THE CO$T OF HUNGER IN AFRICA

Social and Economic Impact of Child Undernutrition in Egypt, Ethiopia, Swaziland and Uganda

Implications for the Social and Economic Transformation of Africa

African Union
NEPAD TRANSFORMING AFRICA
WFP World Food Programme wfp.org
United Nations Economic Commission for Africa

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Foreword

The time for Africa is now. As the continent experiences its most important economic expansion period in the last 30 years, it faces the challenge and the opportunity to reorient the drivers of growth towards the structural transformation required for inclusive economic and social development.

The current economic growth rate on the continent is not yet sufficient to allow for change towards equity and human development in most nations. As such, Africa's decision-makers must continue to shift gears towards policies that focus on both short-term and medium-term results to reduce the structural barriers that constrain its social and economic development.

From an economic perspective, there is an important opportunity to shift from a commodity-driven growth strategy to a more diversified production base through industrialization of commodities and further integration of products into national and regional value chains. This shift can be a key element in providing young people with decent labour opportunities in economic activities that will also help Africa move toward a more industrialized and urbanized society that builds on the continent's comparative advantages.

The Cost of Hunger in Africa study provides policy makers with information on how economic growth is affected by undernutrition. The study also provides a picture of what the continent stands to lose if undernutrition is not addressed.

A critical element of the social transformation agenda must focus on ensuring human capital growth through improved health, education and labour productivity. The gap in access to health services between the rural and urban population must be reduced to provide the most vulnerable populations with proper health care, and reduce child and maternal mortalities. The continent cannot afford the losses in human capital associated with poor health and its consequences to society.

Moreover, as urbanization continues to grow in the coming years, economies are likely to shift from ones based on manual labour to ones based on skilled labour. Africa, having the world's highest percentage of youth, with over 40 percent of the population in sub-Saharan Africa under the age of 15, stands to gain important human capital by reducing drop-out rates in schools and increasing educational levels. The continent must work to reduce the barriers that affect human development in order to maximize the benefits of this transformation.

The Cost of Hunger in Africa study demonstrates that child nutrition can be a determinant factor in achieving Africa's transformation agenda.

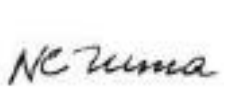
The African Union Commission and its NEPAD Planning and Coordinating Agency have partnered with the World Food Programme and the United Nations Economic Commission for Africa to analyse the crippling effects of child undernutrition. This study has been implemented in an effort to understand the implications of child undernutrition on the continent's economic and social transformation agenda.

Children and women in Africa are faced with a series of cultural, economic and social challenges throughout their lives. This study illustrates the additional barriers faced by undernourished children in health, school performance and labour markets. These additional disadvantages limit their ability to contribute to social and economic development on the continent.

The results of the study also provide a compelling case to support the concept that human capital gain, particularly in pre-school nutrition, will help consolidate the economic expansion of Africa. The cost borne by Africa's economies as a consequence of food and nutritional insecurity in the past and present has hindered the continent's full economic and social potential. The study's conclusions also call for actions directed at reducing the current levels of child stunting and ensuring that social protection programmes address the physical and cognitive consequences that affect the school-age and working-age populations that are currently at the centre of Africa's development.

There is a growing consensus and understanding of the consequences of child undernutrition at the individual and community levels, specifically the losses in individual physical and cognitive capacity. Nevertheless, there is less understanding of the aggregate effect to the economy and society as a whole. The Cost of Hunger in Africa study provides policy makers with information on how economic growth is affected by undernutrition. The study also provides a picture of what the continent stands to lose if undernutrition is not addressed.

As conclusions are drawn from this study, it must be made clear that reducing stunting alone will not be sufficient to ignite inclusive growth on the continent. However, a reduction of stunting would be an indication that social policies are taking a significant step forward, as well as being evidence that social protection mechanisms effectively reach the most vulnerable. It is clear that alongside a reduction in the number of undernourished children, increased investments in education, innovation and technology must be made to complete the gains in human capital, and opportunities in the labour market must be created, emphasizing the role and empowerment of women as driver for positive change. Nevertheless, a healthy childhood is an important, and sometimes vital, precondition to this development, and as such, addressing stunting would be a first and crucial investment to build the foundation of the economic and social transformation of Africa.



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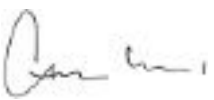

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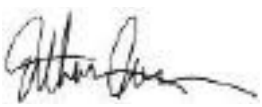

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Acronyms

ADS	Acute Diarrhoeal Syndrome
AfDB	African Development Bank
ARNS	African Regional Nutrition Strategy
ARI	Acute Respiratory Infection
ATFFND	African Task Force on Food and Nutrition Development
AU	African Union
AUC	Africa Union Commission
CAADP	Comprehensive Africa Agriculture Development Programme
CAPMAS	Central Agency for Public Mobilization and Statistics
CEN-SAD	Community of Sahel-Saharan States
COHA	Cost of Hunger in Africa
COMESA	Common Market for Eastern and Southern Africa
CSA	Central Statistics Agency
DHS	Demographic and Health Survey
ECA	United Nations Economic Commission for Africa
ECCAS	Economic Community of Central African States
ECLAC	Economic Commission for Latin America and the Caribbean
ECOWAS	Economic Community of West African States
EGP	Egyptian Pound
EHICES	Ethiopia Household Income, Consumption and Expenditure Survey
EHNRI	Ethiopian Health and Nutrition Research Institute
EMIS	Education Management Information Systems Unit
ETB	Ethiopian Birr
FAFS	Framework for African Food Security
FAO	Food and Agriculture Organization
FMoH	Federal Ministry of Health
GDP	Gross Domestic Product
GNI	Gross National Income
HIECS	Household Income, Expenditure and Consumption Survey
ICU	Intensive Care Unit
IPD	Inpatient Department
IDSC	Information and Decision Support Center
IGAD	Intergovernmental Authority for Development
ILO	International Labour Organization
IMAM	Integrated Management of Acute Malnutrition
IMCI	Integrated Management of Childhood Illness
ISIC	International Standard Industrial Classification
IUGR	Intra Uterine Growth Retardation
LAC	Latin America and the Caribbean
LBW	Low Birth Weight
LFS	Labour Force Survey

MDGs	Millennium Development Goals
MENA	Middle East and North Africa
MICS	Multiple Indicator Cluster Survey
MoE	Ministry of Education
MoFED	Ministry of Finance and Economic Development
MoH	Ministry of Health
NCHS	National Center for Health Statistics
NEPAD	The New Partnership for Africa's Development
NIT	National Implementation Team
NPCA	NEPAD Planning and Coordinating Agency
NPA	National Planning Authority
OPD	Outpatient Department
OPM	Office of the Prime Minister
OR	Odds Ratio
REACH	Renewed Efforts Against Child Hunger
SADC	Southern African Development Community
SAM	Severe Acute Malnutrition
SCU	Special Care Unit
SHIES	Swaziland Household Income and Expenditure Survey
SNNC	Swaziland National Nutrition Council
SUN	Scaling Up Nutrition Initiative
SZL	Swazi Lilangeni
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health Survey
UNHS	Uganda National Household Survey
UGX	Ugandan Shillings
UMA	Union du Maghreb Arabe
USD	United States Dollar
UNECA	United Nations Economic Commission for Africa
WAP	Working Age Population
WFP	World Food Programme

Guidance for Reading this Report

The authors wish to provide initial clarification on several points found in this report:

1. This report is the first instalment of a larger project, the Cost of Hunger in Africa. This report highlights the results of four countries that have completed the study process. Thus, all results only reflect the results of these four countries. These countries were selected to be diverse, and represent various characteristics of the continent; however, these countries cannot yet be identified as continentally representative.

2. The report refers to "children" to highlight data on health, nutrition and additional demographic information. In all cases, when the word "child" or "children" is used, the authors are referring to children under 5 years, unless explicitly stated otherwise.

3. As highlighted in the methodology section of the report, the study is based on the concept of differential probabilities (see Annex 2). Given this approach, the authors refer to various affects as being "associated with undernutrition." This terminology highlights the greater risk of various negative consequences for people who were stunted as children, without attributing definitive causality.

4. Data in this report is collected at national level, from nationally representative data. Data sources and assumptions are catalogued in Annex 5: Assumptions by Country.

EXECUTIVE SUMMARY

Overview of the Cost of Hunger in Africa

1. Cost of Hunger in Africa Executive Summary

1.1 Introduction

The Cost of Hunger in Africa (COHA) Study is a project led by the African Union Commission (AUC) and the New Partnership of Africa's Development (NEPAD) Planning and Coordinating Agency and supported by the UN Economic Commission for Africa (ECA) and the UN World Food Programme (WFP). COHA is a multi-country study aimed at estimating the economic and social impacts of child undernutrition in Africa.

This continent-wide initiative is being led by the Department of Social Affairs, AUC, within the framework of the Revised African Regional Nutrition Strategy (2005-2015), the objectives of the African Task Force on Food and Nutrition Development (ATFFND) and the principles of the AU/ NEPAD's Comprehensive Africa Agriculture Development Programme (CAADP) Pillar 3.

In March 2012, the COHA study was presented to African Ministers of Finance, Planning and Economic Development, who met in Addis Ababa, Ethiopia. The ministers issued Resolution 898 (Annex 1), confirming the importance of the study and recommending it continue beyond the initial stage.

The core implementers of the study are national teams organized 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.

The COHA study is a watershed initiative that highlights a new understanding by African governments of child undernutrition as not only a health or social issue, but also as an economic issue. The initiative also highlights the African Union's strong leadership in addressing development issues, as well as the collaboration among governments and agencies within the continent.

The COHA study is being carried out in 12 countries, namely Botswana, Burkina Faso, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Malawi, Mauritania, Rwanda, Swaziland and Uganda. The data in this document are the results collected from the COHA initiative in the four first-phase countries: Egypt, Ethiopia, Swaziland and Uganda.

1.2 Background

Africa has experienced a recent period of economic growth that has positioned the continent as a key area for global investment and trade. The pace of real gross domestic product (GDP) growth on the continent has doubled in the last decade, and six of the world's fastest growing economies are in Africa. All this has occurred despite some of the highest rates of child undernutrition in the world.

The vast and rising numbers of food insecure and undernourished people continue to pose very serious concerns in Africa. Over the past two years, global food price increases, followed by economic and

financial crises, have pushed more people into poverty and hunger. Globally, as many as 868 million people are affected by food insecurity, with Africa contributing to nearly one third of the world's hungry people.[1]

Child undernutrition is one of the most critical negative effects of hunger. When a child is undernourished before the age of five, his or her body and brain cannot develop at its potential, and they are at risk of cognitive delays. Seventeen countries on the continent have stunting rates above 40 percent, and 36 countries have rates above 30 percent.[2]

COHA also provides a useful opportunity to compare the nutritional situations of several countries across the continent. The countries were selected based on availability of data, geographic distribution, and socio-economic diversity. These differences allow stakeholders to consider the contextual factors that impact the economic burden of child undernutrition.

1.3 Brief Description of the Methodology

COHA is based on a model originally developed in Latin America by the Economic Commission for Latin America and the Caribbean (ECLAC). With support from ECLAC and the African Task Force for Food and Nutrition Security, the model has been adapted for use on the African continent.

The COHA model is used to estimate the additional cases of morbidities, mortalities, school repetitions, school dropouts and reduced physical capacity that can be directly associated to a person's undernutrition before the age of 5.

In order to estimate social impacts for a single year, the model focuses on the current population, identifies the proportion of that population that were undernourished before the age of 5, and then estimates the associated negative impacts experienced by the population in the current year.

Estimates on health, education and productivity are based on the concept of the relative (or differential) risk experienced by individuals who suffer from undernutrition.

Using these risk factors, alongside economic, demographic, nutritional, health and educational data provided by each country team, the model then estimates the associated economic losses incurred by the economy in health, education and potential productivity in a single year.

With the support of experts and representatives from the National Implementation Teams (NITs) of the

Effects of Child Undernourishment through Life	
0-5 years	Undernourished children are at higher risk of anaemia, diarrhoea, fever and respiratory infections. These additional cases of illness are costly to the health system and to families. Undernourished children are at a higher risk of dying.
6-18 years	Stunted children are at a higher risk of repeating grades in school and dropping out of school. Grade repetitions are costly to the education system and to families.
15-64 years	If a child has dropped out of school early and has entered the workforce, he or she may be less productive, particularly in the non-manual labour market. If engaged in manual labour, he or she is likely to have reduced physical capacity and will tend to be less productive. People who are absent from the workforce as a result of undernutrition-related child mortality represent lost economic productivity.

participating countries, a conceptual framework was adapted to the context of Africa. This framework establishes clear linkages between the direct consequences of undernutrition, taking into account the particular structures of the labour market on the continent, as well as the limitations in available data. The result allows the model to clearly define boundaries in the cost analysis, both from a public and individual perspectives, as well as to define a clear differentiation between direct costs and opportunity costs in the results.

The COHA model utilizes a two-dimensional analysis to estimate the costs arising from the consequences of child undernutrition in health, education and productivity. The incidental retrospective dimension analyses the history of child undernutrition in the country in order to estimate the current economic and social consequences. To complement this analysis, a prospective dimension is used to project and generate scenarios for analysis.

1.4 Social and Economic Impact of Child Undernutrition in Four Countries

According to the initial results generated by the COHA study, the equivalent losses shown in Table 1.1 are incurred by each studied country annually as a result of child undernutrition. These losses summarize costs to health, education and productivity, as discussed in more detail below.

TABLE 1.1
SUMMARY OF COSTS OF CHILD UNDERNUTRITION

Country	Losses in local currency	Losses in USD	Equivalent % of GDP
Egypt	EGP20.3 billion	3.7 billion	1.9%
Ethiopia	ETB55.5 billion	4.7 billion	16.5%
Swaziland	SZL783 million	92 million	3.1%
Uganda	UGX1.8 trillion	899 million	5.6%

Source: COHA Study.

1.5 Social and Economic Impact of Child Undernutrition on Health

When a child is undernourished, he or she will have an increased chance of experiencing specific health problems.[3] Research shows that undernourished children under five are more likely to experience

TABLE 1.2
ECONOMIC IMPACT OF CHILD UNDERNUTRITION ON HEALTH

Country	Underweight children	Annual additional morbidity episodes	Economic Cost		Proportion covered by the families
			National currency	USD (millions)	
Egypt	658,516	901,440	EGP1.1 billion	213	73%
Ethiopia	3.0 million	4.4 million	ETB1.8 billion	155	90%
Swaziland	9,645	25,446	SZL60.7 million	7	88%
Uganda	975,450	1.6 million	UGX525.8 billion	254	87%

Source: COHA Study.

cases of anaemia, acute diarrhoeal syndrome (ADS), acute respiratory infection (ARI) and fever. The treatment of undernutrition and related illnesses is a critical, recurrent cost for the health system. For example, treating a severely underweight child requires a comprehensive protocol that is often more costly than the monetary value and effort needed to prevent undernutrition, especially when other diseases are present in parallel. Table 1.2 summarizes the total costs incurred by each country as a result of additional morbidities.

Research shows that undernourished children under five have an increased risk of dying.[4] In this case, the costs associated with mortality are identified in losses to national productivity. If these children were able to reach adulthood, they could have contributed to the economy. Table 1.3 highlights the number of children who died from causes associated with undernutrition and the percent of child mortalities that can be attributed to undernutrition.

TABLE 1.3
CHILD MORTALITIES ASSOCIATED WITH UNDERNUTRITION

	Number of mortalities associated with undernutrition (last 5 years)	% total child mortalities associated with undernutrition
Egypt	28,102	11%
Ethiopia	378,591	28%
Swaziland	1,351	8%
Uganda	110,220	15%

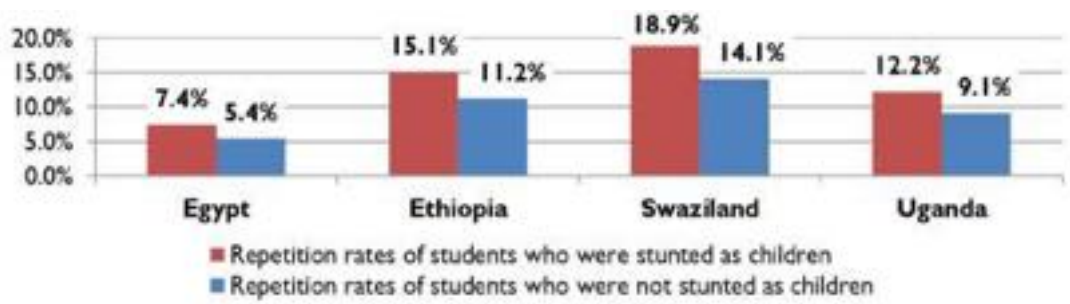
Source: COHA Study.

1.6 Social and Economic Impact of Child Undernutrition in Education

1.6.A Impact of Undernutrition on Repetition

There is no single cause for students to repeat grades and dropout of school; however, there is substantive research that shows that students who were stunted before the age of five will have reduced cognitive capacity and are more likely to underperform in school and to repeat grades.[5] Figure 1.1 illustrates the repetition rates for stunted children as compared to non-stunted children in each of the countries.

FIGURE 1.1
REPETITION RATES BY NUTRITIONAL STATUS



Source: COHA Study.

Repetitions are costly both to the family of the student and to the education system, as both need to invest resources for an additional year of schooling. Table 1.4 highlights the economic costs of additional repetitions associated with students' childhood undernutrition. A more detailed analysis shows that the cost of a repetition in secondary school is significantly higher than in primary school; however, the majority of repetitions occur during primary school years.

TABLE 1.4
ECONOMIC COSTS OF GRADE REPETITIONS ASSOCIATED WITH CHILD UNDERNUTRITION

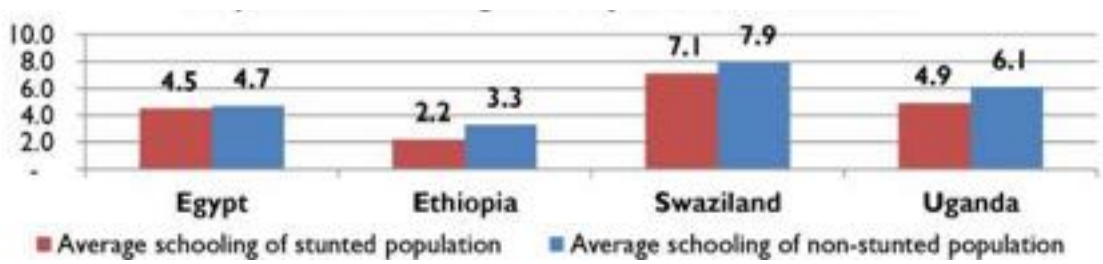
Country	Number of stunted children of school age	% of repetitions associated with stunting	Economic Cost		Proportion covered by the education system
			Local currency	USD	
Egypt	7.9 million	10%	EGP271 million	49 million	61%
Ethiopia	17.5 million	15.8%	ETB93 million*	8 million*	36%
Swaziland	168,228	10.1%	SZL6 million	0.7 million	70%
Uganda	5.8 million	7.3%	UGX20 billion	9.5 million	46%

Source: COHA Study.
*Only considers primary school

1.6.B Impact of Undernutrition on Retention

Students who are undernourished are also more likely to drop out of school than those who experience healthy childhoods.[6] The data from the first-phase countries indicates that the expected number of schooling years achieved by a student who was stunted is as much as 1.2 years lower than the expected schooling for a student who was never undernourished. The graph in Figure 1.2 illustrates these levels of expected schooling achievement. As shown, countries with low overall schooling achievement also illustrate a higher differential achievement between children who were stunted and those who were never undernourished.

FIGURE 1.2
EXPECTED SCHOOLING YEARS BY NUTRITIONAL STATUS



Source: COHA Study.

The economic impact of school dropout does not, however, incur while a person is of school age. Rather, the economic costs are incurred when the population is of working age, as people may be less productive and earn less income, as a result of fewer years of schooling achieved.[7] Thus, considerations of losses associated to lower schooling are described in the following section.

1.7 Social and Economic Impact of Child Undernutrition in Productivity

1.7.A Losses in Potential Productivity

The COHA model estimated that between 40 to 67 percent of the working-age population in the four countries 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.[8]

The impact of this lower productivity varies depending on the particular labour structure of the country and the type of economic achievement in which the individual is engaged. For people engaged in non-manual sectors, the lower educational levels achieved by those affected by stunting is reflected in a lower income.[9] As for stunted workers engaged in manual activities, research shows that they tend to have less lean body mass[10] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[11] As a result, losses in productivity are classified as losses in potential productivity in manual and non-manual activities, which are summarized in Table 1.5.

TABLE 1.5
LOSSES IN PRODUCTIVITY ASSOCIATED WITH CHILD UNDERNUTRITION

Country	Stunted population of working age (15-64)		Lost productivity in manual activities		Lost productivity in non-manual activities	
	Number	Estimated Prevalence	National Currency	USD	National Currency	USD
Egypt	21 million	41%	EGP10.7 billion	2.0 billion	EGP2.7 billion	484 million
Ethiopia	26 million	67%	ETB12.9 billion	1.1 billion	ETB625 million	53 million
Swaziland	283 618	40%	SZL126 million	15 million	SZL251 million	30 million
Uganda	8 million	54%	UGX417 billion	201.5 million	UGX241 billion	116.5 million

Source: COHA Study.

1.7.B Losses in Productivity due to Working Hours Lost as a Result of Mortality

As mentioned in the health section of this report, undernourished children have a higher risk of dying compared to children who are not underweight. In addition to the clear social problems associated with increased mortality, there is also a related economic cost. The COHA model estimates the proportion of child mortalities that is associated with undernutrition and then estimates the potential productivity of those individuals, had they lived and been part of the workforce (15-64) in 2009. The model uses current income data to estimate this lost productivity in terms of both lost income and lost working hours. According to these estimates, the working hours lost are equivalent to between 0.7 to

8.3 percent of the current workforce as a result of undernutrition-related mortalities. Considering the present value of these working hours lost, in many countries, this is the most significant productivity cost associated with undernutrition.

