# The Cost of HUNGER in Malawi

## Implications on National Development and Vision 2020

**The Social and Economic Impact of Child Undernutrition in Malawi**

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## in Malawi

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World Food Programme

United Nations
Economic Commission for Africa

NEPAD
A PROGRAMME OF THE AFRICAN UNION

When a child is undernourished, the negative consequences follow that child for his/her entire life. These negative consequences also have grave effects on the economies where s/he lives, learns and works.

# Contents

# Foreword

Malawi has made remarkable progress in improving child health outcomes as evidenced by reduction in infant and under- five mortality. However, there has been slow progress in reducing malnutrition. Currently, the country has high levels of stunting among under- five children, which is an indication that chronic food and nutrition insecurity are still prevalent. The high prevalence of malnutrition has impacted greatly on education and health outcomes.

The Cost of Hunger in Africa Study, which was commissioned by the African Union and supported by the United Nations Economic Commission for Africa and the World Food programme, in which Malawi participated, has confirmed the magnitude of the consequences that child malnutrition have on health, education as well as on the national economy. The study has highlighted that the country has incurred huge economic losses associated with under nutrition, the highest being the cost in loss of potential productivity.

The study findings have clearly shown that adequate nutrition is critical for one's physical and intellectual development, and work productivity, hence an integral element for the socio – economic development. It is in this context that we are determined as a Government, that moving forward; we need to channel adequate resources towards nutrition interventions. Government will also strengthen institutional and human capacities for effective delivery of nutrition services.

I would like to thank the Office of the Coordination of Humanitarian Affairs, Rockefeller Foundation, and the World Food Programme for providing financial support towards the production of the Report. Special thanks should also go to the United Nations Economic Commission for Africa and the World Food Programme for their technical support.

It is my hope that the findings in this report will inspire all stakeholders to expedite the implementation of programmes to ensure that child under nutritionis reduced.

Goodall E. Gondwe
MINISTER OF FINANCE, ECONOMIC PLANNING AND DEVELOPMENT

# Acknowledgements

# Acronyms

| | |
|---|---|
| ACS | African Centre for Statistics |
| ADFNS | Africa Day for Food and Nutrition |
| ADS | Acute Diarrheal Syndrome |
| ARI | Acute Respiratory Infection |
| ARNS | Africa Regional Nutrition Strategy |
| ATYS-VMD | Africa Ten-Year Strategy for the Reduction of Vitamin and Mineral Deficiencies |
| AUC | Africa Union Commission |
| CAADP | Comprehensive Africa Agriculture Development Programme |
| COHA | Cost of Hunger in Africa |
| DHS | Demographic and Health Survey |
| ECLAC | Economic Commission for Latin America and the Caribbean |
| EDPRS | Economic Development and Poverty Reduction Strategy |
| FAFS | Framework for African Food Security |
| FAO | Food and Agriculture Organization of the United Nations |
| FTF | Feed the Future |
| GDP | Gross Domestic Product |
| GNI | Gross National Income |
| ICU | Intensive Care Unit |
| ILO | International Labour Organization |
| IUGR | Intra Uterine Growth Retardation |
| LBW | Low Birth Weight |
| MGDS | Malawi Growth and Development Strategy |
| NEPAD | The New Partnership for Africa's Development |
| NIT | National Implementation Team |
| NPCA | NEPAD Planning and Coordinating Agency |
| OECD | Organization for Economic Cooperation and Development |
| PANI | Pan- African Nutrition Initiative |
| P4P | Purchase for Progress |
| REACH | Renewed Efforts Against Child Hunger |
| SAM | Severe Acute Malnutrition |
| SUN | Scaling Up Nutrition |
| UNECA | United Nations Economic Commission for Africa |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNICEF | United Nations Children's Fund |
| USAID | United States Agency for International Development |
| WFP | World Food Programme |
| WHO | World Health Organization |

# Executive Summary

The Cost of Hunger in Africa (COHA) study is an African Union Commission (AUC) led initiative through which countries are able to estimate the social and economic impacts of child under nutrition in a given year. In March 2012, the regional COHA study was presented to African Ministers of Finance, Planning, and Economic Development during the 5[th]Joint Africa Union (AU) and Economic Commission for Africa (ECA) Conference of Ministers of Economic Planning and Finance held in Addis Ababa, Ethiopia. At the meeting, the Ministers issued a resolution confirming the importance of the study and recommending it continue beyond the initial stage. Twelve countries were initially selected to participate in the study in phases, Malawi being among the four countries in second-phase to implement the study.

The COHA illustrates that child under nutrition is not only a social, but also an economic issue, as countries are experiencing significant economic loss as a result of current and past child under nutrition. The COHA study in Malawi is led by National Implementation Team (NIT), composed of experts from the Ministry of Economic Planning and Development (MEPD), National Statistical Office of Malawi (NSO), Ministry of Health, Ministry of Agriculture Irrigation and Water Development (MoIWD), Ministry of Labour (MoL), Ministry of Gender, Children and Social Welfare (MOGCSW), Ministry of Education, Science and Technology (MOEST), Lilongwe University of Agriculture and Natural Resources (LUANAR), United Nations Children's Fund (UNICEF) as well as from WFP-Malawi.

During the implementation process of the study, secondary datasets were obtained from the National Statistics Office of Malawi, Malawi Third Integrated Household Survey (IHS3-2010-2011), Demographic and Health Survey (DHS-2010), Statistical Yearbook 2011, Education Management Information System (EMIS-2012), Household Basic Education Cost in Malawi (2013), Malawi Multiple Indicator Cluster Survey (MICS-2006), Malawi Public Expenditure Review (2013), Malawi Government Financial Statement (2012-2013) while primary data were collected from Malawi Central Drug Store, Queen Elizabeth Central Hospital in Blantyre and Zomba Referral Hospital.

## Methodology

The COHA model is used to estimate the additional cases of morbidity, mortality, school repetitions, and dropouts and reduced physical capacity that can be associated to a person's under nutrition status before the age of five. In order to estimate these social impacts for a single year, the model focuses on the current[1]population, identifies the percentage of that population who were undernourished before the age of five, and then estimates the associated negative impacts experienced by the population in the current year. Using this information and the data provided by the Malawi NIT, the model estimates the associated losses incurred by the economy in health, education and potential productivity in a single year.

## Trends in Child Undernutrition

Recent improvements in poverty rates in Malawi have been accompanied by a reduction in child under nutrition. However, stunting rates remain high. According to the 2010 Demographic and Household Survey (DHS), approximately 47 percent of Malawian children under the age of 5 were suffering from stunting, and 12.8 percent of children were underweight. In 2012, there were an estimated 1.268 million (of the 2.766 million) children affected by stunting and almost 350,715 children were underweight. This situation is especially critical for children between 18 and 23 months, where 54.3 percent are affected by stunting, and 14.6 percent were underweight.

## Initial Results: The Social and Economic Cost of Child Undernutrition in Malawi

### Social and Economic Impacts on Health

- Overall, estimated data from the DHS, 2010 shows that, 862,477 clinical episodes in Malawi in 2012, of which 176,748 were episodes of diarrhoea, fever, respiratory infections and anemia associated with the higher risk of children being underweight, and 685,728 cases of low weight in children, generating a total cost of MWK 11.4 billion. According to the estimated data, only 42.5 percent of these episodes received proper health attention.

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[1]As the model set 2012 as the base year, it is referred to as "current" in this report.

- Between 2008 and 2012 alone, it is estimated that 81,783 child deaths in Malawi were directly associated with under nutrition, which represent 23 percent of all child mortalities for this period. The model also estimated that 59.9 percent of the working-age population (4,469,235 adults), suffered from growth retardation before reaching the age of five. Out of the total current working age population, 10.7 percent (i.e. 800,566 people who would be between 15-64 years old) has been lost due to the impact of under nutrition in increasing child mortality rates.

## Social and Economic Impacts on Education

- Results show that grade repetition rate for stunted children in schools in 2012 was 20.6 percent, as compared to 15.2 percent for non-stunted children, i.e. an incremental risk of 5.3 percentage points for stunted children. Overall 18 percent (147,044) of all repetitions in 2012 were associated with stunting, bearing a total cost of MWK 3.4 billion, 65.3 percent of which was borne by the families.
- The lower educational achievement of the stunted population has an impact on the expected level of income a person would earn as an adult. Based on historical information the model estimates that 59.9 percent of the working age population in Malawi were stunted as children.

## Social and Economic Impacts on Productivity

- Out of the 5,018,218 people in Malawi that are engaged in manual activities, 3,294,142 (65.6 percent) were stunted as children. This represented an annual loss in potential income due to lower productivity that surpasses MWK 16.5 billion (US$ 66.7 million), equivalent to 1.15 percent of the GDP.
- The results further indicate that 1,595,078, of the 2,447,509 people engaged in non-manual activities also suffered from childhood stunting. The estimated annual losses in productivity for this group is MWK 25.1 billion (US$ 101.6 million), equivalent to 1.76 percent of the GDP in 2012.
- An estimated 800,566 working hours were lost in 2012 due to absent workforce as a result of incremental under nutrition-related child mortalities. This represented MWK 90.8 billion (US$ 368.3 million), equivalent to 6.37 percent of the country's GDP. Worth noting is the fact that the largest share of productivity loss is attributed to under nutrition-related mortality, which represents 68.6 percent of the total cost. Altogether, the productivity loss in 2012 due to the impact of child under nutrition is MKW 132 billion (US$ 537 million), equivalent to 9.3 percent of the GDP.

## Total Economic Impact

- Results in Malawi show that an estimated 147 billion MKW (or US$ 597 million) were lost in the year 2012 as a result of child under nutrition. These losses are equivalent to 10.3 percent of GDP in 2012. The highest element in this cost is the loss in potential productivity as a result of under nutrition-related mortalities.

# Analysis of scenarios

In addition, to calculate a retrospective cost for 2012, the model can also highlight potential savings, based on two scenarios, the reference year serving as the baseline scenario. In scenario #1 setting a goal to reduce the prevalence of stunting and underweight of children under the age of five by half from the base year scenario, could generate total savings of MKW 197. 4 billion (US$ 800 million). Further, in scenario #2, setting an aggressive goal of reducing stunting to 10 percent and underweight to 5 percent, a total savings of 275.5 billion (US$ 1.1billion) by 2025 can be generated.

| Scenario | Scenario #1: Halving the Prevalence of Child Undernutrition by 2025 | | Scenario #2: The 'Goal 'Scenario: "10 and 5 by 2025" | |
|---|---|---|---|---|
| | MWK *(in Millions)* | USD *(in Millions)* | MWK *(in Millions)* | USD *(in Millions)* |
| Total Potential Savings (2012-2025) | 197,401 | 800 | 275,515 | 1,117 |
| Average Annual Savings (2012-2025) | 15,185 | 62 | 21,193 | 86 |
| Annual percentage reduction of stunting necessary (2012-2025) | 1.81% | | 2.85% | |

## Summary of conclusion and recommendations

The Cost of Hunger Study in Malawi confirms the magnitude of the consequences that child malnutrition can have on individual health, education, productivity; but most importantly, it emphasizes the impact on the national economy and the need for a multi-sectoral policy approach in order to counteract the short and long-term consequences of stunting in the country. The study highlights both challenges and opportunities for Malawi in reducing child under nutrition. It sheds some new light on the implications of adequate child nutrition for development, thus providing an opportunity to scale up commitments and interventions towards the elimination of child stunting in the country.

The results of this study encourage the government of Malawi to leverage policy action for a drastic reduction of stunting in the next ten to fifteen years. In order to define interventions towards a clear elimination of stunting in Malawi, national experts and stakeholders have jointly reflected on a set of key actions that would contribute effectively to this goal. These include:

**Set ambitious targets to reduce under nutrition in Malawi.** Emphasizing on reducing stunting to 23 percent by the year 2025 with an average annual reduction by 2 percent and develop additional nutrition-sensitive indicators to address child malnutrition. In addition establishing a national nutrition database to ensure effective monitoring of child under nutrition targets and indicators over time.

**Scale up high-impact nutrition interventions as outlined in national nutrition policy & strategy.** It is imperative to formulate and implement programmes that can have long-lasting improvements in the nutrition status thus government should establish innovative financing mechanisms for actors involved in nutritional programmes –by funding key sectors, including for the expansion of health coverage and health insurance mechanisms. The MGDS 2011-2016 should integrate nutrition, and in particular the reduction of stunting, in all sectoral policies and strategies. The national nutrition act under way should serve as an important catalyst in this direction. On the other hand, decentralization is an important step to ensure proper allocation of funds for nutrition under the leadership of the Ministry of Local government and establishing comprehensive social protection programmes that are more nutrition-sensitive. Another important element is strengthening health and nutrition programmes in school focusing interventions on the prevention of child malnutrition in the first 1000 days of life. When it comes to agriculture building on existing intiatives such as the Pan- African Nutrition Initiative (PANI) or the Comprehensive Africa Agriculture Development Programme (CAADP), which focus on reducing hunger and improving food and nutrition security is a vital component to generate multiplier effects in all sectors. Also the private sector needs to play a more important role alongside the government and development partners.

**Communication & Advocacy.** Increasing awareness and advocacy of key stakeholders at all levels on the social and economic impacts of child under nutrition to ensure nutrition with a focus on addressing stunting, receives the highest possible level of commitments along with strengthening the capacity and role of the ministry of information in communicating and advocating for correct nutrition at all levels. Another important element is to scale up the potential and role of existing structures to increase advocacy action and bring in the voice of non-state actors in nutrition interventions. And also putting in place a harmonized national strategy that coordinates nutrition advocacy activities and building the capacity of the government for promoting advocacy and effectiveness of nutrition interventions as well as promoting awareness and behavioural change in the populations to adopt good practices of hygiene and proper nutrition in favour of children, pregnant women, lactating and non-lactating mothers by creating awareness on the importance of nutrition and hygiene. More importantly promoting nutritional practices based on a better use of local food potential.

**Coordination.** Nutrition is currently integrated in five key social sectors, including agriculture, health, education, gender/children/social welfare, and local governance. There is a need to strengthen the role of the Department of Nutrition, HIV, and Aids (DNHA) as the national coordinating body for nutrition-related interventions and also build up coordination and dialogue among sectoral ministries, implementing partners and key stakeholders to build a coherent and integrated policy response around nutrition and stunting. The role of the private sector and civil society organizations – including the Civil Society Organizations Nutrition Alliance (CSONA) – could be influential in this regard.

**Monitoring & Evaluation.** Scale up and strengthen nutrition M&E rollout, ensuring stakeholders' awareness and ownership of their roles in sectoral data collection (agriculture (AMIS), health (HMIS), education (EMIS), etc.), and analysis from frontline workers and community members to national institutions including the National Statistical Office (NSO) to strength the program.

# Section 1: The Cost of Hunger in Africa

# The Cost of Hunger in Africa: Towards the Elimination of Child Undernutrition in Africa

## A. Introduction: Why is it important?

Over the past decade, Africa has experienced a remarkable economic performance that has made the continent increasingly attractive for global investment and trade. The pace of real GDP growth on the continent has doubled in the last decade, and six of the world's fastest growing economies are in Africa.[2] Yet, the continent still displays some of the highest rates of child under nutrition in the world.

Human capital is the foundation of social and economic development. Improved nutritional status of people has a direct impact on economic performance through increased productivity and enhanced national comparative advantage. In order for Africa to maximize its present and future economic prospects, there is an urgent need for sustainable, cost-effective interventions that address the nutritional situation of the most vulnerable members of its society.

Achieving nutrition and food security would generate immediate impact on the achievement of the Millennium Development Goals (MDGs). If child under nutritionwere reduced, there would be a direct improvement in child mortality rates, as under nutrition is the single most important contributor to child mortality.[3] If girls were not undernourished, they would be less likely to bear underweight children. Further, healthy children would achieve better education, be more productive as adults and have higher chances of breaking the cycle of poverty.

Undernutrition leads to a significant loss in human and economic potential. The World Bank estimates that undernourished children are at risk of losing about 10 percent of their lifetime earning potential, thus affecting national productivity. Recently, a panel of expert economists at a Copenhagen Consensus Conferenceconcluded that fighting malnourishment should be the top priority for policy makers and philanthropists.[4]  At that conference, Nobel Laureate Economist, Vernon Smith stated that: "One of the most compelling investments is to get nutrients to the worlds undernourished. The benefits from doing so – in terms of increased health, schooling, and productivity – are tremendous."[5] Improving the nutritional status of children is therefore a priority that needs urgent policy attention to accelerate socio-economic progress and development in Africa.

However, in spite of the compelling economic value of nutrition interventions, investments with apparent shorter-term returns are prioritized in social budgets. Hence, efforts need to be scaled up to sensitize the general population, policy makers and

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[2]"World Economic Outlook Database October 2012", World Economic Outlook Database October 2012, October 2012, http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx.

[3]Robert E. Black et al., "Maternal and child undernutrition: global and regional exposures and health consequences," *The Lancet* 371, No. 9608, 2008, doi: 10.1016/S0140-6736(07)61690-0.

[4] Copenhagen Consensus 2012, *Top economists identify the smartest investments for policy-makers and philanthropists,* 14 May 2012, http://www.copenhagenconsensus.com/Default.aspx?ID=1637.

[5]*Idem.*

development partners on the high costs of under nutrition, in order to strengthen national and international commitments and ensure that young children in Africa grow healthy and properly nourished.

Positioning nutrition interventions as a top priority for development and poverty reduction is often difficult, partly due to the lack of credible data on short-term returns. Indeed, there is not enough country-specific evidence to demonstrate how improved nutrition can have a direct impact on school performance, and thereby improving opportunities in the labour market and physical work. Additionally, nutrition is too often regarded as a health issue, disregarding the rippling social and economic implications it has on other areas of development.

Despite the aforementioned challenges, efforts continue, both at regional and global levels, to address the issues of under nutrition and hunger. At the regional level, these efforts include initiatives such as the *African Regional Nutrition Strategy*, the *Comprehensive Africa Agriculture Development Programme* (CAADP), especially CAADP Pillar III, focusing on reducing hunger and improving  food and nutrition security, the *Pan African Nutrition Initiative* (PANI), the *Framework for African Food Security* (FAFS), the *Africa Ten Year Strategy for the Reduction of Vitamin and Mineral Deficiencies* (ATYS-VMD), and the *African Day for Food and Nutrition Security* (ADFNS). At the global level, initiatives include *Renewed Efforts Against Child Hunger* (*REACH*), *Purchase for Progress* (P4P), *Scaling Up Nutrition* (SUN), *Feed the Future* (FTF), the *"1,000 Days"* partnership, as well as the *Abuja Food Security Summit* of 2006. All these efforts are designed to reduce hunger, malnutrition, and vulnerability, in a bid to also achieve the Millennium Development Goals.

Within the framework of the African Regional Nutrition Strategy (2005-2015)[6], the objectives of the African Task Force on Food and Nutrition Development[7] and CAADP, the African Union and the New Partnership for Africa's Development (NEPAD) Planning and Coordinating Agency (NPCA), the United Nations Economic Commission for Africa (UNECA), and the World Food Programme (WFP) have combined their efforts to conduct the *Cost of Hunger Study on the Social and Economic Impact of Child Undernutrition in Africa*. This study is built on a model developed by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC). Through a South-South cooperation agreement, ECLAC has supported the adaptation of the model to the African context.

This study aims at generating evidence to inform key decision makers and the general public about the cost African societies are already paying for not addressing the problem of child under nutrition. The results provide compelling evidence to guide policy dialogue and increase advocacy around the importance of preventing child under nutrition. Ultimately, it is expected that the study will encourage revision of current budgetary allocation practices in each participating country to ensure provision of the human and financial resources needed to effectively combat child under nutrition, specifically during the first 1,000 days of life when most of the damage occurs.

## B.  Current Food and Nutrition Situation in Africa

Globally, there has been tremendous progress in reducing both the rate of stunting (low height-for-age) and the number of stunted children over the past 20 years. In Africa, the reported rate of stunted children has decreased from 41.6 percent in 1990 to 35.6 percent in 2011 (see Table I.1). Nevertheless, over the same period, the absolute number of stunted children has increased from 45.7 million to 56.3[8] million. The largest proportion of these children, 22.8 million, is located in East Africa, representing more than 40 percent of all stunted children on the continent. Together with West Africa, they account for three out of four stunted children on the continent.

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[6]African Regional Nutrition Strategy (2005-2015). Objectives I-III: I. To increase awareness among governments of the region, regional and international development partners and the community on the nature and magnitude of nutrition problems in Africa and their implications for the development of the continent and advocate for additional resources for nutrition. II. To advocate for renewed focus, attention, commitment and a redoubling of efforts by member states, in the wake of the worsening nutrition status of vulnerable groups. III. To stimulate action at the national and regional level that lead to improved nutrition outcome, by providing guidance on strategic areas of focus.

[7]African Union, "CAHM5 Moves into gear with meeting on food and nutrition development", 14 April 2011, http://www.au.int/en/sites/default/files/task%20force%20on%20food%20and%20nutrition%20development.pdf

[8]United Nations Children's Fund, World Health Organization, The World Bank. UNICEF-WHO-World Bank Joint Child Malnutrition Estimates. UNICEF, New York; WHO, Geneva; The World Bank: DC,

**TABLE 1.1**
**ESTIMATED PREVALENCE AND NUMBER OF STUNTED CHILDREN UNDER FIVE YEARS OF AGE**
**(MODERATE OR SEVERE), BY UN REGION: 1990, 2010, and 2011**

| Region | Prevalence estimate (%) | | | Number (million) | | |
|---|---|---|---|---|---|---|
| | **1990** | **2010** | **2011** | **1990** | **2010** | **2011** |
| Africa | 41.6 | 35.9 | 35.6 | 45.7 | 55.8 | 56.3 |
| Eastern | 50.6 | 42.5 | 42.1 | 18 | 22.6 | 22.8 |
| Middle | 47.2 | 35.6 | 35 | 6.4 | 7.8 | 7.8 |
| Northern | 28.6 | 21.3 | 21 | 6.3 | 5 | 5 |
| Southern | 36.2 | 31.1 | 30.8 | 2.2 | 1.9 | 1.8 |
| Western | 39.1 | 36.5 | 36.4 | 12.8 | 18.6 | 18.9 |

Source: United Nations Children's Fund, World Health Organization, The World Bank. UNICEF-WHO-World Bank Joint Child Malnutrition Estimate.

