) to estimate the number of food insecure under different Ebola scenarios until March 2015.

Figure 1. Ebola spread by country and administrative unit (province or district), 24 March – 2 October 2014

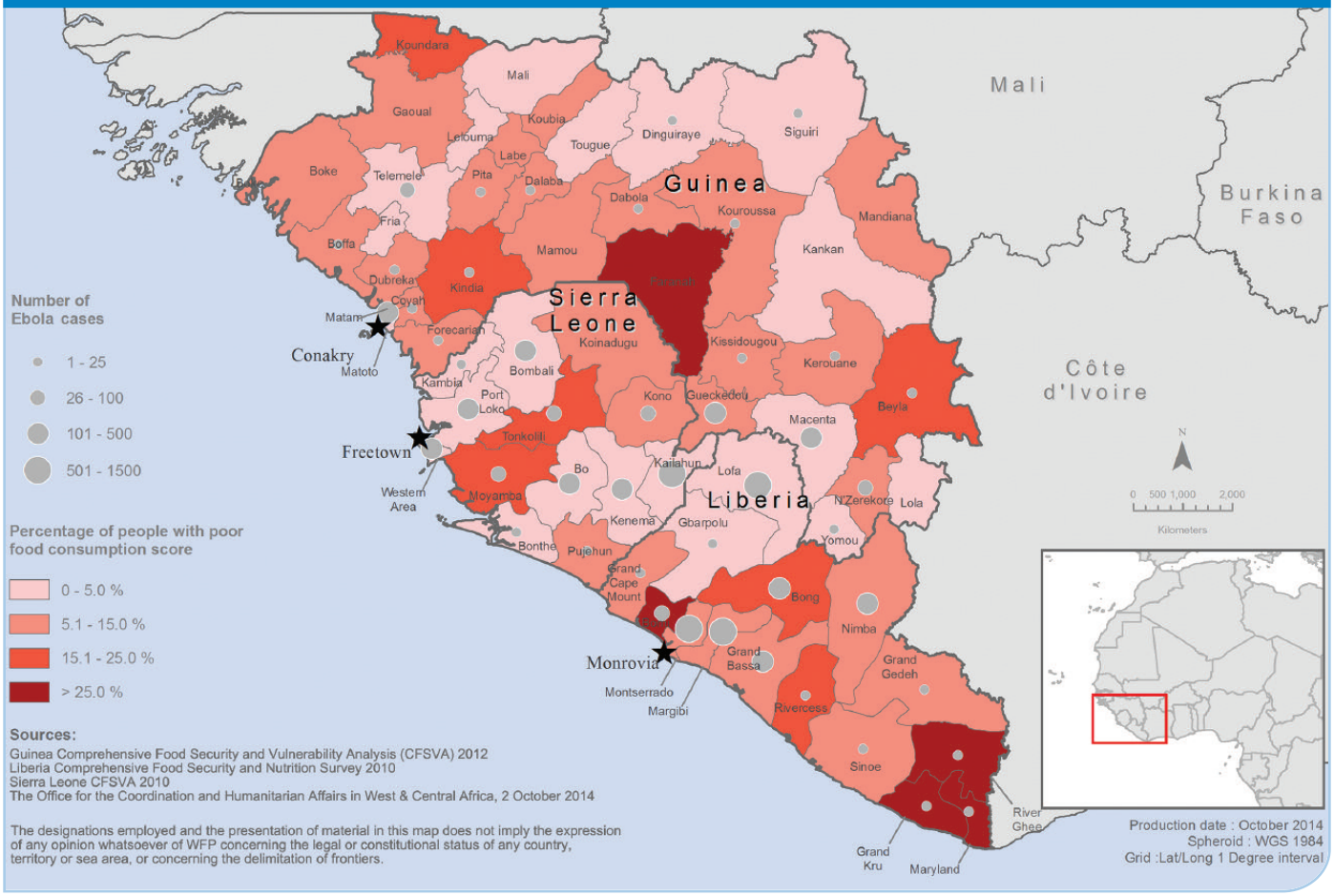


Ebola spread and food insecurity – what do we know?

Figure 1 shows the weekly spread of Ebola by country and province from the start of the outbreak in March to early October 2014. We use data published by each country's ministry of health on Ebola cases. This data is available from the Office for the Coordination of Humanitarian Affairs in West and Central Africa (OCHA ROWCA).[2] The situation in Liberia is critical both in terms of the current number of cases and the rate of spread. Particularly in the provinces of Montserrado (including the capital, Monrovia), Lofa and Margibi the number of cases is high and rapidly increasing. In Sierra Leone, there is a high but stabilizing number of cases in Kailahun and Kenema, with a lower number of cases but rapidly increasing infection rates in Western Area (including the capital, Freetown), Port Loko and Bombali. Based on current data, the situation in Guinea appears to be stabilized with the exception of Conakry (the capital), Macenta and Gueckedou. The capitals in all three countries are experiencing an increasing number of Ebola cases, highlighting the vulnerability of urban areas when it comes to the spread of the infection.