TABLE 1.6
LOSSES IN PRODUCTIVITY DUE TO MORTALITY ASSOCIATED WITH CHILD UNDERNUTRITION

	Total annual working hours lost	Percentage of Current Workforce	Cost in national currency	Cost in USD
Egypt	857 million	0.7%	EGP5.4 billion	988 million
Ethiopia	4.7 billion	8.3%	ETB40.1 billion	3.4 billion
Swaziland	37 million	2.4%	SZL340 million	40 million
Uganda	943 million	3.8%	UGX657billion	317 million

Source: COHA Study.

1.8 Scenarios

The model generates a baseline, to be compared to the nutritional goals established in each country. These scenarios are constructed based on the estimated costs of the children born in each year, from 2009 to 2025 (net present value). While the previous sections calculated the costs incurred in a single year by historical undernutrition, these values represent the projected costs and savings generated by children born during and after 2009.

Baseline Scenario. The Cost of Inaction. Progress in reduction of stunting and underweight child stops. In this scenario, the progress of reduction of the prevalence of undernutrition stops at the level achieved in 2009. Although highly unlikely, it serves as a basis for estimating the saving for other scenarios.

Scenario #1. Cutting by Half the Prevalence of Child Undernutrition by 2025. In this scenario, the prevalence of underweight and stunted children would be reduced to half of the value of the reference year of 2009.

Scenario #2. The Goal Scenario. Reduce Stunting to 10 percent and Underweight children to 5 percent, by 2025. In this scenario, the prevalence of stunted children would be reduced to 10 percent and underweight children with less than five years to 5 percent.

As presented in Table 1.7, the potential economic benefits illustrate an opportunity to help build a case for increased investment in nutrition. With this information countries can have a benchmark for increasing investment, while at the same time, being able to compare this with the potential economic gains of reduced stunting rates.

TABLE 1.7
COMPARISON OF PROJECTED COSTS AND SAVINGS OF REDUCED STUNTING RATES IN TWO SCENARIOS

Country	Scenario #1: Halving the Prevalence of Child Undernutrition by 2025			Scenario #2: The Goal Scenario: **"10 and 5 by 2025"**		
	% Annual reduction of stunting required*	Total savings to be achieved	Average annual savings	% Annual reduction of stunting required*	Total savings to be achieved	Average annual savings
Egypt	0.9%	EGP11.7 billion	EGP732 million (USD133 million)	1.2%	EGP14.5 billion	EGP907 million (USD165 million)
Ethiopia	1.5%	ETB71 billion	ETB4.4 billion (USD376 million)	2.3%	ETB148 billion	ETB9.2 billion (USD784 million)
Swaziland	0.9%	SZL402 million	SZL25 million (USD3 million)	1.2%	SZL511 million	SZL32 million (USD4 million)
Uganda	1.1%	UGX2.8 trillion	UGX179 billion (USD88 million)	1.6%	UGX4.3 trillion	UGX267 billion (USD132 million)

Source: COHA Study.
*Percentage points

1.9 Conclusions

The COHA study is an important step forward to better understand the role that child nutrition and human development can play as a catalyser, or as a constraint, in the social and economic transformation of Africa.

Health Sector

- Child undernutrition generates health costs equivalent to between 1 and 11 percent of the total public budget allocated to health. These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children and the protocols necessary for their treatment.
- In the larger proportion of these episodes, 69 to 82 percent, do not seek medical attention or are treated at home, increasing the risk for complications and evidencing an unmet demand for health care.

Eliminating the inequality in access to health care is a key element of the social transformation agenda in Africa, which requires, as a precondition, a reduction of the rural/urban coverage gap. As health coverage expands to rural areas, there will be an increase of people seeking medical attention; this can potentially affect the efficiency of the system to provide proper care services. This study illustrates that a reduction of child undernutrition could facilitate the effectiveness of this expansion by reducing the incremental burden generated by the health requirements of underweight children.

Education Sector

- Children who were stunted experienced higher repetition rates in school ranging from 2 to 4.9 percent.
- Moreover, 7 to 16 percent of all grade repetitions in school are associated with the higher incidence of repetition among stunted children, the majority (90 percent) of which occurs in primary school.
- These numbers suggest that a reduction in stunting prevalence could support an improvement in school quality, as it would reduce preventable burdens to the education system.

Increasing the educational levels of a population, and maximizing the productive capacity of Africa's population dividend, is a key element in increasing competitiveness and innovation on the continent. This represents a particular opportunity in sub-Saharan Africa, where the population under 15 years is estimated to be 40 percent of the total population. Children and youth must be equipped with the skills necessary for competitive labour. Thus, underlying causes for low school performance and early dropout must be addressed. As there is no single cause for this phenomenon, a comprehensive strategy must be put in place that considers improving the quality of education and the conditions required for school attendance. This study demonstrates that stunting is one barrier to attendance and retention that must be removed to effectively elevate educational levels and improve individuals' labour opportunities in the future.

Labour Productivity

- 52 percent of the working age population in the analysed countries is currently stunted.
- This population has achieved, on average, lower school levels than those who did not experience growth retardation, ranging from 0.2 to 1.2 years of less schooling.
- The working-age population has been diminished by 1 to 8 percent due to child mortality associated with undernutrition.

On the continent, more than half of the population is expected to live in cities by 2035.[12] An important component to prepare for this shift is to ensure that the workforce is ready to make a transition towards a more skilled labour, and economies are able to produce new jobs to reduce youth unemployment. By preventing child stunting, thus avoiding the associated loss in physical and cognitive capacity that hinders individual productivity, people can be provided with a more equal opportunity for success.

Potential Economic Benefits

- The model estimated that a reduction of the prevalence of undernutrition to half of the 2009 level by the year 2025 can generate annual average savings from USD3 million to USD376 million for the analysed countries.

This economic benefit, which would result from a decrease in morbidities, lower repetition rates and an increase in manual and non-manual productivity, presents an important economic argument for the incremental investments in child nutrition. This does not only impact those people affected by undernutrition, but the society as a whole.

Evidence-Based Policy and South-South Collaboration

- COHA is an important example of how South-South collaboration can work to implement cost-effective activities in development and knowledge sharing. It demonstrated that developing and implementing tools that are sensitive to the particular conditions of the continent is feasible.
- It illustrates the valuable role that data and government-endorsed research can play in shedding light on pertinent issues on the continent. Although the availability of uniform and readily available data in Africa is limited, the COHA results have shown that analysis has the potential to bring the issue of child nutrition to the forefront of the development arena.

1.10 Policy Recommendations

Stunting is a useful indicator to evaluate effective social policies

The causes of and solutions for chronic hunger are linked to social policies across numerous sectors. As such, stunting reduction will require interventions from the health, education, social protection and social infrastructure perspectives. Stunting can be an effective indicator of success in larger social programmes.

Strong political will can be reflected in aggressive goals

This study encourages countries not to be content with "acceptable" levels of stunting; equal opportunity should be the aspiration of the continent. In this sense, it is recommended that aggressive targets are set in Africa for the reduction of stunting that go beyond proportional reduction, to establish an absolute value as the goal for the region at 10%. Countries with high and very high levels of stunting, of over 35%, might pursue an interim goal of reduction to 20%, but for countries that have been able to achieve progress enough to reduce stunting to below 35%, the establishment this target would be acceptable and desirable.

A multi-causal problem requires a multi-sectoral response

The achievement of this aggressive goal cannot be reached from just the health sector. To have a decisive impact on improving child nutrition, a comprehensive multi-sectoral policy must be put in place, with strong political commitment and allocation of adequate resources for its implementation.

Efficient rural economies and effective social protection schemes are key drivers for the sustained reduction of child undernutrition

Fostering rural economies, by enhancing the productivity of agricultural activities and expanding the non-agricultural activities, is a key element is accelerating the reduction rate of malnutrition. Efforts carried-out by CAADP and the development of value chains of strategic agricultural commodities can be key elements to focus efforts on in the coming years. Additionally, it is important to consider the role of social protection programmes in reducing hunger and malnutrition, in order to achieve the appropriate combination of transfers and services that is adequate for each context.

Sustainability requires strong national capacity

To ensure sustainability of these actions, whenever possible, the role of international aid must be complementary to nationally led investments, and further efforts have to be made in ensuring the strengthening of national capacity to address child undernutrition.

Monitoring is needed for progress

To measure short-term results in the prevention of stunting, a more systematic approach with shorter periodicity is recommended, such as two years between each assessment. As prevention of child undernutrition should target children before two years of age, these results would provide information to policy makers and practitioners on effectiveness of social protection and nutrition programmes.

Long-term commitment is necessary to achieve results

The COHA initiative represents a valuable opportunity to place nutrition within a strategy to ensure Africa's sustainable development. As the deadline for Millennium Development Goals nears, new priorities and targets will be set that will serve as a guide for development policies in years to come. It is recommended that the prioritization of the elimination of stunting be not only presented in the traditional forums, but also included in the wider discussions of development, as a concern for the economic transformation of Africa.

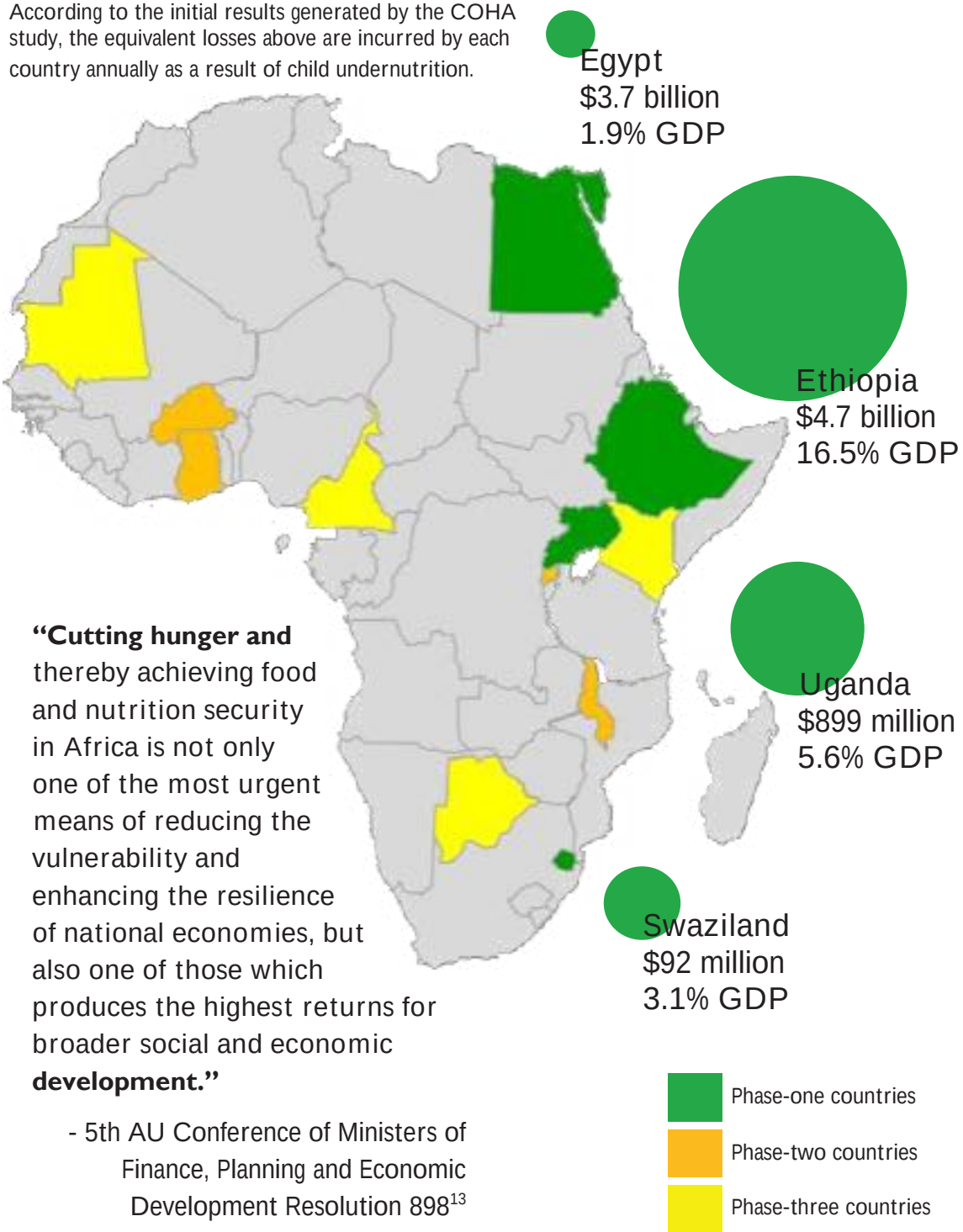
1.11 Pending questions and research opportunities

The COHA represents an important step forward in shedding light on the importance of nutritional investments, as a fundamental basis for human development. Nevertheless, the process also served as an important exercise to identify gaps in knowledge that can help increase the dimensions of the analysis, that include:

- Sub-national differences in the social and economic impacts of child undernutrition. There is an opportunity to raise the advocacy on sub-regional and local actions by developing a model to distribute the cost of hunger by region and further engage local governments and communities in the implementation of local actions to improve nutrition.
- **The impact of early child malnutrition on women's contributions to the household.** As most women in Africa are responsible for household chores and caring activities, their contributions are not accurately measured by proxy of labour productivity, rather, by their capacity to provide wellbeing in the household. Nevertheless, the intensity in which this capacity is affected as a consequence of child malnutrition in not comprehensibly address in current literature.
- There are still gaps of region-specific risk analysis in Africa, particularly in educational outcomes and labour productivity. A comprehensive analysis of a longitudinal study in Africa, can also serve as an important source of information to update further the relative risks faced by undernourished children, in different aspects of their lives.
- Complementary analysis could be carried out to further understand the sectoral consequences of undernutrition. Additional multi-variable analysis could also help to explain variations across countries.

1.12 COHA Countries and 1st Phase Results — Social and Economic Impact of Child Undernutrition

According to the initial results generated by the COHA study, the equivalent losses above are incurred by each country annually as a result of child undernutrition.



"Cutting hunger and thereby achieving food and nutrition security in Africa is not only one of the most urgent means of reducing the vulnerability and enhancing the resilience of national economies, but also one of those which produces the highest returns for broader social and economic **development."**

- 5th AU Conference of Ministers of Finance, Planning and Economic Development Resolution 898[13]

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PART I:

A Model for Africa: Methodology & Conceptual Foundations

2. Introduction

2.1 Why is Child Undernutrition Important?

Recently, Africa has been experiencing a steady economic growth that has positioned the continent as a key region for global investment and trade. The pace of real gross domestic product (GDP) growth on the continent has doubled in the last decade, and six of the world's fastest growing economies are in Africa.[1]

While this growth has been recorded despite some of the highest rates of child undernutrition in the world, the continent is still short of its full potential.

Human capital is the foundation of economic development. The 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 growth opportunities, increased efforts are needed for cost-effective interventions that address the nutritional situation of the most vulnerable members of the society.

Achieving nutrition and food security would generate immediate impact on the achievement of the Millennium Development Goals (MDGs). If child undernutrition were reduced, there would be a direct improvement in child mortality rates, as undernutrition is the single most important contributor to child mortality.[2] If girls were not undernourished, they would be less likely to bear underweight children. Further, healthy children would be more productive as adults and would have a higher chance of breaking the cycle of poverty for their families.

Undernutrition leads to a significant loss in human and economic potential. Studies carried out in Zimbabwe show that lost schooling equivalent to 0.7 grades corresponds to a 12 percent loss in wealth throughout a lifetime.[3] In Ghana, studies show that for every year of delayed school entry, there was a 3 percent loss of wealth throughout the lifetime.[4] Additionally, studies in Brazil indicated that working stunted people have less lean body than their non-stunted counterparts.[5] This can correspond to reduced ability to earn income.[6]

Recently, a panel of expert economists at a Copenhagen Consensus Conference concluded that fighting malnutrition should be the top priority for policy makers and philanthropists. At that conference, Nobel Laureate economist, Vernon Smith declared, "One of the most compelling investments is to get nutrients to the world's undernourished. The benefits from doing so – in terms of increased health, schooling, and productivity – are tremendous."[7] Improving the nutrition status is therefore a priority area that needs urgent policy attention to accelerate socio-economic progress and development in Africa.

However, despite a compelling economic case for nutrition, investments with apparent shorter-term returns are often prioritized in social budgets. This is in part due to a lack of credible country-specific

data on potential returns in nutrition investments, which could be seen in school performance and in labour productivity in the medium-term. Further, nutrition is often looked at as a health issue, without considering the rippling social impact it has on other areas of development

Hence, stronger efforts are required to sensitize the general population, policy makers, and development partners on the high cost of undernutrition, in order to strengthen national and international political and financial commitments and to ensure that young children, as wells as entire societies, do not continue to suffer from the consequences of child undernutrition in Africa.

Despite the aforementioned challenges, efforts continue, both at continental and global levels, to address the issues of undernutrition and hunger. At the regional level, these efforts include initiatives and strategies such as the *African Regional Nutrition Strategy*,[8] the *Comprehensive Africa Agriculture Development Programme* (CAADP), especially CAADP Pillar III, which focuses on reducing hunger and improving food and nutrition security,[9] the *Pan African Nutrition Initiative* (PANI),[10] *Framework for African Food Security* (FAFS),[11] *Africa Ten Year Strategy for the Reduction of Vitamin and Mineral Deficiencies* (ATYS-VMD)[12] and African Day for Food and Nutrition Security (ADFNS).[13] At the global level, initiatives include *REACH*,[14] *Purchase for Progress* (P4P),[15] *Scaling Up Nutrition* (SUN),[16] *Feed the Future* (FTF),[17] the "1,000 Days" partnership,[18] as well as the *Abuja Food Security Summit* of 2006.[19] All these efforts are designed to reduce hunger, malnutrition and vulnerability, in a bid to also achieve the MDGs.

Within the framework of the African Regional Nutrition Strategy (ARNS 2005-2015), the objectives of the African Task Force on Food and Nutrition Security (ATFFND) 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 (ECA), and the World Food Programme (WFP) undertook 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 collaboration 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 undernutrition. The results provide compelling evidence to guide policy dialogue and advocacy around the importance of preventing child undernutrition. Ultimately, it is expected that the study will encourage revision of current allocation practices in each participating country to ensure provision of the human and financial resources needed to effectively combat child undernutrition, specifically during the first 1,000 days of life, when most of the damage occurs.[20]

2.2 Current Food and Nutrition Situation in Africa

Globally, there has been progress in reducing both stunting (low height-for-age) rates and the number of stunted children in the last 20 years. In Africa, the proportion of stunted children reported has decreased from 41.6 percent (1990) to 35.6 percent (2011) (see Table 2.1). Nevertheless, for that same period, the number of stunted children has increased from 45.7 million to 56.3 million,[21] evidencing that stronger efforts must be put in place to have a decisive impact. The biggest proportion of these children are located in East Africa., where 22.8 million represent more than 40 percent of all stunted children on the continent. Together with West Africa, they account for three out of every four stunted children on the continent.[22]

TABLE 2.1
ESTIMATED PREVALENCE AND NUMBER OF STUNTED CHILDREN UNDER FIVE YEARS OF AGE (MODERATE OR SEVERE), BY UN REGION: 1990, 2010, 2011

	Prevalence estimate (%)			Number (million)		
Region	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	18.0	22.6	22.8
Middle	47.2	35.6	35.0	6.4	7.8	7.8
Northern	28.6	21.3	21.0	6.3	5.0	5.0
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 Estimates.[23]

The vast and rising numbers of food insecure and undernourished people continue to pose very serious concerns in Africa. Over the past few years, global food price increases, followed by economic and financial crises, 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 20 years, Africa has fallen back, reporting an increase in the number of undernourished people from 175 million to 239 million (see Figure 2.2).[24] Africa's share in the world's undernourished population has also increased from 18 percent to 28 percent,[25] evidence the need for stronger efforts in improving food security.

Severe food insecurity and malnutrition have been recurrent in Africa, particularly in the Horn of Africa and the Sahel. The current food and nutrition crisis in the Horn of Africa is the most severe food security emergency in the world today. More than 12 million people in that region require emergency assistance to save lives, support livelihoods, prevent further deterioration in food security and build resilience to mitigate the impact of future crises. Similarly in 2012, several Sahel countries were once again at high risk of food insecurity and malnutrition.[26]

Figure 2.1 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 access diets containing

TABLE 2.2
NUMBER OF UNDERNOURISHED PEOPLE, BY REGION
(in millions)

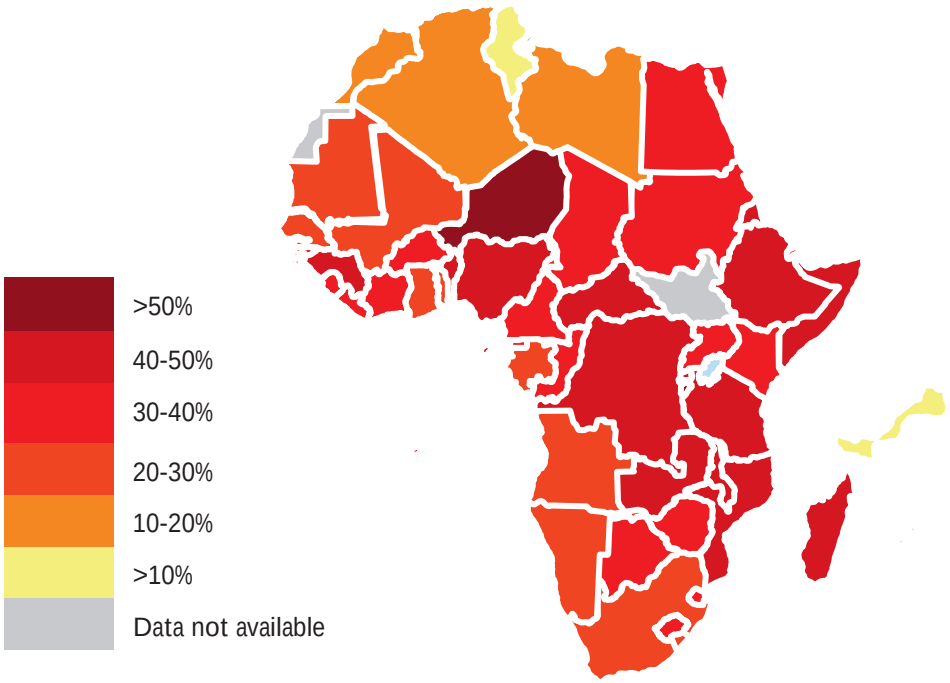
Region	1990-1992	Proportion	2010-2012	Proportion
Africa	175	18%	239	28%
Asia	739	74%	563	65%
Latin America & Caribbean	65	7%	49	6%
Oceania	1	0%	1	0%
World	1000		868	

Source: *The state of food insecurity in the world 2012*, Report, Food and Agriculture Organization (FAO).[27]

the essential vitamins and minerals required for optimum health and productivity.[28]

Erratic rains in 2011 negatively affected cereal and pasture production through much of Africa. Localized cereal deficits for the 2011/2012 season and sustained high food prices place 10 million people at risk of food insecurity.[29]

FIGURE 2.1
STUNTING RATES BY COUNTRY



Source: Data from "WHO Global Database on Child Growth and Malnutrition," WHO.[30]

The first Millennium Development Goal (MDG 1) calls for the eradication of extreme poverty and hunger.[31]The nutrition status of children under five years of age is one of the key indicators used to assess progress towards MDG 1. Latest data show that only nine of the world's 63 developing countries are on track to reaching Target 1C, MDG 1, i.e. to reduce by halve the prevalence of underweight children. Only three of these are from Africa.[32] Unless coherent national strategies are urgently put into place and fully supported to orchestrate well-coordinated and decisive priority actions, any small gains are likely to be reversed.