The rising number of food insecure and undernourished people continues to pose serious challenges in Africa. Over the past few years, the increase in global food prices, followed by the economic and financial crisis, have pushed more people into poverty and hunger. Even though the number of undernourished people has reduced globally from 1 billion to 868 million in the last twenty years, Africa has fallen back, reporting an increase in the number of undernourished people from 175 million to 239 million (see Table I.2).[9] Africa's share in the world's undernourished population has also increased from 18 percent to 28 percent[10] calling for stronger efforts to improve food security and nutrition on the continent.

**TABLE 1.2**
**NUMBER OF UNDERNOURISHED PEOPLE, BY REGION**
*(In millions)*

| Region | 1990-1992 | Proportion | 2010-2012 | Proportion |
|---|---|---|---|---|
| Africa | 175 | 18% | 239 | 28% |
| Asia | 739 | 74% | 563 | 65% |
| Latin America & Caribbean | 65 | 7% | 49 | 6% |
| Oceania | 1 | 0.1% | 1 | 0.1% |
| World | 1000 | | 868 | |

Source: The state of food insecurity in the world 2012, Report, Food and Agriculture Organization (FAO)

Figure I.1 below illustrates the rates of stunting (low height-for-age) in Africa. According to these data, 17 countries on the continent have stunting rates above 40 percent and 36 countries have rates above 30 percent. Furthermore, a large proportion of Africa's population often does not have access to food containing the essential vitamins and minerals required for optimum health and nutrition.

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[9]FAO, WFP and IFAD. 2012. The State of Food Insecurity in the World 2012. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Rome, FAO.
[10] Ibid

**FIGURE1.1
STUNTING RATES BY COUNTRY**

| | |
|---|---|
| � | >50% |
| | 40-50% |
| | 30-40% |
| | 20-30% |
| | 10-20% |
| | >10% |
| | Data not available |
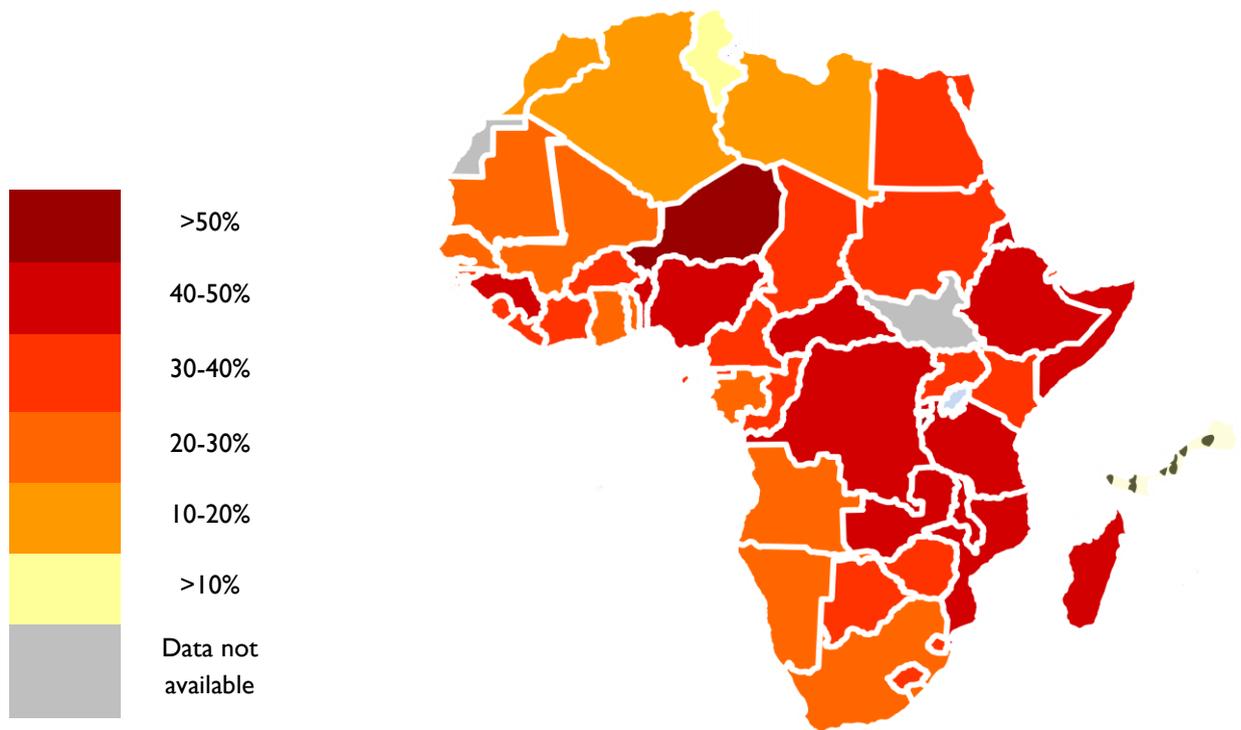
Source: Data from "WHO Global Database on Child Growth and Malnutrition".

The first Millennium Development Goal (MDG 1) calls for the eradication of extreme poverty and hunger.[12] Indeed, the nutritional status of children under five years of age is one of the key indicators used to assess progress towards MDG 1. According to the latest global MDG Report[11], the current rate of progress is not sufficient to meet Target 1C of MDG 1, i.e. to reduce by half the prevalence of underweight children. Unless coherent national strategies are urgently put in place and fully supported to ensure well-coordinated and decisive priority actions, any small gain is likely to be reversed. Achievement of MDG 1 is in fact crucial for overall socio-economic progress. Failure to achieve this goal is likely to jeopardize the realization of all the other MDGs, including goals to reach universal primary education (MDG 2), promote gender equality and empowerment of women (MDG 3), reduce child mortality (MDG 4) and improve maternal health (MDG 5)[12].

## C. Mandate to Advocate for Nutrition in Africa

At the 4th Joint, Meeting of the AU Conference of Ministers of Economy and Finance and the ECA Conference of African Ministers of Finance, Planning and Economic Development held in 2011, the African Union (AU) recognized the compelling evidence that vibrant economic growth in Africa has not translated into equitable social progress, particularly with regards to poverty reduction and job creation.

Experience from other regions of the world – most notably Latin America and Asia – confirms that cutting hunger and thereby achieving food and nutrition security in Africa is not only one of the most urgent needs for reducing vulnerability and enhancing resilience, but also one of the highest return outcomes for broader social and economic development. This suggests that, had more progress been made against hunger in Africa, the continent's recent growth performance would have been even more impressive with potentially stronger impacts on poverty reduction.

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[11]UnitedNations. The Millennium DevelopmentGoalsReport, 2013.

[12]"Unstats | Millennium DevelopmentGoalsIndicators," RSS Main, July 2, 2012, "Childrenunder 5 moderately orseverelyunderweight, percentage," accessedMarch 13, 2013, http://mdgs.un.org/unsd/mdg/Data.aspx.

Nevertheless, advocating for nutrition investments has been a challenge for development stakeholders. Often, child nutrition is perceived as a long-term investment, which will take several years to generate social returns, thus making short-term investments being prioritized in budget allocations. Further, food security and response to emergency hunger situations often retain most of the attention associated to nutrition investments.

Recognizing these challenges, the African Union Commission (AUC), strongly supported by WFP, NEPAD and other partners, proposed the development of the COHA study at the 5[th]Joint Meeting of the AU Conference of Ministers of Economy and Finance and the ECA Conference of African Ministers of Finance, Planning and Economic Development in March 2012. The purpose of this multi-country study was to provide strong evidence on the social and economic consequences of child under nutrition, in order to inform, raise awareness, build consensus and catalyse action towards under nutrition in Africa. As a result, *Resolution 898 (XLV)[13] the Cost of Hunger in Africa: Social and Economic Impacts of Child Undernutrition* was adopted, acknowledging     the importance

*"The Conference of Ministers…*
***Welcomes*** *the multi-country study on the Cost of Hunger in Africa being led by the African Union Commission and the Economic Commission for Africa, in collaboration with the World Food Programme, to quantify the aggregate social and economic impacts of chronic hunger in Africa;*
***Anticipates*** *that the study will lead to increased understanding among key national and regional policymakers of the depth and breadth of child undernutrition on the continent, and its aggregate social and economic consequences, and thereby establish a firmer foundation for policies and investments to cut hunger in Africa; and*
*[**Requests** partners] to expedite the successful completion of the study, including wide dissemination of the results at country and regional levels."*

- Extract from Resolution 898 (XLV) the Cost of Hunger in Africa:
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of the study and recommending it to continue beyond the initial stage.

This mandate was a clear guideline for the AUC to integrate the COHA study into the advocacy efforts of the ARNS (2005-2015)[14] and use the results of the study as a tool to mainstream nutrition in the development process. The resolution also promoted a dialogue with political actors at the country level, motivated consideration of nutrition issues within the economic and planning sectors, and repositioned child nutrition in the context of economic development. This report is the result of the commitment by the AUC, NEPAD, ECA, WFP and other partners to highlight the tangible consequences of child under nutrition in Africa.

Most recently, the Heads of State and Government of the African Union, having met at their Twenty Third Ordinary Session of the AU Assembly in Malabo, Equatorial Guinea, from 26 to 27 June 2014, on the theme of the African Year of Agriculture and Food Security: "Transforming Africa's Agriculture for Shared Prosperity and Improved Livelihoods through Harnessing Opportunities for Inclusive Growth and Sustainable Development", further reiterated the importance of COHA.In Declaration 4 of the Assembly, titled"Declaration on Nutrition Security for Inclusive Economic Growth and Sustainable Development in Africa"[15] the Heads of State noted with concern that the results of the study on the Cost of Hunger in Africa(COHA) revealed the degree to which child under-nutrition influences health andeducational outcomes; the additional barrier it has on children's ability to achieve their full potential; and the impact it has on national productivity; and called upon member States, who have not yet done so, to consider participationin the study on the Cost of Hunger in Africa and Request the Commission,UNECA, WFP, UNICEF and other Development Partners to expedite the successful completion of the study, including wide dissemination of the results at country and regional levels.

### D. Adapting a Methodology for Africa: a Consultative Process

[13]Resolution 898: TheCost of Hunger in Africa: Social and Economic Impacts of ChildUndernutrition," in Report of theCommittee of Experts of TheFifthJointAnnualMeetings of the AU Conference of Ministers of Economy and Finance and ECA Conference of AfricanMinisters of Finance, Planning and EconomicDevelopment (Addis Ababa: AfricanUnion, 2012), pg. 15, http://www.uneca.org/sites/default/files/uploaded-documents/COM/com2012/com2012-reportcommittee-of-experts_en.pdf.
[14]*African Regional Nutrition Strategy: 2005-2015*, report (Addis Ababa: African Union), http://www.who.int/nutrition/topics/African_Nutritional_strategy.pdf
[15]Declaration 4 on Nutrition Security for Inclusive Economic Growth and Sustainable Development in Africa Assembly of the Union. Twenty-Third Ordinary Session 26-27 June 2014 Malabo, Equatorial Guinea.

The model for the COHA study represents a step forward in estimating the social and economic consequences of child under nutrition in Africa. Several national and regional efforts have been implemented to assess the costs of under nutrition globally and in the region. Notable initiatives at the regional level include those led by ECLAC, carried out jointly with WFP in Latin America and the Caribbean (LAC) and the Profiles initiatives[16], which developed similar country-level estimations in selected countries worldwide. The COHA, however, represents the only effort constructed for the African continent, involving nutrition experts from the continent, who provided recommendations during the adaptation process, with critical support of country teams. The model developed by ECLAC to estimate the social and economic consequences on child under nutrition in LAC[17], presented the most appropriate base to develop a model for Africa. In the development of the model for LAC, the authors focused on the consequences of child under nutrition from a life-cycle approach, avoiding the potential overlaps with other nutritional deficiencies. This approach proved to be an important political instrument to mobilize stakeholders around nutrition in LAC, and was considered by many to be state-of-the-art knowledge in this field.

The development of the COHA model proved to be a good practice of South-South collaboration between two regional UN Economic Commissions. ECLAC and ECA worked together in a series of joint technical activities and consultations to transfer knowledge and generate the adjustments for the development of the new model to Africa. An interdivisional working group was created within ECA that included the African Centre for Statistics, the African Centre for Gender and Social Development, the Economic Development and NEPAD Division of the ECA as well as a number of UN partners, namely WFP, UNICEF, the International Labour Organization (ILO) and WHO – to ensure multidisciplinary contributions in the development of the model.

At the regional level, the technical validation of the COHA model was provided by the African Task Forcefor Food and Nutrition Development (ATFFND). The Task Force, which brings together regional nutrition experts and practitioners, was the ideal body to provide guidance in the development of the model. In consecutive meetings, the ATFFND provided key recommendations, thus laying out a roadmap for the adaptation process, and finally expressed its satisfaction with the proposed COHA model.

To facilitate the implementation of the project, leadership roles were identified: the AUC Department of Social Affairs and the NEPAD Planning and Coordinating Agency led the initiative; ECA/ECLAC coordinated its implementation, while WFP and other partners supported the capacity building process, both at regional and country levels. Further, the following governing structures were established:

1. The Steering Committee/ATFFND: The high-level Steering Committee is chaired by the AUC. The Steering Committee is charged with convening partner organizations, approving the study design and action plan and overseeing the implementation of the study and dissemination of results. The Steering Committee also provides political support to the initiative.
2. The Regional Secretariat: The Regional Secretariat, based at ECA, worked through a small technical team, drawn from ECA, NEPAD, AUC, WFP, ECLAC and other relevant organizations, to support the preparation, implementation and dissemination of the study, as well as to facilitate smooth and quality work of the national implementation teams and expert committees. The Secretariat reported to the Steering Committee and executed the study budget.
3. The National Implementation Team (NIT): The core implementation of the study was carried out by a national team in each participating country, drawn from relevant governmental institutions, such as the Ministry of Health, Ministry of Education, Ministry of Social Development, Ministry of Planning, Ministry of Finance, and the National Statistics Institution. In certain situations, a broader reference group was also created to include other actors and United Nations agencies, such as WFP, UNICEF, and WHO. The WFP country offices facilitated the process according to specific country situations and supported coordination of the NIT as required.

For the initial phase of the project, a number of criteria were agreed upon to select the initial countries. The requirements were as follows:

1. Data availability: The availability of at least two recent, nationally representative survey datasets on fertility, family planning, maternal and child health, gender, malaria and nutrition, preferably the Demographic and Health Survey (DHS).
2. Sub-regional coverage: At least one country selected from each AU region: Community of Sahel-Saharan States (CEN-SAD), Common Market for Eastern and Southern Africa (COMESA), Economic Community of Central African States (ECCAS), Economic Community of Western African States (ECOWAS), Intergovernmental Authority for Development

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[16]"FHI 360 Profiles," FHI 360 Profiles, accessed September 27, 2013, http://fhi360profiles.org/.

[17]Rodrigo Martínez and Andrés Fernández, *Model for Analyzing the Social and Economic Impact of Child Undernutrition in Latin America* (Santiago De Chile: NacionesUnidas, CEPAL, Social Development Division, 2007).

(IGAD), Southern African Development Community (SADC), and Union du Maghreb Arab (UMA). Overlapping membership to various Regional Economic Communities was also taken into account in the final selection of countries.

3. Socio-economic representation: Prevalence of poverty and under-nourishment in the overall population and occurrence of episodes of drought or other natural disasters.
4. Existence of a national platform on malnutrition and hunger.

Based on these criteria, 12 initial countries were selected (see Table 1.3). Four of these countries, namely Egypt, Ethiopia, Swaziland, and Uganda, participated as first-phase countries. Contributions from the NITs in these countries helped in the adaptation of the model. Four countries represent the second phase: Burkina Faso, Ghana, Malawi, and Rwanda. Four countries have also been selected for the third phase: Botswana, Cameroon, Kenya, and Mauritania.

**TABLE 1.3**
**COUNTRY SELECTION CRITERIA**

| Country | AU Region | Data availability (Survey Dates)[a] | Proportion of under-nourished in total pop. (%)[b] | Crude birth rate (births per 1,000 pop.)[c] | <5 mortality rate, (per 1,000 live births)[d] | UN HDI value ranking[e] | Prevalence of Stunting in children <5 years[f] |
|---|---|---|---|---|---|---|---|
| Botswana | SADC | # CSO/UNICEF. | 27.9 | 24 | 48 | 118 | 31[g] |
| Burkina Faso | ECOWAS | 2010, 2003, 1998-99 Standard DHS | 25.9 | 41 | 102 | 181 | 34.6 |
| Cameroon | ECCAS | 2004, 1998, 1991 Standard DHS | 15.7 | 38 | 97 | 150 | 32.5 |
| Egypt | CEN-SAD, COMESA | 2008, 2005, 2000 Standard DHS | <5 | 24 | 22 | 113 | 28.9 |
| Ethiopia | IGAD, COMESA | 2010, 2005, 2000 Standard DHS | 40.2 | 34 | 68 | 174 | 44.4 |
| Ghana | ECOWAS | 2008, 2006, 1998 Standard DHS, 2006 MICS | <5 | 31 | 80 | 135 | 28.0 |
| Kenya | IGAD, COMESA | 2008-09, 2003, 1998 Standard DHS | 30.4 | 36 | 73 | 143 | 35.3 |
| Malawi | SADC, COMESA | 2010, 2004, 2000 Standard DHS | 23.1 | 40 | 71 | 171 | 47.1 |
| Mauritania | UMA | 2003-04 Special2000-01 Standard DHS | … | 34 | 93 | 159 | 23[g] |
| Rwanda | COMESA | 2010, 2005, 2000 Standard DHS | 28.9 | 36 | 55 | 166 | 44.2 |
| Swaziland | SADC, COMESA | 2006-07 Standard DHS, 2002 MICS | … | 30 | 82 | 140 | 28.9 |
| Uganda | IGAD, COMESA | 2010 Standard AIS,2006, 2000-01 Standard DHS | 34.6 | 44 | 69 | 161 | 33.4 |

[a]"MEASURE DHS - Quality information to plan, monitor and improve population, health, and nutrition programs," MEASURE DHS, accessed December 26, 2014, http://www.measuredhs.com/.

[b]Population below minimum level of dietary energy consumption *The state of food insecurity in the world*, Report, FAO, Rome, 2012, http://www.fao.org/docrep/016/i3027e/i3027e.pdf

[c]"Birth rate, crude (per 1,000 people)," Data, World Bank, accessed December 26, 2014, http://data.worldbank.org/indicator/SP.DYN.CBRT.IN.

[d]"Mortality rate, under-5 (per 1,000 live births)," Data, World Bank, accessed December 26, 2014, http://data.worldbank.org/indicator/SH.DYN.MORT.

[e]*Human Development Report 2011*, Report, UNDP, New York, 2011, http://hdr.undp.org/en/content/human-development-report-2011/.

[f]"MEASURE DHS - Quality information to plan, monitor and improve population, health, and nutrition programs," MEASURE DHS, accessed December 26, 2014, http://www.measuredhs.com/.

[g] The state of the World's Children 2013, "UNICEF Statistics, accessed December 26, 2014,http://www.unicef.org/sowc2013/statistics.html

## E.  Guiding Principles

Throughout the adaptation, implementation, and utilization of the COHA model, four guiding principles were developed. With the overall goal of improving the nutritional situation in Africa, these principles allowed the team to approach the study in a holistic manner, considering the necessary steps for its implementation. The four guiding principles are described below.

### a. National ownership of the process

One of the guiding principles in the development of the COHA study is to engage regional experts and policy makers as the main actors of the process. To this purpose, a feasibility workshop was carried out in the early stages of the process, bringing together practitioners across various sectors in order to analyse the challenges ahead and jointly produce a roadmap. Representatives from the 12 initial countries and major partners met to assess the process ahead and provided key recommendations for the adaptation of the ECLAC model. Some of these elements included capacity building, strong communication strategies, and synergies with other on-going costing initiatives.

As a result of this feasibility workshop, NITs were established in each of the four first-phase countries, and an initial training on the model and data requirements was carried out. A key milestone of the adaptation process was a regional technical meeting held in Entebbe, Uganda, where NITs presented a series of specific recommendations to the process based on the constraints and lessons learned. This feedback allowed the Regional Secretariat to develop a final roadmap for methodological adaptation, adjust the data collection instruments, and develop a final proposal for the COHA model for Africa.

### b. Building national capacity to advocate for child nutrition

A second guiding principle for the COHA is to ensure that national capacity is strengthened during the implementation of the study. Similar costing initiatives have had limited impact due, in part, to the lack of national ownership and limited understanding by the stakeholders of the technical aspects of the study. These elements hinder the national stakeholders' capacities to effectively communicate the results, which could limit the policy impact of the study.

The main implementing actors of COHA in each country are specialists from the key government institutions, academics, and practitioners, often led by the Ministry of Economy and/or Planning or the Ministry of Health. Once a team of eight to ten specialists was established, a training workshop was held to review all technical aspects of the model, form a task force for data collection and develop an initial communication strategy. In this workshop, a work plan was developed by the NIT that served as a guideline for future activities.

The Regional Secretariat supported the capacity building process of the NITs by holding regular teleconferences with representatives from each team and by providing technical assistance in the analysis of data and initial results. The national ownership of the study was emphasized by creating an NIT-led approach and by relying on nationally validated information. Once a country report was drafted, a national validation workshop of the results was held by the NIT and specific advocacy documents were prepared for key stakeholders.

One of the advantages of this process was the integration of the COHA by the NITs within their national nutritional strategies. This was possible as the actors participating in the study were the same professionals shaping national nutritional strategies. This ensured alignment within the processes and maximized the potential contribution and sustainability of the initiative.

### c. Engagement of COHA with global nutrition initiatives and movements

The third guiding principle for the COHA is to generate synergies with partners and global initiatives to maximize contributions. To achieve this, strong efforts were made to link the COHA with relevant initiatives that contribute to reducing child under nutrition.