Figure 2 shows a map overlaying the food insecurity situation before Ebola with the number of current infections by province/district. The food security data is based on Comprehensive Food Security and Vulnerability Analysis Surveys from year 2012 in Guinea, and year 2010 in Liberia and Sierra Leone. The pre-crisis food insecurity is measured as the percentage of households with a poor food consumption score. The data shows that many of the worst-affected areas were relatively food secure prior to the outbreak. By contrast, many of the areas least affected by Ebola were highly food insecure before the crisis. Of the highly infected provinces in Liberia, Montserrado and Margibi had a moderate share of food-insecure households before Ebola; meanwhile, the highly food-insecure provinces in the south of Liberia have barely been affected by Ebola. In Sierra Leone, all counties with high Ebola rates were relatively food secure before the crisis. In Guinea, only Gueckedou was moderately food insecure before the crisis.

Figure 2. Guinea, Liberia and Sierra Leone - Baseline Food Insecurity under Current Ebola Scenario



2. This is also the source of WHO data.

Approach for estimating the number of food insecure by province

The model described below is designed to estimate the number of food-insecure people who are directly or indirectly affected by Ebola both currently and under possible future scenarios. It recognises that mostly indirect channels will be responsible for driving people into food insecurity because of the Ebola outbreak.[3] Indirect effects come about due to people's fear of contagion and the decisions of governments and private actors to close borders, seaports, airports and businesses. Behavioural changes and actions taken to reduce the spread of the virus have an impact on the movement of goods and people and will affect the availability and the prices of food in the markets. They also affect labour markets and people's livelihoods and, as a consequence, earnings. In other words, both food availability and food access can be subject to indirect effects. To this end, the model relies on data on the infection rate at province/district level, or their future projections, combined with pre-crisis data on food insecurity, market dependency and livelihoods.

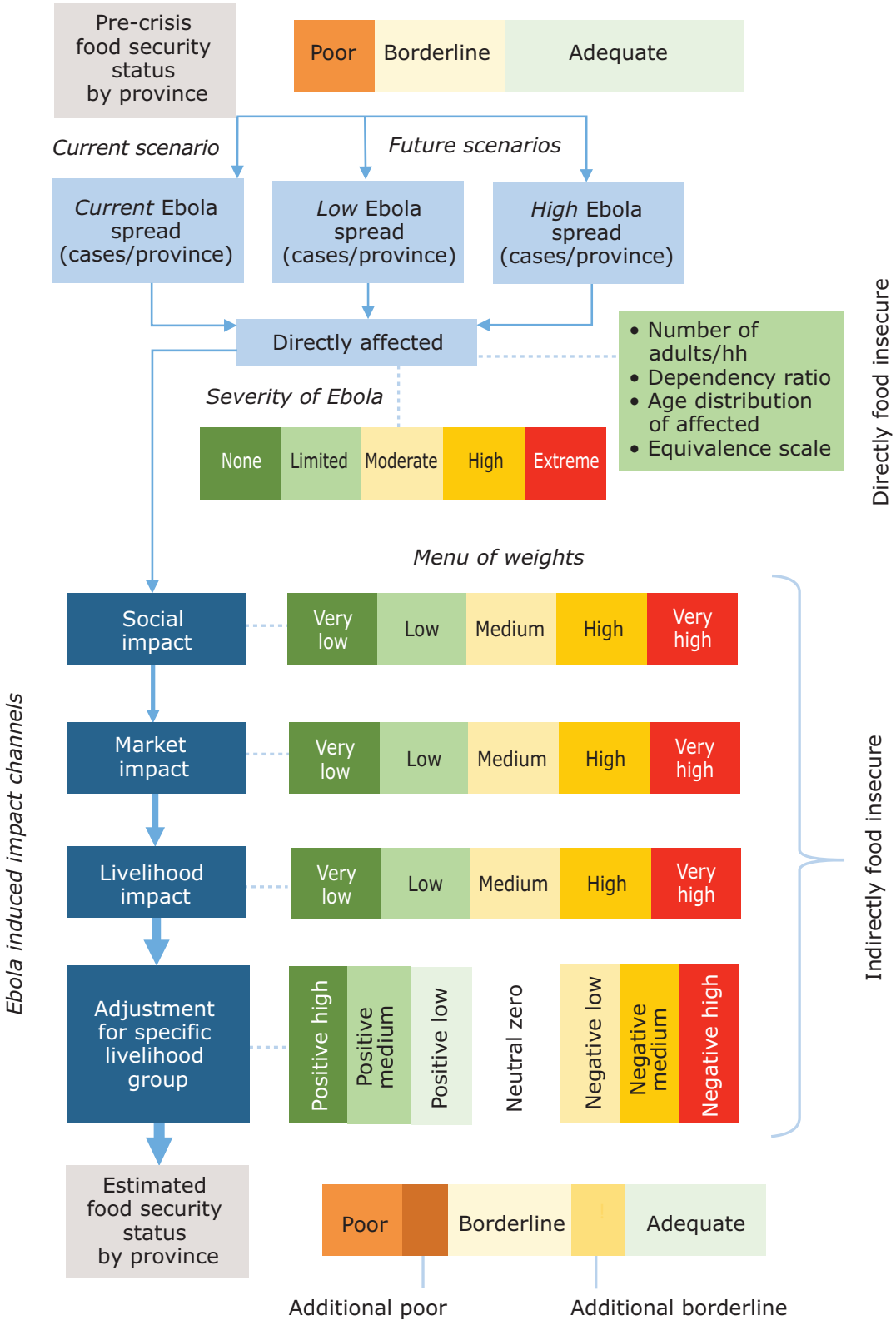
The estimates will be amended as more accurate or updated information becomes available, for example, from post-crisis assessments or market studies.[4]