Achievement of MDG 1 is crucial for national socio-economic progress and development. Failure to achieve it jeopardizes the realization of all the other MDGs, including goals to reach universal primary education (MDG 2), promote gender equality and empower women (MDG 3), reduce child mortality (MDG 4) and improve maternal health (MDG 5).[33]

2.3 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 growing evidence from across Africa that despite vibrant economic growth in many countries, equitable social growth has not improved as much, particularly with regards to poverty reduction and job creation.

Experience from other parts of the world – most notably Latin America and Asia – confirmed 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 strong impacts on poverty reduction.

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 short-term investments are prioritized in budget allocations. Further, food security and response to emergency hunger situations often take 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 5th 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 nutrition, in order to inform, raise awareness, build consensus and catalyse action towards increasing the attention on this issue.

As a result, *Resolution 898 (XLV) the Cost of Hunger in Africa: Social and Economic Impacts of Child Undernutrition* was adopted, confirming the importance of the study and recommending it to continue beyond the initial stage. [34]

"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: Social and Economic Impacts of Child Undernutrition

This mandate was a clear guideline for the AUC to integrate the COHA study into the advocacy efforts of the ARNS (2005-2015)[35] and use the results of the study as a tool to help mainstream nutrition in the development context. 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 from the AUC, NEPAD, ECA, WFP and other partners to report on the tangible consequences of child undernutrition in Africa.

2.4 Adapting a Methodology for Africa: a Consultative Process

The model for the COHA study represents a step forward in estimating the social and economic consequences of child nutrition in Africa. Several national and regional efforts have been implemented globally and in the region. Notable past 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,[36] which developed similar country-level estimations in selected countries world-wide. COHA, however, represents the only effort constructed for the African continent, involving regional nutritional experts, who with the support of country teams, provided recommendations during the adaptation process. The model developed by ECLAC to estimate the social and economic consequences on child undernutrition in LAC[37], 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 undernutrition 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 for 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 and 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 Force of 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 lead the initiative, ECA/ECLAC coordinated its implementation and 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/ATFFDN: A high-level Steering Committee 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, 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 data sets 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 (IGAD), Southern African Development Community (SADC) and Union du Maghreb Arabe (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 undernourishment 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 2.3). 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.

2.5 Guiding Principles

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

TABLE 2.3
COUNTRY SELECTION CRITERIA

Country	AU Region	Data availability (Survey Dates)[38]	Proportion of under-nourishment in total pop. (%)[39]	Crude birth rate (births per 1,000 pop.)[40]	<5 mortality rate, (per 1,000 live births)[41]	UN HDI value ranking[42]	Prevalence of Stunting in children <5 years[43]
Botswana	SADC	# CSO/UNICEF.	27.9	24	30	118	31.4
Burkina Faso	ECOWAS	2010, 2003, 1998-99 Standard DHS	25.9	43	152	181	35.1
Cameroon	ECCAS	2004, 1998, 1991 Standard DHS	15.7	37	131	150	32.5
Egypt	CEN-SAD, COMESA	2008, 2005, 2000 Standard DHS	<5	23	24	113	44.2
Ethiopia	IGAD, COMESA	2010, 2005, 2000 Standard DHS	40.2	32	86	174	28.6
Ghana	ECOWAS	2008, 2006, 1998 Standard DHS 2006 MICS	<5	32	81	135	35.2
Kenya	IGAD, COMESA	2008-09, 2003, 1998 Standard DHS	30.4	38	79	143	47.8
Malawi	SADC, COMESA	2010, 2004, 2000 Standard DHS	23.1	44	95	171	23
Mauritania	UMA	2003-04 Special 2000-01 Standard DHS	…	34	113	159	44.2
Rwanda	COMESA	2010, 2005, 2000 Standard DHS	28.9	41	68	166	40.4
Swaziland	SADC, COMESA	2006-07 Standard DHS 2002 MICS	…	30	115	140	33.4
Uganda	IGAD, COMESA	2010 Standard AIS 2006, 2000-01 Standard DHS	34.6	46	98	161	30.7

2.5.A National ownership of the process

One of the guiding principles in the development of the COHA 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 challenge 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.

2.5.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. 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, establish a task force for data collection and develop an initial communication strategy. In this workshop, a plan was developed by the NIT that served as a guide for future activities.

The Regional Secretariat supported the capacity building process of the NIT by holding regular teleconferences with representatives from each team and by providing technical assistance in the analysis of the data and initial results. The national ownership of the study was emphasized by creating a NIT-led approach and 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.

2.5.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 the relevant initiatives that contribute to reducing child undernutrition.

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.*[44]

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 populations and the loss in manual and non-manual productivity, helping thus, to position nutrition in the wider development agenda. REACH facilitators are also typically members of the NIT in each country where REACH is present.

2.5.D Strategic advocacy for change

The fourth guiding principle of the COHA is to ensure that the results reach stakeholders with the capacity to make change. The communication component of the COHA is a basic element 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 understanding on the consequences of child undernutrition. Thus, a six-step approach has been developed, as follows:

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

Each NIT was provided 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.

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3. Brief Description of the Model

The following text is adapted from Rodrigo Martínez and Andrés Fernández, Model for analysing the social and economic impact of child undernutrition in Latin America, Naciones Unidas, CEPAL, Social Development Division, Santiago De Chile, 2007, in collaboration with the authors.

3.1 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.[1]

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

KEY TERMS AND CONCEPTS FOR COHA MODEL*

Chronic hunger: The status of people whose food intake regularly provides less than their minimum energy requirements leading to undernutrition.[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 undernutrition.[3]

Intrauterine growth restriction (IUGR): An infant suffering from IUGR is defined as being below the 10 percent percentile of the recommended gender-specific birth weight for gestational age reference curves.[4]

Low birth weight (LBW): A new-born is considered to have low birth weight when he or she weighs less than 2,500 grams.[5]

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 undernutrition (food deprivation) and obesity (excessive food intake in relation to energy requirements).[6]

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. The model uses it as the indicator to analyse the impact on educational performance and productivity.[7]

Underweight: Measured by comparing the weight-for-age of a child with a reference population of well-nourished and healthy children. The model utilizes it to analyse the impact of child undernutrition on health.[8]

*All terms adapted for COHA based on sources indicated.

services and care taker's time needed to ensure adequate nutrition status for an active and healthy life at all times for all people.[9] A direct and measurable consequence of nutrition insecurity is low birth weight, underweight (low weight-for-age) and/or stunting (low 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, infancy and pre-school, school years or adult life. This is because the nutrient requirements and the needs are different for each stage.[10]

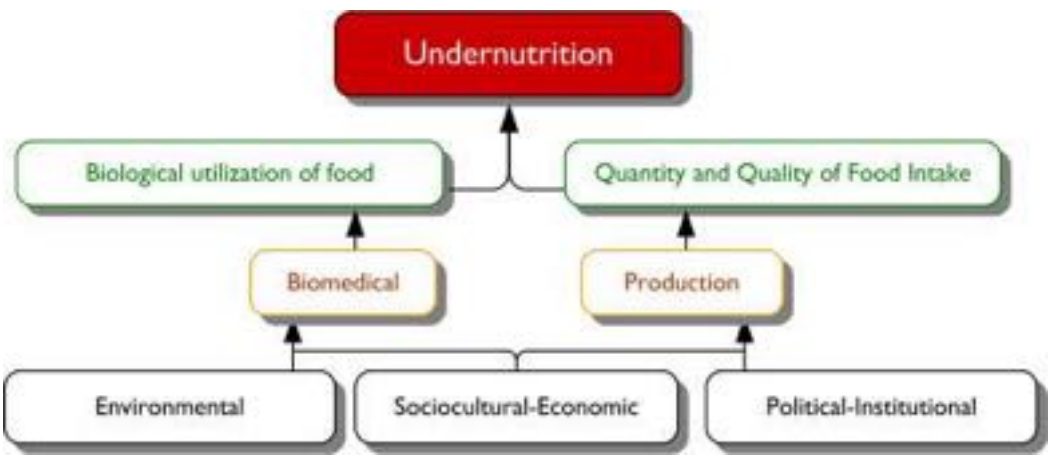
The following section explains central elements, considered in the model, to estimate the effects and costs of child undernutrition based on the concepts mentioned above, along with a brief description of the causes and consequences of undernutrition. The discussion also describes the dimension of analysis and the principal methodological aspects used to interpret the results.[11]

3.2 Causes of Undernutrition

The main factors associated with undernutrition as a public health problem can be grouped into the following: environmental (natural or entropic causes), sociocultural-economic (linked to poverty and inequality) and political-institutional. Together, these factors increase or decrease biomedical access and productivity abilities, through which they determine the quantity and quality of dietary intake and the absorption capacity, which constitute the elements of undernutrition.[12]

Each of these factors increases or decreases the likelihood of a person to suffer from undernutrition (see Figure 3.1). 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 level of undernutrition.[13]

FIGURE 3.1
CAUSES OF UNDERNUTRITION



Source: Modified from 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.[14]

Environmental factors define the surroundings in which the subject and his or her family live. These include the risks stemming from the natural environment itself and its cycles (floods, droughts, frosts, earthquakes and other phenomena), as well as those produced by humans themselves (such as water and air pollution, contamination of food, expansion of agriculture, etc.). The sociocultural-economic determinants include elements associated with poverty and inequality, 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[15]

Production factors include those directly associated with the production and access to food by the population at risk. 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.[16]

Finally, biomedical factors take into account the individual's susceptibility to undernutrition, insofar as deficiencies in certain elements limit the capacity to make biological use of the food consumed (regardless of quantity and quality).[17]

3.3 Consequences of Undernutrition

Child undernutrition has long-term negative effects on a person's life, most notably in the aspects of health, education, and productivity (see Figure 3.2).[18] 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 undernutrition grows.

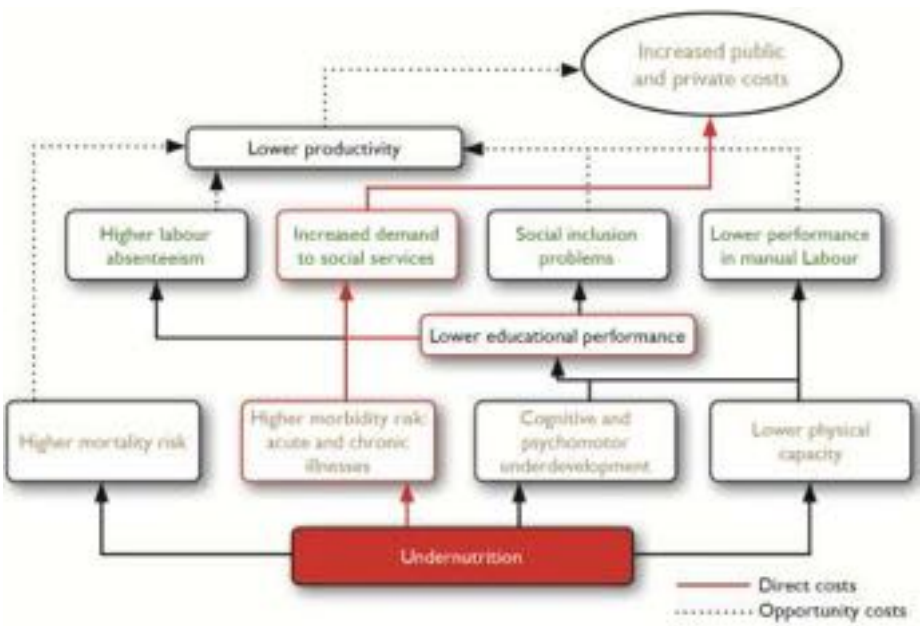
Undernutrition may have immediate or evolving impacts throughout a person's lifetime; individuals who suffered from undernutrition during early years of their life cycle (including intrauterine) are more likely to be undernourished later in life.[19] Health studies have shown that undernutrition leads to increased appearance or intensified severity of specific pathologies and increases the chance of death during specific stages of the life cycle.[20] The nature and intensity of the impact of undernutrition on pathologies depends, in part, on the epidemiological profile of a given country.

In education, undernutrition affects student performance through disease-related weaknesses and results in limited learning capacity associated with deficient cognitive development.[21] 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.[22]

Later in life, individuals may experience lower physical capacity as a result of stunting. 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.[23]

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 undernutrition (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 (TC^U), the function can be written as:

FIGURE 3.2
THE COHA FRAMEWORK OF SOCIAL AND ECONOMIC CONSEQUENCES OF CHILD UNDERNUTRITION IN AFRICA



Source: Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America*[24], based on consultations carried out by authors.

Note: The COHA Framework of Consequences of Undernutrition, proposed in the ECLAC model, was adapted for the African context. This framework provides the basis for the conceptual elements which define the COHA model. It was agreed upon in the first-phase phase of the study by a continental steering committee and has been validated by the ATFFND.

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

In the area of health, the high probability resulting from the epidemiological profile of individuals suffering from undernutrition 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 undernutrition in each age group, the probability that a particular group will suffer from diseases because of undernutrition, 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) and cases treated at home. 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 undernutrition increase costs to the educational system (ESC^U), considering only the differential risk between repeating rates of the undernourished and the overall repeating rates. 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 undernutrition is equal to the loss in human capital (HK) incurred by a society, stemming from a lower educational level achieved by stunted 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 child deaths caused by undernutrition (MMC^U), based on the recorded levels of productivity in the study year. 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 undernutrition, the model considers its consequences on health, education and productivity by translating them into costs. For more detailed information on the model and the functions, see Annex 2, Supplemental Methodological Information.

3.4 Dimensions of Analysis

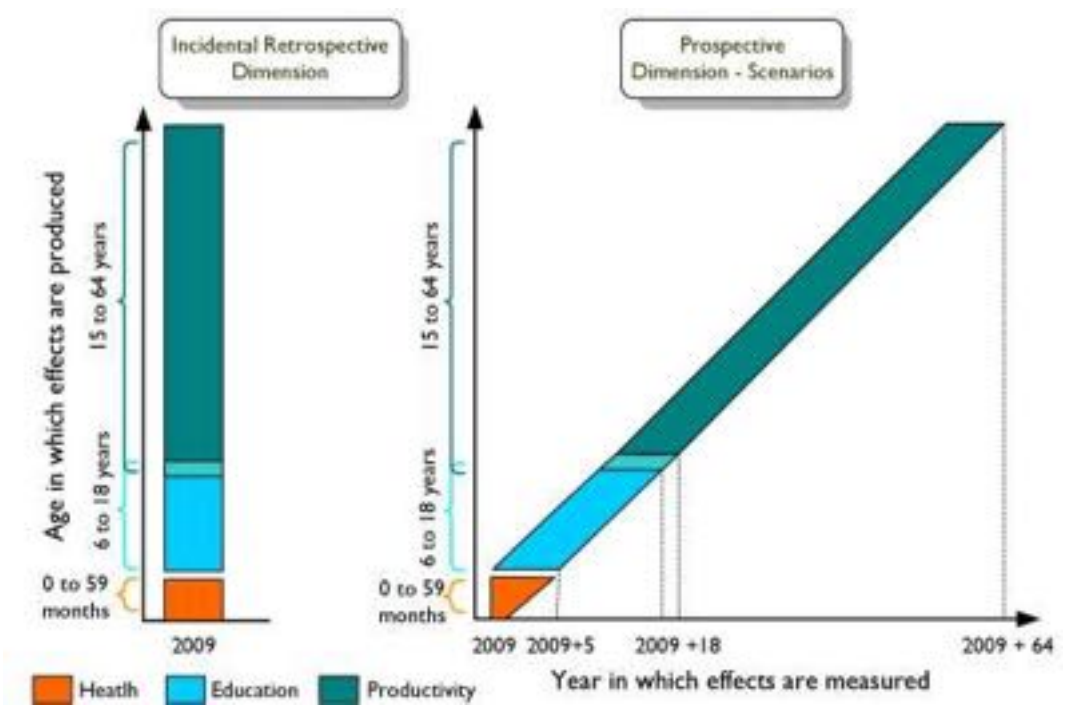
Considering that a country's undernutrition situation and the consequences thereof reflect a specific epidemiological and nutritional transition process, a comprehensive analysis involves estimates of the current situation. This can be extrapolated from previous transitional stages.

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

1. *Incidental retrospective dimension* focuses on the population in the study year, including those who would have been alive in the study year. they had not died of undernutrition related causes. The retrospective dimension estimates the nutritional situation of individuals before they reached 5 years of age to identify the related economic costs in the study year. Thus, using detailed economic and demographic data, it is possible to estimate the health costs of pre-school boys and girls who suffer from undernutrition during the year of analysis; the education costs stemming from the children currently in school who suffered from undernutrition during the first five years of life; and the economic costs due to lost productivity by working-age individuals who were exposed to undernutrition before the age of five. For detailed information on the data used, see Annex 5: Assumptions by Country.
2. *Prospective or potential savings dimension.* This dimension focuses on a single cohort of children under 5 in a the study base 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 of that cohort of children. Based on this analysis, potential savings derived from actions taken to achieve nutritional objectives can be estimated.

As shown in Figure 3.3, the incidental retrospective dimension includes the social and economic consequences of undernutrition in a specific year (for the purposes of this report 2009 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 undernutrition recorded in the reference year of the study. These are 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 undernutrition. The prospective dimension is the basis for establishing scenarios to estimate the

FIGURE 3.3
DIMENSIONS OF ANALYSIS,
BY POPULATION AGE AND YEAR WHEN EFFECTS OCCUR



Source: Based on Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America.*[26]

economic and social savings of an improved nutritional situation.

3.5 Methodological Aspects

The analysis focuses on undernutrition 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.[25] 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 undernutrition was 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 undernutrition indicators that are measurable and appropriate to the different stages of an individual's life cycle. For intrauterine undernutrition, low birth weight (LBW) due to intrauterine growth restriction (IUGR, defined as a weight below the tenth percentile for gestational age) is estimated. For the pre-school stage, moderate and severe stunting categories (height-for-age scores below-2 standard deviations) are used, with reference, where possible, to WHO distribution for comparison purpose.[27]

Estimates of the impacts of undernutrition on health, education and productivity are based on the concept of the relative (or differential) risk run by individuals who suffer from undernutrition 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, its application has specific characteristics in each case. 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).

3.6 Methodological Adaptations: Integrating the Context of Africa in the Analysis

The consequences of child undernutrition are profound, far-reaching and often irreversible. Undernutrition weakens the immune system, making children more susceptible to diseases and reducing their chances of surviving illnesses such as diarrhoea,[28] pneumonia,[29] and malaria.[30] It is estimated that undernutrition is the underlying cause of over 30 percent of all child deaths.[31] This combination of recurring illnesses often manifests in growth faltering, irreversibly damaging physical development and mental capacity. As a result, undernourished children are less likely to attend school, may perform more poorly when in school, and are more likely to drop out early, as compared to their well-nourished counterparts.[32] Their capacity to earn a decent living is diminished, and they are less able to care for their children. Thus, the vicious cycle of undernutrition and poverty often continues across generations.

Despite the common impacts of undernutrition on children across regions, the same consequences can be heightened or reduced based on particular contexts. Therefore, the application of a model to estimate the impact of child undernutrition in Africa required an in-depth analysis of the nature of undernutrition on the continent, the particular pathologies that are commonly associated with undernourished children and labour market considerations to correctly access the productivity aspects of the region.

Some of the key elements that have been revised in the COHA model from the model utilized in LAC are described below:

- The utilization of WHO curves and updated research to estimate the mortality risk of the undernourished. Historical underweight rates were adjusted to consider the impact of mortality on undernourished children.
- Given the difficulties in accessing public health systems on the continent, variables that

consider the distribution between public and private health costs were included in the model, to better estimate the burden carried by the families. These values were collected from various sources, including national health data, DHS, and through consultations with experts at national level. For detailed information on the data used, see Annex 5: Assumptions by Country.

- The relationship between undernutrition and educational performance was revised to establish the relationship between stunting (rather than underweight) and school performance. Specific analysis was undertaken for the COHA study to determine the relative risk of stunted children repeating grades or dropping out of school.
- Given the specific structure of African economies, the productivity associated with manual labour was analysed in the model. The model applied in LAC focused on the phenomenon of underweight and its relationship to grade repetition and school dropout, as well as the consequential impacts on income. In addition to this dimension, COHA examines the effects of stunting on earning potential in manual labour. This was a key element of the adaptation, as it allowed the study to highlight the particularities of the agricultural sector and rural production. The revised model used data on the proportion of the working-age population in manual versus non-manual labour and estimated impacts of stunting on each of these groups separately.
- For the analysis of scenarios developed under the prospective dimension of the COHA model, a discount rate was applied to establish the present value of the future cost of child undernutrition. A key element in this analysis is ensuring that the investment rate reflects the multisectoral perspective of the investments required to address child malnutrition, beyond just the health sector, which typically applies a 3 percent rate for prospective analysis, as is the case for Disability Adjusted Life Years. In consultation with partners in the region, various options were analyzed, including, discount rates applied by the African Development Bank to assess investment in the social sector; discount rates applied by the pilot countries in analysis investment of public funds; and discount rates applied in analyzing social investment in other sectors.