The Scaling Up Nutrition (SUN) Movement was launched in 2010 and includes selected countries with high burdens of malnutrition. The purpose of the movement is described as follows:

> It unites people - governments, civil society, the United Nations, donors, businesses, and scientists – in a collective effort to improve nutrition. The Movement recognizes that good nutrition in the 1,000 days of a mother's pregnancy until her child's second birthday is an essential requirement and right for each world citizen to earn, learn, stay healthy and achieve his or her lifetime potential. The SUN Movement is founded on the compelling evidence that investment in nutrition yields major economic returns.[45]

COHA contributes to the SUN Movement by presenting strong arguments for investing in child nutrition in specific country contexts. By doing so, countries have developed the capacity to generate change in the nutritional situation of their populations.

Another important global actor in the nutrition context is represented by the *Renewed Efforts Against Child Hunger* (REACH) initiative. This joint initiative proposed by WFP, WHO, UNICEF and FAO provides technical assistance to national governments in developing plans and strategies to scale up nutrition investments. An important part of their advocacy actions at the country level includes engaging non-traditional actors in discussions on nutrition, in order to mainstream nutrition in their planning and activities. The COHA also represents an opportunity for joint collaboration, as it provides strong evidence on the consequences of stunting in educational performance, the loss of working hours by working age population and the loss in manual and non-manual productivity – thus helping to position nutrition in the wider development agenda. REACH facilitators are also typically members of the NIT in each country where REACH is present.

### d. Strategic advocacy for change

The fourth guiding principle of the COHA is to ensure that the results reach key stakeholders with the capacity to make a change. The communication strategy of the COHA is a basic component of the project. As a result, strong efforts are carried out by each NIT to reach decision-makers with the appropriate information in order to increase their interest and understand the consequences of child under nutrition. In this regard, a six-step approach has been developed, as follows:

1. Familiarize the team with the problems contributing to under nutrition and proven nutrition interventions;
2. Identify and categorize key actors;
3. Develop objectives for each actor;
4. Produce information materials and brief stakeholders;
5. Adapt results and present them to target decision-makers; and
6. Follow up and provide support.

Each NIT was providedwith detailed information on the six steps. Additionally, the NIT held communication and advocacy sessions at each of the technical workshops to discuss the implementation of the six-step approach.

# Section II: Cost of Hunger in Africa Methodology

# Cost of Hunger in Africa Methodology

## A. Brief description of the model

### i. Conceptual framework

Hunger is caused and affected by a set of contextual factors. "Hunger" is an overarching term that reflects an individual's food and nutrition insecurity. Food and nutrition insecurity occur when part of the population does not have assured physical, social and economic access to safe and nutritional food to satisfy dietary needs.

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**DEFINITION OF TERMS FOR COHA MODEL**

1. **Chronic Hunger**: The status of people, whose food intake regularly provides less than their minimum energy requirements leading to under nutrition.[18]

2. **Child Undernutrition**: The result of prolonged low levels of food intake (hunger) and/or low absorption of food consumed. It is generally applied to energy or protein deficiency, but it may also relate to vitamin and mineral deficiencies. Anthropometric measurements (stunting, underweight, and wasting) are the most widely used indicators of under nutrition.[19]

3. **Malnutrition:** A broad term for a range of conditions that hinder good health caused by inadequate or unbalanced food intake or from poor absorption of food consumed. It refers to both under nutrition (food deprivation) and over nutrition (excessive food intake in relation to energy requirements).[20]

4. **Food insecurity:** Exists when people lack access to sufficient amounts of safe and nutritious food, and therefore are not consuming enough for an active and healthy life. This may be due to the unavailability of food, inadequate purchasing power or inappropriate utilization at household level.[21]

5. **Food vulnerability:** Reflects the probability of an acute decline in food access or consumption, often in reference to some critical value that defines minimum levels of human wellbeing.[22]

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Nutrition security therefore, depends on a person's food security or insecurity. Specifically, nutrition security can be described as, the "appropriate quantity and combination of food, nutrition, health services and care taker's time needed to ensure adequate nutrition status for an active and healthy life at all times for all people."[23]

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[18]"Hunger statistics", FAO Hunger Portal, Undernourishment or Chronic Hunger, FAO, accessed March 14, 2013, http://www.fao.org/hunger/ en/.

[19]*Ibid*

[20]*Ibid.*

[21]*Ibid.*

[22]WFP, *VAM Standard analyticalframework*, World Food Programme, 2002.

[23] USAID, *USAID Commodities reference guide*, Annex I: Definitions, January 2006, http://transition.usaid.gov/our_work/humanitarian_assistance/ ffp/crg/annex-l.htm.

A direct and measurable consequence of nutrition insecurity is low birth weight, underweight and/or lower than normal height-for-age. Levels of nutrition security in a country are related to epidemiological and nutritional transitions, which can be evaluated to assess the population's nutritional situation. Further, a person's nutritional situation is part of a process that is expressed differently depending on the stage of the life cycle: intrauterine and neonatal life, infancy and pre-school, school years or adult life. This is because the nutrient requirements and the needs are different for each stage[24].

Below is the discussion of the central elements, considered in the model, to estimate the effects and costs of child under nutrition based on the concepts mentioned above, along with a brief description of the causes and consequences of undernutrition. The discussion also describes the dimension of analysis and the principal methodological aspects used to interpret the results.[25]

### ii.    Causes of under nutrition

The main factors associated with under nutrition, as a public health problem, can be grouped into the following: environmental (natural or entropic causes), socio cultural-economic (linked to poverty and inequality) and political-institutional. Together, these factors increase or decrease biomedical and productivity vulnerabilities, through which they determine the quantity and quality of dietary intake and the absorption capacity, which constitute the elements of under nutrition.[26]

Each of these factors helps increase or decrease the likelihood of a person to suffer from under nutrition (see Figure 2.I). Further, the importance of each of these factors depends on the level of the country's demographic and epidemiological transition as well as on the person's current stage in the life cycle. Together these factors determine the intensity of the resulting vulnerability to under nutrition.



**FIGURE 2.I**
**CAUSES OF UNDERNUTRTION**

Source: Modefied from Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America* (see footnote) based on consultations carried out by authors.
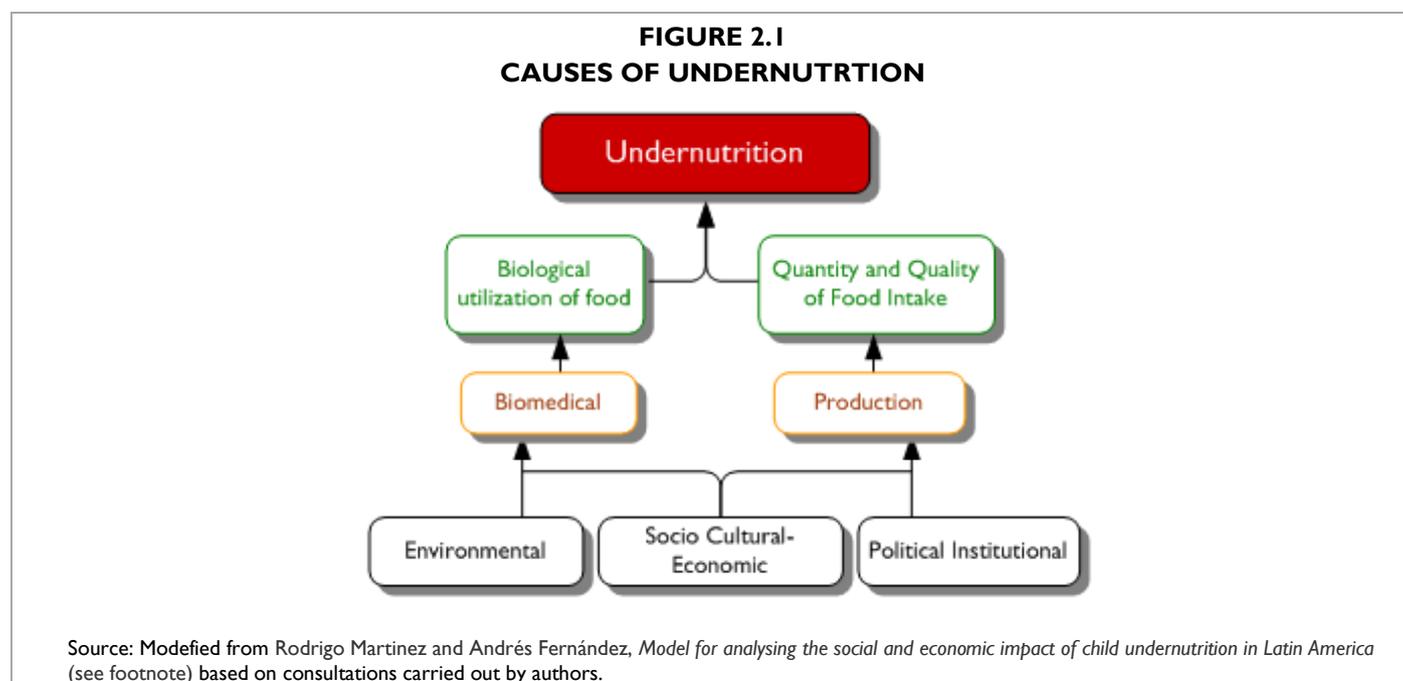
One of the key considerations in assessing under nutrition is the environmental factor. Environmental factors define the surroundings in which the subject and his or her family live, including the risks stemming from the natural environment itself and its cycles (from floods, droughts, frosts, earthquakes, and other phenomena), and those produced by humans themselves (such as the contamination of water, air, and food, the expansion of agricultureinto new territories, etc.). The socio cultural-economic determinants include elements associated with poverty and equality, education and cultural norms, employment and wages, access to social security, and coverage of aid programmes. The political-institutional factors encompass government policies and programmes aimed specifically at solving the population's food and nutritional problems.

Another key factor in the analysis relates to production. The production factors have been directly associated with the food output in Africa, but an important element of this dimension is the unequal access that people living in social, environmental and economic

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[24]Rodrigo Martínez and Andrés Fernández, *Model for analyzing the social and economic impact of child undernutrition in Latin America,* NacionesUnidas, CEPAL, Social Development Division, Santiago De Chile, 2007.

[25]A summarized version of the theoretical background and the basic characteristics considered in the model of analysis are presented. For a more detailed discussion of the model, see Rodrigo Martínez and Andrés Fernández, *Model for analyzing the social and economic impact of child undernutrition in Latin America,* NacionesUnidas, CEPAL, Social Development Division, Santiago De Chile, 2007.

[26]Rodrigo Martínez and Andrés Fernández, *Model for analyzing the social and economic impact of child undernutrition in Latin America,* NacionesUnidas, CEPAL, Social Development Division, Santiago De Chile, 2007.

vulnerability have to food. The availability and autonomy of each country's dietary energy supply depend directly on the characteristics of production processes, the degree to which they utilize natural resources, and the extent to which these processes mitigate or aggravate environmental risks and hence access to food and nutrition.

Finally, the analysis is also based on the biomedical factors. The analysis based on these factors provides the opportunity for an in-depth analysis of the individual's susceptibility to under nutrition, insofar as deficiencies in certain elements limit the capacity to make biological use of the food consumed (regardless of quantity and quality).

### iii.    Consequences of under nutrition

Child under nutrition has long-term negative effects on a person's life[27], most notably in the aspects of health, education, and productivity (see Figure 2.2). These elements are quantifiable as costs and expenditures to both the public sector and to individuals. Consequently, these effects exacerbate problems in social integration and increase or intensify poverty. A vicious cycle is perpetuated as vulnerability to under nutrition grows.

Undernutrition may have immediate or evolving impacts throughout a person's lifetime, although individuals who suffered from under nutrition during early years of their life cycle (including intrauterine) are more likely to be undernourished later in life. Health studies have shown that under nutrition leads to increased appearance or intensified severity of specific pathologies, and increases the chance of death during specific stages of the life cycle.[28] The nature and intensity of the impact of under nutrition on pathologies depends on the epidemiological profile of a given country.

In education, under nutrition affects student performance through disease-related weaknesses and results in limited learning capacity associated with deficient cognitive development.[29] This translates into a greater probability of starting school at a later age, repeating grades, dropping out of school, and ultimately obtaining a lower level of education.

Later in life, individuals may experience lower physical capacity in manual labour as a result of stunting.[30] Stunting, which is caused by food deprivation and nutrient deficiencies, is established by low height-for-age measurements during childhood. In adulthood, it leads to an overall reduced body mass when compared to the full adult potential.

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[27]Alderman H., et al., "Long-term consequences of early childhood malnutrition", FCND Discussion Paper No. 168, IFPRI, 2003.

[28]Amy L. Rice et al., "Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries," *Bulletin of the World Health Organization* 78, No. 2000, 2000.

[29]Melissa C. Daniels and Linda S. Adair, "Growth in young Filipino children predicts schooling trajectories through high school," *The Journal of Nutrition*, March 22, 2004, Jn.nutrition.org.

[30]Lawrence J. Haddad and Howarth E. Bouis, "The impact of nutritional status on agricultural productivity: wage evidence from the Philippines," *Oxford Bulletin of Economics and Statistics* 53, No. 1, February 1991, doi:10.1111/j.1468-0084.1991.mp53001004.x.

**FIGURE 2.2**
**CONSEQUENCES OF UNDERNUTRITION**
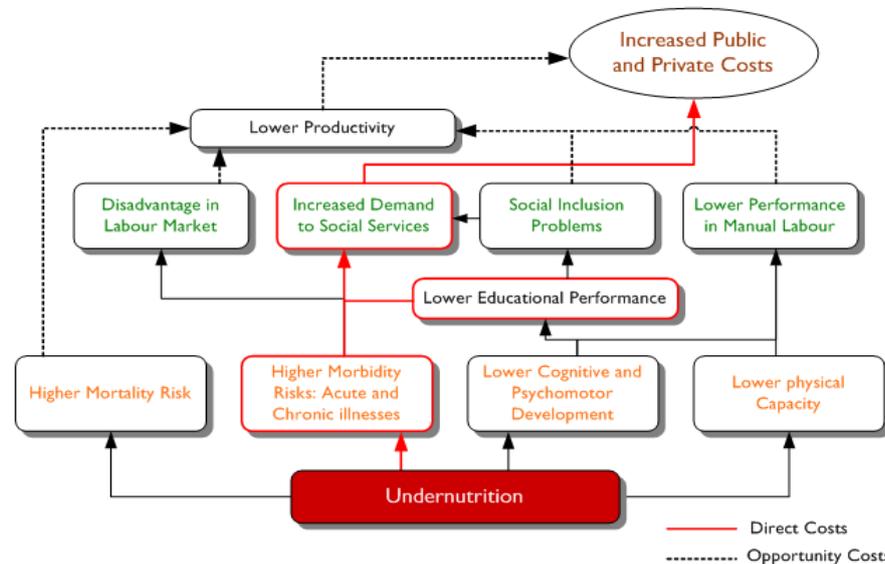
Source: Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America* (see footnote) based on consultations carried out by authors.

Undernutrition and each of its negative impacts on health, education, and productivity, as described above, lead to a social as well as an economic loss to the individual and society as a whole (see Figure 3.2). Thus, the total cost of under nutrition ($TC^U$) is a function of higher health-care spending ($HC^U$), inefficiencies in education ($EC^U$) and lower productivity ($PC^U$). As a result, to account for the total cost of under nutrition ($TC^U$), the function can be written as:

$$TC^U = f\,(HC^U,\,EC^U,\,PC^U)$$

In the area of health, the high probability resulting from the epidemiological profile of individuals suffering from under nutrition proportionally increases the costs in the health care sector ($HSC^U$). In aggregate, this is equal to the sum of the interactions between the probability of under nutrition in each age group, the probability that a particular group will suffer from the diseases because of under nutrition, and the costs of treating the pathology ($HSC^U$) that typically includes diagnosis, treatment, and control. To these are added the costs paid by individuals and their families as a result of lost time and quality of life ($IHC^U$). Thus, to study the variables associated with the health cost ($HC^U$) the formula is:

$$HC^U = f\,(HSC^U,\,IHC^U)$$

In education, the reduced attention and learning capacity of those who have suffered from child under nutrition increase costs to the educational system ($ESC^U$). Repeating one or more grades commensurately increases the demand that the educational system must meet, with the resulting extra costs in infrastructure, equipment, human resources, and educational inputs. In addition, the private costs (incurred by students and their families) derived from the larger quantity of inputs, external educational supplementation, and more time devoted to solving or mitigating low performance problems ($IEC^U$) are added to the above costs. Thus, in the case of the education cost ($EC^U$), the formula is:

$$EC^U = f\,(ESC^U,\,IEC^U)$$

The productivity cost associated with under nutrition is equal to the loss in human capital (HK) incurred by a society, stemming from a lower educational level achieved by malnourished individuals ($ELC^U$), a lower productivity in manual labour experienced by individuals who suffered from stunting ($MLC^U$) and the loss of productive capacity resulting from a higher number of deaths caused by under nutrition ($MMC^U$). In the model, these costs are reflected as losses in potential productivity ($PC^U$). Thus:

$$PC^U = f\,(ELC^U,\,MLC^U,\,MMC^U)$$

As a result, in order to comprehensively analyse the phenomenon of under nutrition, the model considers its consequences on health, education and productivity by translating them into costs.

### iv.      Dimensions of analysis

Considering that a country's under nutrition situation and the consequences thereof reflect a specific epidemiological and nutritional transition process, a comprehensive analysis involves estimates of the current situation extrapolated from previous transitional stages as well as estimates of the future to predict potential cost and saving scenarios based on prospective interventions to control or eradicate the problem.

On this basis, a two-dimensional analysis model was developed to estimate the costs arising from the consequences of child under nutrition in health, education, and productivity:

1. Incidental retrospective dimension. This dimension focuses on the population in the study year, including mortality cases of those who would have been alive in the study year. The retrospective dimension estimates the nutritional situation of individuals under the age of five to identify the related economic costs in the study year. Thus, it is possible to estimate the health costs of pre-school boys and girls who suffer from under nutrition during the year of analysis, the education costs stemming from the children currently in school who suffered from under nutrition during the first five years of life, and the economic costs due to lost productivity by working-age individuals who were exposed to under nutrition before the age of five.

2. Prospective or potential savings dimension. This dimension focuses on children under five in a given year and allows analysis of the present and future losses incurred as a result of medical treatment, repetition of grades in school and lower productivity. Based on this analysis, potential savings derived from actions taken to achieve nutritional objectives can be estimated.

As shown in Figure 2.3, the incidental retrospective dimension includes the social and economic consequences of under nutrition in a specific year (for the purposes of this report 2012 was set as the base year) for cohorts that have been affected (0 to 4 years of age for health, 6 to 18 years for education and 15 to 64 years for productivity). The prospective dimension on the other hand, projects the costs and effects of under nutrition recorded in the reference year of the study. Theseare based on the number of children born during the period selected in the analysis and, with the application of a discount rate, on the present value estimates of future costs to be incurred due to the consequences of under nutrition. The prospective dimension is the basis for establishing scenarios to estimate the economic and social savings of an improved nutritional situation.



**FIGURE 2.3**
**DIMENSIONS OF ANALYSIS BY POPULATION AGE AND YEAR WHEN EFFECTS OCCUR**
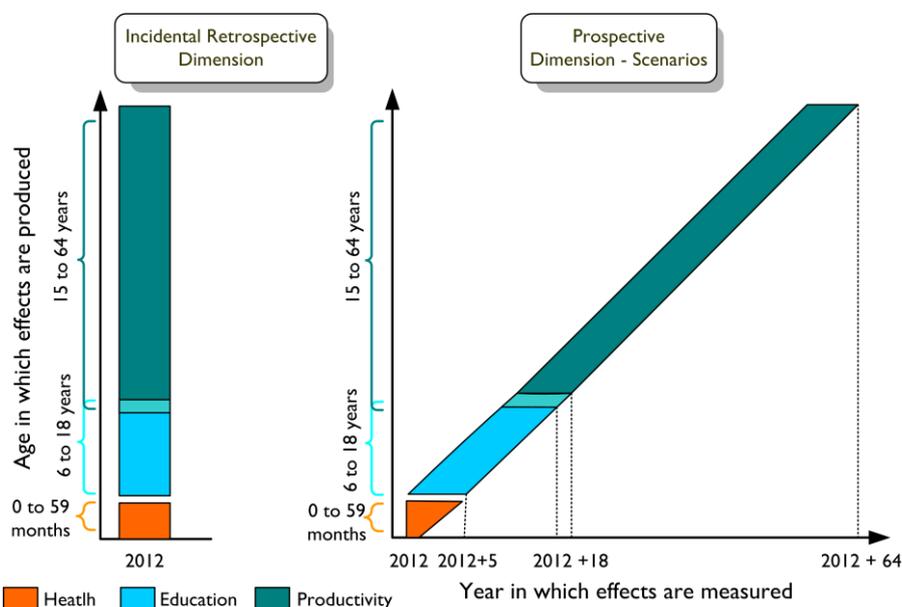
Source: Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America* based on consultations carried out by authors.

### v.        Methodological aspects

The analysis focuses on under nutrition during the initial stages of the life cycle and its consequences throughout life. This limits the study to the health of the foetus, the infant and the pre-schooler, i.e. those aged 0 to 59 months.[31] Similarly, the effects on education and productivity are analysed in the other demographic groups, i.e. 6-18 years old and 15-64 years old, respectively.

The population of children suffering from under nutritionwas divided into sub-cohorts (0 to 28 days, 1 to 11 months, 12 to 23 months, and 24 to 59 months) in order to highlight the specificity of certain effects during each stage of the life cycle.

The study uses under nutrition indicators that are measurable and appropriate to the different stages of an individual's life cycle. For intrauterine under nutrition, low birth weight (LBW) due to intrauterine growth restriction (IUGR, defined as a weight below the tenth percentile for gestational age) is estimated, and the period until 5 years, the indicator used as proxy for children suffering of under nutrition is underweight (weight-for-age). For the pre-school stage, after the child turns 6, moderate and severe stunting categories (weight-for-height scores below -2 standard deviations) are used, with reference, where possible, to the World Health Organization (WHO) distribution for comparison purpose.[32] For losses in productivity at working age population, the model continues to use height-for-age as a proxy for the lifelong consequences of childhood under nutrition.