We use two projections under assumptions of the continuing (average) and worsening (maximum) spread of the virus based on the historical spread of the disease in each province/district.[5] If a province has had no new cases in the last 42 days (two incubation periods), the situation is considered stable and inactive. In the low estimate scenario, it is assumed that the *average* rate of the weekly spread observed in the previous 42 days will continue for the next three months in a given province. In the high estimate scenario, we assume that the *maximum* weekly spread observed in the previous 42 days will also apply for the next three months. Under both scenarios, the infection rate is assumed to slow down by January 2015. The date of the turning point is based on goals set up by the UN mission for Ebola Emergency response.[6] These plans are aligned with estimates by Centers of Disease Control and Prevention (CDC) on how rapidly the disease will start to reverse once efforts to control it are put in place. We also use the *rates* of decrease as estimated by CDC once the turning point is reached. According to these estimates, the reduction in the number of cases per week is around 13 percent once 60 percent of Ebola patients are hospitalized or in effective home isolation (by January–February in our model) and 24 percent once 70 percent are in such care (by March).[7] Modifications to these assumptions do not significantly change our estimates of food insecurity caused by Ebola.

Figure 3 illustrates the model for estimating the food insecurity under Ebola.

3. The World Bank notes in a report on Ebola that 80–90 percent of the economic impacts from pandemics are due to behavioural changes. See World Bank. 2014. *The Economic Impact of the 2014 Ebola Epidemic: Short and Medium Term Estimates for Guinea, Liberia, and Sierra Leone*. 17 September.
4. For example, the remote mobile surveys (mVAM) carried out by WFP provide critical and useable information for this model.
5. The CDC has estimated the future spread. However, to be used for our purposes, information on hospitalization/isolation of Ebola patients on provincial/district levels would be required. See http://www.cdc.gov/mmwr/preview/mmwrhtml/su6303a1.htm?s_cid=su6303a1_w
6. See for example www.un.org/ebolaresponse/pdf/CNN_Nabarro.pdf
7. The epidemic curve is likely to reach its peak when a lower number of patients are in effective care. However, the rate of decrease is slow (1.8 percent) as long as only half of patients are in effective care.

Figure 3. Model for estimating food insecurity under Ebola



Estimating the directly food insecure

We first estimate the number of people directly affected by Ebola. We use Ebola spread data by province under the current, low and high scenario projections. We assume that if a household member is affected by Ebola, the whole household becomes food insecure. However, impact is scaled down if children or the elderly are affected as opposed to adults, who are likely to be the breadwinners.[8] We derive the number of directly food insecure by taking into account the population distribution of those affected, the average number of adults in a household and the dependency ratio in a given province.

Estimating the indirectly food insecure

The key components for estimating the number of indirectly food insecure people are described in the table below.

Driving Factors	Description	Purpose
Pre-crisis food insecurity	The pre-crisis food insecurity as determined by the Food Consumption Score (FCS). For the purpose of the analysis, those with *poor* (as opposed to *borderline* or *acceptable*) FCS are defined as food insecure.	The model allows transitions of this variable from *FCS borderline* to *FCS poor* and from *FCS adequate* to *FCS borderline* because of the Ebola crisis.
Social impact	The social impact is quantified by the infection rate at province/district level.	This is the first impact channel in the model and captures risk stemming from socio-behavioural changes caused by Ebola. The weights for social risk are combined with a growth factor depending on the severity of Ebola in a given province. The infection rate in a province provides a proxy for this impact – the higher the infection rate, the higher the social disruption.
Market impact	The percentage of households dependent on the market for cassava: while rice is the main staple, households use gari (cassava flour) as a substitute. When households run out of cassava, they have to rely on the market for their main staples.	With this variable, we capture the market impact of Ebola. Market dependency on cassava indirectly also takes into account the development of price patterns. Households who are dependent on markets for their food consumption are more affected by market disruptions. Market dependency varies depending on the season. This is the second impact channel in the model. The weights for the market impact are combined with a growth factor depending on the severity of Ebola in a given province.
Livelihood impact	The livelihood profile of the household. Nine livelihood profiles are defined: *food crops* *cash crops* *fishing* *petty trade* *unskilled labour* *salary and skilled labour, handicrafts* *trading, commercial activities* *remittances and gifts* *other*	This gives the livelihood impact for specific livelihood groups and is the third impact channel in the model.