This section will summarize the main elements that were adapted in the COHA model. Further methodological details are available in Annex 2.

3.6.A Risk of Mortality for Undernourished Children

Undernourished children have a higher risk of dying due to their condition; this is a key element in addressing the relationship between undernutrition and productivity. The model utilizes risk factors associated to mortality to define the attribution of mortality to undernutrition and to avoid over-attribution.

In the LAC model, this higher risk was based on research carried out by Fishman et al., where the model derived a higher relative risk of mortality for underweight children at a factor of 3.95.[33] Since this report was published, updated information has been made available to estimate this risk relationship. New analysis of the odds ratio (OR) for mortality for clinically underweight, stunted and wasted children were presented by Black et al in *The Lancet* (see Table 3.1).[34] The COHA model

utilized these odds ratios, which were based on updated underweight curves from WHO,[35] to determine the proportions of mortalities that associated with undernutrition. More details are

TABLE 3.1
ODDS RATIO FOR MORTALITY BY WEIGHT-FOR-AGE, HEIGHT-FOR-AGE AND WEIGHT-FOR-HEIGHT, BY CAUSE OF DEATH

Cause of Death	Severe <–3 (95% CI[a])	Moderate –3 to <–2 (95% CI)	–2 to <–1 (95% CI)	More than –1
Weight-for-age (*Z* score)				
Overall	9.7 (5.2–17.9)	2.5 (1.8–3.6)	1.8 (1.2–2.7)	1.0
Diarrhoea	9.5 (5.5–16.5)	3.4 (2.7–4.4)	2.1 (1.6–2.7)	1.0
Pneumonia	6.4 (3.9–10.4)	1.3 (0.9–2.0)	1.2 (0.7–1.9)	1.0
Malaria	1.6 (1.0–2.7)	1.2 (0.5–3.5)	0.8 (0.2–3.2)	1.0
Measles	6.4 (4.6–9.1)	2.3 (1.7–3.2)	1.3 (1.1–1.5)	1.0
Height-for-age (*Z* score)				
Overall	4.1 (2.6–6.4)	1.6 (1.3–2.2)	1.2 (0.9–1.5)	1.0
Diarrhoea	4.6 (2.7–8.1)	1.6 (1.1–2.5)	1.2 (0.9–1.7)	1.0
Pneumonia	3.2 (1.5–6.7)	1.3 (0.9–2.1)	1 (0.6–1.6)	1.0
Malaria	2.1 (0.9–4.9)	1.0 (0.4–2.4)	0.7 (0.5–0.9)	1.0
Measles	2.8 (1.4–5.8)	1.7 (0.8–3.6)	0.7 (0.5–0.9)	1.0
Weight-for-height (*Z* score)				
Overall	9.4 (5.3–16.8)	3.0 (2.0–4.5)	1.5 (1.2–1.9)	1.0
Diarrhoea	6.3 (2.7–14.7)	2.9 (1.8–4.5)	1.2 (0.7–1.9)	1.0
Pneumonia	8.7 (4.8–15.6)	4.2 (3.2–5.5)	1.6 (1.1–2.4)	1.0
Malaria	2.3 (1.6–3.2)	3.0 (1.0–8.9)	0.9 (0.3–2.6)	1.0
Measles	6.0 (4.3–8.2)	3.7 (2.5–5.5)	1.8 (0.9–3.6)	1.0

a/ Confidence Interval
Source: Robert E. Black et al., "Maternal and child undernutrition: global and regional exposures and health consequences."[36]

provided in Annex 2. Estimations that indicated ORs by specific pathologies, such as diarrhoea, pneumonia, malaria and measles, were carried out, but were not used in the COHA methodology.

As the model was designed to work based on relative risk differential and not odds ratio, the COHA technical team derived these factors in order to estimate relative risk values that could be used in the model. Relative risk are advantageous as they establish the differential probability of having a problem (in health, education, productivity) between different populations (those that do or do not suffer from undernutrition). The OR are more commonly used to reflect the effectiveness of an intervention in the affected population (that is, those who have those problems), compared to the population for which no intervention has been made.

3.6.B Access to Health Services

One of the important development challenges for Africa is the expansion of health services to the population. The region has the second lowest level of public investment in health and coverage of pre-natal health care in the world, ranking higher than only that of South Asia (Table 3.2).[37] Often, cases of common illness such as diarrhoea, ARI and malaria can generate complications if untreated, increasing the intensity of the episode and heightening the risks for recurrence and mortality, especially in

TABLE 3.2
HEALTH COVERAGE INFORMATION. BY REGION

Region	Health expenditure per capita[a]	Pregnant women receiving prenatal care (%)[b]
Arab World	296	--
Caribbean small states	536	97.9
East Asia & Pacific*	226	92
Europe & Central Asia*	436	…
Latin America & Caribbean*	715	96
Middle East & North Africa*	233	--
North America	8,311	--
South Asia	53	70.1
Sub-Saharan Africa*	94	76.3
World		80.6

* Developing only
[a/] Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. Data are in current U.S. dollars. (2011). Source: World Bank statistical database.[38]
[b/] UNICEF, *State of the World's Children*,[39] and Demographic and Health Surveys by ICF International (2009).[40]

undernourished children. These cases that go untreated can generate higher private cost to the family when compared to the treatment that the child should have received.

In order to address this important contextual element in the COHA model, a series of variables were created, allowing each NIT to determine the different coverage rates particular to every pathology and country context. The data collected in this section frequently came from proxy indicators based on the information gathered by DHS. For a detailed list of these variables and proxy variables. by country, see Annex 5. As there is no element to estimate the costs of untreated cases, the model utilizes the cost of a case treated in the health system as a shadow price, and assigns the total value as a private cost to the caretakers. This illustrates the opportunity costs borne by families as a result of low levels of health care coverage. In this way, the model avoids overestimating these untreated cases, while it generates a public-private distribution of costs and thus, better reflects the reality of each country.

3.6.C Stunting and Educational Performance

The relationship between child nutrition and school performance has been the focus of many research papers.[41,42] Although it is clear that grade repetition and dropout are a consequence of multiple elements, such as remoteness of schools, the need to work, quality of schooling[43] and lower parental education, there seems to be strong evidence that undernutrition also plays an important role in low school performance, grade repetition, and high dropout rates.

In order to best capture the effect of undernutrition on school performance, it is optimal to analyse this relationship with a long-term, chronic undernutrition indicator. As such, stunting is a strong predictor for the effect of undernutrition on school performance (as compared to weight-for-height).

Several specific country-based studies have been carried out in Africa to analyse the relationship between nutrition and educational performance. Most of this research has highlighted the effect of

stunting on late enrolment[44] or the nutritional status of school age children and their school performance,[45] but no specific longitudinal studies on stunting, as a predictor of schooling trajectories, were identified within the African continent.

Particular research was undertaken utilizing data from the Cebu Longitudinal Health and Nutrition Survey in the Philippines that analysed the higher risk of stunted children to repeat grades and to drop out earlier from school than children with normal height-for-age.[46] To carry out their analysis, the research team adjusted for confounding factors, such as parity, parental education, maternal height, household assets, environmental cleanliness, presence of electricity and household income, and followed the schooling trajectory of over 2,000 children. As Table 3.3 shows, the results indicated that

TABLE 3.3
RELATIVE RISK RATIOS FOR STUNTED CHILDREN:
GRADE REPETITION AND DROPOUTS

Condition	Stunted as Children	Non-Stunted as Children	Total
Repeated grades (RG)	668	233	901
Did not repeat grades	644	387	1031
Total	1312	620	1932
Risk Factor	0.50915	0.37581	0.46636
Differential Risk – RG	0.1333	Relative Risk Ratio	1.3548

Condition	Stunted as Children	Non-Stunted as Children	Total
Dropped out of school (DO)	680	201	881
Did not drop out	649	433	1082
Total	1329	634	1963
Risk Factor	0.51166	0.31703	0.44880
Differential Risk – DO	0.1946	Relative Risk Ratio	1.6139

Source: Calculated based on data from Cebu Longitudinal Health and Nutrition Survey.[47]

stunted children were 1.35 times more likely to repeat grades and 1.61 times more likely to drop out of school than children who have never been stunted. Given the data limitations in the African continent, these relative risk ratios were utilized in the COHA model.

3.6.D Stunting and Manual Productivity

Manual activities are one of the key drivers of production in Africa. Currently, more than 60 percent of the population on the continent lives in rural areas,[48] and almost half of every geographical region on the continent is covered by agricultural land (see Table 3.4).[49]

The agricultural sector is an extremely important contributor to the GDPs of African countries. Further, 57 percent of the population in Africa is engaged in agricultural activities, including forestry and fisheries, as compared to 11 percent who work in industry, such as manufacturing and construction (see Figure 3.4).[50] Specific data on distribution of labour between manual and non-manual labour is outlined in the sections of this report dedicated to each participating country. This particular context makes it necessary for COHA to explore the differential impact that child undernutrition has on physical productivity of adults.

TABLE 3.4
RURAL DEVELOPMENT INFORMATION, BY REGION (2007-2010)*

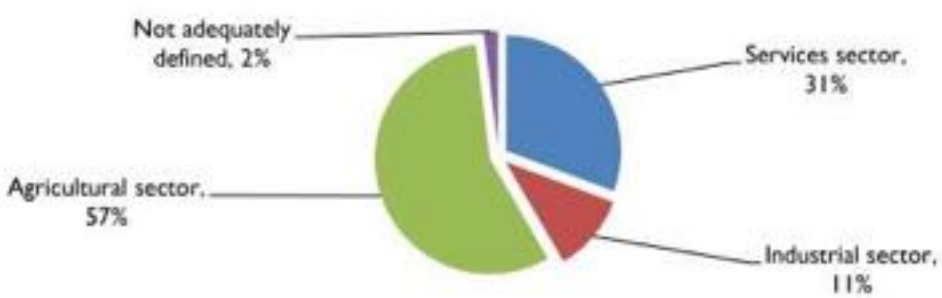
Region	Rural population (% of total population)[52]	Agricultural land (% of land area)[53]	Agriculture, value added (% of GDP)[54]
Arab World	43.63	40.15	6.88
East Asia & Pacific	48.30	49.26	3.39
Europe & Central Asia	29.98	29.38	1.88
Latin America & Caribbean	21.19	35.80	6.24
Middle East & North Africa	37.75	33.41	7.35
North America	18.01	25.82	1.18
South Asia	69.44	54.64	18.28
Sub-Saharan Africa	63.96	44.63	11.16
World	48.48	37.66	2.81

Source: World Bank Development Indicators. **Last years available*

Substantial research has been carried out indicating that stunted children would have reduced stature and body mass as adults, which influences their productive capacity in physical work.[51] Given the ethical imperatives of analysing human conditions, most of the available research is based on causal linkages that are logically inferred, without proving a definitive causal relationship. Ultimately, the context in which an individual is situated is the major determinant for his/her production levels and his/her capacity to convert that production into income.

There is a lack of region-specific research on the impact of child undernutrition on adult manual productivity in Africa. However, a study carried out in an agricultural context in Asia analysed this link

FIGURE 3.4
DISTRIBUTION OF ECONOMIC ACTIVITIES IN AFRICA



Source: Key Indicators from the Labour Market (KILM) report, Seventh Edition (International Labour Organization, 2011).[56]

by utilizing adult height as a determinant of income in agricultural productivity, while controlling for other contextual elements . It determined that for each percentage point lost in height due to child undernutrition, a person would earn 1.38 percent less income compared to non-stunted individuals.[55]

On the other hand, some specific research has been undertaken in Africa to determine the impact that stunting has on adult height. One study analysed the catch-up capacity of stunted girls and boys as they grew into adulthood; it determined that even though there is some catch-up capacity prior to reaching

adulthood, it does not substantially decrease the difference in height between the formerly stunted and non-stunted children.[57] These elements constitute the base for the model developed to estimate the potential losses in income of the adult population affected by childhood stunting.

In order to estimate losses in income associated with stunting, it is necessary to determine the distribution of manual and non-manual labour, as well as the estimated production capacity in each country. Household Consumption, Income and Expenditure Surveys (HCIES) contain income and expenditure information by age, educational level and economic activity. Due to the fact that each category of economic activities considered in the survey included a mix of both manual and non-manual labour, the COHA study utilized a distribution based on 'mostly manual' and 'mostly non-manual'

TABLE 3.5
DISTRIBUTION OF MANUAL AND NON-MANUAL ACTIVITIES

Manual activities	Non-Manual activities
Agriculture, forestry and fishing	Wholesale and retail trade, repair of motor vehicles and motorcycles
Mining and quarrying	Transportation and storage
Manufacturing	Accommodation and food service activities
Construction	Information and communication
Electricity, gas, steam and air conditioning supply	Financial and insurance activities
	Real estate activities
Water supply, sewerage, waste management and remediation activities	Professional, scientific and technical activities
	Administrative and support service activities
	Public administration and defence, compulsory social security
	Education
	Human health and social work activities
	Arts, entertainment and recreation
	Other service activities
	Activities of households as employers, undifferentiated goods- and service-producing activities of households for own use
	Activities of extraterritorial organizations and bodies

Source: Authors' proposal based on International Standard Industrial Classification (ISIC) of economic activities.[59]

activities, using the International Standard Industrial Classification (ISIC) of economic activities.[58] Labour productively is calculated based on the estimated income or expenditure among the working-age population on an individual basis.

3.6.E Limitations to the COHA model

The framework to estimate the social and economic cost of undernutrition was constructed based on a thorough review of the consequences of child undernutrition in Africa. Nevertheless, there are also methodological limitations to establishing a social or economic value to these elements. Challenges are partly due to the lack of available research, difficulties in establishing attributions or managing potential overlaps. These limitations will be pending elements in future work of this model, as more research is made available on each topic.

(1) Limitations in integrating social aspects

Women's role in reducing child undernutrition is critical. Women are often the primary caregivers for

infants, and it is important that they have sufficient information on nutrition to make informed choices. An undernourished woman is also more likely to bear a low-birth-weight child and continue the cycle of poverty and malnutrition.[60]

Nevertheless, when the authors of this study attempted to disaggregate the results of the COHA model based on gender, several challenges were encountered. From a biological perspective, undernutrition seems to have a similar impact on all children before the age of five, regardless of gender. Undernourished children are more affected by illness, as compared to healthy children; however, no apparent difference can be attributed to gender. Additionally, there are no protocol differences in terms of attention given to girls and boys in the public health system for the common pathologies associated to undernutrition.

Similarly, for school-age children, there is no conclusive evidence to prove that the effect of child undernutrition on cognitive development and educational performance has a higher impact on students of either gender. Further, there is no substantial difference of costs incurred to the public system or the families of girls or boys in school.

A more complicated scenario was faced when researchers attempted to disaggregate the gender aspects of productivity. The COHA model utilizes official information available in HCIES to estimate the potential productivity of an individual, given his or her particular socio-economic context, economic activity and age. Nevertheless, these surveys often focus on consumption, income or expenditure capacity within the households and fail to consider the in-kind contribution provided by mothers in terms of care and time use. As a result, women's contribution to the household economy is often estimated at a lower value than that of men. When analysing this situation from a cost perspective, it would seem that since women's productivity is proportionally less, the losses in their productivity are also lower in absolute terms In this scenario, it would seem then that improving the nutritional status of men would generate more savings to the economy, which is inaccurate.

Research indicates that exposure to severe undernutrition during pregnancy impacts the future capacity of the born child to develop literacy skills, compete in the labour market and create wealth. It has not been able to establish however, the specific ratios to determine the dimension of this impact. Given these methodological constraints, the COHA research team and advisory panel opted to maintain the results aggregated and to enhance the gender aspects of nutrition as part of the advocacy efforts and interventions that are put in place to reduce child undernutrition.

(2) Limitations in integrating biological aspects

HIV has been an issue of concern in Africa for several decades. According to UNAIDS, the sub-Saharan region is the most affected area in the world, with 1 out of 20 adults living with HIV. HIV-positive people in sub-Saharan Africa account for 69 percent of the people and 90 percent of children living with HIV worldwide. Although the level of new infections is currently declining, the Sub-Saharan region accounted for 71 percent of new infections in 2011.[61]

The relationship between nutrition and HIV has been explored in many studies. Undernutrition is a major complication in HIV-positive patients and early nutritional interventions are recommended in order for these patients to gain lean body mass.[62] However, there is no research that attributes a higher risk of infection as a causal or direct logical relationship to child undernutrition; an

undernourished child does not have an increased incremental probability of becoming infected with HIV compared to a child who is not undernourished, other conditions being equal.

However, the nutritional condition of a child does have an important impact on the child already living with HIV. Undernourished children, who are HIV positive, are at a higher risk of becoming ill.[63] These children will have increased incremental episodes of common illnesses such as diarrhoea, anaemia and pneumonia, which are associated with undernutrition. In countries with high HIV prevalence, this will be reflected in a higher number of average episodes per child. Based on this, the model integrates the impact of undernutrition on children living with HIV and the incremental cost that this generates to their families and to the public health system.

(3) Limitations in integrating environmental aspects

The linkages between nutrition and climate change are often highlighted in the analysis of child undernutrition. Environmental shocks impact heavily on the availability of food and clean water and can also generate migration that has a toll in the nutritional situation of a population. Often, the most affected are the elderly and the children, due to their particular vulnerabilities and nutritional requirements. This is of particular concern in Africa, which is becoming the most exposed region in the world to the effects of climate change[64].

The ability to cope with climate-related challenges is strongly based on the resilience of the individuals and household. However, the existing social policies and community interaction are also critical coping elements. In this sense, it is difficult to establish a long-term differential consequence of climate change on child nutrition at the individual level, as the dynamics of this system are often in constant evolution.

Famine has also been a particular threat to the nutritional situation of individuals in the region, with several events occurring in Africa in the 20th century and particularly in the last 10 years. The impact of famine on mortality is reflected in the mortality and survival rate projections that the model utilizes for each particular country. Further, some research suggests that the effect of famine might even have consequences on ensuing generations.[65] Nevertheless, increased research defining relative risks ratios, especially in undernourished children, would enrich the analysis of this study.

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PART II:

First-Phase Country Results

4. Country Results: Egypt

4.1 Brief Socio-Economic and Nutritional Background

The Arab Republic of Egypt (hereafter referred to as Egypt), with a population of 82 million, is the largest Arab country and the third largest African country by population. Egypt has a Gross Domestic Product (GDP) estimated at EGP1.042 trillion (2009) and a per capita Gross National Income (GNI) of approximately USD2,600, which has grown considerably in the last decade (see Table 4.1).[1] Further, inequality and extreme poverty rates have maintained relatively low levels in the country, with a Gini index of 30.[2] Less than 2 percent of the population living on under USD1.25 a day; however estimates for people living on under USD2.00 a day are as high as 18 percent.[3]

One of Egypt's main socioeconomic challenges centres on youth employment. The national unemployment level is estimated at 12 percent; nevertheless, youth unemployment is two times higher, and nearly half of all women 15-24 are unemployed.[4]

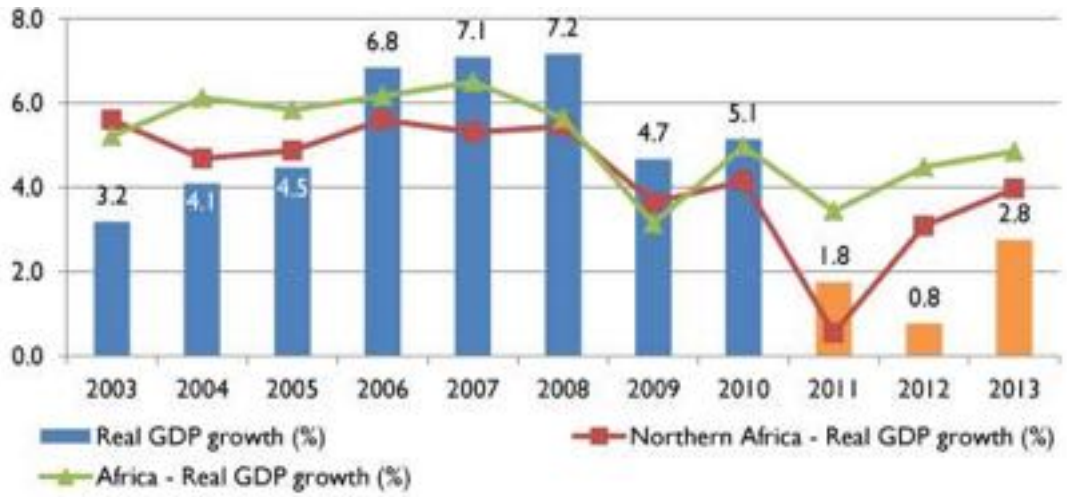
Egypt has experienced an important period of economic expansion in the last decade, with average growth rates higher than those reported for both the African continent and the North Africa region (see Figure 4.1). Nevertheless, this performance has slowed in recent years due in part to political and civil unrest. According to estimates from the African Economic Outlook, the real GDP growth rates will range from 0.8 percent to 2.8 percent in the next two years.[5]

TABLE 4.1
SOCIO-ECONOMIC INDICATORS, EGYPT

Indicators	2000-2002	2005-2007	2009-2011
GDP, total in billions of EGP[a]	378.9	744.8	1042.2 (08/09)
GNI per capita (Atlas method, current USD)	1,370	1,560	2,600
Poverty - $1.25 a day (PPP) (% of population)[a]	1.81	1.99	1.69
Population below the national poverty line (% of population)[b]	16.7	19.6	25.2
Gini Index	32.8	32.1	30.8
Unemployment, % of total labour force	10.2%	8.9%	12%
Unemployment, youth total (% of total labour force ages 15-24)	27.1%	24.8%	…
Unemployment, youth female (% of female labour force ages 15-24)	40%	47.9%	…
Population growth (annual %)	1.85%	1.80%	1.73%
Life expectancy at birth, total (years)	70	72	73

Source if not otherwise noted: World Bank Database.[6]
[a] "World Economic Outlook Database October 2012.[7]

FIGURE 4.1
TRENDS IN REAL GDP GROWTH, EGYPT 2003-2013
(In percentages)



Source: World Economic Outlook Database October 2012.[9] Figures for 2010 are estimates; Orange bars for 2011 and later are projections.