Estimates of the impacts of under nutrition on health, education, and productivity are based on the concept of the relative (or differential) risk run by individuals who suffer from under nutrition during the first stages of life as compared to a healthy child. This is valid both for the incidental-retrospective analysis and for the prospective-savings analysis; however, as its application has specific characteristics in each case, they are detailed separately in this document.

To estimate the costs for the incidental retrospective dimension, the values occurring in the year of analysis are totalled based on estimates of differential risks undergone by the different cohorts of the population. In the prospective analysis on the other hand, a future cost flow is estimated and updated (to present value).

The methodological approach presented here considers the most detailed and complete set of causes and effects of child under nutrition. Further, consideration has been made to ensure that certain causes and effects are not overemphasized or double counted. The methodological framework is based on strong research as well as institutional support from international organizations, and has been deemed a strong basis for the purpose of the research described in this report.

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[31] In the original design, the idea of analyzing direct information on the nutritional and health situation of pregnant women was considered, but the lack of reliable information on the incidence of undernutritionled to its exclusion from the analysis.

[32] In the estimation of stunting, a complementary analysis is done based on NCHS Standard in order to estimate the relative risk of lower productivity.

# Section III: Brief Socio-Economic Background

# Brief Socio-Economic and Nutritional Background

The Republic of Malawi (hereafter referred to as Malawi) is a small landlocked country with a population figure of 15.9 million inhabiting in 118,484 km$^2$ of which 24,000 km$^2$ is fresh water (Lake Malawi). Malawi's Gross Domestic Product (GDP) for 2012 is estimated at MWK 1,091.5 billion[33] (US\$ 4.3billion) and a per capita Gross National Income (GNI) of approximately US\$ 320, which has grown considerably in the last decade, from US\$ 160 at the beginning of the decade. Malawi has a predominantly agriculture-based economy with export heavily relying on cash crops such as tobacco, sugar, tea and cotton. Maize is the dominant crop and staple food for the rural population. According to the Global Hunger Index, the food insecurity situation is classified as "serious"- contributing largely to child under nutrition and child mortality, which represent important challenges for the country's future development. Nonetheless, the Global Hunger Index further indicates that Malawi has been among the ten countries with the highest progress in food security since 1990.[34]

Poverty remains a continuous challenge for Malawians. In 2012, the poverty headcount ratio at national level was 50.7 percent. The incidence of poverty is higher in rural areas, where approximately 82.3 percent of the population was living on less than US\$ 2 a day and 61.6 percent living on less than US\$ 1.25 a day, as compared to 17.3 percent in urban areas. This indeed reflects the higher burden of poverty on rural communities.[35]

**TABLE 3.1**
**SOCIO-ECONOMIC INDICATORS**

| Indicators | 2000-2002 | 2005-2007 | 2010-2012 |
|---|---|---|---|
| Total population, in millions | 11.9 | 13.7 | 15.9 |
| GDP total in billions of MWK | 2.665 | 3.647 | 4.263 |
| GNI per capita (atlas method current US\$) | 160 | 250 | 320 |
| Poverty - \$1.25 a day (PPP) (% of population) | … | 73.9 | 61.6 |
| Population below the national line (% of the Population) | … | 52.4 | 50.7 |
| GINI Index | … | 39 | 43.9 |
| Unemployment, % of total labour force [a/] | 7.7 | 7.6 | 7.6 |
| Unemployment, youth total (% of total labour force ages 16-24)[a/] | 13.5 | 13.25 | 13.45 |
| Population growth (annual %) | 2.6 | 3 | 2.9 |
| Life expectancy at birth, total (years) | 47 | 51 | 55 |

Source if not otherwise noted: World Development Indicators, The World Bank.

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[33] Ministry of Economic Planning and Development 2012
[34] IFPRI "Global Hunger Index, www.ifpri.org
[35] World Development Indicators, The World Bank.

Surprisingly, despite high levels of poverty, Malawi reports low unemployment, with only 7.6 percent of adults and 13.45 percent of youth between16-24 as being unemployed in 2012.[36] From an economic perspective, Malawi's economic structure has not changed substantially over the last two decades. According to estimates from the African Economic Outlook, the real GDP growth rates during 2011-2014 range from 4.3 percent to 6.1 percent, with real GDP growth in 2012 dropping down to 2 percent following a contraction in the agricultural and manufacturing sectors. Malawi indeed has faced serious macroeconomic challenges in 2011 and 2012 as a result of inadequate policies, which led to a growing fiscal deficit, rising inflation and the depletion of international gross reserves in a context of an overvalued exchange rate.[37] However, real GDP growth in 2013 and 2014 is expected to rebound to 5.5 percent and 6.1 percent respectively (Figure 3.1).[38]



**FIGURE 3.1**
**TRENDS IN REAL GDP GROWTH, 2003-2013**
*(In Percentages)*
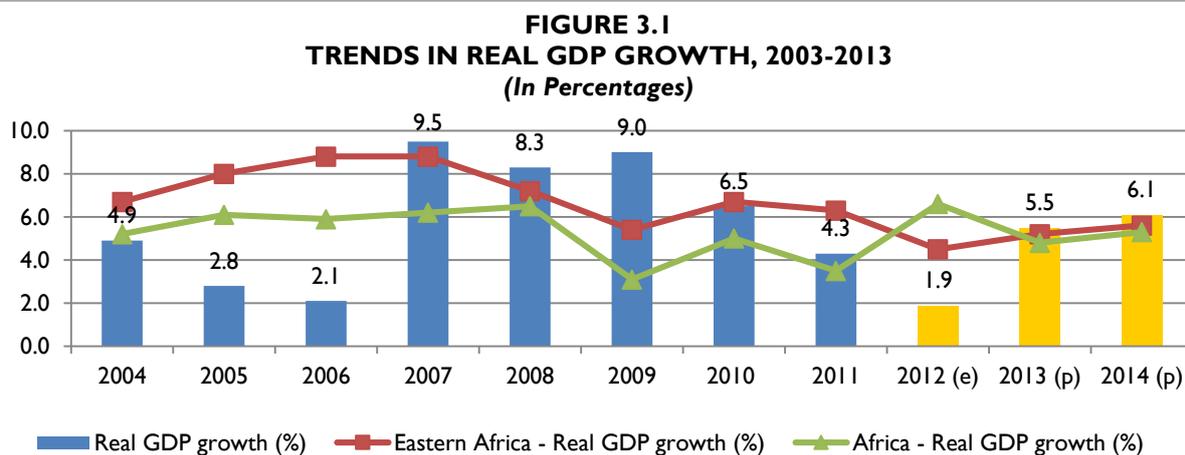
Source: "World Development Indicators, World Bank (2012)" accessed on May 2014.
Figure for 2012 is Estimation (e) and for 2013 & 2014 are projections (P).

Public investment in the social sector has remained rather stable over the last decade, but is still below average, as compared to the Sub-Saharan African region. Public spending in education is estimated at 5.4 percent, which ranks above the regional average of 4.3 percent. Health expenditures are 8.3 percent of GDP, as compared to 6.5 percent for the rest of the region. However, health expenditures from a per capita perspective are low compared to the rest of the region, but high as a proportion of GDP and as a percentage of total health expenditures (Table 3.2)[39].

**TABLE 3.2**
**SOCIAL INVESTMENT INDICATORS**

| Indicators | 2000-2001 | 2005-2006 | 2010-2011 | Sub-Saharan Africa* |
|---|---|---|---|---|
| Public spending on education, total (% of gov. exp.) | … | … | 14.9 | 18.1 |
| Public spending on education, total (% of GDP) | 4.5 | … | 5.4 | 4.3 |
| Health expenditure per capita (current US$) | 8 | 21 | 30 | 96.2 |
| Health expenditure, total (% of GDP) | 5.1 | 9 | 8.3 | 6.5 |
| Health expenditure, public (% of total health expenditure) | 43.8 | 68.9 | 72.4 | 43.9 |

Source: World Development Indicators, The World Bank. Most recent year available
* Latest data available – Developing countries only

## A. Nutritional Status in Malawi

Malawi has been able to successfully maintain a relatively low prevalence of underweight children, however, reducing the stunting levels continue to be a challenge. According to the 2010 Demographic and Household Survey (DHS), approximately 47.1 percent

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[36]World Bank.
[37] Malawi Economic Outlook: http://www.afdb.org/en/countries/southern-africa/malawi/malawi-economic-outlook/
[38]Idem.
[39]World Development Indicators, World Bank.

of Malawian children under the age of 5 were suffering from stunting (low height for their age), which is slight improvement from the 52.5 percent stunting prevalence reported in the year 2004. In the same vein, the prevalence of underweight children has also improved from 18.4 percent to 12.1 percent, for the same period, very close to reaching the low threshold that WHO considers for underweight levels in a country of 10 percent.

## FIGURE 3.2
## ESTIMATED UNDERNUTRITION TRENDS IN CHILDREN UNDER-FIVE, 1990-2010
### (In Percentages)
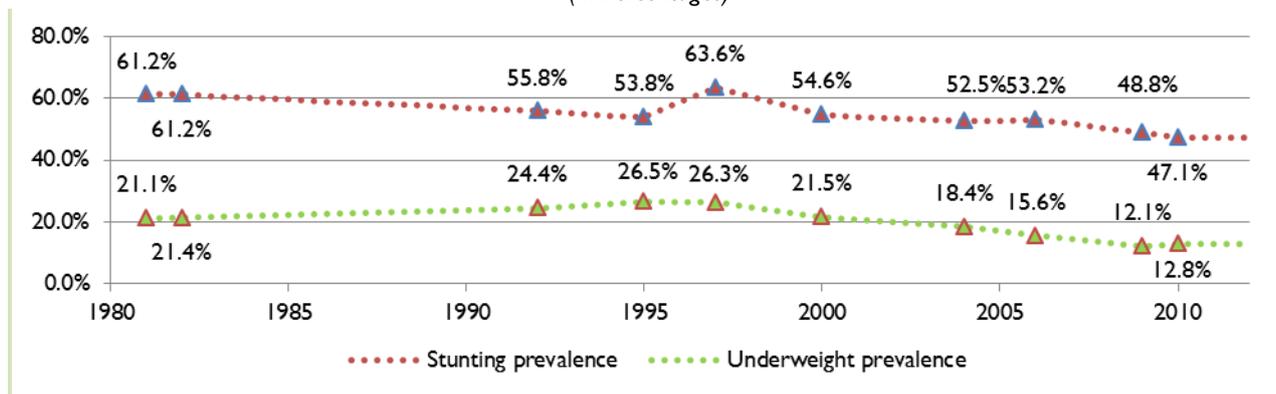


Source: Stunting and Underweight prevalence trends from the period 2000 to 2010 was prepared in house based on information from DHS 2010, 2004, 2000. WHO Global Database on Child Growth and Malnutrition data for Malawi has been used to estimate the prevalence of both underweight and stunting trends prior to 2000. Data prior to 2006 has been updated in line with new Child Growth Standards introduced by WHO in 2006 to replace the 1977 International Growth Reference, formulated by the National Centre for Health Statistics (NCHS). For further analysis, please refer Section VII, Annex 2, Methods and Assumptions-for Health Data.

When analysing the progress at sub-national level, it is evident that the policies and responses to child under nutrition have been more effective in certain regions than others. As shown in Table 3.3, for the period from 2000 to 2010, the highest rate of reduction was experienced in the Central region, where the prevalence of child stunting was reduced by almost 13 percent, from 60 percent in 2000 to 47.2 percent in 2010. This represents a drop in 12.8 percentage points in a period of ten years, for an average reduction of 1.28 annual percentage points.

In contrast, in the Northern and Southern regions there has been limited progress with proportional reductions of less than five percent in this ten-year period. It is important to note that in the period from 2000 to 2004, the prevalence of stunting increased in the Northern region of Malawi, from 45.7 percent to 48.1 percent. This means that the reduction only took place in the period from 2004 to 2010, and this was by 3.4 percentage points.

## TABLE 3.3
## TENDENCIES IN CHILDHOOD STUNTING AT SUB-REGIONAL LEVEL, 2000-2010
### (In Percentages)

| Sub-Region | 2000 | 2004 | 2010 | Proportional Reduction (%) | Reduction in Percentage Points | Annual average Rate of Reduction[a] |
|---|---|---|---|---|---|---|
| Northern | 45.7 | 48.1 | 44.7 | 2.1 | 1.0 | 0.1 |
| Central | 60.0 | 56.8 | 47.2 | 21.3 | 12.8 | 1.28 |
| Southern | 52.0 | 50.2 | 47.6 | 8.4 | 4.4 | 0.44 |
| **National** | **54.6** | **52.5** | **47.1** | **13.7** | **7.5** | **0.75** |

Source: Prepared by UNECA based on DHS 2010, DHS 2004and DHS 2000 and data from the WHO. Data prior to 2006 has been updated in line with new Child Growth Standards introduced by W`HO in 2006 to replace the 1977 International Growth Reference, formulated by the National Centre for Health Statistics (NCHS).

[a] The Annual average Rate of Reduction is estimated based on a 10 year period considering the values of 2000 and 2010.

Differences within the country are also clear at district level (Figure 3.3). Based on data from DHS 2000, 2004 and 2010, the prevalence rates of child stunting in Malawi range from 30 percent to 50 percent and above. In particular, three central and four southern districts have stunting prevalence of above 50 percent; 16 districts display rates between 40-49.9 percent, while 4 have stunting rates between 30-39.9 percent.

It is clear that from a sub-national perspective Malawi has been able to put in place interventions that have demonstrated results at impact level in some of the sub-regions. As a step forward, it is important to review the existing policies and programmes that have been put in place, considering those that have succeeded, in order to scale-up, and replicate these actions within other sub-regions, and in countries with similar context and challenges.

**FIGURE 3.3**
**TENDENCIES IN CHILDHOOD STUNTING AT DISTRICT LEVEL, 2000-2010**
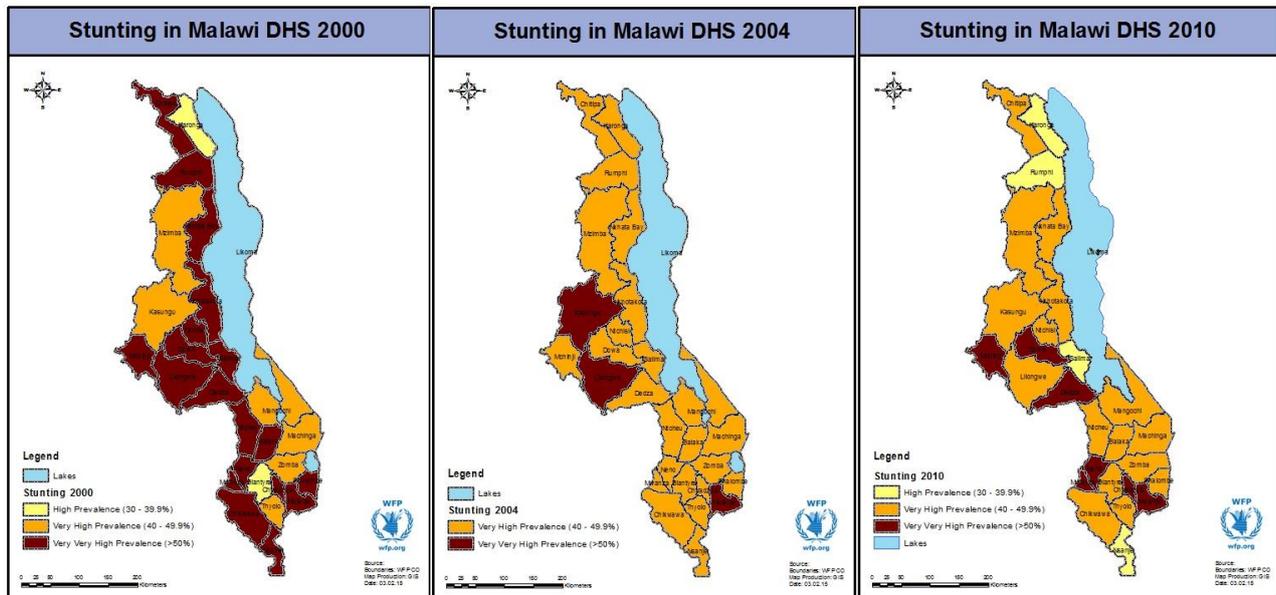


Source: Map produced by WFP Malawi based on DHS 2000, 2004 and 2010.

The current levels of child under nutrition illustrate the continuing challenges for reduction of child hunger. It is estimated that 1.268 million of the 2.765 million children under the age of five in Malawi were affected by stunting in 2012 and almost 350,715 children were underweight (Table 3.4). This situation is especially critical for children between 12 and 23 months, where 54.3 percent of children are affected by stunting.

**TABLE 3.4**
**POPULATION AND CHILD UNDERNUTRITION, 2012**

| Age groups | Population size | Low Birth Weight | | Underweight | | Stunting | |
|---|---|---|---|---|---|---|---|
| | | Population affected | Prevalence | Population affected | Underweight prevalence | Population affected | Stunting prevalence |
| New-born (IUGR)a | | 75,566 | 12.3% | | | | |
| 0 to 11 months | 614,359 | | | 60,207 | 9.8% | 139,459 | 22.7% |
| 12 to 23 months | 576,793 | | | 84,212 | 14.6% | 313,199 | 54.3% |
| 24 to 59 months | 1,574,779 | | | 206,296 | 13.1% | 815,736 | 51.8% |
| Total | 2,765,931 | 75,566 | 12.3% | 350,715 | 12.8% | 1,268,394 | 47.1% |

Source: Calculated in-house based on DHS surveys 2010 and recent Demographic information obtained from NSO of Malawi.
a. In a given year, the new-born population is the same as the 0-11 month's age group.

# Section IV: Effects and Costs of Child Undernutrition

# Effects and Costs of Child Undernutrition

Undernutrition is mainly characterized by **wasting** - a low weight-for-height, **stunting** - low height-for-age and **underweight** - low weight-for-age. In early childhood, under nutrition has negative life-long and intergenerational consequences; undernourished children are more likely to require medical care as a result of under nutrition-related diseases and deficiencies.[40] This increases the burden on public social services and health costs incurred by the government and the affected families. Without proper care, underweight and wasting in children results in higher risk of mortality.[41] During schooling years, stunted children are more likely to repeat grades and drop out of school,[42] thus reducing their income-earning capability later in life.[43] Furthermore, adults who were stunted as children are less likely to achieve their expected physical and cognitive development, thereby impacting on their productivity.[44]

## A. Social and economic cost of child under nutrition in the health sector

Undernutrition at an early age predisposes children to higher morbidity and mortality risks.[45] The risk of becoming ill due to under nutrition has been estimated using probability differentials, as described in the methodology. Specifically, the study has examined medical costs associated with treating low birth weight (LBW), underweight, anemia, acute respiratory infections (ARI), acute diarrhoeal syndrome (ADS), and fever/malaria associated with under nutrition in children under the age of five.

### i.      Effects on morbidity

Undernourished children are more susceptible to recurring illness.[46]Based on the differential probability analysis undertaken using DHS data in Malawi, underweight children under 5 years have an increased risk of anemia (increased risk equal to 11.7 percentage points), an increased risk of diarrhoea (increased risk equal to 6.2 percentage points), an increased risk of respiratory infection (increased risk equal to 0.7 percentage points), and an increased risk of fever/malaria (increased risk equal to 2.4 percentage points).

The study estimated that in 2012 there were 176,748 incremental episodes of illness related to diseases associated with underweight in Malawi (Table 4.1). In addition, pathologies related to calorie and protein deficiencies and low birth weight associated with intrauterine growth restriction (IUGR), totalled more than 685,728 episodes in 2012.As a consequence, the country had to address 862,477 morbidities in children that required medical attention and generated costs both to families and to the health sector.

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[40]Ramachandran P. &Gopalan H., "Undernutrition&risk of infections in preschool children", Indian J Med Res 130, November 2009, pp. 579-583
[41]Robert E. Black et al., "Maternal and child undernutrition: global and regional exposures and health consequences," The Lancet 371, No. 9608, 2008, doi:10.1016/S0140-6736(07)61690-0
[42]Melissa C. Daniels and Linda S. Adair, "Growth in young Filipino children predicts schooling trajectories through high school," The Journal of Nutrition, March 22, 2004, pp. 1439–1446, accessed September 11, 2012, Jn.nutrition.org
[43]H. Alderman, "Long Term Consequences of Early Childhood Malnutrition," Oxford Economic Papers 58, no. 3 (May 03, 2006), doi:10.1093/oep /gpl008
[44]Idem
[45]Ramachandran P. &Gopalan H., *"Undernutrition&risk of infections in preschool children"*, Indian J Med Res 130, November 2009, pp. 579-583
[46]Idem

**TABLE 4.1**
**MORBIDITIES FOR CHILDREN UNDER-FIVE ASSOCIATED WITH UNDERWEIGHT,**
**BY PATHOLOGY, 2012**

| Pathology | Number of episodes | Percentage of episodes |
|---|---|---|
| Anemia | 72,713 | 41% |
| ADS | 67,407 | 38% |
| ARI | 5,739 | 3% |
| Malaria | 30,887 | 17% |
| Subtotal | 176,748 | |
| LBW | 44,506 | 6% |
| Underweight | 641,222 | 94% |
| Subtotal | 685,728 | |
| Total | 862,477 | |

Source: Model estimations based on DHS 2010, and demographic information.

The highest number of reported episodes of all pathologies is anaemia. The reason for having such a high number of anaemia episodes occurring can be explained by the shortage of iron-rich foods that are needed to prevent iron-deficiency, anemia. On average, more than 60 percent of the total food quantity consists of staple foods, composed primarily of maize. Fruits, fats and protein-source foods are scarce in the diet much of the year[47]. Such low diets are the cause of micronutrient deficiencies such as iron.