8. The equivalence scale that we use gives the weight 0.5 to a child (aged 0–15) and 0.7 to an elderly person (aged 60+).

A menu of impact weights, ranging from very low (1) to very high (5), are attached to each impact channel (Figure 3). These weights are then used to determine what proportion of people will shift from *FCS borderline* to *FCS poor* and from *FCS adequate* to *FCS borderline*. The impact weights for social risk reflect the severity of Ebola. The market risk is combined with social risk through another set of weights, not only taking into account the Ebola spread, but also the level of market dependency. If harvest failure or market disruptions lead to increasing food prices, this is reflected by a higher weight attached to this impact channel. If such disruptions have a particular impact on some livelihood groups, the adjustment factors for those livelihood groups will be increased. For each livelihood group, adjustment factors ranging from *negative high* (1) to *positive high* (7) are used. The adjustment factor can also be *neutral zero*, which indicates that the livelihood groups are not affected by the Ebola outbreak. One such livelihood group could be households who depend on remittances. The dashboard where the weights can be selected is shown below.

Figure 4. Dashboard for Ebola model - An illustrative example

WFP vam food security analysis wfp.org

EBOLA IMPACT ON FOOD SECURITY SCENARIO BULIDING

SELECT AN EBOLA SPREAD SCENARIO	Worsening	WEEKS	24
Impact Channels	**Guinea**	**Liberia**	**Sierra Leone**
Social Risk	Medium	High	High
Market Risk	Medium	High	High
Livelihoods Risk	Medium	High	High
Livelihood Groups			
food crops	Negative_Low	Negative_Medium	Negative_Medium
cash crops	Negative_Low	Negative_High	Negative_High
fishing	Neutral_Zero	Neutral_Zero	Neutral_Zero
petty trade	Negative_Low	Negative_High	Negative_High
unskilled labor	Negative_Medium	Negative_High	Negative_High
salary and skilled labor, handicrafts	Neutral_Zero	Negative_Low	Negative_Low
trading, commercial activities	Negative_Low	Negative_Medium	Negative_Medium
remittances and gift	Neutral_Zero	Neutral_Zero	Neutral_Zero
other	Neutral_Zero	Neutral_Zero	Neutral_Zero

Adjust the variables in grey to build scenarios

Limitations of the model

The data-model has a few limitations: 1) the impact weights are subjective; 2) the data on food security was collected in June–July (Guinea, Sierra Leone) and May–August (Liberia) when, because of seasonality, relatively more people are food insecure; and 3) the baseline data on the level of food security is a few years old, so there may have been some changes in the food security profiles of the populations.

Medium-term impacts on food insecurity under different scenarios of the spread of Ebola

Food insecurity under Current Ebola scenario

We start by estimating the food insecurity impacts of the current Ebola spread. We adjust the weighting in the model according to currently available information. We know that while there are some restrictions on the movement of goods and people, assessment and market data suggest that food is still available on the markets and prices are mostly within the seasonally adjusted normal range. While borders are formally closed, shipping lines are still working, so imported rice is reaching at least the capitals. However, there is much uncertainty about the harvest.

Under these assumptions, we estimate that there are 1.7 million food-insecure people in the three countries. Ebola accounts for 200,000 people or 16 percent of the total number of food insecure. Of these, 30,000 are estimated to be directly food insecure due to Ebola and 170,000 indirectly food insecure. See Figure 5 for country breakdowns and Figure 6 for a map with the estimated food insecurity under the current Ebola scenario.