Public investment in the social sector has also been maintained in the last decade, but is still below the average, by proportion, compared to the Middle East and North Africa (MENA) region (see Table 4.2). Public spending in education is estimated at 11.9 percent, which ranks below the regional average of 19.9 percent. Health expenditures are also low compared to the rest of the region, both from a per capita perspective and as a proportion of GDP.[10]

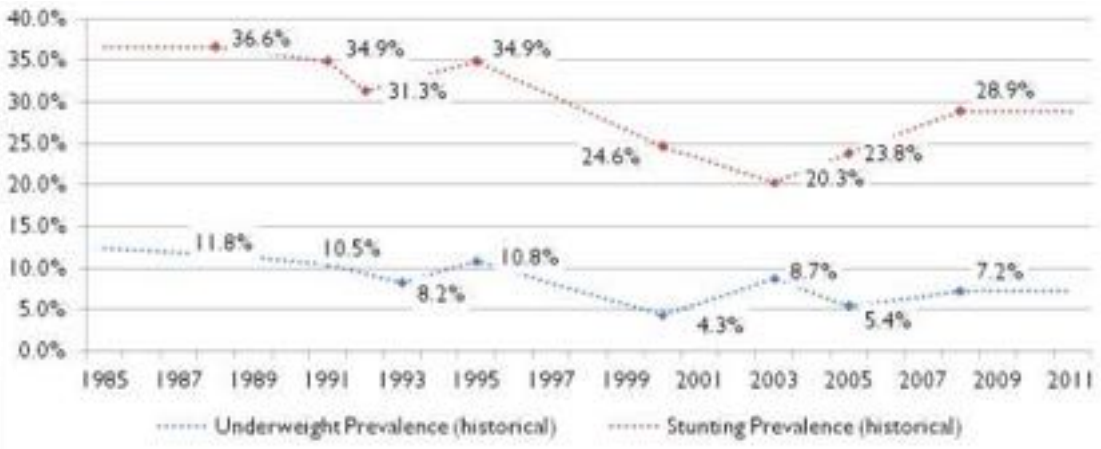
TABLE 4.2
SOCIAL INVESTMENT INDICATORS, EGYPT

Indicators	2005-06	2007-08	2009-10	Middle East & North Africa*
Public spending on education (% of government expenditure)	11.9%	11.9%	...	19.9%
Public spending on education, total (% of GDP)	4.0%	3.8%	...	4.8%
Health expenditure per capita (current USD)	75.2	101.2	123.2	203.2
Health expenditure, total (% of GDP)	5.3%	4.8%	4.6%	5.3%
Health expenditure, public (% of total health expenditure)	44.2%	42.2%	37.4%	50.1%

Source: World Bank Database, most recent year available.[11]
* Developing countries only - Latest data available

From a nutritional perspective, Egypt has maintained low levels of underweight children for the past decade. Nevertheless, the stunting rates have increased in the same period from 20.3 percent to 28.9 percent, as reported in DHS reports (see Table 4.2).[12, 13]

FIGURE 4.2
ESTIMATED UNDERNUTRITION TRENDS IN CHILDREN UNDER-FIVE, EGYPT, 1990-2010
(In percentages)



Source: Prepared in-house based on information from Egypt DHS 2008[14] and National Surveys.[15] Data prior to 2006 has been updated in line with new Child Growth Standards[16] introduced by WHO in 2006 to replace the 1977 International Growth Reference, formulated by the National Center for Health Statistics (NCHS).[17]

The current levels of child undernutrition illustrate the challenges in reducing child hunger. It is estimated that 2.7 million of the 9.2 million children under the age of 5 were affected by growth retardation, and 658,515 children were underweight in 2009 (see Table 4.3). This situation is especially critical for children between 12 months and 24 months, where one out of every three children is affected by growth retardation.[18]

TABLE 4.3
POPULATION AND CHILD UNDERNUTRITION, EGYPT, 2009
(Population in thousands)

		Low Birth Weight		Underweight		Stunting	
Age groups	Population size[a]	Population affected	Prevalence[b]	Population affected	Prevalence	Population affected	Prevalence
New-born (IUGR)[b]	1,876	117	6.2%				
0-11 months				163	8.7%	370	19.7%
12-23 months	1,858			124	6.7%	641	34.5%
24-59 months	5,453			371	6.8%	1,734	31.8%
Total	9,187	117	6.2%	658	7.2%	2,744	28.9%

Source: Estimated based on DHS surveys 2008[19] and demographic projections.
[a] In a given year, the new-born population is the same as the 0-11 month's age group.
[b] Estimated on the basis of the equation of De Onis et al, 2003.[20]

4.2 Effects and Costs of Child Undernutrition

Undernutrition is mainly characterized by wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age). In early childhood, undernutrition has negative life-long and intergenerational consequences; undernourished children are more likely to require medical care as a result of undernutrition-related diseases and deficiencies.[21] 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 a higher risk of mortality.[22] During schooling years, stunted children are more likely to repeat grades[23] and drop out of school,[24] thus reducing their income-earning capability later in life.[25] Furthermore, adults who were stunted as children are less likely to achieve their expected physical and cognitive development, thereby impacting on their productivity. [26]

4.2.A Social and Economic Cost of Child Undernutrition in the Health Sector

Undernutrition at an early age predisposes children to higher morbidity[27] and mortality risks.[28] The risk of becoming ill due to undernutrition 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, anaemia, acute respiratory infections (ARI), and acute diarrhoeal syndrome (ADS) associated with undernutrition in children under the age of five.

(1) Effects on morbidity

Undernourished children are more susceptible to recurring illness.[29] Based on the differential probability analysis undertaken with DHS data in Egypt, underweight children between 28 days and 11 months are more affected by anaemia (increase of 13.4 percentage points), and children between 12 and 24 months have a higher risk of diarrhoea (increase of 1.42 percentage points).[30]

The COHA study estimated that in Egypt in 2009, there were 901,440 incremental episodes of illness related to diseases associated with underweight (see Table 4.4). In addition, pathologies related to calorie and protein deficiencies and low birth weight associated with intrauterine growth restriction (IUGR), totalled more than 775,218 episodes in 2009.

TABLE 4.4
MORBIDITIES FOR CHILDREN UNDER-FIVE ASSOCIATED WITH UNDERWEIGHT, BY PATHOLOGY, EGYPT, 2009

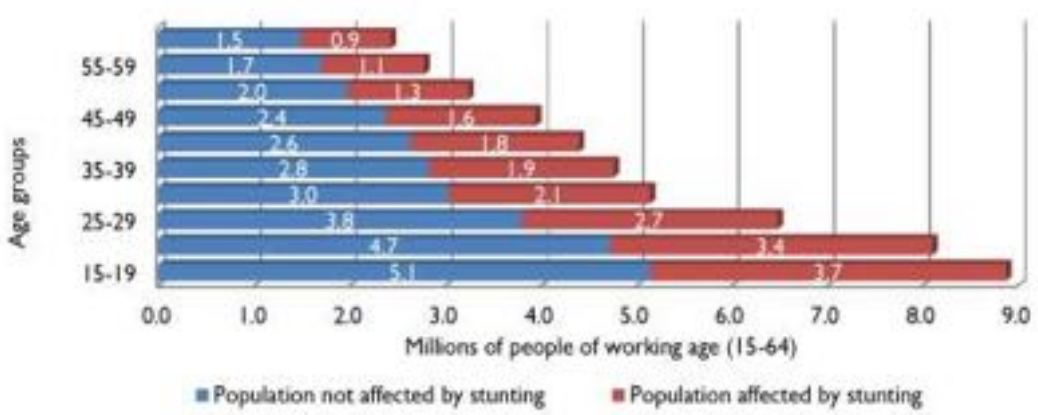
Pathology	Number of episodes	Percentage of episodes
Anaemia	102,965	82%
ADS	18,342	15%
ARI	4,915	4%
Subtotal	126,222	
LBW	116,702	15%
Underweight	658,516	85%
Subtotal	775,218	
Total	901,440	

Source: Model estimations based on DHS 2008, and demographic information.[31]

(2) Stunting levels of the working age population

Undernutrition leads to stunting in children, which can impact on their productivity at later stages in life. Egypt has made important historical progress in reducing stunting in children; nevertheless, there has been a reported recent increase in the prevalence of chronic undernutrition.[32] As illustrated in Figure 4.3, the model estimated that 20.5 million adults in the working-age population suffered from growth retardation before reaching five years. In 2009, this represented 41 percent of the population aged 15-64 who were in a disadvantaged position as compared to those who were not undernourished as children.

FIGURE 4.3
WORKING AGE POPULATION AFFECTED BY CHILDHOOD STUNTING, BY AGE GROUP, EGYPT
(In millions of people)



Source: Model estimations based on demographic information and WHO/NCHS database.[33]

(3) Effects on mortality

Child undernutrition can lead to increased cases of mortality most often associated with incidences of diarrhoea and pneumonia and malaria.[34] 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[35] to estimate the risk of increased child mortality as a result of child undernutrition. Mortality risk associated with undernutrition was calculated using these relative risk factors, historical survival and mortality rates,[36] and historical nutrition information.

TABLE 4.5
IMPACT OF UNDERNUTRITION ON CHILD MORTALITY, EGYPT, ADJUSTED BY SURVIVAL RATE, 1945-2009
(In number of mortalities)

Period	Number of child mortalities associated with undernutrition
1945-1994	352,813
1995-2004	79,932
2005-2009	28,102
Total	460,847

Source: ECA, on the basis of life tables provided by UN Population Division[37] and population data provided by CAPMAS.[38]

In the last 5 years alone, it is estimated that 28,102 child deaths in Egypt were directly associated with undernutrition (see Table 4.5). These deaths represent 11 percent of all child mortalities for this period. Thus, it is evident that undernutrition 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.

These historical mortality rates will also have an impact on national productivity. The model estimates that an equivalent of 0.92 percent of the current workforce has been lost due to the impact of undernutrition in increasing child mortality rates. This represents 352,813 people who would have between 15-64 years old, and part of the working age population of the country.

(4) Estimation of public and private health costs

The treatment of undernutrition and related illnesses is a critical recurrent cost for the health system. Treating a severely underweight child, for example, requires a comprehensive protocol[39] that is often more costly than the monetary value and effort needed to prevent undernutrition. The economic cost of each episode is often increased by inefficiencies when such cases are treated without proper guidance from a health-care professional or due to lack of access to proper health services. These costs generate a significant important burden not just to the public sector but to society as a whole. It is estimated that 901,440 clinical episodes in Egypt in 2009 were associated with the higher risk present in underweight children. As indicated in Table 4.6, these episodes generated an estimated cost of EGP1.17 billion.

TABLE 4.6
HEALTH COSTS OF UNDERNUTRITION-RELATED PATHOLOGIES, EGYPT, 2009

Pathology	Number of episodes	Cost in EGP (millions)	Cost in USD (millions)
Underweight	658,516	149	27.2
Low birth weight (IUGR)	116,702	516	93.8
Anaemia	102,965	470	85.4
Acute diarrhoeal syndrome (ADS)	18,342	32	5.8
Acute respiratory infection (ARI)	4,915	3	0.5
Total	901,440	1,170	212.7

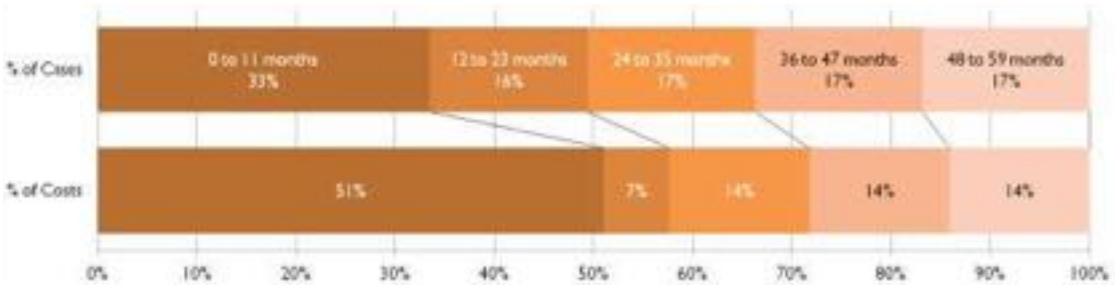
Source: Model estimations based on DHS 2008.[40]

Most of these costs incurred were associated with the protocol required to bring an underweight child back to a proper nutritional status, which often requires therapeutic feeding.[41] An important element to highlight is the particular costs generated by the treatment of low birth weight children. These cases represented 14 percent of all the episodes but generated 45 percent of the total cost, making it the highest per capita element analysed. This is due to the special management protocol required by LBW children, which often includes hospitalization and time in intensive care.[42]

A large proportion of costs related to undernutrition are borne by families, as these children are often not provided with proper health care. Based on the information collected by the NIT and DHS surveys[43], the model estimated that only 20 percent of these episodes presented receive proper health care.[44] As explained in the methodology section of this report, medical costs incurred in a treatment facility are used as shadow costs to estimate the burden borne by families. Figure 4.5 summarizes the institutional (public system) costs and costs to caretakers of treating pathologies associated with undernutrition. In Egypt, it is estimated that families bear around 73 percent of the costs associated

with undernutrition, EGP849 million, while the cost to the health system was EGP321 million, or 27 percent.

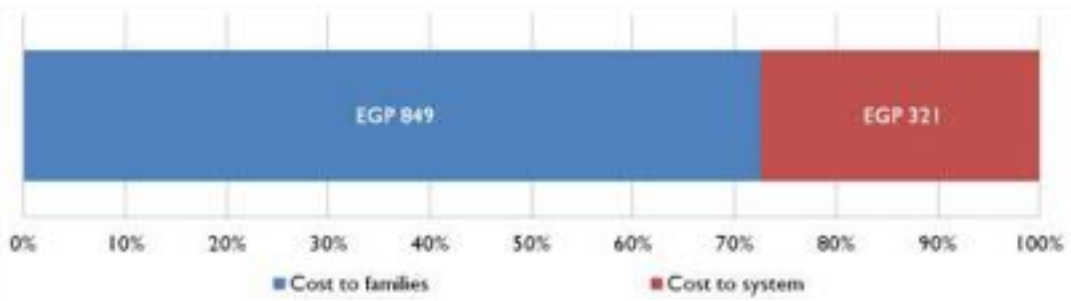
FIGURE 4.4
DISTRIBUTION OF INCREMENTAL EPISODES AND COSTS OF ILLNESS ASSOCIATED WITH UNDERNUTRITION BY AGE GROUP, EGYPT



Source: Model estimations based on DHS 2008[45], and demographic information.

Although the families of undernourished children incur most of the health costs related to undernutrition, the burden of this phenomenon is still an important expenditure component in the public sector. In 2009-2010, the annual estimated cost to the public sector was equivalent to 1.62 percent of the total budget allocated to health.[46] On the whole, the economic impact of undernutrition in health-related aspects was equivalent to 0.11 percent of the GDP of that year.

FIGURE 4.5
DISTRIBUTION OF PRIVATE AND PUBLIC HEALTH COSTS, EGYPT
(In percentages and millions of EGP)



Source: Model estimations based on demographic information and WHO/DHS nutritional surveys.[45]

4.2.B Social and Economic Cost of Child Undernutrition in the Education Sector

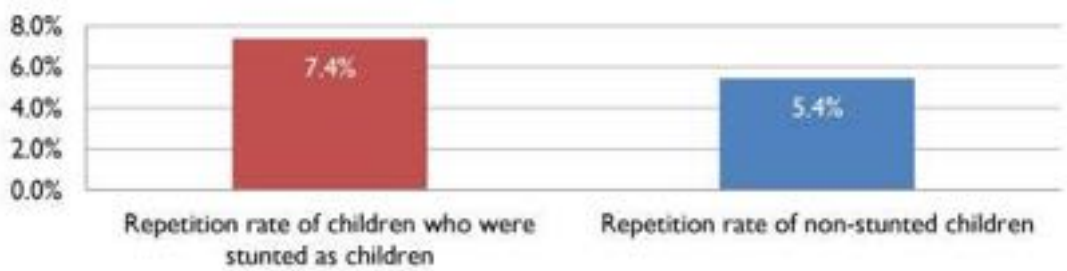
There is no single cause for repetition and dropout; however, there is substantive research that shows that students who were stunted before the age of 5 are more likely to underperform in school.[47] The number of repetition and dropout cases considered in this section results from applying a differential risk factor associated to stunted children to the official government information on grade repetition and dropouts in 2009. 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 Egypt in 2009, as well as estimations of costs incurred by families to support schooling.[48]

(1) Effects on repetition

Children who suffered from undernutrition before 5 years of age are more likely to repeat grades, compared to those were not afflicted by undernutrition.[49] In Egypt in 2009, enrolment rates were relatively high, with 95 percent enrolment in primary education and 68 percent enrolment in secondary education.[50]

Based on official information provided by the Ministry of Education, over 830,603 children repeated grades in 2009.[51] Using data on increased risk of repetition among stunted students, the model estimated that the repetition rate for stunted children was 7.4 percent, while the repetition rate for non-stunted children was 5.4 percent (see Figure 4.6). Thus, given the proportion of stunted students, the model estimates that 79,396 students, or 10 percent of all repetitions in 2009 were associated with stunting.

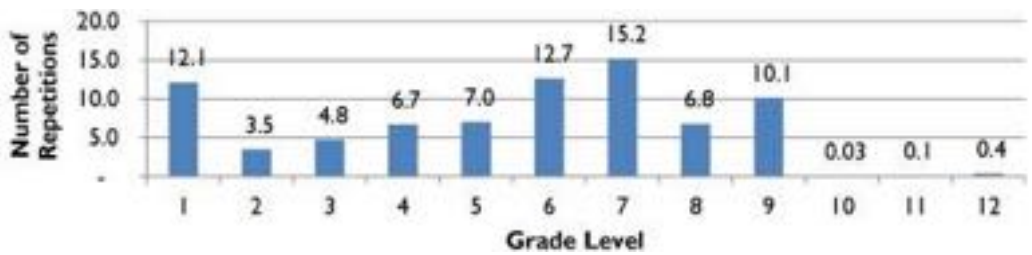
FIGURE 4.6
REPETITION RATES IN EDUCATION BY NUTRITIONAL STATUS, EGYPT, 2009
(In percentages)



Source: Estimations based on data provided by NIT (Ministry of Education – Education Statistics Annual Abstract 2008/09).[52]

As shown in Figure 4.7, most of these grade repetitions happen during the primary and preparatory school. There are far fewer children who repeat grades during secondary school; this largely due to the fact that many underperforming students would have dropped out of school before reaching secondary education.

FIGURE 4.7
GRADE REPETITION OF STUNTED CHILDREN, BY GRADE, EGYPT, 2009

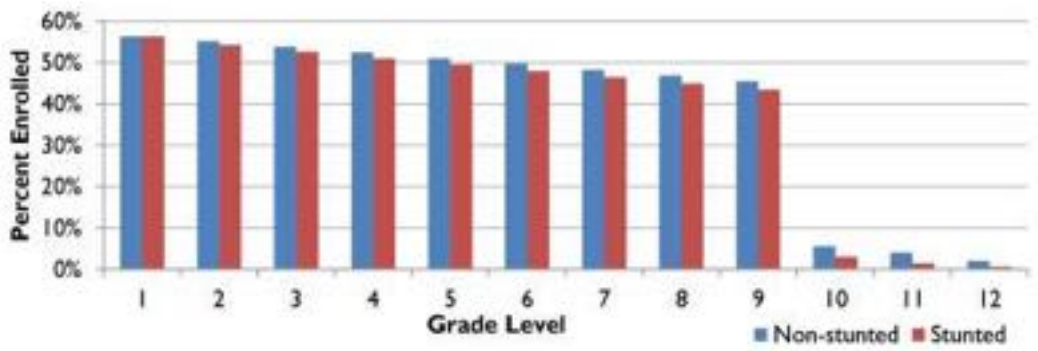


Source: Estimations based on data from Ministry of Education.[53]

(2) Effects on retention

Research shows that students who were stunted as children are more likely to drop out of school.[54] According to available data and taking into account relative risks relating to the consequences of stunting on education, it can be estimated that only 45 percent of non-stunted people (of working age) in Egypt completed lower secondary school, compared to 43 percent completion estimates for those who suffered from stunting. Further, only 3 percent of non-stunted people completed secondary school, while only 1 percent of stunted people did. Figure 4.8, below, shows the estimated grade achievement, based on nutritional status.

FIGURE 4.8
GRADE ACHIEVEMENT BY NUTRITIONAL STATUS, EGYPT, 2009
(In percentages)



Source: Estimations based on data provided by NIT.[54]

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 2009, the analysis focuses on the differential in schooling levels achieved by the population who suffered from stunting as children and the schooling levels of the population who was never stunted.

(3) 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 education system, as they require twice as many resources to repeat the year. In addition, the caretakers also have to pay for an additional year of education.

In 2009, the 79,396 students who repeated grades and whose repetitions are considered to be associated with undernutrition incurred a cost of EGP271 million. The largest proportion of repetitions occurred during primary school, where the cost burden falls mostly on the public education system. Table 4.7 summarizes the public and private education costs associated with stunting.

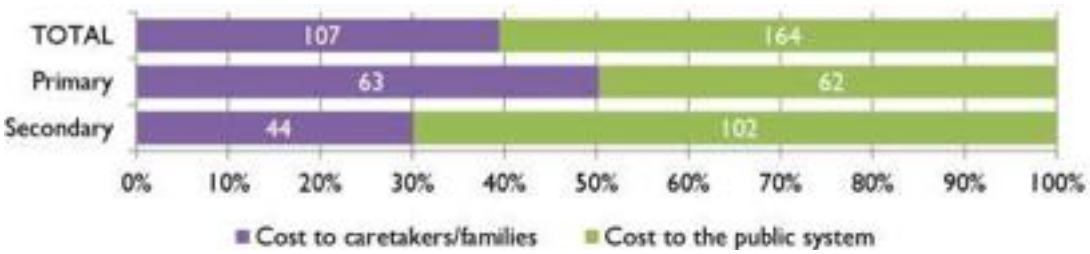
TABLE 4.7
COSTS OF GRADE REPETITIONS ASSOCIATED WITH STUNTING, EGYPT, 2009

	Primary	Secondary	Total
Number of repetitions associated with stunting	46,762	32,634	79,396
Total public costs (in millions EGP)	62.2	101.8	163.9
Total private costs (in millions EGP)	62.9	43.9	106.8
Total (in millions EGP)	125.1	145.7	270.7
Total public costs (in millions USD)	11.3	18.5	29.8
Total private costs (in millions USD)	11.4	8.0	19.4
Total (in millions USD)	22.7	26.5	49.2

Source: Model estimations based on costing data from the Ministry of Education.[55]

As in the case of health, the social cost of undernutrition in education is shared between the public sector and the families. Of the overall costs, a total of EGP107 million (39 percent) are being covered by the care takers, while EGP164 million (61 percent) is borne by the public education system (see Figure 4.9). Nevertheless, the distribution of this cost varies depending on whether the child repeated grades in primary or secondary education. In primary education, the families cover over 50 percent of the associated costs of repeating a year, whereas in secondary the burden on the families is reduced to 30 percent and the government carries the largest proportion of investment in education.