## ii.    Stunting levels of the working age population

Undernutrition leads to stunting in children, which can impact on their productivity at later stages in life.[48] Malawi has made progress in reducing the current levels of stunting in children; however, the higher stunting rates experienced historically have had an important impact on today's working age population. As illustrated in Figure 4.1, the model estimates that 4,469,235 adults in the current working-age population suffered from growth retardation before reaching five years. In 2012, this represented 59.9 percent of the population aged 15-64 who were in a disadvantaged position as compared to those who were not stunted as children.

**FIGURE 4.1**
**WORKING AGE POPULATION AFFECTED BY CHILDHOOD STUNTING, BY AGE**
*(In Millions of people)*
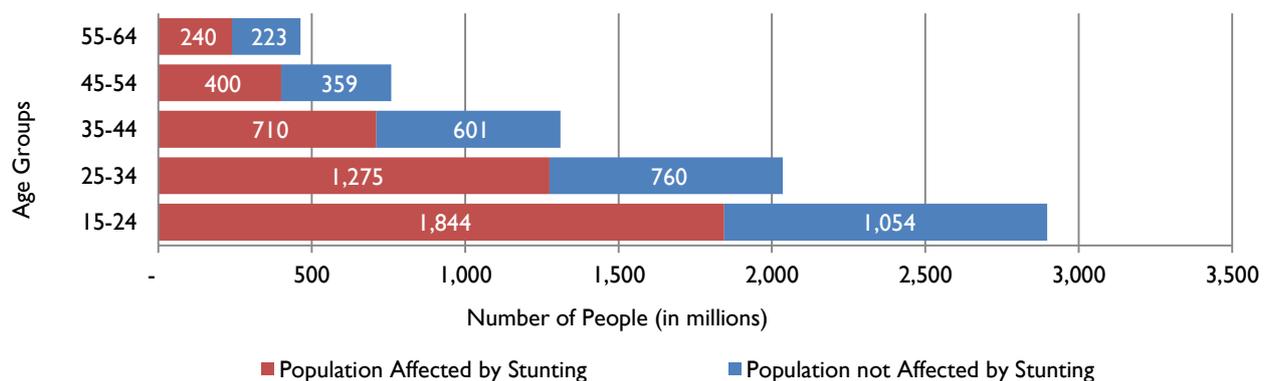


Source: Model estimations based on demographic information and WHO/NCHS database.

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[47]Ecker, O., and M. Qaim. 2010. "Analysing Nutritional Impacts of Policies: An Empirical Study for Malawi." IFPRI Discussion Paper 01017. International Food Policy Research Institute.
[48]H. Alderman, "Long Term Consequences of Early Childhood Malnutrition," Oxford Economic Papers 58, no. 3 (May 03, 2006), doi:10.1093/oep /gpl008

### iii.        Effects on mortality

Child under nutrition can lead to increased cases of mortality – most often associated with incidences of diarrhoea, pneumonia, and malaria.[49] Nevertheless, when the cause of death is determined, it is rarely attributed to the nutritional deficit of the child, but rather to the related illnesses. Given this limitation in attribution, the model utilizes relative risk factors[50] to estimate the risk of increased child mortality as a result of child under nutrition. Mortality risk associated with under nutritionwas calculated using these relative risk factors, historical survival and mortality rates,[51] as well as historical nutrition information.

Between 2008 and 2012, it is estimated that 81,783 child deaths in Malawi were directly associated with under nutrition (Table 4.2). These deaths represent 23 percent of all child mortalities for this period. Thus, it is evident that under nutrition significantly exacerbates the rates of death among children and limits the country's capacity to achieve the MDGs, especially the goal to reduce child mortality.

**TABLE 4.2**
**IMPACT OF UNDERNUTRITION ON CHILD MORTALITY, ADJUSTED BY SURVIVAL RATE, 1948-2012**
*(In number of mortalities)*

| Period | Number of child mortalities associated to undernutrition |
|---|---|
| 1948-1997 | 800,566 |
| 1998-2007 | 190,731 |
| 2008-2012 | 81,783 |
| **Total** | **1,073,080** |

Source: ECA on the basis of life tables provided by UN Population Division

These historical mortality rates will also have an impact on national productivity. The model estimates that an equivalent of 10.7 percent of the current workforce has been lost due to the impact of under nutrition in increasing child mortality rates. This represents 800,566 people who would be between 15-64 years old, and part of the working age population of the country.

### iv.        Public and private health costs of under nutrition

The treatment of under nutrition and related illnesses is a critical recurrent cost for the health system. Treating a severely underweight child for example, requires a comprehensive protocol[52] that can often be prevented with appropriate nutrition-sensitive actions. The economic cost of each episode can be increased by inefficiencies when such episodes are treated without proper guidance from a health-care professional or due to lack of access to proper health services. These costs generate an important burden not just to the public sector but to society as a whole.

In the section '*Effects on morbidity*' it is estimated that 862,477 clinical episodes in 2012 in Malawi were associated with the incremental risk to morbidity due to children being underweight. Each of these episodes required a specific protocol for treatment that includes medicines and medical care costs, in addition to the cost of caretakers of providing these treatments. The data collection process generated cost estimations for the in-patient and out-patient treatment of each of the pathologies, namely Anemia, ADS, ARI, Malaria/Fever, as well as cost of therapeutic treatment of underweight children and low birth weight in children, as described in detail in Annex 2.

By aggregating each individual cost associated to specific pathologies, by the number of incremental episodes given by the risk associated to underweight children, as indicated in Table 4.3,these episodes generated an estimated cost of MWK 11,386 million.

[49]Robert E. Black et al., "Maternal and child undernutrition: global and regional exposures and health consequences," The Lancet 371, No. 9608, 2008, doi:10.1016/S0140-6736(07)61690-0
[50]Idem
[51]Data provided by the UN Population Division, http://www.un.org/esa/population/unpop.htm
[52]WHO, Management of severe malnutrition: a manual for physicians and other senior health workers ISBN 92 4 154511 9, NLM Classification: WD 101, 1999.

**TABLE 4.3**
**HEALTH COSTS OF UNDERNUTRITION-RELATED PATHOLOGIES, 2012**

| Pathology | % of episodes | Cost (Millions of MWK) | Cost (Thousands of US$) | % of cost |
|---|---|---|---|---|
| Underweight | 74% | 3,552.5 | 14.4 | 31% |
| Low birth weight (IUGR) | 5% | 5,834.1 | 23.7 | 51% |
| Anemia | 8% | 267.1 | 1.1 | 2% |
| Acute diarrheal syndrome (ADS) | 8% | 1,046.5 | 4.2 | 9% |
| Acute respiratory infection (ARI) | 1% | 86.6 | 0.4 | 1% |
| Fever/Malaria | 4% | 598.8 | 2.4 | 5% |
| Total | | 11,385.8 | 46.2 | |

Source: Model estimations based on DHS 2010

When analysing the origin of the cost by the different pathologies, it is evident that the majority of the costs incurred were associated with the protocol required to bring a low birth weight child back to a proper nutritional status, which often requires therapeutic feeding and special care.

An important perspective of this analysis is organizing the information based on specific age groups. As shown in Figure 4.2, children under 12 months generate 16 percent of all episodes associated with under nutrition, which however, represent 59 percent of the total costs in the health sector. This result emphasizes the importance of focusing the interventions on the prevention of child malnutrition, in accordance with the 1000 Days campaign[53], and working with mothers before and during pregnancy to ensure that children are born and develop with proper weight and health during this most difficult stage of life.

**FIGURE 4.2**
**DISTRUBUTION OF INCREMENTAL EPISODES AND COSTS OF ILLNESS**
**ASSOCIATED WITH UNDERNUTRITION BY AGE GROUP**
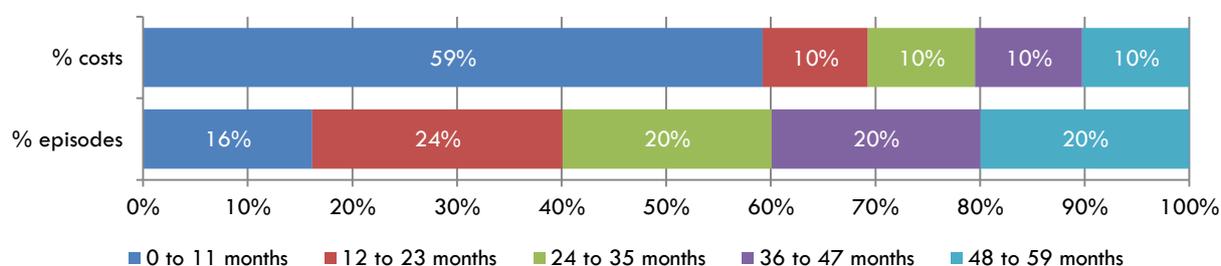


Source: Model estimations based on DHS 2010, and demographic information provided by the UNDESA Population Division. The cost of treatment of each pathology and coverage was estimated by the NIT. See annex 2 for list of Methods and Assumptions.

Based on the information collected by the NIT, the model estimates that only 42.5 percent of the episodes presented receive proper health care, igniting an important discussion on the distribution of private and public cost of care, between the caretakers and the public health system. The public cost is based on two major elements; the cost of the medical inputs, such as medicines and tests, and the unit cost per attention for the health system, such as the time of the physicians, and the overhead costs to the medical centre. These costs are separated to avoid duplications, as one episode of any pathology might require several follow-up visits, but only one full set of medical inputs. For the private costs, the main costs considered are transportation costs to and from the health centre, the opportunity cost of waiting time, and the medical inputs not covered by the system. These costs are also calculated differentially for ambulatory care, and for in-patients that require hospitalization, for each pathology and age group.

The model also takes into account the large proportion of cases that are tended to at home and that do not obtain formal health

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[53] The 1,000 Days partnership promotes targeted action and investment to improve nutrition for mothers and children in the 1,000 days between a woman's pregnancy and her child's 2nd birthday when better nutrition can have a life-changing impact on a child's future and help break the cycle of poverty. For more information visit: http://www.thousanddays.org/

treatment. For this estimation, the model utilizes information based on the DHS surveys, complemented by information gathered from field visits to the health centres, interviews with experts and information from national health systems. As there is very little information on the actual costs and time allocation of home care for underweight children who present compounding illnesses, a shadow cost equivalent to the per unit treatment of each episode is set for the treatment of each pathology, and associated to those cases that did not receive formal medical attention. This however, does not consider the inefficiencies and complications that can arise from non-formal home treatment and might lead to the underestimation of the real cost of home care.

As a result, the model estimated that families bear around 48.7 percent of the costs associated with under nutrition, as compared to 51.3 percent for the public health system, as presented in Figure 4.3. While the public health system incurs most of health cost related to under nutrition, the burden on the families of undernourished children is still high.

**FIGURE 4.3**
**DISTRIBUTION OF PRIVATE AND PUBLIC COSTS**
*(In percentages and millions of MWK)*



Source: Model estimations based on demographic information and WHO/DHS nutritional surveys. The cost of treatment of each pathology and coverage was estimated by the NIT. See annex 2 for list of Methods and Assumptions.
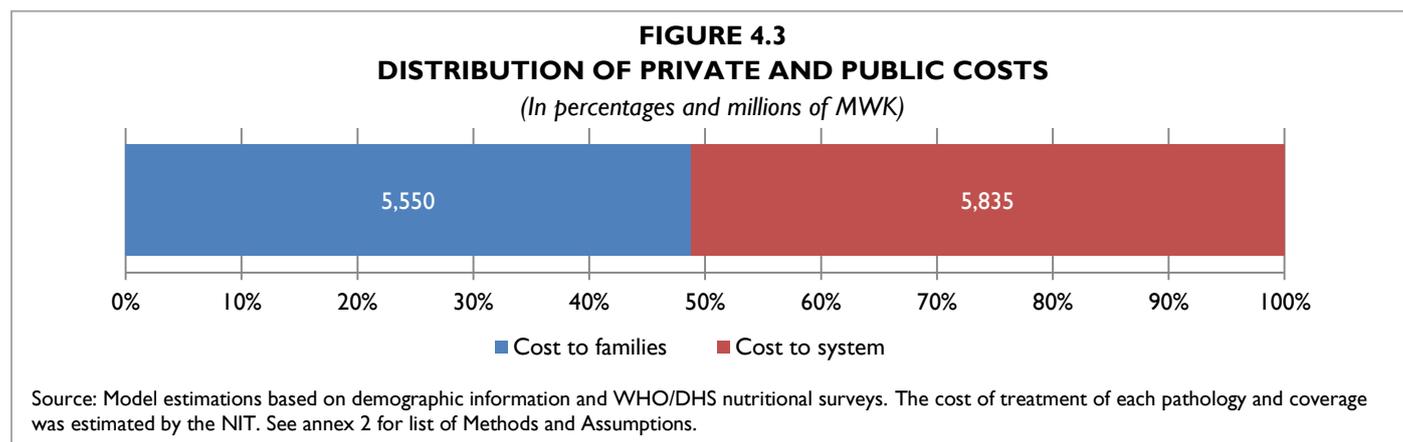
The annual cost of under nutrition to the public sector was estimated at 19.5 percent of the total budget allocated to health. At the macro level, the economic impact of under nutrition in health-related aspects was equivalent to 0.8 percent of the GDP of the year 2012.

## B. Social and economic cost of child under nutrition in education

There is no single cause for repetition and dropout, however, there is substantive research suggesting that students who were stunted before the age of five are more likely to underperform in school.[54] The number of repetition and dropout cases considered in this section result from applying a differential risk factor associated to stunted children to the official government information on grade repetition and dropouts in 2012. The cost estimations are based on information provided by the Ministry of Education on the average cost of a child to attend primary and secondary school in Malawi in 2012, as well as estimations of costs incurred by families to support schooling.

### i.     Effects on repetition

Children who suffered from under nutrition before 5 years of age are more likely to repeat grades, as compared to those who were not affected by under nutrition[55]. Based on official information provided by the Ministry of Education[56], 818,138 children repeated grades in 2012. Using data on increased risk of repetition among stunted students, the model estimates that the repetition rate for stunted children was 20.6 percent, while the repetition rate for non-stunted children was 15.2 percent, i.e. an incremental differential risk of 5.4 percentage points for stunted children (Figure 4.4). Thus, given the proportion of stunted students, the model estimates that 147,044 students, or 18 percent of all repetitions in 2012, were associated with stunting.

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[54]Melissa C. Daniels and Linda S. Adair, "Growth in young Filipino children predicts schooling trajectories through high school," The journal of Nutrition, March 22, 2004, pp. 1439-1446, accessed September 11, 2012, Jn.nutrition.org
[55]Idem
[56]Malawi. Ministry of Education Scienceand Technology (Education Management Information System), Education statistics 2012.

**FIGURE 4.4**
**REPETITION RATES IN EDUCATION BY NUTRITIONAL STATUS, 2012**
*(In Percentages)*
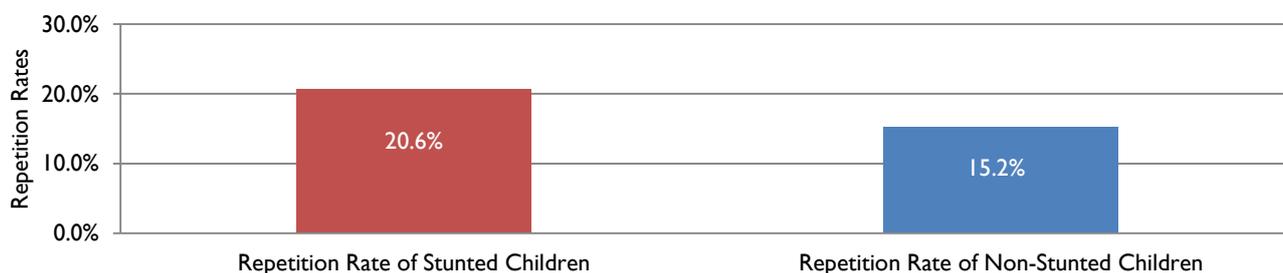


Source: Estimations based on data provided by Ministry of Education and relative risk factors.

As shown in Figure 4.5, most of these grade repetitions happen during the primary school levels. There are far fewer children who repeat grades during secondary school levels - largely due to the fact that many underperforming students would have dropped out of school before reaching secondary education.

**FIGURE 4.5**
**GRADE REPETITION OF STUNTED CHILDREN, BY GRADE, 2012**
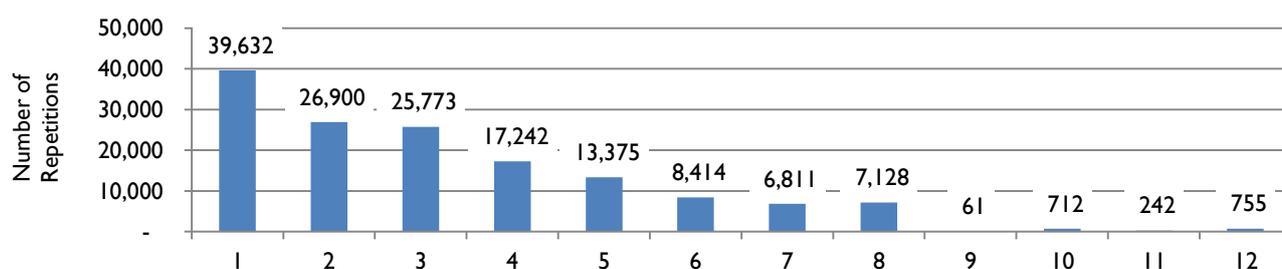


Source: Estimations based on data from Ministry of Education.

### ii.     Effects on retention

Progressive education is a key driver of human capital, and keeping children longer in school is a key element of inclusive development and economic growth. There are several compounding factors that combine to increase the risk of dropping out of school, both contextual such as living in poor households, distance to schools, school fees, teacher absenteeism and intrinsic, such as health and motivation[57]. Additionally, the relationship between grade repetitions and school desertion has been documented in literature[58-59]. In this sense, the incremental risk of repetition, and higher absenteeism associated to children who are stunted also augments the risk of those children to dropout of school.

According to available data and taking into account the relative risks associated to the consequences of stunting on educational performance, there is an important gap in school completion between those who suffered from stunting as children and those with a healthy childhood. The model estimates that from the current working age population aged 20 to 64, only 43 percent of those who were stunted as child (and presently of working age) completed primary school compared to 60 percent of those who were never stunted.

The costs associated with school dropouts are reflected in the productivity losses experienced by individuals searching for opportunities in the labour market. As such, the impact is not reflected in the school age population, but in the working-age population. Hence, in order to assess the social and economic costs in 2012, the analysis focuses on the differential in schooling

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[57]Colclough, C., Rose, P. &Tembon, M. 2000. Gender inequalities in primary schooling: The roles of poverty and adverse cultural practice. International Journal of Educational Development 20: 5-27.

[58]UNESCO Institute of Statistics.*Global Education Digest 2012. Opportunities Lost: The Impact Of Grade Repetition And Early School Leaving*. UNESCO

[59]Pierre André. Is grade repetition one of the causes of early school dropout? Evidence from Senegalese primary schools. December 4th 2009

levels achieved by the population who suffered from stunting as children and the schooling levels of the population who were never stunted.



**FIGURE 4.6**
**GRADE ACHIVEMENT BY NUTRITIONAL STATUS, 2012**
(*In Percentages*)
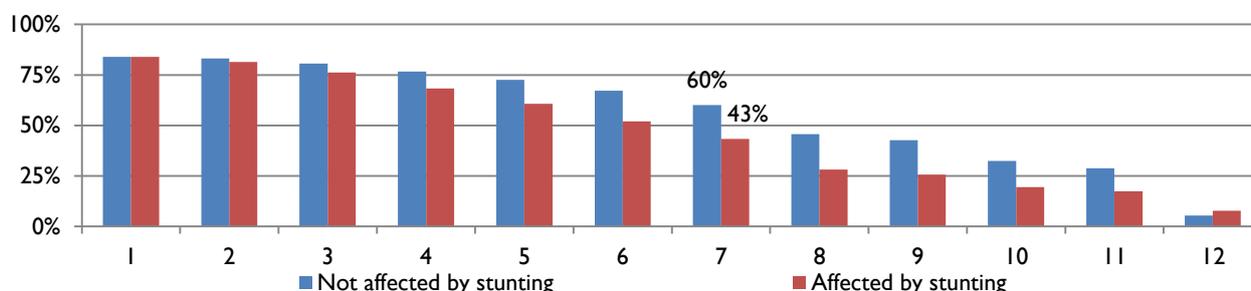
Source: Estimations based on data from Ministry of Education.

### iii.    Estimation of public and private education costs

Repetition in schooling has direct cost implications for families and the school system. Students who repeat grades generate an incremental cost to the educational system, as they require twice as many resources to repeat the year. In addition, the caretakers have to pay for an additional year of education.

In 2012, the 147,044 students who repeated grades (and whose repetitions are considered to be associated with under nutrition) incurred a cost of MWK 3.4 billion. The largest proportion of repetitions occurred during primary school, where the cost burden falls mostly on the families. The following chart summarizes the public and private education costs associated with stunting.

**TABLE 4.4**
**COSTS OF GRADE REPETITIONS ASSOCIATED WITH STUNTING**
(*In Millions of MWK*)

| | Primary | | Secondary | | Total | |
|---|---|---|---|---|---|---|
| | In MWK | In USD | In MWK | In USD | In MWK | In USD |
| Number of repetitions associated with stunting | 131,335 | | 15,709 | | 147,044 | |
| Public Costs per student | 6,033 | 24.46 | 25,024 | 101.47 | | |
| Total Public Costs (in millions) | 792 | 3.21 | 393.10 | 1.59 | 1,185.40 | 4.81 |
| Private Costs per student | 7,187 | 29.14 | 82,000 | 332.50 | | |
| Total Private Costs (in millions) | 944 | 3.83 | 1,288.10 | 5.22 | 2,232.1 | 9.05 |
| Total Costs | 1,736.3 | 7.0 | 1,681.2 | 6.8 | 3,417.5 | 13.9 |
| % Social expenditure on education | 5.88% | | | | | |

Source: Model estimations based on costing data from the Ministry of Education.