Figure 5.
Food Insecurity under the current Ebola spread

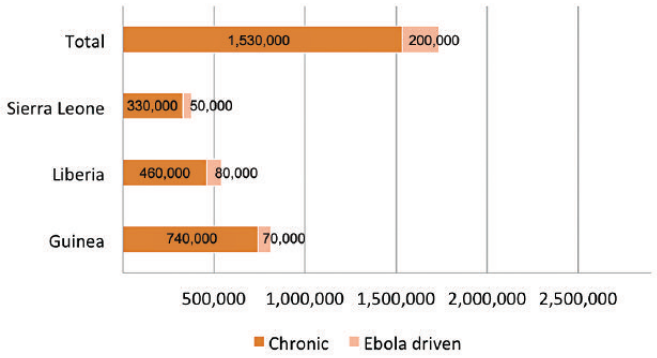
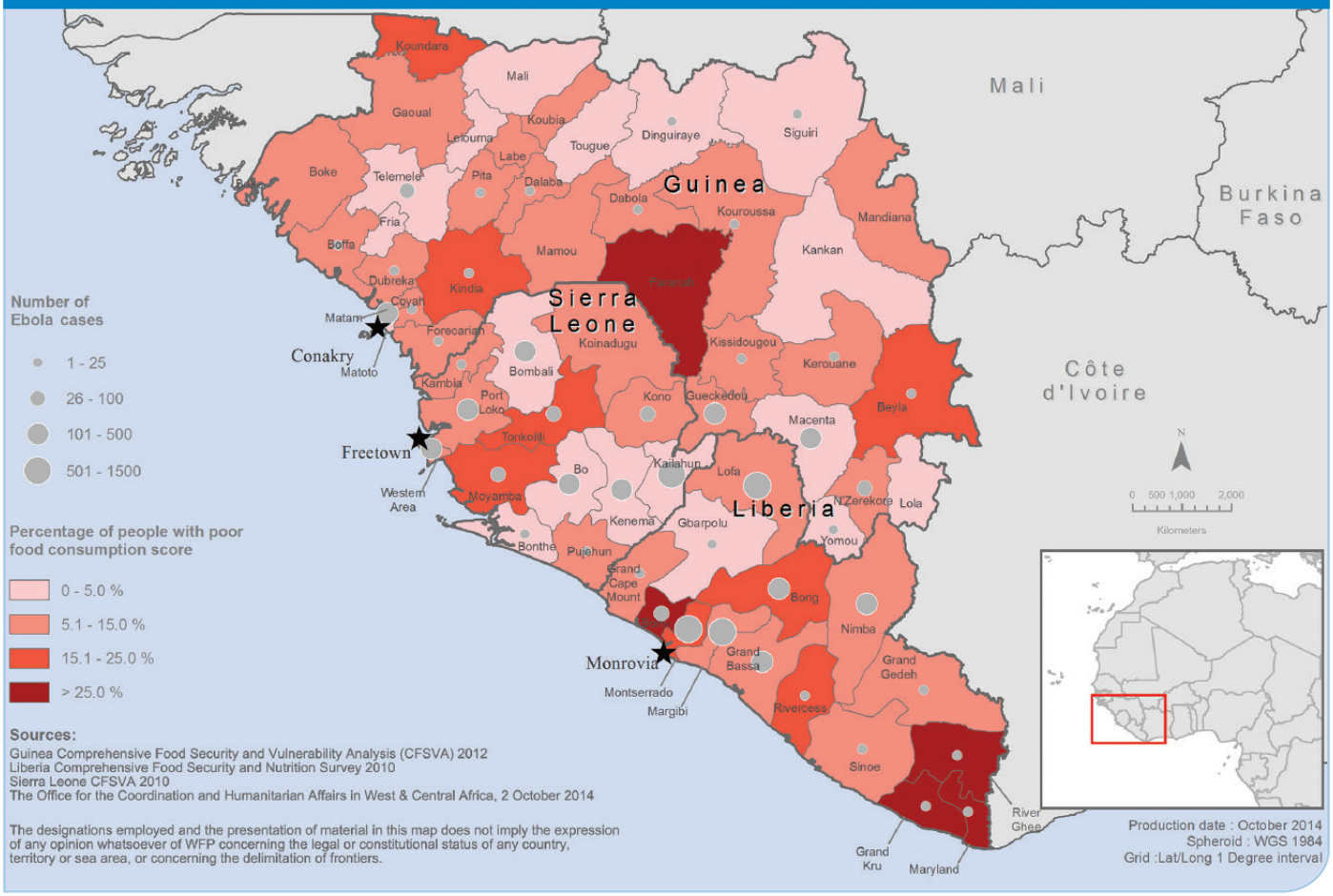


Figure 6. Guinea, Liberia and Sierra Leone - Food Insecurity under Current Ebola Scenario



Food insecurity under Low Ebola Scenario

Our model predicts that there will be 46,500 (cumulative) cases by March 2015 if Ebola continues to spread at the same *average* rate as observed in the previous 42 days in each province and then starts to decrease as of early January 2015. Higher social risk, higher market-related risks and greater impact on individual livelihoods will increase the number of Ebola-driven food-insecure people. Rural food-producing households will start to feel the effects of market disruptions as they gradually become more dependent on markets for their food needs during the first quarter of 2015. Under the low Ebola scenario, the number of Ebola-driven food-insecure people is estimated to be 750,000. Of these, 150,000 are estimated to be directly food insecure due to Ebola and approximately 600,000 indirectly food insecure. Therefore, the total number of food insecure including Ebola-driven cases will be 2.3 million people.