FIGURE 4.9
DISTRIBUTION OF COSTS IN EDUCATION, EGYPT
(In percentages and millions of EGP)



Source: Estimations based on data provided by NIT.[56]

4.2.C Social and Economic Cost of Child Undernutrition in Productivity

As described in the health section of this country report (4.2.A), the model estimated that 41 percent of the working-age population in Egypt 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 20.5 million people whose potential productivity is affected by undernutrition.

National productivity is significantly affected by historical rates of child undernutrition. Firstly, stunted people, on average, have achieved fewer years of schooling than non-stunted people.[57] In non-manual activities, higher academic achievement is directly correlated with higher income.[58] Research shows that stunted workers engaged in manual activities tend to have less lean body mass[59] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[60] Finally, the population lost due to child mortality hinders economic growth, as they could have been

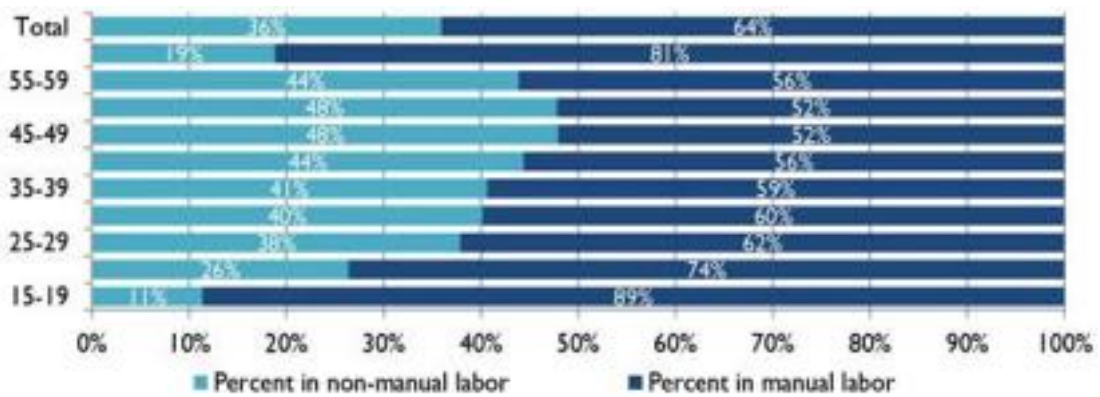
healthy productive members of the society.

The model utilizes historical nutritional information, in-country demographic projections, adjusted mortality rates, and data reported in the Egypt Household Income, Expenditure and Consumption Survey (HIECS)[61] from 2009 to estimate the proportion of the population whose labour productivity is affected by childhood nutrition.

The cost estimates in labour productivity were calculated 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 2009.

The distribution of the labour market is an important contextual element in determining the impact of undernutrition on national productivity. As shown in Figure 4.10, 64 percent of the working age population is engaged in manual activities. The trend of manual labour seems to be higher at with the younger group from 15 to 24 years and non-manual activities seems to be more common from 25 to 59 years old; nevertheless, the proportion is consistently lower for non-manual activities. In 2009, 16.7 million people were involved in non-manual activities.[62]

FIGURE 4.10
MANUAL AND NON-MANUAL LABOUR DISTRIBUTION, BY AGE, EGYPT, 2009
(In percentages)



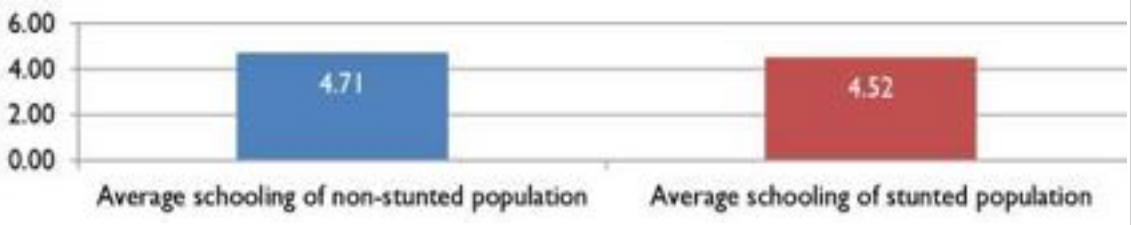
Source: Estimated from Egypt Labour Force Survey, 2009, CAPMAS.[63]

(1) Losses in non-manual activities

As described in the education section of this country 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 on people who are engaged in non-manual activities, in which a higher academic education represents a higher income.

Based on information from the HIECS, and as shown in Figure 4.11, it is estimated that the educational gap between the stunted and non-stunted population is 0.2 years. It is important to note that over time there has been an improvement in the average years of schooling among the working population. Whereas the cohort from 60-64 years show an average level of school education of 1.8 years, the cohort aged 20-24 shows an average of seven years of education.

FIGURE 4.11
AVERAGE SCHOOLING YEARS
FOR STUNTED AND NON-STUNTED POPULATION, EGYPT
(In years of education)



Source: Estimated from Egypt HIECS 2009,[65] CAPMAS[66] and relative risk ratios.

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 4.8, the model estimates that 7.2 million people engaged in non-manual activities suffered from childhood stunting. This represents 6.3 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 EGP2.7 billion, equivalent to 0.3 percent of the GDP in 2009.

TABLE 4.8
REDUCED INCOME IN NON-MANUAL ACTIVITIES
DUE TO STUNTING, EGYPT, 2009

Age in 2009	Population working in non-manual sectors who were stunted as children *(In thousands of people)*	Income losses in non-manual labour *(In millions of EGP)*
15-24	1,354	685
25-34	1,947	1,003
35-44	1,674	715
45-54	1,483	230
55-64	724	26
Total	7,182	2,659
% GDP		0.3%

Source: Model estimations based on HIECS 2009[67] CAPMAS[68] and DHS 2008.[69]

(2) Losses in manual activities

Manual activities are mainly observed in the agricultural, forestry and fishing subsectors, employing more than 64 percent of the Egyptian population.[70] Research shows that stunted workers engaged in manual activities tend to have less lean body mass[71] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[72] The model estimated that 33.5 million Egyptians are engaged in manual activities, of which 13.7 million were stunted as children. This represented an annual loss in potential income that surpasses EGP10.7 billion, equivalent to 1.03 percent of the GDP in potential income lost due to lower productivity.

TABLE 4.9
LOSSES IN POTENTIAL PRODUCTIVITY IN MANUAL ACTIVITIES DUE TO STUNTING, EGYPT, 2009

Age in 2009	Population working in manual labour who were stunted as children *(In thousands)*	Loss in productivity due to stunting *(In millions of EGP)*
15-24	5,791	4,793
25-34	2,928	2,719
35-44	2,128	1,594
45-54	1,481	964
55-64	1,372	662
Total	13,700	10,732
% GDP		1.03%

Source: Estimations based on data from CAPMAS[73] and WHO/NCHS Database information.[74]

(3) Opportunity cost due to mortality

As indicated in the health section of this country report, there is an increased risk of child mortality associated with undernutrition. The model estimated that 352,813 people of working age were absent from Egypt's workforce in 2009 due to child mortality associated with undernutrition. This represents a 1 percent reduction in the current workforce.

TABLE 4.10
LOSSES IN POTENTIAL PRODUCTIVITY DUE TO MORTALITY ASSOCIATED WITH UNDERNUTRITION, EGYPT, 2009

Age in 2009	Working hours lost due to higher mortality of underweight children (in millions of Working Hours)	Loss in productivity *(in millions of EGP)*
15-24	317	2,250
25-34	202	1,441
35-44	159	899
45-54	107	572
55-64	71	274
Total	857	5,436
% GDP		0.52%

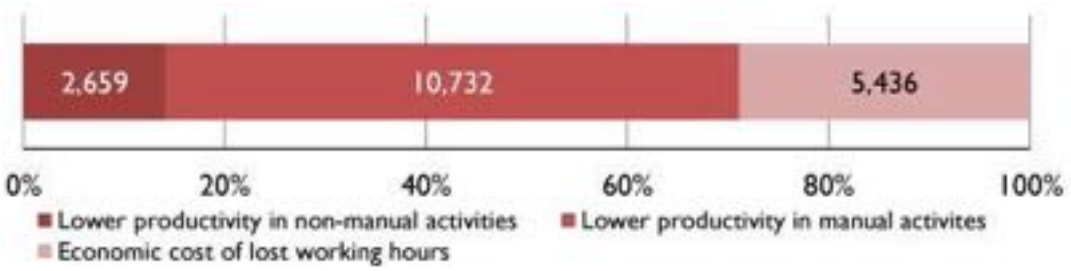
Source: Estimations based on data from CAPMAS[75] and WHO/NCHS database information.[76]

Considering the productive levels of the population, by their age and sector of labour, the model estimated that in 2009, the economic losses (measured by working hours lost due to undernutrition-related child mortality) were EGP5.4 billion, which represented 0.52 percent of the country's GDP (see Table 4.10).

(4) Overall productivity losses

The total losses in productivity for 2009 are estimated at approximately EGP18.8 billion, which is equivalent to 1.8 percent of Egypt's GDP. As presented in Figure 4.12, the largest share of productivity loss is due to reduced productivity in manual activities, which represents 57 percent of the total cost. The lost working hours due to the higher mortality risk of underweight children represents 29 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 14 percent of the total costs.

FIGURE 4.12
DISTRIBUTION OF LOSSES IN PRODUCTIVITY, BY SECTOR, EGYPT, 2009
(in percentage and millions of EGP)



Source: Estimated from Egypt HIECS 2009,[77] CAPMAS.[78]

4.2.C Summary of Effects and Costs

The methodology is used to analyse the impact of child undernutrition 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 undernutrition.

For Egypt, the total losses associated with undernutrition are estimated at EGP20.3 billion, or USD3.7 billion for the year 2009. These losses are equivalent to 1.9 percent of GDP of that year (see Table 4.11) The highest element in this cost is the loss in potential productivity in manual activities associated with stunting.

TABLE 4.11
SUMMARY OF COSTS, EGYPT, 2009

	Episodes	Cost in millions of EGP	Cost in millions of USD	Percentage of GDP
Health Costs				
LBW and Underweight	775,217	665	120.9	
Increased Morbidity	126,223	505	91.8	
Total for Health	901,440	1,170	213.0	0.11%
Education Costs				
Increased Repetition - Primary	46,762	125	22.7	
Increased Repetition - Secondary	32,634	146	26.5	
Total for Education	79,396	271	49.2	0.03%
Productivity Costs				
Lower Productivity - Non-Manual Activities	7,182,482	2,659	483.5	
Lower Productivity - Manual Activities	13,700,990	10,732	1,951.3	
Lower Productivity - Mortality	352,813	5,436	988.4	
Total for Productivity	21,236,285	18,827	3,423.0	1.81%
TOTAL COSTS		20,268	3,685.0	1.94%

Source: COHA Model estimations.

Due to the multi-causal phenomenon of grade repetition, the direct costs in education tend to be the lowest of the three sectors. However, school retention is significant, as 13 percent of the losses recorded are due to lost income related to reduced schooling achievement.

4.3 Analysis of Scenarios

The previous section showed the social and economic costs that affect Egypt in 2009 due to high trends of child undernutrition. Most of these costs are already cemented in society and policies must be put in place to improve the lives of those already affected by childhood undernutrition. Nevertheless, there is still room to prevent these costs in the future. Currently, three of out every ten children under-5 in Egypt is stunted.

This section will analyse the impact that a reduction in child undernutrition can have on the socioeconomic context in the country. The results presented in this section project the additional costs in health and education and losses in productivity that Egyptian children would bear in the future,

The model can generate a baseline for various scenarios, based on nutritional goals established in each country. Scenarios, which were agreed upon with the national implementation team in Egypt, can then be used to advocate for increased investments in proven nutritional interventions.

Scenarios were constructed based on the estimated net present value of the costs of the children born in each year, from 2009 to 2025. While the previous section calculated the costs incurred in a single year by historical trends of undernutrition, these costs represent the present values and savings generated by children born during this period.

The scenarios developed for this report are as follows:

Baseline. The cost of inaction — Progress in reduction of stunting and underweight child stops

For the baseline, progress in the reduction of the prevalence of undernutrition stops at the level achieved in 2009. 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.

Scenario #1: Cutting by half the prevalence of child undernutrition by 2025

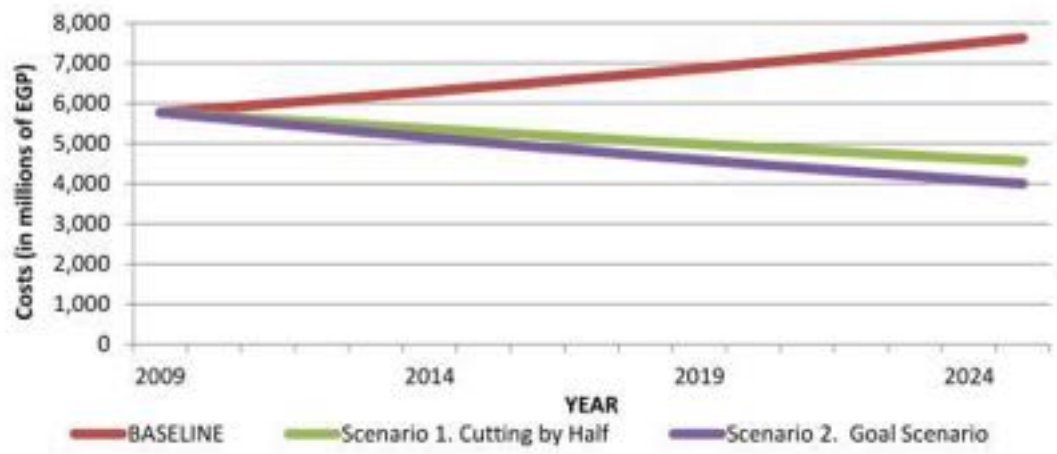
In this scenario, the prevalence of underweight and stunted children would be reduced to half of the 2009 value. In the case of Egypt, this would mean a constant reduction of 0.9 percent points annually in the stunting rate, from 30.7 (estimate for 2009) to 15.4 percent in 2025. With the right combination of proven interventions, this scenario would be achievable, as the average rate of reduction for stunting between 2000 and 2008 is estimated at 0.76 percentage points, which is very close to the progress rate required in achieving these scenarios. Nevertheless, for the period 2005-2008, the country faced a setback in progress at a rate of -2.3 percentage points, which appears to indicate that stronger investments are required to return to a positive trend.

Scenario #2: The goal scenario — Reduce stunting to 10 percent and underweight children to 5 percent by 2025

In this scenario, the prevalence of stunted children under 5 would be reduced to 10 percent and the prevalence of underweight children under the age of 5, 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 continental challenge for which countries of the continent could collaborate to achieve. The progress rate required to achieve this scenario would be a 1.2 percentage point annual reduction for a period of 16 years, from 2009 to 2025.

As Figure 4.13 shows, the progressive reduction of child undernutrition generates a similar reduction in the cost associated with it. The distances between the trend lines indicate the savings that would be achieved in each scenario. Figure 4.14 indicates the differences in economic terms.

FIGURE 4.13
TRENDS OF ESTIMATED COSTS OF CHILD UNDERNUTRITION, EGYPT, 2009-2025
(In millions of EGP)



Source: COHA Model estimations.

In the baseline, where the progress of reduction of child undernutrition would stop at the level of 2009, the cost in 2025 would reach EGP7.6 billion (USD1.4 billion).

In Scenario #1 in which a reduction of half of the current prevalence is achieved, the cost in 2025 would reduce to EGP4.6 billion (USD828.5 million). For the full period between 2009 to 2025, this would represent a total savings of EGP11.7 billion (USD2.1 billion). Although the tendency of savings would not be linear, as they would increase over time as progress was achieved, a simple average of the annual savings would represent EGP732 million (USD133 million) per year.

TABLE 4.12
COSTS AND SAVINGS BY SCENARIO, EGYPT
(All values in millions)

	Baseline		S1. Cutting by Half		S2. Goal Scenario	
	EGP	USD	EGP	USD	EGP	USD
Projected cost in the year 2025	7,613.4	1,384.3	4,556.9	828.5	3,996.5	726.6
Total projected savings (2009-2025)	-	-	11,708.7	2,128.8	14,514.7	2,639.0
Annual projected savings (2009-2025)*	-	-	731.8	133.1	907.2	164.9
Annual percentage points reduction in stunting rates required achieve scenario (2009-2025)	Progress stops		0.90%		1.20%	

Source: COHA Model estimations.

In the case of the goal scenario, the cost in 2025 would be reduced to EGP3.9 billion (USD726.6 million). This translates into an increase in total savings to EGP14.5 billion (USD2.6 billion), which represents USD164.9 million per year for the same 16-year period.

The potential economic benefits of reducing undernutrition are a key element in making the investment case for nutrition investments. The reduction in clinical episodes for the health system, grade repetition, improvements in educational performance and physical capacity are elements that have a direct contribution in national productivity.

4.4 Conclusions and Recommendations

4.4.A Implications for Egypt's Social and Economic Development

The COHA study is an important step forward to better understand the role that child nutrition and human development can play as a catalyser, or as a constraint, in social and economic transformation. This report marks the first analysis on the social and economic impact of child undernutrition specific for Egypt, opening the way for increased understanding of its consequences.

Its results strongly suggest that in order for the country to achieve sustainable human and economic growth, special attention must be given to the early stages of life as the foundation of human capital. The results of the study are supported by a strong evidenced base, and a model of analysis specially adapted for Africa, which demonstrates the depth of the consequences of child undernutrition in health education and labour productivity. This study further quantifies the potential gains of addressing child undernutrition as a priority. Stakeholders in Egypt now have not only the ethical imperative to address child nutrition as a main concern, but a strong economic rationale to position stunting in the centre of the development agenda.

The study estimates that child undernutrition generated annual health costs in 2009 equivalent to EGP1.1 billion (USD213 million). These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children and the protocols necessary for their treatment. It is also important to note that only one of every five children is estimated to be receiving proper health attention. As the health coverage expands to rural areas, there will be an increase of people seeking medical attention; this can potentially affect the efficiency of the system to provide proper care services. This study illustrates that a reduction of child undernutrition could facilitate the effectiveness of this expansion by reducing the incremental burden generated by the health requirements of underweight children.

Furthermore, the study estimates that 11 percent of all cases of child mortality in Egypt are associated with the higher risk of undernutrition. Hence, a preventive approach to undernutrition can help reduce this preventable loss of human capital that has an impact on society and the economy.

Increasing the educational level of the population, and maximizing the productive capacity of the population dividend, is a key element to increase competitiveness and innovation. This represents an interesting opportunity in Egypt, where the population under 15 years is estimated to be 31 percent of the total. These children and youth must be equipped with the skills necessary for competitive labour. Thus, the underlying causes for low school performance and early desertion must be addressed. As there is no single cause for this phenomenon, a comprehensive strategy must be put in place that

considers improving the quality of education and the conditions required for school attendance. The study demonstrates that stunting is one of the major contributing factors to the impaired cognitive and physical development that negatively impacts academic performance, which when addressed efficiently can improve scholastic achievements and hence individuals' labour opportunities in the future.

The study estimated that children who were stunted experienced a 2 percent higher repetition rate in school. As a result, 10 percent of all grade repetitions in school are associated with the higher incidence of repetition that is experienced by stunted children. About 59 percent of these cases of grade repetition occur in primary school. These numbers suggest that a reduction in the stunting prevalence could also support an improvement in schooling results, as it would reduce preventable burdens to the education system.

On the African continent, more than half of the population is expected to live in cities by 2035.[79] An important component to prepare for this shift is to ensure that the workforce is ready to make a transition towards more skilled labour and economies are able to produce new jobs to reduce youth unemployment. By preventing child stunting and thus avoiding the associated loss in physical and cognitive capacity that hinders individual productivity, people can be provided with a more equal opportunity for success.

The study estimates that 41 percent of the working age population in Egypt is stunted. This population has achieved on average 0.2 years of lower schooling levels than those who did not experience growth retardation. As the country continues to urbanize, and an increasing number of people participate in skilled employment, this loss in human capital will be reflected in a reduced productive capacity of the population. Thus, it may be a particularly crucial time to address child undernutrition and prepare future youth for better employment by prioritizing the reduction of stunting in Africa's transformation agenda.

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 undernutrition. The model estimates that, in the analysed countries, a reduction of the prevalence to half of the current levels of child undernutrition by the year 2025 can generate annual average savings of EGP732 million (USD133 million). An additional scenario shows that a reduction to 10 percent stunting and 5 percent underweight for that same period could yield annual average savings of EGP907 billion (USD165 million). The economic benefit that would result from a decrease in morbidities, lower repetition rates and an increase in manual and non-manual productivity presents an important economic argument for the incremental investments in child nutrition.

This study is also an important example of how South-South collaboration can work to implement cost effective activities in development and knowledge sharing. Egypt's participation as one of the first-phase countries of the study, and its feedback in challenges faced in collecting the data at national level was an important element in adapting the COHA methodology to Africa. The contributions of the Egypt NIT will serve to facilitate the expansion of this tool on the continent.

Although the COHA study is an important step forward in this type of analysis, there are still important questions left unanswered. Egypt is currently facing an increased prevalence of non-communicable diseases, such as strokes, heart attacks and diabetes (which is also affecting children), which in many cases are a consequence of malnutrition, particularly obesity, which is a type of

malnutrtion. These consequences have not been addressed as part of this analysis, which implies that the health cost of undernutrition could have been underestimated in this framework and that the actual impact is indeed higher than the values presented.