As in the case of health, the social cost of stunting in education is shared between the public sector and the families. Of the overall costs, a total of MWK 2.23 billion (65.3 percent) is covered by families, while MWK 1.185 billion (34.7) is borne by the public education system. Moreover, the distribution of this cost varies depending on whether the child repeated grades in primary or secondary education. In primary education, the families cover 54 percent of the associated costs of repeating a year, whereas in secondary education the burden on the families is increased to 77 percent. In both cases, families cover a larger proportion of the burden. The increase on the costs to the families in secondary education is driven by a higher spending on educational materials and a higher contribution that the families make for the tuition fee in secondary education.

**FIGURE 4.7
DISTRIBUTION OF COSTS IN EDUCATION**
*(In percentage and millions of MWK)*



Source: Estimations based of data provided by NIT
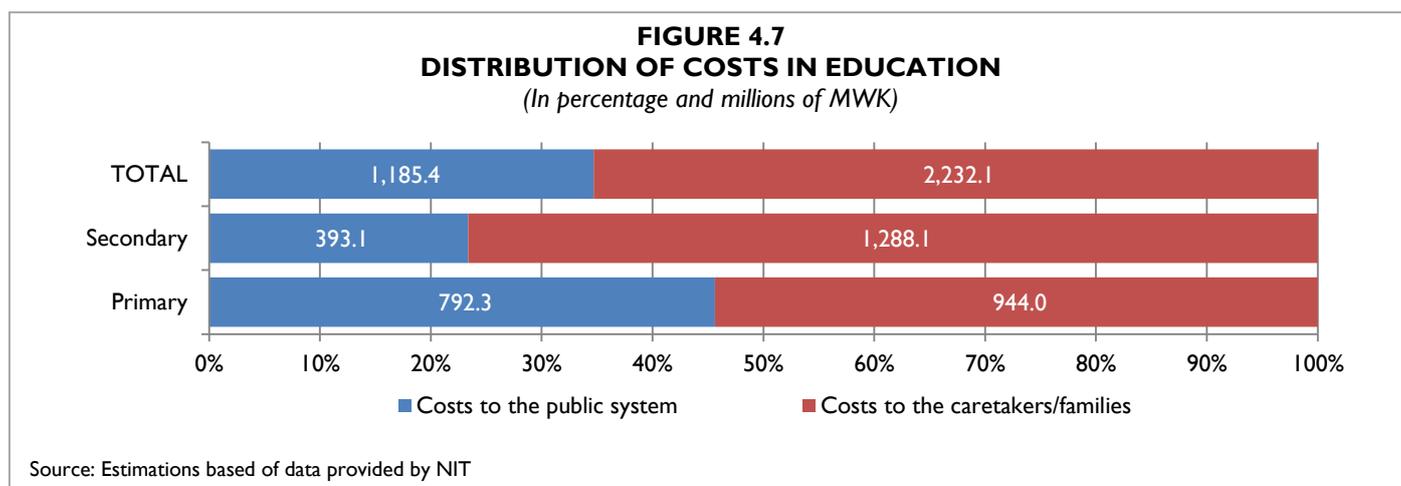
## C. The social and economic cost of child under nutrition in productivity

National productivity is significantly affected by historical rates of child under nutrition. Firstly, stunted people, on average, have achieved fewer years of schooling than non-stunted people[60]. In non-manual activities, higher academic achievement is directly correlated with higher income.[61]Research shows that stunted workers engaged in manual activities tend to have less lean body mass[62] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[63] Finally, the population lost due to child mortality lower economic growth, as they could have been healthy and productive members of the society.

The model utilizes historical nutritional information, in-country demographic projections, adjusted mortality rates, and data reported in the DHS Survey from 2010 to estimate the proportion of the population whose labour productivity is affected by childhood nutrition.

As described in the health section of the report, the model estimated that 59.9 percent of the working-age populations in Malawi were stunted as children. Research shows that adults who suffered from stunting as children are less productive than non-stunted workers and are less able to contribute to the economy. This represents more than 4.47 million people whose potential productivity is affected by under nutrition.

The cost estimates in labour productivity were estimated by identifying differential income associated with lower schooling in non-manual activities, as well as the lower productivity associated with stunted people in manual work, such as agriculture. The opportunity cost of productivity due to mortality is based on the expected income that a healthy person would have been earning, had he or she been part of the workforce in 2012.

The distribution of the labour market is an important contextual element in determining the impact of under nutrition on national productivity. As illustrated in Figure 4.8, 64 percent of the working age population is engaged in manual activities. The tendency to work in manual activities seems to be reduced for age category 35-44 years, where at least 2 in 5 people are engaged in non-manual work. This could indicate a transition of the type of activity that the middle age (35-44 years) working population is able to access from the labour market, which is inclined towards more qualified labour.

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[60]Melissa C. Daniels and Linda S. Adair, "Growth in young Filipino children predicts schooling trajectories through high school," The journal of Nutrition, March 22, 2004, pp. 1439-1446, accessed September 11, 2012, Jn.nutrition.org

[61]Based on the expenditure/income data form Malawi Integrated Household Survey (IHS3), 2010/11, National Statistical Office (NSO), Malawi.

[62]C. Nascimento et al., Stunted Children gain Less Lean Body Mass and More Fat Mass than Their Non-stunted Counterparts: A Prospective Study., report (Sao Paulo: Federal University of Sao Paulo, 2004).

[63]Lawrence J. Haddad and Howarth E. Bouis, "The impact of nutritional status on agricultural productivity: wage evidence from the Philippines," Oxford Bulletin of Economics and Statistics 53, No. 1, February 1991, doi: 10.1111/j.1468-0084.1991.mp53001004.x.

**FIGURE 4.8**
**MANUAL AND NON-MANUAL LABOUR DISTRIBUTION, BY AGE, 2012**
*(In Percentage)*

| Age | Non-manual | Manual |
|-----|-----------|--------|
| 15-24 | 26% | 74% |
| 25-34 | 34% | 66% |
| 35-44 | 41% | 59% |
| 45-54 | 38% | 62% |
| 55-64 | 34% | 66% |
| Total | 36% | 64% |

■ Percent in non-manual labour    ■ Percent in manual labour
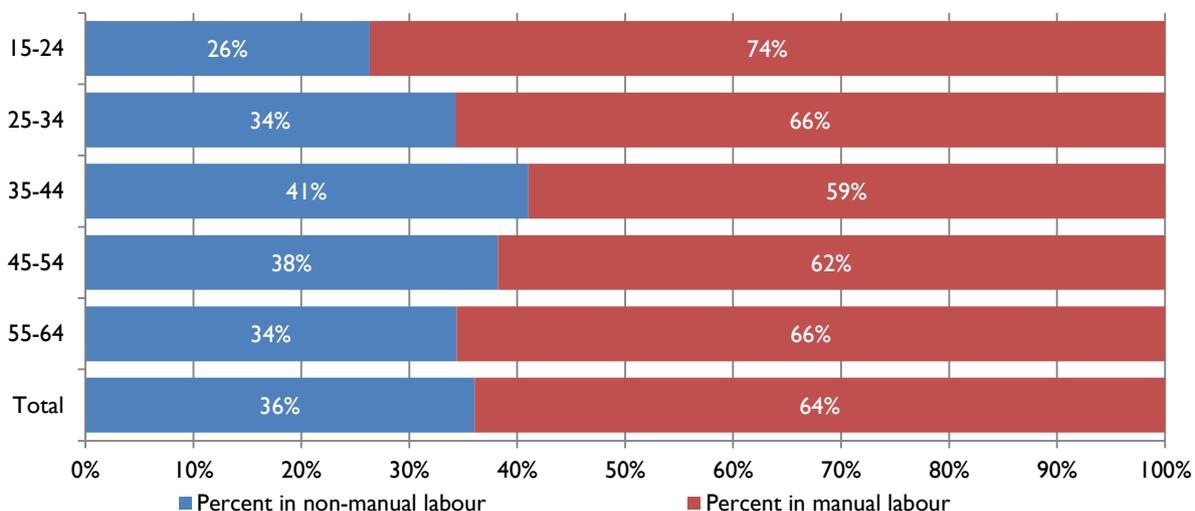
Source: Model Estimations based on "Malawi Integrated Household Survey (IHS3), 2010/11" National Statistical Office (NSO), Malawi.

### i.    Losses from non-manual activities due to reduced schooling

As described in the education section of this report, students who were undernourished as children complete, on average, fewer years of schooling than students who were adequately nourished as children.[64] This loss in educational years has particular impact for people who are engaged in non-manual activities, in which a higher academic education represents a higher income.

Based on information from the IHS3, it is estimated that the average schooling achievement for a person between 20-64 years in Malawi is 6.2 years of education. However, applying the relative risk of dropping out associated to stunted children, the model estimates that persons who suffered from stunting as a child achieve on average 5.6 years of education, whereas a person who did not suffer from stunting achieved on average 7.1 years of education, evidencing an educational gap between the stunted and non-stunted population of 1.5 years (Figure 4.9).

**FIGURE 4.9**
**AVERAGE SCHOOLING YEARS**
**FOR STUNTED AND NON-STUNTED POPULATION**
*(In Years of education)*

| | Value |
|---|---|
| Average Schooling of the Non-Stunted Population | 7.1 |
| Average Schooling of the Stunted Population | 5.6 |
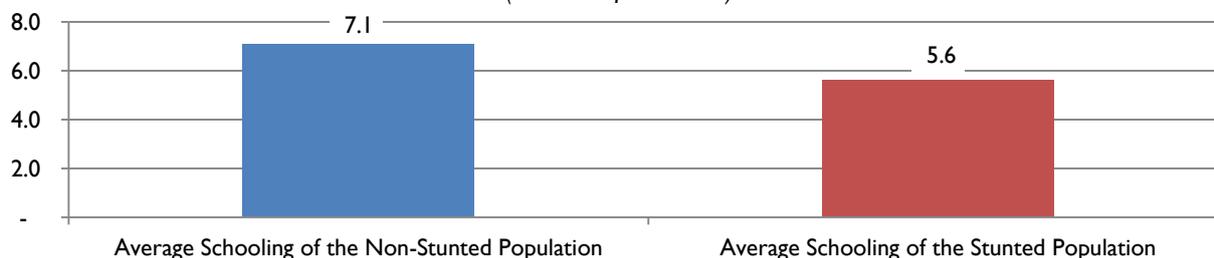
Source: COHA model estimations based on data from Malawi IHS3.

It is important to note that the data also shows and important progression in the improvement of the educational level of the population, where the group aged 60-64 would only achieve 2.7 years of education, the group aged 25-29 would have 7.3 years of education on average.

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[64]Melissa C. Daniels and Linda S. Adair, "Growth in young Filipino children predicts schooling trajectories through high school," The Journal of Nutrition, March 22, 2004, pp. 1439–1446, accessed September 11, 2012, Jn.nutrition.org

The lower educational achievement of the stunted population has an impact on the expected level of income a person would earn as an adult. As presented in Table 4.5, the model estimates that 1,595,078 people engaged in non-manual activities suffered from childhood stunting. This represents 21.37 percent of the country's labour force that is currently less productive due to lower schooling levels associated to stunting. The estimated annual losses in productivity for this group are MWK 25.05 billion (US$ 101.58 million) equivalent with 1.76 percentof the GDP in 2012.

**TABLE 4.5**
**REDUCED INCOME IN NON-MANUAL ACTIVITIES DUE TO STUNTING, 2012**

| Age in 2012 | Population working in non-manual sectors who were stunted as children | Income losses in non-manual labour | |
| --- | --- | --- | --- |
| | | Millions of MWK | Millions of USD |
| 15-24 | 518,703 | 9,249 | 38 |
| 25-34 | 471,667 | 6,792 | 28 |
| 35-44 | 329,757 | 3,812 | 15 |
| 45-54 | 177,518 | 3,467 | 14 |
| 55-64 | 97,434 | 1,731 | 7 |
| Total | 1,595,078 | 25,053 | 101.6 |
| % GDP | | 1.76% | |

Source: COHA model estimations based on data from IHS3.

### ii.     Losses in manual intensive activities

Earlier research shows that stunted workers engaged in manual activities tend to have less lean body mass[65] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[66]

The model estimated that 5,018,218 people in Malawi are engaged in manual activities, of which 3,294,142 were stunted as children. This represented an annual loss in potential income that surpasses MWK 16.5 billion (US$ 66.7million), equivalent to 1.15 percent of the GDP in potential income lost due to lower productivity (Table 4.6).

**TABLE 4.6**
**LOSSES IN POTENTIAL PRODUCTIVITY IN MANUAL ACTIVITIES**
**DUE TO STUNTING, 2012**

| Age in 2012 | Population working in manual labour who were stunted as children | Income losses in manual labour | |
| --- | --- | --- | --- |
| | | Millions of MWK | Millions of USD |
| 15-24 | 1,439,163 | 7,199 | 29 |
| 25-34 | 907,704 | 4,799 | 19 |
| 35-44 | 474,046 | 2,287 | 9 |
| 45-54 | 287,257 | 1,308 | 5 |
| 55-64 | 185,972 | 861 | 3 |
| Total | 3,294,142 | 16,455 | 66.7 |
| % GDP | | 1.15% | |

Source: COHA model estimations based on data from IHS3.

[65]C. Nascimento et al., Stunted Children gain Less Lean Body Mass and More Fat Mass than Their Non-stunted Counterparts: A Prospective Study, report (Sao Paulo: Federal University of Sao Paulo, 2004).
[66]Lawrence J. Haddad and Howarth E. Bouis, "The impact of nutritional status on agricultural productivity: wage evidence from the Philippines," Oxford Bulletin of Economics and Statistics 53, No. 1, February 1991, doi: 10.1111/j.1468-0084.1991.mp53001004.x.

### iii.    Opportunity cost due to child mortality

As indicated in the health section of this report, there is an increased risk of child mortality associated with under nutrition.[67]The model estimated that 800,566 people of working age were absent from Malawi's workforce in 2012 due to child mortality associated with under nutrition. This represents a 10.7 percent reduction in the current workforce.

**TABLE 4.7**
**LOSSES IN POTENTIAL PRODUCTIVITY**
**DUE TO MORTALITY ASSOCIATED WITH UNDERNUTRITION, 2012**

| Age in 2012 | Population working in non-manual sectors who were stunted as children | Working Hours Lost due to Higher mortality of underweight children *(In Millions of hours)* | Income losses in non-manual labour | |
|---|---|---|---|---|
| | | | Millions of MWK | Millions of USD |
| 15-24 | 239,647 | 498 | 30,971 | 126 |
| 25-34 | 204,175 | 425 | 25,115 | 102 |
| 35-44 | 146,947 | 306 | 13,896 | 56 |
| 45-54 | 114,671 | 239 | 11,571 | 47 |
| 55-64 | 95,126 | 198 | 9,288 | 38 |
| Total | 800,566 | 1665 | 90,842 | 368 |
| % GDP | | | 6.37% | |

Source: COHA Model estimations based on adjusted mortality rates, demographic projections, and data from IHS3.

Considering the productive levels of the population, by their age and sector of labour, the model estimated that in 2012, the economic losses (measured by working hours lost due to under nutrition-related child mortality) were MWK 90.8 billion, which represented 6.4 percent of the country's GDP.

### iv.    Overall productivity losses

The total losses in productivity for 2012 are estimated at approximately MWK 132.3 billion (US$ 537 million), i.e. equivalent to 9.3 percent of Malawi's GDP. As presented in Figure 4.10, the largest share of productivity loss is the result of reduced productivity due to mortality related to under nutrition, which represents 68.6 percent of the total cost. The lost productivity in non-manual activities represents 18.9 percent of the costs. The income differential in manual labour, due to the lower physical and cognitive capacity of people who suffered from growth retardation as children represents 12.4 percent of the total costs.

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[67]Robert E. Black et al., "Maternal and child undernutrition: global and regional exposures and health consequences," The Lancet 371, No. 9608, 2008, doi:10.1016/S0140-6736(07)61690-0

**FIGURE 4.10**
**DISTRIBUTION OF LOSSES IN PRODUCTIVITY**
*(In percentage and millions of MWK)*
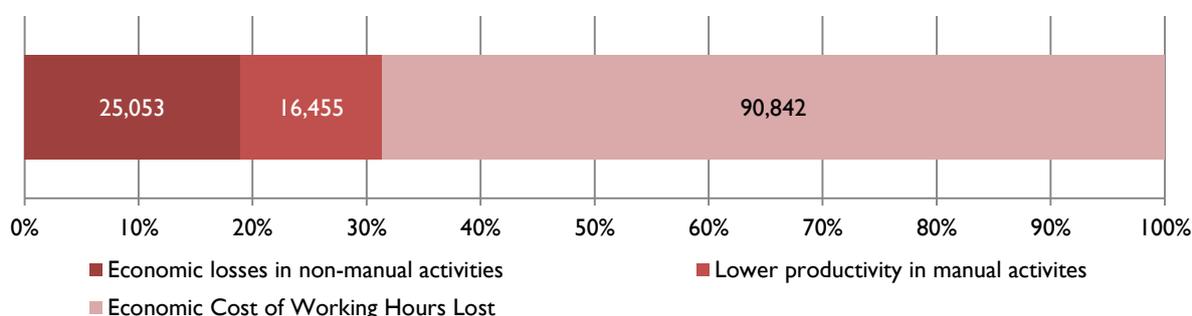


- Economic losses in non-manual activities
- Lower productivity in manual activites
- Economic Cost of Working Hours Lost

Source: COHA Model estimations based on adjusted mortality rates, demographic projections, and data from IHS3.

## D. Summary of effects and costs

The methodology described in Section II is used to analyse the impact of child under nutrition in different stages of the life cycle, without generating overlaps. As a result, the individual sectoral costs can be aggregated to establish a total social and economic cost of child under nutrition. For Malawi, the total losses associated with under nutrition are estimated at MWK 147 billion, or US$ 597 million for the year 2012. These losses are equivalent to 10.3 percent of the GDP of that year. The highest element in this cost is the loss in potential productivity as a result of under nutrition-related mortalities (Table 4.8).

**TABLE 4.8**
**SUMMARY OF COSTS, 2012**

| | Episodes | Cost in Millions of MWK | Cost in Millions of Dollars | Percentage of GDP |
|---|---|---|---|---|
| **Heath Costs** | | | | |
| LBW and Underweight | 685,728 | 9,387 | 38.1 | |
| Increased Morbidity | 176,748 | 1,999 | 8.1 | |
| *Total for Health* | 862,477 | 11,386 | 46 | 0.8% |
| **Education Cost** | | | | |
| Increased Repetition - Primary | 131,335 | 1,736 | 7.0 | |
| Increased Repetition - Secondary | 15,709 | 1,681 | 6.8 | |
| *Total for Education* | 147,044 | 3,418 | 13.9 | 0.24% |
| **Productivity Costs** | | | | |
| Lower Productivity - Non-Manual Activities | 1,595,078 | 25,053 | 101.6 | |
| Lower Productivity - Manual Activities | 3,294,142 | 16,455 | 66.7 | |
| Lower Productivity - Mortality | 81,783 | 90,842 | 368.3 | |
| *Total for Productivity* | 4,971,002 | 132,349 | 537 | 9.3% |
| **TOTAL COSTS** | | **147,152** | **597** | **10.3%** |

Source: UNECA and WFP Calculations

# Section V: Analysis of Scenarios

# Analysis of Scenarios

The previous chapter showed the social and economic costs that affected Malawi in 2012 due to high historical trends of child under nutrition. Most of these costs are already cemented in the society, and policies must be put in place to improve the lives of those already affected by childhood under nutrition. Nevertheless, there is still room to prevent these costs in the future. Currently, one out of every two children under the age of five in Malawi is stunted.

This section analyses the impact that a reduction in child under nutrition could have on the socio-economic context of the country. The results presented in this section project the additional costs to the health and education sectors as well as losses in productivity that Malawian children would bear in the future. In addition, it also indicates the potential savings to be achieved. This is a call for action to take preventive measures and reduce the number of undernourished children to avoid large future costs to the society.

The model generates a baseline that allows development of various scenarios based on nutritional goals established in each country using the prospective dimension. The generated outcomes can be used to advocate for increased investments in proven nutritional interventions. These scenarios are constructed based on the estimated net present value of the costs of children born in each year between 2012 and 2025. The methodology follows each group of children and, based on each scenario, estimates a progressive path towards achieving the set nutritional goals.

The scenarios developed for this report are as follows:

1.  **Baseline: The Cost of Inaction. Progress towards reducing the prevalence of stunting and underweight children remains at the level achieved in 2012**

    For the baseline, the progress towards reducing the prevalence of under nutrition stops at the levels achieved in 2012. It also assumes that the population growth would maintain the pace reported in the year of the analysis, hence increasing the number of undernourished children and the estimated cost. As this scenario is highly unlikely, its main purpose is to establish a baseline, to which any improvements in the nutritional situation are compared in order to determine the potential savings in economic costs.

2.  **Scenario #1: Cutting by half the prevalence of child under nutrition by 2025.**

    In this scenario, the prevalence of underweight and stunted children would be reduced to half of the 2012 values corresponding to the reference year. In the case of Malawi, this would mean a constant reduction of 1.81 percent points annually in the stunting rate from 47.1 percent (estimate for 2012) to 23.55 percent in 2025. A strong effort has to be carried out to achieve this scenario that would require a revision of the effectiveness of on-going interventions for the reduction of stunting, as the average rate of reduction for stunting between 2004 and 2010 was estimated at just 0.9 percent. This is, however, an improvement from the previous measurement, where between 2000 and 2004, the average annual rate of progress in the reduction of stunting was only 0.53 percent.

3.  **Scenario #2: The 'Goal' Scenario. Reducing stunting to 10% and underweight to 5% by 2025.**

    In this scenario, the prevalence of stunted children would be reduced to 10 percent and the prevalence of underweight children under the age of five, to 5 percent. Currently, the global stunting rate is estimated at 26 percent, with Africa having the highest prevalence at 36 percent. This Goal Scenario would require a true call for action and would represent an important regional challenge, in which countries of the region could collaborate jointly in its achievement. In Malawi, the progress rate required to achieve this scenario would be 2.85 percent annual reduction for a period of 13 years, from 2012 to 2025.

As shown in Figure 5.1, the progressive reduction of child under nutrition generates a similar reduction in the costs associated to it. The distances between the trend lines indicate the savings that would be achieved in each scenario.