Under the low scenario, in Guinea, just Gueckedou and Coyah will become food insecure as a result of Ebola by the end of March 2015; the other food-insecure provinces in Guinea were already so at the outset. In Sierra Leone, Tonkolili will join the list of food-insecure counties. In Liberia, the food insecurity of several provinces will worsen. See Figure 7 for country breakdowns and Figure 8 for a map.

Figure 7.
Low Scenario: Food Insecurity in March 2015

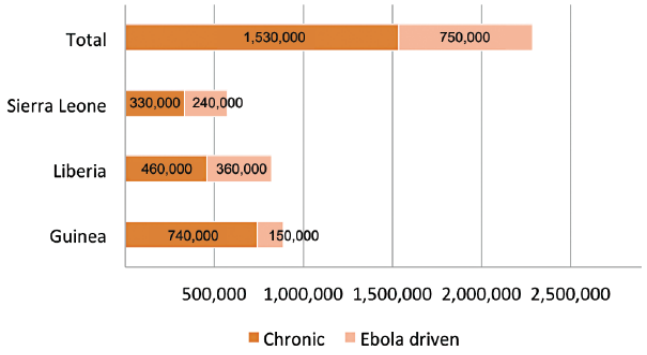
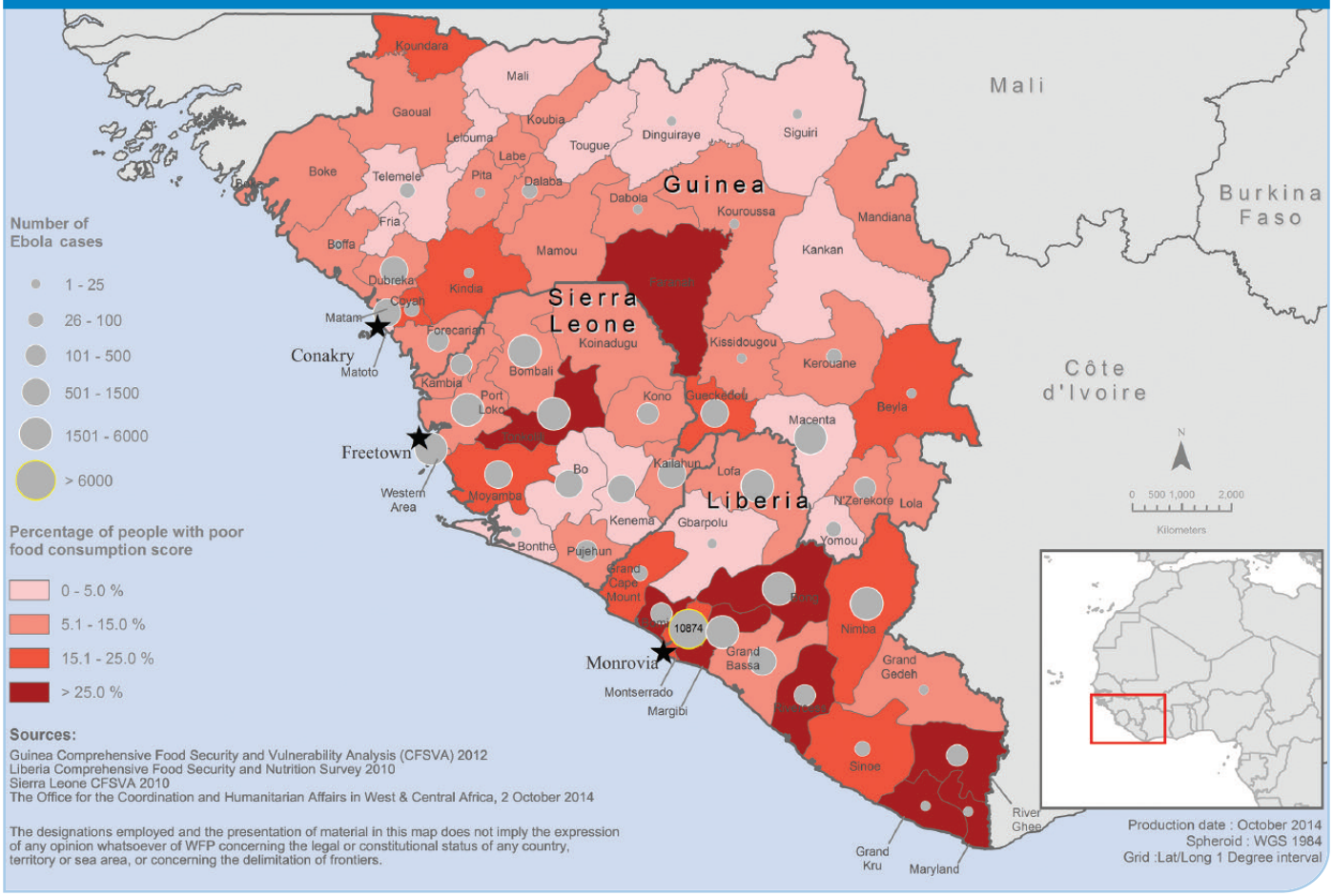


Figure 8. Guinea, Liberia and Sierra Leone - Food Insecurity under Low Ebola Scenario



Food insecurity under High Ebola Scenario

Our model projects that there will be 95,000 (cumulative) Ebola cases by March 2015 if Ebola continues at the maximum rate observed during the previous 42 days in each province and then starts to decrease as of early January 2015. The number of food insecure is estimated to reach 3 million people, almost 1.4 million of whom are due to Ebola. Of these, 330,000 are estimated to be directly food insecure due to Ebola and almost 1.1 million indirectly food insecure. See Figure 9 for country breakdowns and Figure 10 for a map.