Lastly, this study illustrates the valuable role that data and government-endorsed research can play in shedding light on pertinent issues on the continent. This study will help the country engage within global nutrition movements, such as the Scaling Up Nutrition Initiative, as programmes and interventions are put in place to address stunting as a national priority.

4.4.B Recommendations of the Study

This study presents some key initial findings of the Cost of Hunger in Egypt study, as well as both challenges and opportunities to the country regarding the reduction of child undernutrition. The study estimates the economic and social cost of child undernutrition at EGP20.3 billion (USD3.7 billion) for the year 2009. Without measures to combat and eliminate malnutrition this cost is expected to increase by 32 percent by 2025 to reach to EGP26.8 billion. This means there is an additional cost of an estimated EGP6.5 billion if steps are not taken to address undernutrition among children under five, a situation that requires an urgent and systematic response, prioritizing malnutrition in the national health agenda and within the context of a broader development framework.

A clear recommendation of this study is that Egypt must review its national development frameworks to ensure that the reduction of stunting prevalence is a key outcome indicator for social and economic development policies. Chronic child undernutrition can no longer be considered a sectoral issue, as both its causes and solutions are linked to social policies across numerous sectors. As such, stunting reduction will require interventions from the health, education, social protection and social infrastructure perspectives. Stunting can be an effective indicator of success in larger social programmes This study encourages countries not to be content with "acceptable" levels of stunting; equal opportunity should be the aspiration of every country on the continent. In this sense, it is recommended that aggressive targets are set in Egypt for the reduction of stunting that go beyond proportional reduction, to establish an absolute value as the goal at 10 percent.

In order to address the multiple dimensions of child nutrition, a comprehensive response is needed. In this sense, a recommendation of the NIT is to propose a "National Social, Economic and Health Plan", directly under the Prime Minister and President's oversight, in a multi-sectoral effort that includes concerned public and private entities and builds on the National Nutrition Strategy (2007-2017). It is important to consider the role that the Food Security Advisory Board can play in the implementation and evaluation of this plan, expanding its approach to a more holistic nutritional security framework. This plan can be a tool to reallocate strategic funds to the different stakeholders for malnutrition prevention and elimination programmes and also identify redundant activities that can be gradually integrated as part of an articulated national nutritional response. A critical aspect of this plan is to assign specific institutional responsibilities of the involved institutions to ensure clear accountability and a framework of a limited number of nationally agreed indicators of food and nutritional security that are measurable at the output, outcome and impact levels.

A priority area for enhancing the national capacity to address malnutrition is to improve monitoring and evaluation systems Currently, assessments of the prevalence of child nutrition are conducted

periodically, between every three to five years. Nevertheless, in order to be able to measure short-term results in the prevention of stunting, a more systematic approach with shorter periodicity is recommended, of two years between each assessment. As the focus on the prevention of child undernutrition should target children before 2 years of age, these results will provide information to policy makers and practitioners on the results being achieved in the implementation of social protection and nutrition programmes. In practical terms, this may be achieved by strengthening a national nutrition surveillance system and complemented by ensuring that the effectiveness preventive interventions are adequately evaluated.

Another important element is to further the understanding of the determinants of child undernutrition in each context. As an initial step, it is recommended that the assessment of child nutrition also includes information that relates the nutritional status of the children to the livelihoods and economic activities of households, as well as access to basic services, such as water and sanitation. This information can be used to inform programme design and ensure that interventions effectively reach these vulnerable families with appropriate incentives and innovative approaches within social protection schemes.

A key element to addressing stunting is prevention. It is important to consider, in high prevalence areas, shifting from therapeutic policies to precautionary policies to reduce the prevalence of child undernutrition. From the health perspective, there are several actions that can be implemented or expanded to achieve this goal. Particular attention can be given to mothers and caretakers that might improve care practices. Potential programmes could include providing health awareness programmes for females before marriage and pregnancy; increasing the role of female health enumerators in rural areas; and provide them with necessary information to prepare healthy complete meals for their families. An important action can be investing in mass media campaigns by the Ministry of Health aiming at behavioural change, which also include messages developed to inform vulnerable families of nutritious low budget foods. Deworming interventions and infant and young feeding practices should also be considered as part of a complete health package.

To ensure the effectiveness of community interventions, it is vital to also address institutional capacity, particularly at the local level. Establishing training programmes for the capacity building of employees in the health sector can be an important opportunity in this sense, as it builds on the widespread presence of the Ministry of Health and the health units in various geographical locations in Egypt. The historical collaboration between the permanent Committee for Nutrition of the Ministry of Health and various concerned departments in the government will be crucial to propose and follow up on the implementation of policies and interventions and to obtain the adequate allocation of funds for its implementation. Additionally, new institutional arrangements can be proposed to coordinate the social response to the most vulnerable population through, for example, the Ministry of Planning that can guide, regulate and support short- and long-term policies.

In order to also address some of the consequences of childhood stunting, school feeding programmes, with proper targeting and monitoring, can also play an important role in a comprehensive nutritional response. Currently, there are an estimated 17 million students receive school feeding, a programme overseen by the Ministry of Education and supported by WFP. Although this intervention will not have an impact on the reduction of stunting, it can have a positive result in increasing enrolment and

attendance which is key for increasing the educational level of the population. Additionally, fortified date bars are distributed to targeted school complement meals, to address micronutrient deficiencies. There is also the opportunity to integrate nutrition-sensitive elements into these interventions, such as nutritional awareness material in the curriculum and book covers, and reviewing past experiences, such as awareness programmes for teachers on healthy nutrition. Targeting school girls with appropriate nutrition and health awareness, as well as suitable nutrition, is key, as those girls will be future mothers and shall bear the responsibility of feeding practices for their families.

From a market perspective, there are also policies that can be analysed and potentially contribute to an enabling environment that leads to the elimination of child undernutrition. The distribution and inclusion of healthier food commodities that supply a portion of the nutrition intakes for pregnant and lactating women, can have an impact in reducing lack of access to proper food. Examples of tools for distribution could include ration cards in areas of high vulnerability and in some cases special food subsidies. Innovative targeting approaches should be considered, such as categorizing subsidy system to offer food baskets by beneficiary/age group, noting, however, that this would add an additional financial and administrative burden to the food subsidy system; instead, index-linked cash and voucher options could also be considered as a complementary option. In a context of high volatility in the market and macroeconomic instability, mechanisms that limit the variation of food prices can be considered, particularly for healthy foods, such as fruits, vegetables, dairies and pulses. These market policies must consider actions to emphasize the importance of exclusive breastfeeding for children less than six months old, and continued to two years, and avoid its replacement with the milk formula. Also additional education should focus on optimal child weaning practices and including children 6-23 months of age among the target groups.

From an agricultural and production perspective, it is important to revise the agriculture policies and food commodities that are consumed by children, including ensuring basic standards are complied with in food fortification, particularly better control in salt iodization. Community-led interventions, such as educational and social kitchens should be monitored and evaluated in order to assess the efficiency and scalability, as well as analyse lessons learnt from programmes with food intervention components, particularly those targeted by geographic areas, such as slums, or special population groups, such as pregnant and lactating mothers.

The level of engagement of the private sector in eliminating stunting can also be a factor of success. Special incentives can be analysed to encourage corporate social responsibility in supporting non-governmental organizations that are implementing effective nutrition interventions. Additionally, encouraging the private sector and the media to develop nutrition awareness campaigns can have an important impact in improving overall care practices. These campaigns need to be properly guided to ensure proper messaging and targeting to the different beneficiary groups. The interaction with the private sector to agree on the regulation for the fortification of some specific commodities can also represent an important mechanism to reduce vitamin and mineral deficiencies.

Lastly, Egypt can also benefit from the exchange of experiences from within and outside the continent. In this sense, it is recommended that the interaction with the Scaling Up Nutrition Initiative is reactivated in order to integrate national nutritional goals within this global movement and help maintain political attention on child undernutrition as a national and continental priority.

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5. Country Results: Ethiopia

5.1 Brief Socio-Economic and Nutritional Background

In the year 2009, the GDP of the Federal Democratic Republic of Ethiopia (hereafter referred to as Ethiopia) was ETB335.4 billion.[1] The GNI per capita in 2011 was equivalent to approximately USD370, which is below the average for sub-Saharan Africa and the average for other low income countries.[2] Ethiopia is characterized by high food insecurity with a Global Hunger Index categorized at "alarming" due to high undernourishment. Ethiopia is also characterised by child undernutrition, child mortality and high unemployment rates, especially among the young population.[3]

The country has made important progress in the reduction of poverty. According to available data, the country has reduced the population living under the poverty line (earning less than USD1.25 a day), from 56 percent to 30 percent in the last decade (see Table 5.1).[4] Also, population growth rates have had a stable reduction from 2.5 percent to 2.1 percent in the last decade.[5] Ethiopia's main economic activity is agriculture, in which approximately 79 percent of the population works.[6] According to the World Bank, 35 percent of Ethiopia's land is considered agricultural land.[7]

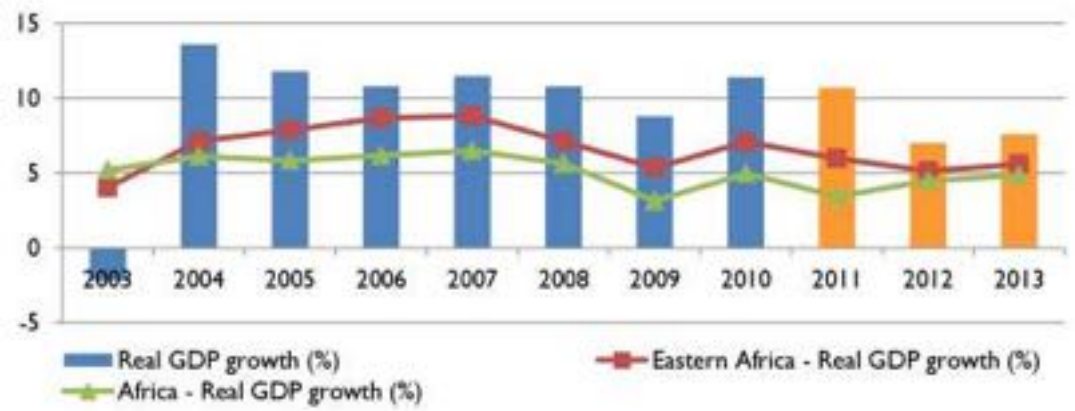
TABLE 5.1
SOCIO-ECONOMIC INDICATORS, ETHIOPIA

Indicators	2000-2002	2005-2007	2009-2011
GDP, total in billions of ETB[a/]	66.56	172	335.4 (2009)
GNI per capita (Atlas method, current USD)	120	230	370
Poverty - $1.25 a day (PPP) (% of population)	56%	39%	30%
Poverty headcount ratio at national poverty line (% of population)	44%	39%	30%
GINI Index	30	29.8	…
Labour Force, total (in millions)	31.2	37.1	41.7
Rural population, percentage	85%	84%	83%
Population in Agriculture, percentage of labour force	…	…	79%
Unemployment, % of total labour force	…	17%	21%
Unemployment, youth total (% of total labour force ages 15-24)	…	25%	…
Unemployment, youth female (% of female labour force ages 15-24)	…	29%	…
Population growth (annual %)	2.5%	2.2%	2.1%
Life expectancy at birth, total (years)	52	56	59

Source if not otherwise noted: World Bank Database.
[a/]"World Economic Outlook Database October 2012.[8]

There is also a positive outlook to the economy. Ethiopia is one of the world's fastest growing economies, exceeding average global growth rates, as well as the averages for both Africa and Eastern Africa. As the African Economic Outlook illustrates, the positive trend is expected to continue through 2013, though with slightly slower growth than in the past few years (see Figure 5.1).[9]

FIGURE 5.1
TRENDS IN REAL GDP GROWTH, ETHIOPIA, 2003-2013
(In percentages)



Source: African Economic Outlook,[10] Figures for 2010 are estimates; Orange bars for 2011 and later are projections.

Levels of public investment in the social sector have varied in the last 10 years (see Table 5.2). Public spending in education has increased as a proportion of the national budget, from 17 percent to 25 percent, above the regional average for Sub-Saharan Africa, with a higher per capita investment in students enrolled in primary education, compared to secondary.[11] However, percentage of public spending on education has descended as percentage of GDP. On the other hand, expenditure in health as a proportion of the GDP is below the regional averages, but with an incremental positive tendency in the last few years.[12]

TABLE 5.2
SOCIAL INVESTMENT INDICATORS, ETHIOPIA

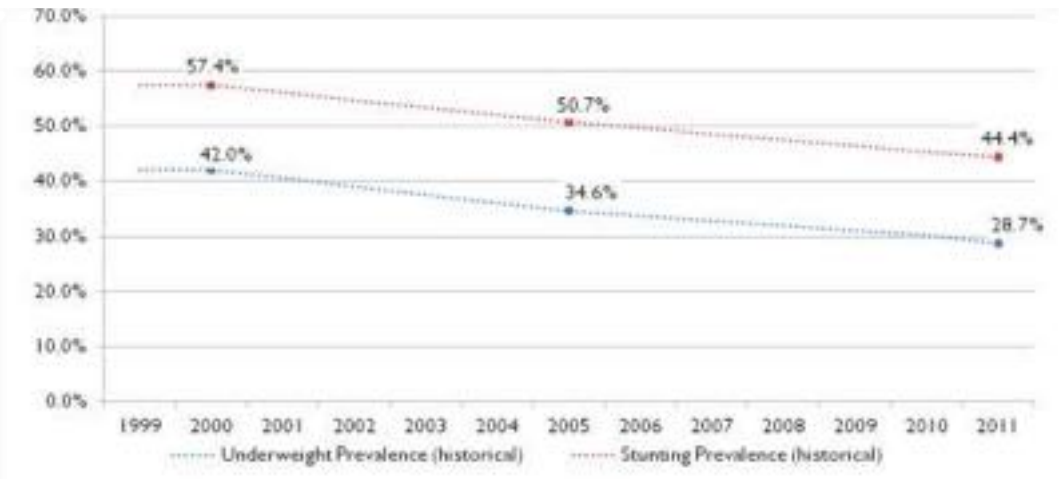
Indicators	2005-06	2007-08	2009-10	Sub-Saharan Africa *
Public spending on education,(% govern. expenditure)	17.5%	22.8%	25.3%	18.8%
Public spending on education, total (% of GDP)	5.5%	5.4%	4.6%	4.6%
Expenditure per student, primary (% of GDP per capita)	…	…	18%	…
Expenditure per student, secondary (% of GDP per capita)	…	…	9.8%	…
Health expenditure per capita (current USD)	8.32	14.04	15.71	84.3
Health expenditure, total (% of GDP)	4.1%	4.3%	4.9%	6.5%
Health expenditure, public (% of total health expenditure)	55.3%	51.9%	53.4%	45%

Source: World Bank Database[13], most recent year available. * Developing countries only - Latest data available.

Ethiopia has made important progress in the reduction of child undernutrition in the last decade.

According to the 2011 DHS survey (see Figure 5.2), approximately 44.2 percent of Ethiopian children under 5 suffered from low height for their age (stunting), which represented an important improvement from 50.7 percent in 2005. Additionally, the prevalence of underweight children has improved from 34.6 percent to 28.7 percent. For that same period, the levels of LBW also improved from 14 percent (2005) to 11 percent (2011).[14]

FIGURE 5.2
ESTIMATED UNDERNUTRITION TRENDS IN CHILDREN UNDER-FIVE, ETHIOPIA, 1990-2010
(In percentages)



Source: Prepared based on information from DHS 2000/2005/2011.[15]
NOTE: Data prior to 2006, has been updated in line with new Child Growth Standards introduced by WHO in 2006[16] to replace the 1977 International Growth Reference, formulated by the National Center for Health Statistics (NCHS).[17]

Nevertheless, the current levels of child undernutrition are evidence of the continuing challenges in the reduction of child hunger. As shown in Table 5.3, it is estimated that 4.3 million of the 12.1 million children under the age of five in 2009 were affected by growth retardation and nearly 3 million children were underweight. This situation is especially critical for children between 12 and 24 months, where half of all children were affected by growth retardation.[18]

TABLE 5.3
POPULATION AND CHILD UNDERNUTRITION, ETHIOPIA, 2009[C]
(Population in thousands)

		Low Birth Weight		Underweight		Stunting	
Age groups	Population size (2009)	Population affected (2009)	Prevalence (2009)[b]	Population affected (2009)	Prevalence (2009)[c]	Population affected (2009)	Prevalence (2009)[c]
New-born (IUGR)[a]	2,484	148	6.0%				
0-11 months				455	18%	497	20%
12-23 months	2,454			793	32%	1,186	48%
24-59 months	7,161			1,743	24%	2,650	37%
Total	12,100	148		2,992	31%	4,333	44%

Source: Estimated based on DHS Surveys 2005 and 2011 and demographic projections.[19]
a/ In a given year, the new-born population is the same as the 0-11 month's age group.
b/ Estimated on the basis of the equation of De Onis et al, 2003.
c/ Data estimated from the most recent undernutrition prevalence figure available.

5.2 Effects and Costs of Child Undernutrition

Undernutrition is mainly characterized by wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age). In early childhood, undernutrition has negative life-long and intergenerational consequences; undernourished children are more likely to require medical care as a result of undernutrition-related diseases and deficiencies.[20] 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 a higher risk of mortality.[21] During schooling years, stunted children are more likely to repeat grades and drop out of school,[22] reducing thus, their income-earning capability later in life.[23] Furthermore, adults who were stunted as children are less likely to achieve their expected physical and cognitive development, thereby impacting on their productivity.[23] In addition to identifying the physical, psychological and social effects of undernutrition, there are significant economic costs.

5.2.A Social and Economic Cost of Child Undernutrition in the Health Sector

Undernutrition at an early age predisposes children to higher morbidity[24] and mortality[25] risks. The risk of becoming ill due to undernutrition has been estimated using probability differentials, as described in the methodology section. Specifically, the study has examined medical costs associated with treating low birth weight (LBW), underweight, anaemia, acute respiratory infections (ARI), acute diarrhoeal syndrome (ADS) and fever/malaria associated with undernutrition in children under the age of five.

(1) Effects on morbidity

Undernourished children are more susceptible to recurring illness.[26] Based on the differential probability analysis undertaken with DHS data, underweight children in Ethiopia are more affected by anaemia (an increase of 12 percentage points), diarrhoea (5 percentage points) and fever (4 percentage points) than healthy children. Acute respiratory infections are also more common in underweight children, particularly for children between 12 months and 24 months of life at an incremental rate of 6 percent.[27]

The COHA study estimated that in Ethiopia during the year 2009, there were almost 4.4 million more episodes associated with the higher vulnerability among underweight children (see Table 5.4). The

TABLE 5.4
MORBIDITIES FOR CHILDREN UNDER-FIVE ASSOCIATED WITH UNDERWEIGHT, BY PATHOLOGY, ETHIOPIA, 2009

Pathology	Number of episodes	Percentage of events
Anaemia	365,311	29%
ADS	527,153	41%
ARI	114,300	9%
Fever/Malaria	264,232	21%
Subtotal	1,270,996	
LBW	148,173	5%
Underweight	2,991,509	95%
Subtotal	3,139,682	
Total	4,410,678	

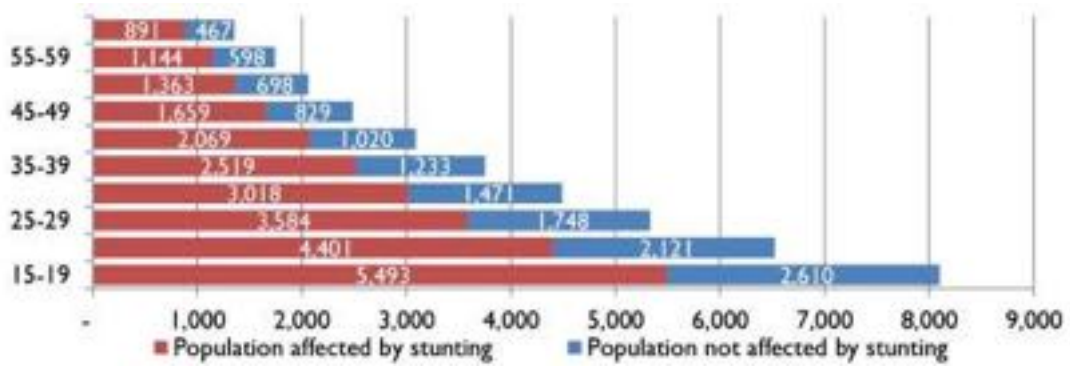
Source: Model estimations based on DHS 2005/2011 and demographic information.[28]

highest occurrence of episodes was found in diarrhoea with 527,153 more episodes in underweight children, followed by anaemia, with over 365,311 annual episodes.

(2) Stunting levels of the working age population

Undernutrition leads to moderate and severe stunting in children, which can impact their physical productivity later stages in life.[29] Although Ethiopia has made important progress in reducing the current levels of stunting in children, a large proportion of the adult population is currently living with the life-long consequences of childhood stunting. As illustrated in Figure 5.4, this study estimates that over 67 percent of the adult population in Ethiopia, aged 15-64, suffered from growth restriction before reaching the age of 5. Currently this represents more than 26.1 million people who are in a disadvantaged position compared to those who had healthy childhoods.

FIGURE 5.3
WORKING AGE POPULATION AFFECTED BY CHILDHOOD STUNTING, BY AGE GROUP, ETHIOPIA
(In thousands of people)



Source: Model compilation based on EHICES 2010/11.[30]

(3) Effects on mortality

Child undernutrition can lead to increased cases of mortality most often associated with incidences of anaemia, diarrhoea, pneumonia and malaria.[31] Nevertheless, when the cause of death is determined, it is rarely attributed to the nutritional deficit of the child but often to the illness that the child manifested. Given this limitation in attribution, the model utilizes relative risk factors[32] to estimate the risk of increased child mortality as a result of child undernutrition. Mortality risk associated with undernutrition was calculated using these relative risk factors, historical survival and mortality rates,[33] and historical nutrition information.

In the last 5 years alone, it is estimated that 378,591 child deaths in Ethiopia were directly associated with undernutrition (see Table 5.5). These deaths represent 28 percent of all child mortalities for this period. Thus, it is evident that undernutrition 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.

These historical mortality rates will also have an impact on national productivity. The model estimates that an equivalent of 8.3 percent of the current workforce has been lost due to the impact of

undernutrition in increasing child mortality rates. This represents 3.2 million people who would have between 15-64 years old, and part of the working age population of the country.