**FIGURE 5.1
TRENDS OF ESTIMATED COSTS OF CHILD UNDERNUTRITION, 2012-2025**
*(In millions of MWK)*
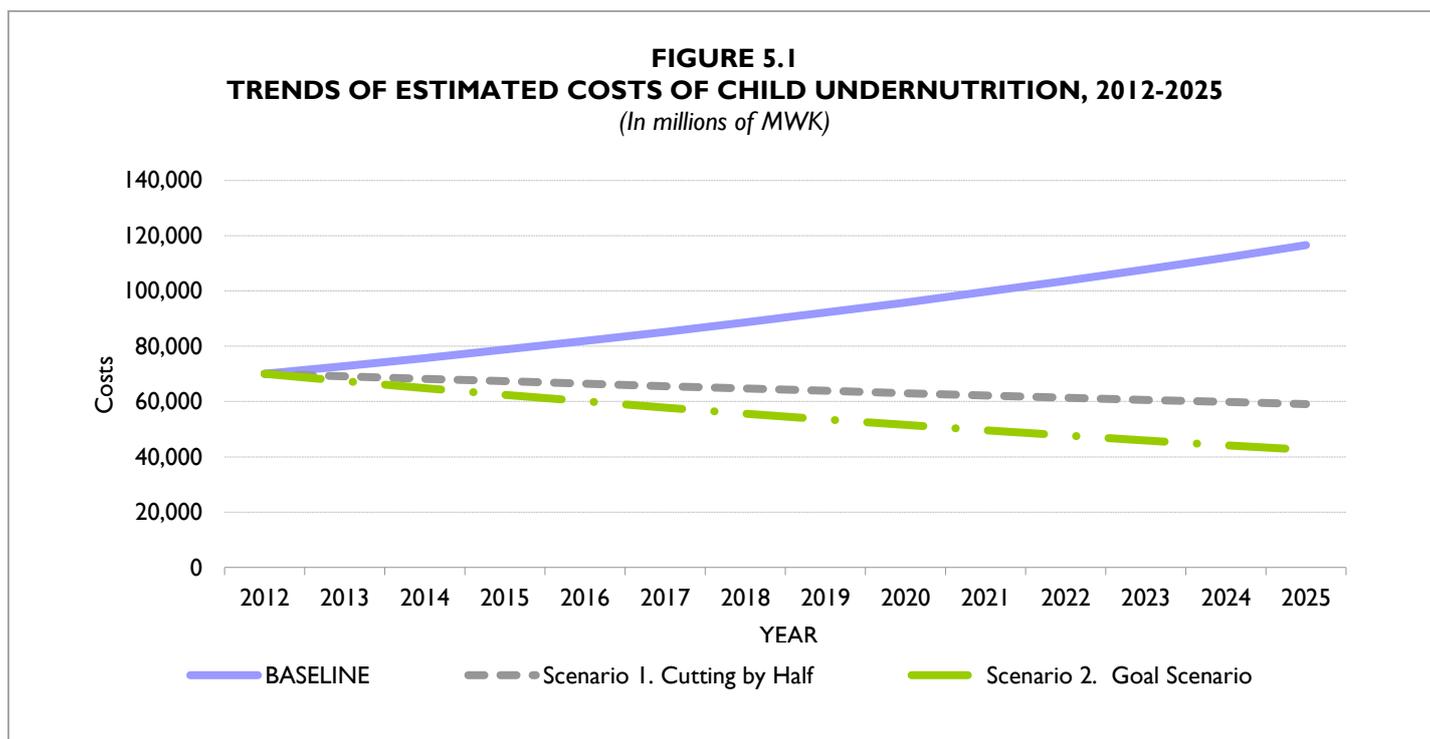


In the baseline, where the progress of reduction of child under nutrition would stop at the levels of 2012, the total cost would increase by 67 percent, from MWK 70 billion to MWK 116.6 billion, during the period leading to 2025. Nevertheless, in Scenario 1, in which a reduction by half of the current prevalence is achieved, the total cost would reduce by 16 percent to MWK 59 billion. In the case of the Goal Scenario on the other hand, there would be a 39 percent education in the estimated total costs, amounting to MWK 42.5 billion.

**TABLE 5.1
ESTIMATED TOTAL COSTS OF CHILD UNDERNUTRITION, BY SCENARIO, 2012**
*(In millions of MWK)[a]*

| | 2012 | Scenarios for the Year 2025 | | |
| --- | --- | --- | --- | --- |
| | | Baseline. The Cost of Inaction | S1. Cutting by Half | S2. Goal Scenario |
| **Heath Costs** | | | | |
| Increased Morbidity | 13,796 | 22,971 | 16,343 | 14,893 |
| **Education Cost** | | | | |
| Increased Grade Repetition | 548 | 913 | 476 | 203 |
| **Productivity Costs** | | | | |
| Lower Productivity in Non-Manual Activities | 19,952 | 33,222 | 10,030 | 3,501 |
| Lower Productivity in Manual Activities | 5,809 | 9,672 | 4,585 | 1,852 |
| Lower Productivity due to Mortality | 29,930 | 49,836 | 27,615 | 22,085 |
| **Total Costs** | **70,035** | **116,613.70** | **59,048.60** | **42,533.10** |
| **Percentage Change from Baseline** | | **67%** | **-16%** | **-39%** |
| Source: Model estimations | | | | |

The potential economic benefits of reducing under nutrition are key elements in making a case for nutrition investments. The reduction in clinical cases in the health system, lowered grade repetition and improved educational performance as well as physical capacity are elements that contribute directly to the national productivity.

As presented in Table 5.2, cutting under nutrition by half by 2025 in Malawi would represent a reduction in costs of over MWK 197 billion, equivalent to US$ 800.4 million for the period of 13 years, from 2012 to 2025. Although the tendency of savings would not be linear, as they are likely to increase over time with the achieved progress, an average of the annual savings would represent US$ 61.6 million per year. In the case of the Goal Scenario, the savings would increase to MWK 275.5 billion, or US$1.1 billion, which represent an average of US$ 85.9 million per year.

| TABLE 5.2 ESTIMATED SAVINGS, BY SCENARIO, 2012 (In millions) | Cutting Undernutrition by Half by 2025 | Goal Scenario |
|---|---|---|
| **Heath Costs** | | |
| Reduced Morbidity | 21,135 | 26,140 |
| **Education Cost** | | |
| Reduced Grade Repetition | 1,464 | 2,672 |
| **Productivity Costs** | | |
| Higher Productivity in Non-Manual Activities | 83,869 | 121,625 |
| Higher Productivity in Manual Activities | 17,266 | 29,958 |
| Increased Working Hours | 73,668 | 95,119 |
| Total Savings in MWK | 197,401.30 | 275,514.50 |
| Total Savings in of US$ | 800.4 | 1,117.20 |
| Average[1] Annual Savings in MWK | 15,184.70 | 21,193.40 |
| Average[1] Annual Savings in US$ | 61.6 | 85.9 |

Source: Model estimations
[1]Simple Average of total savings divided by the years considered in the period from 2012 to 2025

# Section VI: Conclusions and Recommendations

# Conclusion and Recommendations

## A. Conclusion

The Government of Malawi has put forth its Growth and Development Strategy II (MGDS II) 2011-2016, which strives for a Malawi that is a "a God-fearing nation that will be secure, democratically mature, environmentally sustainable, self-reliant with equal opportunities for and active participation by all, having social services, vibrant cultural and religious values and being a technologically driven middle-income economy"[68]. In this vision, which was constructed through an extensive participation process, nine pillars have been identified, and key indicators and targets have been defined that would help to monitor the social and economic development of the country. The Cost of Hunger in Malawi presents a clear opportunity to better understand the role that child nutrition can play for the achievement of the MGDS 2011-2016.

Despite significant progress made in recent years, results from the Cost of Hunger study have shown that almost half of all children under five in Malawi (1.268 million out of 2.765 million children) were affected by stunting in 2012, and almost 350,715 children were underweight. This situation is especially critical for children between 12 and 23 months, out of whom 54.3 percent are affected by stunting.

From a health sector perspective, the study indicates that child under nutrition generates health costs equivalent to 35 percent of the total public budget allocated to sector. These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children as well as the protocols necessary for their treatment. It is also estimated that 1out of every 3 children are not receiving proper health attention in Malawi. As the health coverage expands to rural areas, there will be an increase of people seeking medical attention, which can potentially affect the efficiency of the system to provide proper health care services.

Further, the study has revealed that 23 percent of all cases of child mortality between 2008 and 2012 are associated with a higher risk of under nutrition. Overall, it is estimated that 10.7 percent of the working age population was absent from the workforce in 2012 due to child mortality associated with under nutrition. Hence, a preventive approach to stunting and under nutrition can help reduce children deaths and the incremental burden to the public sector, while abating the costs that are currently being covered by families. In addition, a reduction of child under nutrition has proved to have a significant and positive impact on life expectancy – contributing to meet and possibly exceed the health targets set in the MGDS II and Vision 2020.

From the educational perspective, the study indicate that children who were stunted before the age of five experienced 5.4 percent higher repetition rate in school. As a result, 18 percent of all grade repetitions in school were associated with the higher incidence of repetition that is experienced by stunted children. Also 89 percent of these grade repetitions occur in primary school, suggesting that a reduction in the stunting prevalence could also support an improvement in school results and progression, and reduce preventable burdens to the educational system. Overall, a reduction in the prevalence of stunted children can have an important impact on improving school enrolment, transitions, performance and grade retention, all of which are key indicators outlined in MGDS II 2011-2016.

Increasing the educational level and maximizing the productive capacity of the population dividend are key elements to boost competitiveness and development in the country. This represents a critical opportunity in Malawi where the population under 15 years is estimated to be 46 percent of the total population. This youth must be equipped with the skills necessary to compete on the labour market. As there is no single cause for under nutrition, a comprehensive, multi-sectoral strategy that considers improving the quality of education and the conditions required for school performance must be put in place. Indeed, this study demonstrates the extent to which stunting is a barrier to attendance and retention; and in order to effectively elevate the educational levels and improve individuals' labour opportunities in the future, this barrier must be removed.

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[68]Source: http://www.sdnp.org.mw/malawi/vision-2020/

Another important phenomenon that is evolving at an impressive pace in Malawi, and that is often not associated with the impacts of child under nutrition, is urbanization. As stated in the current MGDS II, Malawi is experiencing at 6.3 percent annual growth in urbanization which also have an impact on the labour market, and employment opportunities An important element of preparing for this shift is to ensure that the workforce is ready and equipped to make a transition towards a more skilled labour, and the economy is able to generate new productive jobs. By preventing child stunting, hence avoiding the associated loss in physical and cognitive capacity that hinders educational attainment and individual productivity, people are in a better position ensured more equal opportunities for success.

The study estimates that almost 60 percent of the current working age population in Malawi suffered from stunting when they were children. This population has achieved, on average, lower schooling levels than those who did not experience growth retardation – i.e. by 1.5 years. As the country continues to urbanize, and an increasing number of people enter skilled labour, this loss in human capital will be reflected in reduced productive capacities of the population.

Overall, the total loss in productivity for 2012 represents 9.3 percent of Malawi's GDP, largely due to reduced productivity associated with under nutrition related mortality. Further, income differentials in manual labour, due to the lower physical and cognitive capacity of people who suffered from growth retardation as children, represent important costs to both individuals and the society as a whole.It is therefore high time for Malawi to prioritise the elimination of child under nutrition, improve the educational level of the population, and prepare the youth for better job opportunities. A reduction of stunting will also impact positively on the productive levels of rural economies, as healthy workers in agricultural environments are expected to become more productive, competitive and earn better wages.

The COHA model also provides an important prospective analysis that sheds light on the potential economic benefits to be generated by a reduction in the prevalence of child under nutrition. The model estimates that in Malawi, a reduction by half of the current levels of child under nutrition by the year 2025 can generate annual average savings of MWK 15,184.7 million (US$ 61.6 million). An additional scenario shows that a reduction to 10 percent stunting and 5 percent underweight over the same period could yield annual average savings of MWK 21,193.4 million (US$ 85.9 million). These economic gains -that result from both a decrease in morbidity and school repetition and an increase in manual and non-manual productivity, present an important economic argument for increasing proper attention and investments in child nutrition.

Overall, the study has proved that chronic child undernutrition can no longer be considered a sectoral issue, as both its causes and consequences depend on policy interventions across numerous sectors. Indeed, stunting reduction will require coordinated action from the health, education, social protection, agricultureandothersectors, and its improvement will represent a major step forward towards a more inclusive and equitable development in the country.

## B. Recommendations to End Child Stunting

The Cost of Hunger Study in Malawi confirms the magnitude of the consequences that child malnutrition can have on individual health, education, productivity; but most importantly, it emphasizes the impact on the national economy and the need for a multi-sectoral policy approach in order to counteract the short and long-term consequences of stunting in the country. The study highlights both challenges and opportunities for Malawi in reducing child under nutrition. It sheds some new light on the implications of adequate child nutrition for development, thus providing an opportunity to scale up commitments and interventions towards the elimination of child stunting in the country.

The results of this study encourage the government of Malawi to leverage policy action for a drastic reduction of stunting in the next ten to fifteen years. In order to define interventions towards a clear elimination of stunting in Malawi, national experts and stakeholders have jointly reflected on a set of key actions that would contribute effectively to this goal. These include:

1. **SET AMBITIOUS TARGETS TO REDUCE UNDERNUTRITION IN MALAWI**

Stunting prevalence in under-fives in Malawi has remained relatively high – with no significant reduction in recent years. There is therefore a critical need to accelerate and put in place targeted interventions and strategies - including:

   1.1. **Reduce Stunting to 23 percent by the year 2025 with an average annual reduction by 2 percent as per SUN targets.**

   1.2. Develop additional nutrition-sensitive indicators, for instance on micro-nutrients deficiency and underweight, which are critical for addressing child malnutrition in the country.

   1.3. Establish a National Nutrition Database – to ensure effective monitoring of child under nutrition targets and indicators over time.

2. **SCALE UP HIGH-IMPACT NUTRITION INTERVENTIONS as outlined in National Nutrition Policy & Strategy**

2.1. It is imperative to formulate and implement programmes that can have long-lasting improvements in the nutrition status of every Malawian, with a special attention to vulnerable groups (especially infants, young children, people living with HIV, people in emergencies, pregnant and lactating women, boys and girls in school, and poor men and women), such as:

2.1.1. Breastfeeding and complementary feeding for children 0-2 years
2.1.2. Diverse Diets for all
2.1.3. Water, Sanitation and Hygiene programmes
2.1.4. Prevention and Treatment of under-nutrition (deworming, micronutrients treatments)

2.2. **Increase national investment in key strategies and actions** that can have a long-lasting impact on child undernutrition.

Collective effort is required by the State and its development partners to support national nutrition policies. In addition, the government should establish innovative financing mechanisms for actors involved in nutritional programmes –by funding key sectors, including for the expansion of health coverage and health insurance mechanisms.

2.3. **Implementation of sector-specific interventions**

2.3.1. The MGDS 2011-2016 should integrate nutrition, and in particular the reduction of stunting, in all sectoral policies and strategies. Strong political commitment and leadership are needed to strengthen visibility and ensure an integrated policy response to nutrition. The National Nutrition Act under way should serve as an important catalyst in this direction.

2.3.2. Decentralization is an important step to ensure proper allocation of funds for nutrition under the leadership of the Ministry of Local Governance. Fast track the recruitment and placement of District Nutrition Coordinators and Community Nutrition Extension workers in all villages.

2.3.3. The complementarities between sectoral programmes are not always maximised, and it is recommended to **establish comprehensive social protection programmes** that are more nutrition-sensitive, and are well-linked to development interventions that promote resilience and have important multiplier effects on the development and nutritional status of the child.

2.3.4. Education- Strengthen **Health and Nutrition programmes in school** to instil the importance of nutrition, food security and dietary diversification in education from early childhood to tertiary learning.

2.3.5. Health - Children under 12 months generate 16 percent of all episodes associated with under nutrition, but almost 60 percent of total costs in the health sector. This highlights the importance of **focusing interventions on the prevention of child malnutrition in the first 1000 days of life,** and working with mothers before and during pregnancy to ensure that children are born and develop with proper weight and health during this most difficult stage of life.

2.3.6. Agriculture– **Ensure multi-sectoral interventions** – including by building on existing initiatives such as the *Pan-African Nutrition Initiative* (PANI) or the *Comprehensive Africa Agriculture Development Programme* (CAADP), which focus on reducing hunger and improving food and nutrition security – to **generate multiplier effects in all sectors**– and counteract the losses associated with under nutrition in both manual and non-manual labour activities.

2.3.7. The private sector needs to play a more important role alongside the government and development partners. The government should take supporting measures to ensure stronger involvement of the private sector in the supply of accessible health services, as well as in the production and commercialisation of enriched food products, and the strengthening of nutritious value chains and labelling standards. The private sector and development partners must collaborate further with the Government in nutrition planning and policy design, including in the implementation and monitoring processes.

3. **COMMUNICATION and ADVOCACY**

3.1. Increase awareness and advocacy of key stakeholders at all levels on the social and economic impacts of child under nutrition to ensure that nutrition, with a focus on addressing stunting, receives the highest possible level of commitments. The results of the COHA study could provide a strong base for guiding policies and enhancing advocacy, resource mobilization and political leverage on nutrition.

3.2. Strengthen the capacity and role of the Ministry of Information in communicating and advocating for correct nutrition at all levels.

3.3. **Scale up the potential and role of existing structures,** such as the Civil Society Organization Nutrition Alliance

(CSONA), the Civil Society Agriculture Network, the Civil Society Education Network, and other relevant organizations – to increase advocacy action and bring in the voice of non-state actors in nutrition interventions.

3.4. **Put in place a harmonized national strategy that coordinates nutrition advocacy activities**. This could be critical in ensuring that Malawi maximizes nutrition efforts of both the government and other stakeholders and implementing partners.

3.5. **Build the capacity of the government for promoting advocacy and effectiveness of nutrition interventions -** both at national and sub-national levels. This could help to ensure that the Cost of Hunger Study results and other nutritional findings be used to the greatest effect for reducing child stunting.

3.6. **Promote awareness and behavioural change in the populations to adopt good practices of hygiene and proper nutrition** in favour of children, pregnant women, lactating and non-lactating mothers through:

**3.6.1** Promote strengthening awareness on the importance of food diversification, correct nutrition and hygiene, while encouraging practices such as exclusive breastfeeding from the perspective of nutrition, food hygiene and preservation of the environment. This could be done by building on successful experiences, such as the Nutritional and Educational Communication Strategy (NECS 2011), or the targeted nutrition flyers developed as part of the Scaling Up Nutrition (SUN) movement.

**3.6.2.** Promoting nutritional practices based on a better use of local food potential. Some communication channels exist, yet with little focus on food and healthy eating. The importance of dietary diversification for children must be communicated vertically to policy makers and horizontally across different segment of the society. Actions of awareness need to be enhanced to convince the populations on the nutritional quality of local foods and to promote culinary practices that preserve these qualities.

## 4. COORDINATION

Nutrition is currently integrated in five key social sectors, including agriculture, health, education, gender/children/social welfare, and local governance. Coordinating structures on nutrition exist across these five sectors and vertically – from national to community levels. However, there is a need to:

4.1 **Strengthen the role of the Department of Nutrition, HIV and AIDS (DNHA)** as the national coordinating body for nutrition-related interventions.

4.2 **Strengthen coordination and dialogue among sectoral ministries, implementing partners and key stakeholders to build a coherent and integrated policy response around nutrition and stunting.** National nutritional platforms exist, including the National Nutritional Committee, which is a framework for multi-sectoral dialogue on nutrition, but whose dynamism and institutional anchorage are weak. However, lack of commitment appears to be one of the key challenges to make these platforms function effectively. Hence, there is a need to strengthen the nutritional networks and improve their functionality, particularly at district level. The role of the private sector and civil society organizations – including the Civil Society Organizations Nutrition Alliance (CSONA) – could be instrumental in this regard.

## 5. MONITORING & EVALUATION

5.1. Scale up and strengthen Nutrition M&E roll-out, ensuring stakeholders' awareness and ownership of their roles in sectoral data collection (agriculture (AMIS), health (HMIS), education (EMIS), etc.), analysis and dissemination that feeds back into programme strengthening.

5.2. Strength data collection, analysis and monitoring of health outcomes from frontline workers & community members to national institutions, including the Bureau of National Statistics.

# Section VII: Annexes

# VII

# Annexes

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## Annex 1. Glossary of Terms

1. **Average number of days required for hospitalization:** The average number of days a child needs to stay in a hospital when hospitalized, to receive adequate care.

2. **Average number of primary care visits per episode:** When a child experiences a given pathology, he/she may require medical care multiple times. This variable is the average number of primary (outpatient) medical care visits a child requires per episode.

3. **Average waiting time spent at primary care:** When a caretaker brings a child to a primary care facility, the time the parent and child spend at the facility for waiting and receiving care.

4. **Cost of medical inputs per event during hospitalization:** This variable includes the medical materials (medicines, procedures) that are covered by the hospital for treatment of each pathology case.

5. **Cost of medical inputs per event in primary care:** This variable includes the medical materials (medicines, procedures) that are covered by the health facility for treatment of each pathology case.

6. **Costs not covered by the health system:** This variable includes the value of the inputs (i.e. medications) that are paid for by the family.

7. **Daily cost of hospital bed during hospitalization:** This variable includes the total cost to the hospital calculated per day per patient staying in the hospital. This value includes the cost of staff, facilities and equipment, as a unit cost per patient.

8. **Daily hours lost due to hospitalization:** The number of hours the caretaker spends at the hospital each day with the child when he/she brings a child to a primary care facility.

9. **Differential Probability (DP):** Refers to the difference between the probability of occurrence of a consequence (i.e., disease, grade repetition and lower productivity) given a specific condition. The model uses this variable specifically to determine the risk among those suffering from under nutrition and those who are not (ECLAC).

10. **Discount rate:** The interest rate used to assess a present value of a future value by discounting (FAO). In the model it is utilized to obtain the present value in the scenario section.

11. **Dropout rate per grade:** Percentage of students who drop out of a grade in a given school year (UNESCO).