Most parts of Liberia, except for a few provinces, are likely to have high prevalence of food insecurity. This includes Montserrado where the capital Monrovia is located. According to these estimates, some provinces in central Sierra Leone will also become highly food insecure.

Figure 9.
High Scenario: Food Insecurity in March 2015

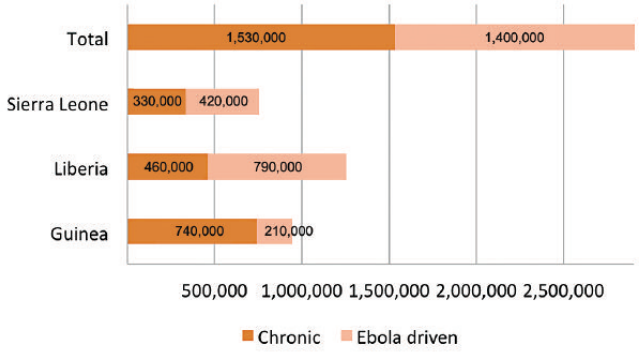


Figure 10. Guinea, Liberia and Sierra Leone - Food Insecurity under High Ebola Scenario

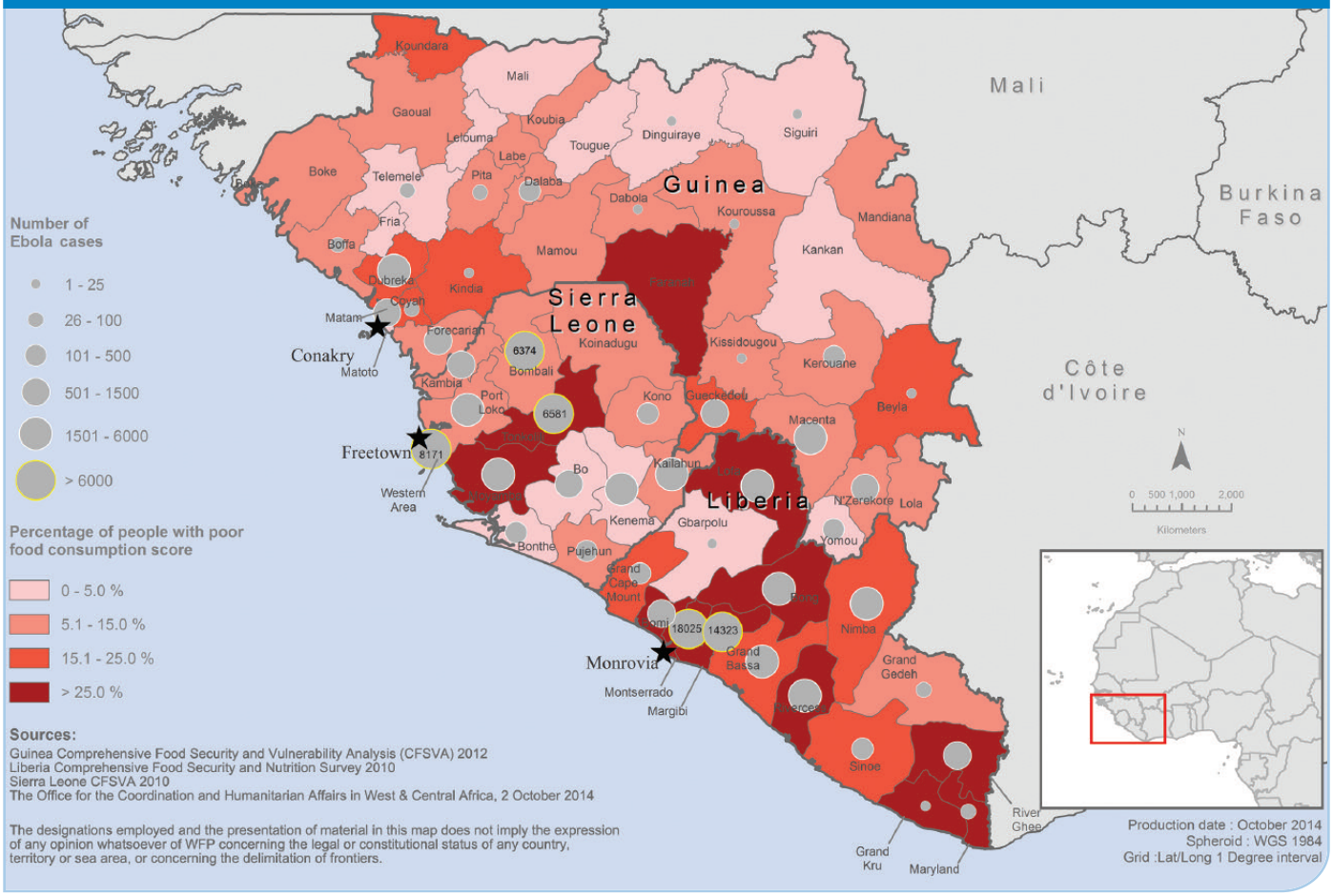
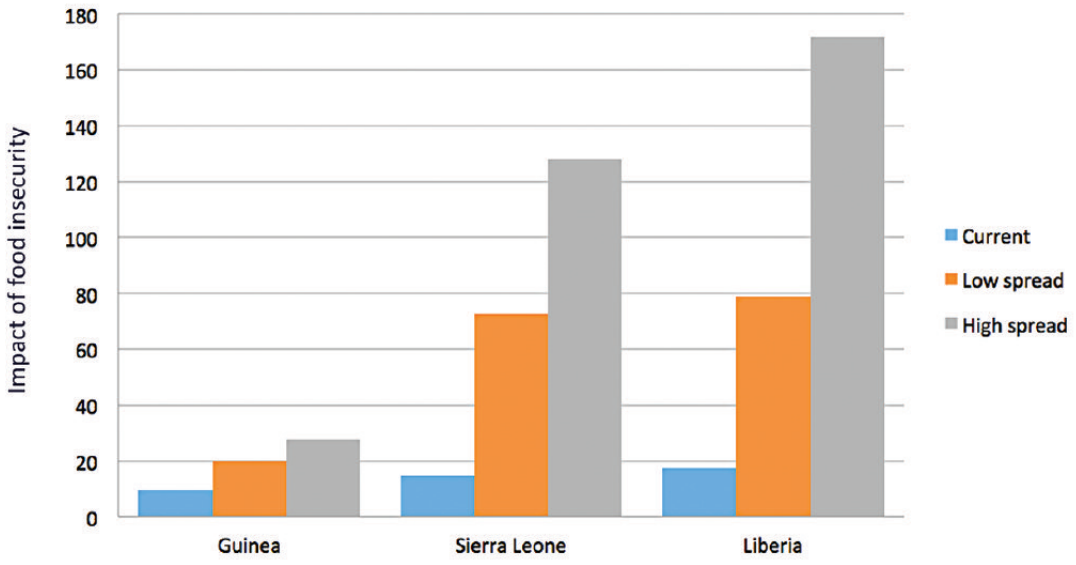