12. **Episodes:** It is the number of disease events occurring for a given pathology. In the model it is based on a 1 year period, i.e. the number of times a specific pathology occurs in 1 year (ECLAC).

13. **Food insecurity:** Exists when people lack access to sufficient amount of safe and nutritious food and therefore, are not consuming enough for an active and healthy life. This may be due to the unavailability of food, inadequate purchasing power or inappropriate utilization at household level (FAO).

14. **Food vulnerability:** Reflects the probability of an acute decline in food access or consumption, often in reference to some critical value that defines minimum levels of human wellbeing (WFP).

15. **Hunger:** The status of persons, whose food intake regularly provides less than their minimum energy requirements, i.e. about 1800 kcal per day. It is operationally expressed by the undernourishment indicator (FAO).

16. **Incidental retrospective dimension:** Used to estimate the cost of under nutrition in a country's population in a given year. The model applies it by looking at the health costs of pre-school children (0 to 5-year-olds) suffering from under

nutrition, the education costs of school-age children (6 to 18-year-olds) and the economic costs resulting from lost productivity by working-age individuals (15 to 64-year-olds) (ECLAC).

17. **Intrauterine growth restriction (IUGR):** Refers to the foetal weight that is below the 10th percentile for gestational age (WHO). In the model, this is the only type of condition considered in the estimation of cost for low birth weight children.

18. **Low Birth Weight (LBW):** A new-born is considered to have low birth weight when he/she weighs less than 2,500 grams (WHO).

19. **Malnutrition:** A broad term for a range of conditions that hinder good health caused by inadequate or unbalanced food intake or by poor absorption of the food consumed. It refers to both under nutrition (food deprivation) and over nutrition (excessive food intake in relation to energy requirements) (FAO).

20. **Mortality rate:** The proportion of deaths per year in a given population, usually multiplied by a 10th population size so it is expressed as the number per 1,000, 10,000, 100,000, individuals per year.

21. **Percentage of cases that attend health services:** The proportion of episodes for which a caretaker brings a child to a primary health facility for treatment.

22. **Productivity/Labour productivity:** Measures the amount of goods and services produced by each member of the labour force or the output per unit of labour (ILO). In the model, it refers to the average contribution that an individual can make to the economy, measured by consumption or income, depending on data availability.

23. **Proportion of episodes requiring hospitalization:** When a child experiences pathology, he/she may require in-patient care. This variable identifies the proportion of the episodes by pathology, for which a child requires hospitalization.

24. **Proportion of episodes requiring ICU:** When a child experiences pathology, he/she may require care in an ICU facility. This variable identifies the proportion of the episodes by pathology, for which a child requires ICU care.

25. **Prospective or potential savings dimension:** This dimension makes it possible to project the present and future losses incurred as a result of medical treatment, repetition of grades in school and lower productivity caused by under nutrition among children under the age of five in each country, in a specific year (ECLAC).

26. **Public social spending:** Social expenditure is the provision by public (and private) institutions of benefits to, and financial contributions targeted at, households and individuals in order to provide support during circumstances, which adversely affect their welfare, provided that the provision of the benefits and financial contributions constitutes neither a direct payment for a particular good or service nor an individual contract or transfer (OECD).

27. **Relative risk:** Refers to the risk of an event occurring, given a specific condition. It is expressed as a ratio of the probability of the event occurring in the exposed group versus a non-exposed group. In the model it is used to establish the risk level of disease, lower educational performance or lower productivity relative to exposure to under nutrition.

28. **Repetition rate per grade:** Number of repeaters in a given grade in a given school year, expressed as a percentage of enrolment in that grade in the previous school year (UNESCO).

29. **Stunting:** Reflects shortness-for-age; an indicator of chronic malnutrition, calculated by comparing the height-for-age of a child with a reference population of well-nourished and healthy children (WFP). The model uses it as the indicator to analyse the impact on educational performance and productivity.

30. **Survival rate:** A rate calculated for a given geographic area that presents the likelihood of a person surviving in a given period of time.

31. **Undernourishment:** Food intake that is continuously insufficient to meet dietary energy requirements. This term is used interchangeably with chronic hunger, or, in this report, hunger (FAO).

32. **Undernutrition:** The result of prolonged low levels of food intake and/or low absorption of food consumed (undernourishment). It is generally applied to energy (or protein and energy) deficiency, but it may also relate to vitamin and mineral deficiencies (FAO).

33. **Underweight:** Measured by comparing the weight-for-age of a child with a reference population of well-nourished and healthy children (WFP). The model utilizes it to analyse the impact of child under nutrition on health.

34. **Unit cost per attention in primary care:** This variable includes the total cost to the health facility per attention, comprising the cost of staff, facilities and equipment, as a unit cost per patient.

35. **Wasting:** Reflects a recent and severe process that led to substantial weight loss, usually associated with starvation and/or disease. Wasting is calculated by comparing weight-for-height of a child with a reference population of well-nourished and healthy children (WFP).

# Annex 2. Methods and Assumptions

| Indicator | Data and Sources |
|---|---|
| **Economic data** | |
| Gross Domestic Product | Source: Ministry of Economic Planning and Development, Annual Economic Report 2012. The figure was crosschecked with the World Bank database. The NIT also provided the latest information during the validation workshop. |
| US$ exchange rate | Based on the data obtained from Reserve Bank of Malawi. World Bank database. Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local). |
| Inflation, average consumer prices | Annual Economic Report, Based on Ministry of Economic Planning and Development, 2013 |
| Social Expenditure | Malawi Public Expenditure Review, Ministry of Economic Planning and Development, 2013 |
| Health Expenditure | Malawi Public Expenditure Review, Ministry of Economic Planning and Development, 2013 |
| Education Expenditure | Malawi Public Expenditure Review, Ministry of Economic Planning and Development, 2013 |
| Average transport cost (two public transportation tickets in urban areas in local currency) | Key informant interviews: Average price of ticket in urban areas was estimated to be MWK 1000. |
| Minimum wage per hour | Malawi Ministry of Labour, Minimum wage per hour was estimated MWK 68.88 |
| Average wage per hour | Ministry of Labour estimated the Average wage per hour to be 104 MWK |
| Average income per years of schooling | Based on the third Integrated Household Survey (IHS3), National Statistic Organization (NSO). Average Expenditure data was considered as a proxy for income. 2010/11 Household Expenditure is adjusted by Adult Equivalent Factor, and distributed on the household members by characteristics. |
| Distribution of workers by Manual and Non-Manual Labour per age group | Based on Expenditure data from the "Third Integrated Household Survey (IHS3)" National Statistics Office (NSO) for Malawi. **Manual Activities** include: 11.00 '11 Agriculture': 12.00 '12 Livestock'; 13.00 '13 Forestry'; 14.00 '14 Fishing & Hunting'; 21.00 '21 Mining'; 22.00 '22 Quarrying'; 31.00 '31 Food Manufacture'; 32.00 '32 Textile Manufacture" 33.00 '33 Wood Products Man.'; 34.00 '34 Paper Products Man.'; 35.00 '35 Chemical Industries'; 36.00 '36 Non-metallic Products. Man.'; 37.00 '37 Metal Manufacture'; 38.00 '38 Metal Products Man.'; 41.00 '41 Gas, Water & Electricity'; 51.00 '51 Construction Buildings"; 52.00 '52 Construction Roads'; 53.00 '53 Rural Reconstruction'. **Non-Manual activities** include 61.00 '61 Wholesale Trade' 62.00 '62 Retail Trade'; 63.00 '63 Other Trade'; 64.00 '64 Hotel & restaurants'; 65.00 '65 Import & Export'; 71.00 '71 Transport'; 72.00 '72 Warehousing'; 73.00 '73 Communications'; 81.00 '81 Banking'; 82.00 '82 Insurance'; 83.00 '83 Real Estate'; 84.00 '84 Business Services'; 91.00 '91 Government, Admin & Social Services'; 92.00 '92 Recreation & Tourism' |
| Annual average income related to productive work, manual intensive activities by age | Based on Expenditure data from the "Third Integrated Household Survey (IHS3)" Average Expenditure data was considered as a proxy for income. Household Expenditure is adjusted by Adult Equivalent Factor and distributed on the household members by characteristics. National Statistics Office (NSO) for Malawi 2010/11. |
| Annual average income related to productive work, NON manual intensive activities by highest educational level attained and age | Based on Expenditure data from the "Third Integrated Household Survey (IHS3)" Average Expenditure data was considered as a proxy for income. Household Expenditure is adjusted by Adult Equivalent Factor and distributed on the household members by characteristics. National Statistics Office (NSO) for Malawi 2010/11. |
| Average working hours per week | Estimated based on the average official government working hour per day (8 hours) and multiplied by the total number of working days per week. |
| Annual worked hours per age group | Estimated based on the average official government working hour per day (8 hours) and multiplied by the total number of working days per week (5 days) and total number of weeks (52 weeks) per year. |
| Employment rate | |
| **Demographic Data** | |

| Indicator | Data and Sources |
|---|---|
| 0 Years of Age - Total Population Projected from 1948-2012 | United Nations Statistics Division – Demographic and Social statistics – Accessed November 2013. Processed with the Support of the African Centre for Statistics at ECA. Tesfaye G. (2013) |
| 0 - 4 years total population Projected from 1948-2012 | Data was also updated with the recent information accessed from National Statistics Office (NSO) in Malawi (May 2014). |
| Population in 2012 by age | |
| Mortality rate for children under 5 and Survival rate, projected from 1950 to 2050 | Calculated from Abridged Life Tables provided by the UN Statistics Division – Demographic and Social statistics. Aseffa S. (2013). For detailed calculation process please review Rodrigo Martínez and Andrés Fernández, *Operational manual for the use of the model for analysing the Social and Economic impact of child under nutrition in Latin America*, Naciones Unidas, CEPAL, Social Development Division, Santiago De Chile, 2008, Pages 18-26. |
| Working age population (WAP) by educational level | Calculated from the third Integrated Household Survey (IHS3) of Malawi. Data accessed from National Statistics Office (NSO), Grade level twelve includes all grade levels equal and above grade twelve. K. Asseffa (2014) |

## Health Data

Field visits were undertaken at Queen Elizabeth Referral Hospital (in Blantyre) and Zomba Referral Hospitals (in Zomba) to get access for health protocol and cost analysis. These hospitals were selected because these are the two big public hospitals in the country with very high number of patients both in OPD and IPD. All referral cases from the nearby governmental hospitals and other health facilities (Health centers, health posts, as well as private hospitals) will be sent to these hospitals. A total of eight health professionals working in OPD & IPD and three non-health professionals from management, finance and planning units were interviewed from each hospital. Key informants from Blantyre Central Drug Store and Zomba hospital pharmacy were consulted for different drug cost estimation. All the Primary data are based on expert's interviews with key informants and experts from the Field visits at Queen Elizabeth Referral Hospital, Zomba Referral Hospitals and Central Drug store.

| Indicator | Data and Sources |
|---|---|
| Underweight prevalence of children under 5 years old | Calculated from Demographic and Health Survey 2010. Ministry of Health (MOH). Historical data calculated based on "WHO Global Database on Child Growth and Malnutrition" WHO. Accessed May 12, 2014. http://www.who.int/nutgrowthdb/en// |
| Stunting prevalence of children under 5 years old | |
| Stunting and Underweight mode prevalence | Calculated based on the highest prevalence register in the age groups based on the historical data obtained from "WHO Global Database on Child Growth and Malnutrition" WHO. Accessed May 12, 2014 http://www.who.int/nutgrowthdb/en// and the data was cross checked with Malawi Demographic and Health Survey 2010. |
| Number of annual disease events per child for (Anaemia, ADS, ARI, Malaria, Underweight) by Age group | Estimated by health specialists and experts on the following values through in-depth interview, The Incidence rate of **Anaemia** for 28 days-11months is 1 episode; 12-23 months is 2 episodes; 24-59 months is 2 episodes per child. **ADS**: 28 days-11months is 3 episodes; 12-23 months is 3 episodes; 24-59 months is 3 episodes/child. **ARI**: 28 days-11months is 2 episodes; 12-23 months is 2 episodes; 24-59 months is 2 episodes per child. **Underweight**: 28 days-11months is 1 episode; 12-23 months is 2 episodes; 24-59 months is 2 episodes/child. **Malaria**: 28 days-11monthsis 2 episodes; 12-23 months is 4 episodes; 24-59 months is 4 episodes per child per year. |
| Average number of primary care visits for each pathology (Anaemia, ADS, ARI, Underweight, Malaria) by Age group | Estimated by health specialists and experts on the following values through in-depth interview, The average no. of primary care visits for **Anaemia** 28 days-11months is 1episode, 12-23 months is 2 episodes, 24-59 months is 2 episodes per child. **ADS**: 28 days-11months is 3 episodes; 12-23 months is 2 episodes; 24-59 months is 1 episode/child. **ARI**: 28 days-11months is 2 episodes; 12-23 months is 2 episodes; 24-59 months is 2 episodes/child. **Underweight**: 28 days-11months is 1 episode; 12-23 months is 2 episodes; 24-59 months is 2 episodes/child. **Malaria**: 28 days-11months is 2 episodes; 12-23 months is 3 episodes; 24-59 months is 3 episodes per child per year. |
| Proportion of events of pathology (Anaemia, ADS, ARI, Malaria, Underweight) by Age group requiring hospitalization | Estimated by health specialists and experts through in-depth interview, on the following values **Anaemia** 28 days-11months is 5 %; 12-23 months is 5%; 24-59 months is 5% (utilized the proportion of moderate & severe anaemia cases as proxy), **ADS**: 28 days-11months is 40%; 12-23 months is 40%; 24-59 months is 40%. **ARI**: 28 days-11months is 50%; 12-59 months is 50% (utilized proportion of moderate & severe ARI as proxy). **Underweight**: 28 days-11months is 5%; 12-23 months 5%; 24-59 months is 5% (utilized proportion of moderate & severe underweight as proxy), **Malaria**:28 days-11months is 20%; 12-23 months is 20%; 24-59 months is 20% utilized proportion of moderate & severe Fever as proxy). Field visits at Queen Elizabeth Referral Hospital and Zomba Referral Hospital. |

| Indicator | Data and Sources |
|---|---|
| Average number of days of hospital treatment for each event (Anaemia, ADS, ARI, Malaria, Underweight) by Age group | Estimated by health specialists and experts through in-depth interview, on the following values (in days of hospitalization) **Anaemia**: 28 days-11months is 5 days; 12-59 months is 3 days. **ADS**: 4 days (same for all sub-cohorts). **ARI**: 28 days-11months is 5 days; 12-59 months is 4 days. **Underweight**: 28 days-11months is 7 days, 12-23 months is 7 days; 24-59 months is 10 days. **Malaria**: 3 days (same for all sub-cohorts). |
| Average waiting time spent at primary care attention by pathology | Estimated by health specialists and experts through in-depth interview, on the following values (in hours) **Anaemia**: 3 hours; **ADS**: 3 hours; **ARI**: 1.8 hours; **Underweight**: 1 hour; **Malaria**: 2 hours. Field visits at Queen Elizabeth Referral Hospital of Blantyre and Zomba Referral Hospital of Zomba. |
| Daily hours lost due to hospitalization by pathology | Estimated at 8 average daily hours lost. |
| Average unit cost for attention in primary care by age group and pathology | Estimates based on hospital records and interviews with health specialists and experts. The unit cost for out-patient attention takes into account the overhead and direct costs associated to provision of medical consultation. As overhead costs were considered: the annual expenditure of water, electric power, fuel as well as the maintenance of the primary care facility. These overhead costs were divided by the annual number of out patients. As direct costs were considered: the number and qualification (paediatricians, general practitioners, nurses) of medical staff and the time (in minutes) each of them dedicate to the patient. Based on their hourly salary the unit cost for attention is subsequently calculated. For a full overview of the average unit cost for attention per pathology please consult the Health Protocol and Costing Guidelines. |
| Average cost of medical inputs for event in primary care by age group and pathology | Estimated by health specialists and experts through interviews. As medical inputs are considered: medicines for treatment. The costing of these inputs is done based on the Central Drug Store costing record and Zomba Hospital Pharmacy record. For a full overview of all the medical input and its cost per pathology please consult the Health Protocol and Costing Guidelines. |
| Average unit cost for attention in hospital by age group and pathology | Estimates based on hospital records and interviews with health specialists and experts. The unit cost for in-patient attention takes into account the overhead and direct costs associated to provision of medical consultation and hospital bed cost. As overhead costs were considered: the annual expenditure of water, electric power, fuel and food as well as the maintenance of the hospital. These overhead costs were divided by the annual number of inpatients. As direct costs were considered: the number and qualification (paediatricians, general practitioners, nurses) of medical staff and the time (in minutes) each of them dedicate to the patient. Based on their hourly salary the unit cost for attention is subsequently calculated. In addition average daily cost of a hospital bed is also included. For a full overview of the average unit cost for attention per pathology please consult the Health Costing Guidelines. |
| Average cost of medical inputs for event in hospital by age group and pathology | Estimated by health specialists and experts through interviews. As medical inputs are considered: medicines for treatment. The costing of these inputs is done based on the Central Drug Store costing record and Zomba Hospital Pharmacy record for in-patients. For a full overview of all the medical input and its cost per pathology please consult the Health Costing Guidelines. |
| Average private cost of medical inputs for event by age group and pathology | In Malawi all health service from public health facilities is given for free (i.e. covered by the government). So far there is no medical input cost incurred by clients to get service from public health facilities. But the government is now (2014) piloting cost sharing skims by clients for health service delivered from some public health facilities. To estimate the costs borne by the families a proxy of % of the total costs of medical input was used. |
| % of Cases who attend Health Services | Percentage of all births with a reported birth weight was considered as a proxy for % of cases who attend health services (66.5%; Page 118, Table 10.1). Calculated from Malawi Demographic and Health Survey 2010. |
| Average travel time for ambulatory care. | Established at 2 hours for all cases and pathologies. It was an estimated time to access referral Hospital from the Blantyre Rural places based on key informant interviews conducted. |
| Percentage of low birth weight children | 12 .3 % was considered as Percentage of Low birth weight, Malawi Demographic and Health Survey 2010 (Page 118, Table 10.1). |
| Proportion of events of LBW requiring/access hospitalization | 100% of cases of LBW would require hospitalization. Estimated by health specialists and experts through in-depth interview. |
| Average number of days of hospital treatment for LBW | A Minimum of 15 days is recommended for LBW. Estimated by health specialists and experts through in-depth interview. |

| Indicator | Data and Sources |
|---|---|
| Morbidity differential probability for anemia among healthy versus underweight children by age groups. | Calculated in-house at 11.7% for children under 5, from Malawi Demographic and Health Survey data, 2010, utilizing the prevalence of anaemia (moderate or severe) of underweight children and the prevalence of non-underweight children differentiated by age groups, with support. Assefa K. (2014) |
| Morbidity differential probability for ADS among healthy versus underweight children by age groups. | Calculated in-house at 6.2% for children under 5, from Malawi Demographic and Health Survey data, 2010, utilizing the prevalence of Acute Diarrheal Syndrome –ADS (reported diarrhoea in the last 2 weeks) of underweight children and the prevalence of non-underweight children differentiated by age groups, with support. Assefa K.(2014) |
| Morbidity differential probability for ARI among healthy versus underweight children by age groups. | Calculated in-house at 0.7% for children under 5, from Malawi Demographic and Health Survey data, 2010, utilizing the prevalence of Acute Respiratory Infection - ARI (data on children who were ill with a cough accompanied by rapid breathing) of underweight children and the prevalence of non-underweight children differentiated by age groups, with support. Assefa K. (2014) |
| Morbidity differential probability for Fever among healthy versus underweight children by age groups. | Calculated in-house at 2.4% for children under 5, from Malawi Demographic and Health Survey data, 2010, utilizing the prevalence of Fever/Malaria (data on children who reported fever in last 2 weeks) of underweight children and the prevalence of non-underweight children differentiated by age groups, with support. Assefa K. (2014) |
| Hazard Ratio of child mortality associated with underweight | Estimated at 2.86, based on calculations by Acosta C., Martinez R. (2013) from Robert E. Black et al., "Maternal and child under nutrition: global and regional exposures and health consequences," The Lancet 371, No. 9608, 2008, doi: 10.1016/S0140-6736(07)61690-0) |
| Hazard ratio for child mortality associated with stunting | Estimated at 2.33, based on calculations by Acosta C., Martinez R. (2013) from Robert E. Black et al., "Maternal and child under nutrition: global and regional exposures and health consequences," The Lancet 371, No. 9608, 2008, doi:10.1016/S0140-6736(07)61690-0 |

## Education Data

| | |
|---|---|
| Enrolment by grade in Primary | Malawi. Ministry of Education. 2012 Education Management Information System. Data were obtained from Ministry of Education Science and Technology, 2014. Page 25, Table 3, |
| Enrolment by grade in Secondary | Malawi. Ministry of Education. 2012 Education Management Information System. Data were obtained from Ministry of Education Science and Technology, 2014. Page 60, Table 18, |
| Number of passes by grade | Calculated by grade by the Ministry of Education with data for 2012. The Promotion Rates both for Primary and Secondary Levels were considered from EMIS 2012 (Page 26, Table 4.1) and applied to the same year enrolment data by grade level. |
| Number of population repeating grades by grade | Calculated by grade by the Ministry of Education with data for 2012. The Repetition Rates both for Primary and Secondary Levels were considered from EMIS 2012 (Page 28, Table 4.3 and Page 69, Table 22) and the rates were applied to the same year enrolment data by grade level. |
| Annual Private/Public cost per student / year by educational level | Estimations by NIT in (MWK). Primary Education – Public Cost: 6,033; Cost to Families: 7,187. Secondary Education – Public Cost 25,024; Cost to Families: 82,000. |
| Relative Risk associated of grade repetition associated with stunting | Estimated at 1.35, based on calculations from Cebu Longitudinal Health and Nutrition Survey, with support from Melissa C. Daniels |
| Relative Risk associated of dropping out associated with stunting | Estimated at 1.61, based on calculations from Cebu Longitudinal Health and Nutrition Survey, with support from Melissa C. Daniels |

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