Figure 11 illustrates the relative impact of Ebola on food insecurity in the three countries under different Ebola scenarios. The relative impact is calculated using the chronic level of food security as the base and expressing the impact of Ebola relative to this base as a percentage.

Figure 11. Relative Impact of Ebola on Food Security under Different Spread Scenarios*



* Relative Ebola Impact (REI) is calculating by dividing Ebola driven food insecurity by chronic food insecurity.

Two-pronged approach: disease containment and assistance to affected populations

This Special Focus describes an analytical model that generates estimates of severely food insecure populations, both current and projected within the context of the Ebola crisis. We believe such estimates are both useful and necessary for planning future assessment work and emergency food assistance operations.

As new data and information becomes available on both the health situation and the food security situation this model will be periodically updated, and similar analytical outputs will be circulated. New data and information will help to refine the model and to adjust estimates and planning figures periodically. Data generated from both ground based traditional food security assessments, as well as data collected remotely via phone surveys, will be useful going forward.

The estimates derived under low and high Ebola scenarios suggest that the cost of inaction is high. The number of food-insecure people almost doubles under the high scenario. Even if the disease slows down as of January, a substantial number of people will be rendered severely food insecure by Ebola, either directly or indirectly.

Drastic changes in the socio-economic environment, such as social stigma and fear of the disease, are curtailing and threatening the mobility of people, goods and services. Markets are becoming increasingly dysfunctional mainly because of uncertainty surrounding supply and demand factors. The commodity price signals need careful interpretation because comparing current prices with seasonally adjusted price trends could be misleading, given the widespread loss of purchasing

power caused by job losses. This is all occurring in poor countries with incredibly weak public services, especially in terms of social protection mechanisms and infrastructure, and particularly in the health sector. If the Ebola infection does not slow down, the health and food insecurity situation will be disastrous.

Therefore, a two-pronged approach is recommended: the disease must be contained, and at the same time, appropriate assistance should be provided not only to those directly affected but also to those who are suffering the indirect repercussions of Ebola-driven socio-economic changes.

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