TABLE 5.5
IMPACT OF UNDERNUTRITION ON CHILD MORTALITY, ADJUSTED BY SURVIVAL RATE, ETHIOPIA, 1945-2009
(In number of mortalities)

Period	Number of child mortalities associated with undernutrition
1945-1994	3,230,218
1995-2004	913,008
2005-2009	378,591
Total	4,521,818

Source: ECA on the basis of life tables provided by UN Population Division[34] and population data provided by CSA.[35]

(4) Estimation of public and private health costs

The treatment of undernutrition and related illnesses is a critical recurrent cost for the health system. Treating a severely underweight child, for example, requires a comprehensive protocol[36] that is often more costly than the monetary value and effort needed to prevent undernutrition. The economic cost of each episode is often increased by inefficiencies when such cases are treated without proper guidance from a health-care professional or due to lack of access to proper health services. These costs generate a significant burden not just to the public sector, but to society as a whole.

It is estimated that 4.4 million clinical episodes in Ethiopia in 2009 were associated with the higher risk present in underweight children. As indicated in Table 5.6, these episodes generated an estimated cost of ETB1.8 billion.

TABLE 5.6
HEALTH COSTS OF UNDERNUTRITION-RELATED PATHOLOGIES, ETHIOPIA, 2009
(In millions of ETB)

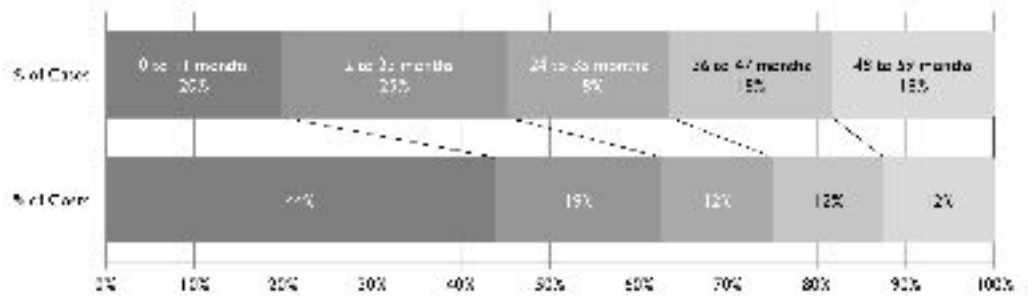
Pathology	Cost	% of episodes	% of cost
LBW/IUGR	563	3%	31%
Anaemia	130	8%	7%
ADS	144	12%	8%
ARI	61	3%	3%
Underweight	693	68%	38%
Fever/Malaria	231	6%	13%
Total Cost	1,822		

Source: Estimations based on data provided by the National Implementation Team, DHS 2006 and 2011,[37] and cost analysis carried out by the NIT (for details see Annex 5).

An important element to highlight is the particular costs generated by the treatment of low birth weight children. These cases represented 3 percent of all the episodes but generated 31 percent of the

total cost, making it the highest per capita element analysed. This is due to the special management protocol required by LBW children, which often includes hospitalization and time in intensive care.[38]

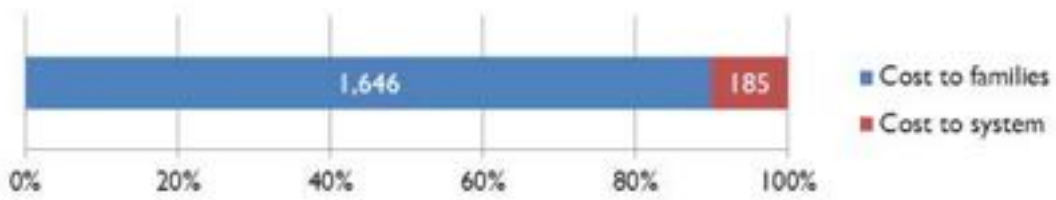
FIGURE 5.4
DISTRIBUTION OF INCREMENTAL EPISODES OF ILLNESS ASSOCIATED WITH UNDERNUTRITION BY AGE GROUP, ETHIOPIA



Source: Model estimations based on DHS 2005/2011, and demographic information.[39]

Another important element to analyse is in the distribution of cost between the public system and the families. The largest proportion of the cost of undernutrition are borne by the families themselves, as often these children are not provided with proper health care (see Figure 5.5). Based on information collected by the NIT, the model estimates that 3 out of every 10 episodes presented in these children are not able to obtain adequate health care. Although the model does not analyse the causes of this, it may be due to lack of access to health services, or the decision on the caretakers not to take the children to health posts.

FIGURE 5.5
DISTRIBUTION OF PRIVATE AND PUBLIC HEALTH COSTS, ETHIOPIA
(In percentages and millions of ETB)



Source: Model estimations based on demographic information and DHS surveys.[42]

A contributing factor to this situation is the relatively low coverage of the national health system. According to information from the Ministry of Health, the service coverage is estimated at 45 percent, but the effective coverage of individuals is estimated to be much lower.[40] of particular concern is data on the percent of birth in proper health facilities, as about 85 percent of women deliver at home, about one in three use traditional birth attendants, and many others are assisted by relatives and family members.[41] Addressing this important element may be a critical to continue reducing the child mortality rates in the country.

The disproportion in the distribution of episodes that do not receive proper health care is also

reflected in the distribution of the health costs. As shown in Figure 5.5, in Ethiopia it is estimated that families carry 90 percent of the costs associated with undernutrition, ETB1.6 billion, while the public system carries 10 percent of the burden at ETB185 million.

Even when the families of the undernourished children are covering most of the health costs related to undernutrition, the burden of this phenomenon is still an important cost component in the public sector. In 2009-2010, the annual estimated cost to the public sector is equivalent to 2.3 percent of the total budget allocated to health.[43] As a whole, the economic impact of undernutrition in health-related aspects is equivalent to 0.55 percent of the GDP of that year.

5.2.B Social and Economic Cost of Child Undernutrition in the Education Sector

There is no single cause for repetition and dropout; however, there is substantive research that shows that students who were stunted before the age of 5 are more likely to underperform in school.[44] As a result, undernourished children are faced with the challenge of competing favourably in school due to their lower cognitive and physical capacities than children who were able to stay healthy in the early stages of life.[45]

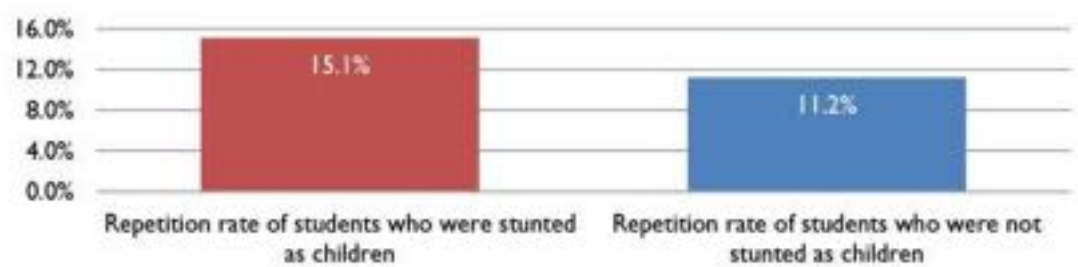
The number of repetition and dropout cases considered in this section of the report result from applying a differential risk factor associated to stunted children, as well as to the official government information on grade repetition and dropouts in the educational system in 2009. The cost estimations are based on the average cost of a child to attend primary and secondary school in Ethiopia in 2009 provided by the Ministry of Education, as well as estimations of costs incurred by families to support child schooling.[46]

(1) Effects on repetition

Children who suffered from undernutrition before 5 years of age are more likely to repeat grades, compared to those were not afflicted by undernutrition (See Figure 5.6).[47] Currently, there are an estimated 17.5 million stunted children of school age, which represents 64 percent of the total population aged between 6 and 18 years in the country.

Based on official information provided by the Ministry of Education, 963,599 primary school students

FIGURE 5.6
REPETITION RATES IN PRIMARY EDUCATION BY NUTRITIONAL STATUS, ETHIOPIA, 2009
(In percentages)

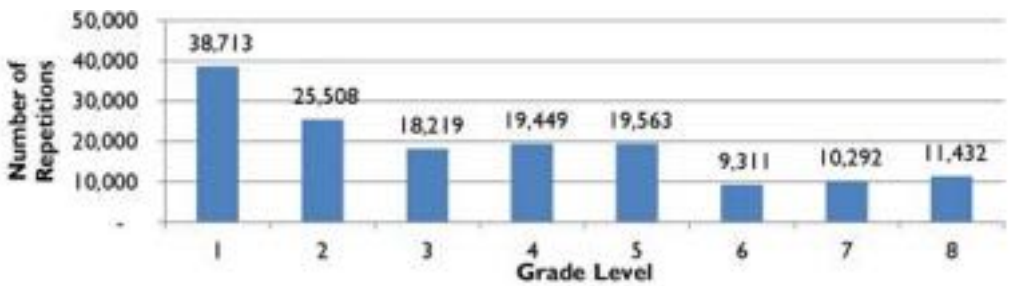


Source: Estimations based on data provided by NIT from Ministry of Education, Education Statistics Annual Abstract 2008-09.[49]

repeated grades in 2009 (13.9 percent).[48] Using data on the increased risk of repetition among stunted students, the model estimated that the repetition rate for stunted children was 15.1 percent, while the repetition rate for non-stunted children was estimated at 11.2 percent

Given these rates and the proportion of stunted students, the model estimated that 152,488 repetitions, or 15.8 percent of all repetitions in 2009 were associated with undernutrition (see Figure 5.7). These children generate an incremental cost to the education system, as they require twice as many resources, since they repeat the year. In addition, caretakers have to cater to their educational cost for an extra year.

FIGURE 5.7
GRADE REPETITION OF STUNTED CHILDREN IN PRIMARY SCHOOL, BY GRADE, ETHIOPIA, 2009



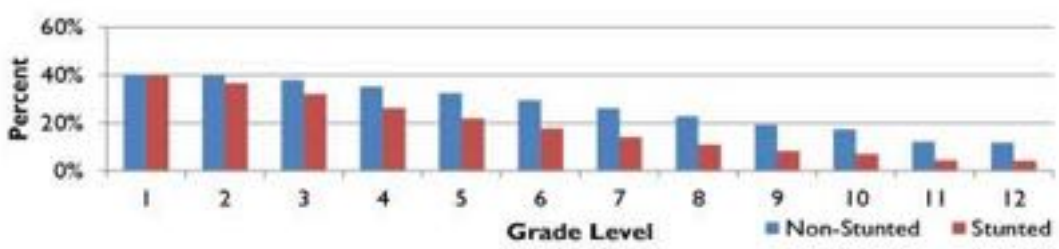
Source: Estimations based on data provided by NIT (Ministry of Education – Annual Abstract).[50]

(2) Effects on retention

Research shows that students who were stunted as children are more likely to drop out of school.[49] According to available data, and taking into account relative risks of stunting on education, it can be estimated that 23 percent of non-stunted population of working age completed primary school, compared to only 11 percent of stunted people. Figure 5.8 below shows the estimated grade achievement, based on their nutritional status.

The costs associated with school dropouts are reflected on 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

FIGURE 5.8
GRADE ACHIEVEMENT BY NUTRITIONAL STATUS, ETHIOPIA, 2009
(In percentages enrolled)



Source: Estimations based on the EHICES 2010/11.[51]

economic costs in 2009, the analysis focuses on the differential in schooling levels achieved by the population who suffered from stunting as children and the schooling levels of the population who were never stunted.

(3) Estimation of public and private education costs

Repetition in schooling years has direct cost implications to families and the school system. Consequently, in 2009, the 152,448 students who repeated grades (and whose repetition was associated with undernutrition) incurred a cost of ETB93 million (see Table 5.7). Given the limitations in data, this analysis only includes grade repetition in primary education; nevertheless, it is important to note that even though proportionally less stunted children would repeat in secondary, as a result of high dropout rates. Further, the per-pupil costs are higher in secondary than in primary education.[53]

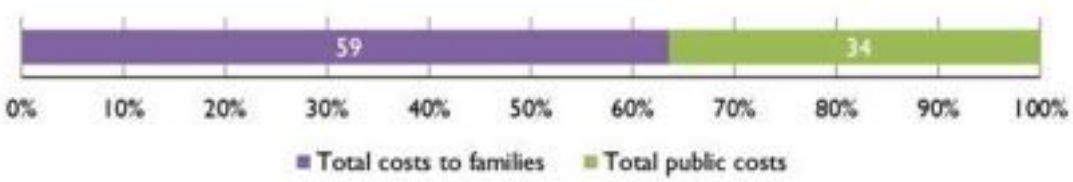
TABLE 5.7
COSTS OF GRADE REPETITIONS ASSOCIATED WITH STUNTING, ETHIOPIA
(In millions of ETB)

	Primary	Secondary	Total
Number of repetitions associated with stunting	152,488	-	152,488
Public Costs per student (ETB)	223	428	
Private Costs per student (ETB)	390	650	
Total Public Costs (millions of ETB)	34	-	34
Total Private Costs (millions of ETB)	59	-	59
Total (millions of ETB)			93
% Social expenditure on education			1.48%

Source: Estimations based on official education statistics of Ministry of Education (2009).[52]

As in the case of health, the social cost of undernutrition in education is shared between the public sector and the families. Of the overall costs, a total of ETB 59.4 million (63 percent) is being covered by the caretakers, while ETB34 million (37 percent) is borne by the public education system (see Figure 5.9).

FIGURE 5.9
DISTRIBUTION OF COSTS IN EDUCATION, ETHIOPIA
(In percentages)



Source: Estimations based on information provided by the Ministry of Education (Education Statistics Annual Abstract).[54]

5.2.C Social and economic cost of child undernutrition in the productivity sector

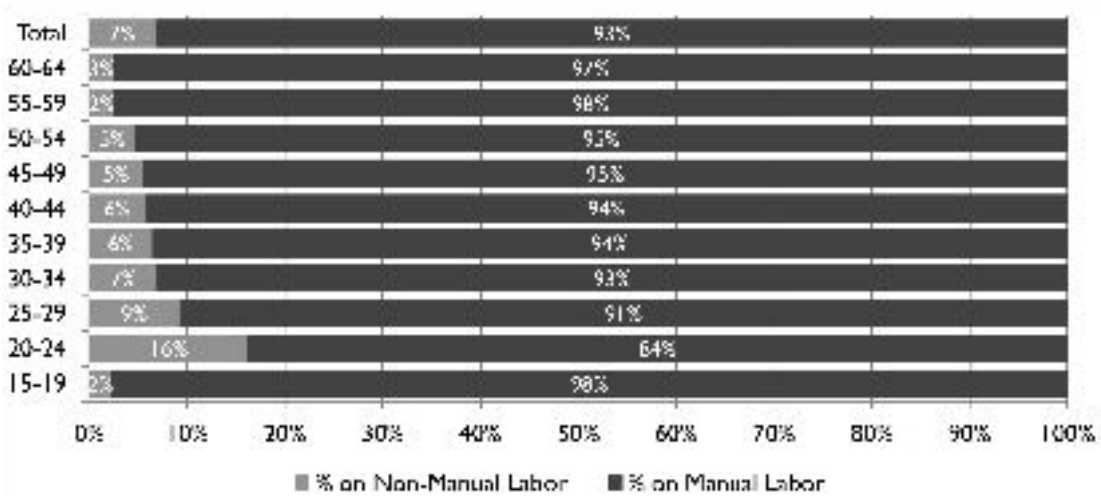
As described in the health section of this report, the model estimated that 67 percent of the working-

age population in Ethiopia were stunted as children. Research shows that adults who suffered from stunting as children are less productive than non-stunted people and are less able to contribute to the economy.[55] This represents more than 26.1 million people in Ethiopia whose productive potential is affected by undernutrition.

Child undernutrition affects human capital and productivity in several dimensions. Stunted people, on average, have achieved fewer years of schooling than non-stunted people.[56] In non-manual activities, higher academic achievement is directly correlated with higher income.[57] Research shows that stunted workers engaged in manual activities tend to have less lean body mass[58] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[59] Moreover, undernutrition-related mortalities contribute to losses in potential national productivity.

The estimation of the population whose labour productivity is affected as a consequence of child undernutrition is based on historical nutritional information, in-country demographics projections, and consumption reported in the EHICES 2010/11.[60] The quantity of people who are absent from the workforce due to the higher mortality risk of undernourished children is estimated in the health section of this report.

FIGURE 5.10
MANUAL AND NON-MANUAL LABOUR DISTRIBUTION, BY AGE GROUP, ETHIOPIA, 2009
(In percentages)



Source: Consumption and Expenditure Survey (EHICES) 2010/11.[61]

The cost estimates for labour productivity are a result of the differential income associated to lower schooling in non-manual activities and the lower productivity associated to stunted children 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 2009.

The distribution of the working population in the labour market is an important contextual element in determining the impact of undernutrition on national productivity. Although the proportion of the

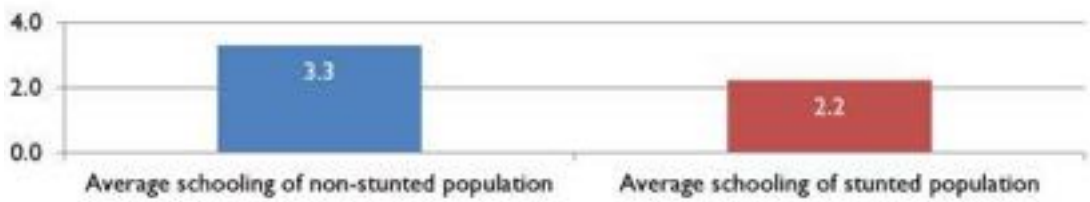
population engaged in non-manual activities is relatively small, the average income of this population is higher than that of the population working in manual activities. As shown in Figure 5.10, the trend of non-manual labour seems to be higher in the younger group (20 to 29 years of age) and manual activities seems to be even more predominant among 30 to 59 year olds. In 2009, 2.8 million of working-age people were involved in non-manual activities.

(1) Losses in non-manual activities

As described in the education section of this country report, students who were undernourished as children complete, on average, fewer years of schooling than students who were adequately nourished as children.[62] 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 EHICES, and as shown in Figure 5.11, it is estimated that the educational

FIGURE 5.11
AVERAGE SCHOOLING YEARS
FOR STUNTED AND NON-STUNTED POPULATION, ETHIOPIA
(In years of education)



Source: Estimated from EHICES 2010/2011[63] CSA.[64]

gap between the stunted and non-stunted population is 1.1 years. It is important to note that over time there has been an improvement in the average years of schooling among the working population. Whereas the cohort from 60-64 years show and average level of school education of 0.7 years, the cohort aged 20-24 shows an average of 4.4 years of education.

TABLE 5.8
REDUCED INCOME IN NON-MANUAL ACTIVITIES
DUE TO STUNTING, ETHIOPIA, 2009

Age in 2009	Population working in non-manual sectors who were stunted as children *(In thousands of people)*	Income Losses in non-manual labour *(In millions of ETB)*
15-24	868	63
25-34	561	212
35-44	293	208
45-54	163	135
55-64	54	7
Total	1,939	625
% GDP		0.20%

Source: Model estimations based on income EHICES 2010/2011,[66] CSA,[67] and DHS 2006 and 2011.[68]

As Figure 5.13 shows, the progressive reduction of child undernutrition generates a similar reduction in the cost associated with it. The distances between the trend lines indicate the savings that would be achieved in each scenario.

In the baseline, where progress in reducing child undernutrition would stop at the level of 2009, the cost in 2025 would reach ETB 43.4 billion million (USD3.7 billion) (see Table 5.12).

In Scenario #1 in which a reduction of half of the current prevalence is achieved, the cost in 2025 would reduce to ETB24.4 billion (USD2.1 billion). For the full period between 2009 to 2025, this would represent a total savings of ETB70.9 billion (USD6.0 billion). Although the tendency of savings would not be linear, as they would increase over time as progress was achieved, a simple average of the annual savings would represent ETB4.4 billion (USD375.6 million) per year.

In the case of the goal scenario, the cost in 2025 would be reduced to ETB9.2 billion (USD777.2 million). This translates into an increase in total savings to ETB148.0 billion (USD12.5 billion), which represents ETB 9.3 billion (USD784.0 million) per year, for the same 16-year period.

In addition to the scenarios presented, an additional analysis has been carried out for Ethiopia. The National Nutrition Plan[74] has established a target of achieving 30 percent stunting by the year 2015. If this target were to be achieved, the model estimated that the annual average savings of this scenario would be an average of USD106 million, and would require a progress of 2.7 percent annually from the values estimated for 2009.

5.4 Conclusions and Recommendations

5.4.A Implications for Ethiopia's Growth and Transformation Plan

The Cost of Hunger in Africa Study is an important step forward to better understand the role the child nutrition and human development can play as a catalyser, or as a constraint, in the implementation of Ethiopia's Growth and Transformation Plan (GTP).[75] This plan, that projects a sustained GDP growth of 11 percent to 15 percent from 2010 to 2015, represents the national strategy of Ethiopia towards poverty eradication. In its implementation, the GTP outlines opportunities in the agricultural and industrial sectors, and a series of indicators that needs to be monitored to assess the progress towards the ultimate goal. The results of the COHA study demonstrate that in order to enhance and sustain the results envisioned in this plan, child stunting must be addressed as a key priority.

The results of the COHA study in Ethiopia strongly suggest that in order for the country to achieve sustainable human and economic growth, special attention must be given to the early stages of life as the foundation of human capital. The results of the study are supported by a strong evidenced base, and a model of analysis specially adapted for Africa, which demonstrates the depth of the consequences of child undernutrition in health education and labour productivity. This study further quantifies the potential gains of addressing child undernutrition as a priority. Now, stakeholders have not only the ethical imperative to address child nutrition as a main concern, but a strong economic rationale to position stunting in the centre of the development agenda.

The GTP has a key element in its implementation that addresses the importance of improving access and quality of health services. This study estimates that child undernutrition generates health costs

The lower educational achievement of the stunted population has an impact on the expected level of income a person would earn as an adult.[65] As presented in Table 5.8, the model estimates that 1.9 million people engaged in non-manual activities suffered from childhood stunting. This represents 5 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 ETB625 million, equivalent to 0.2 percent of the GDP in 2009.

(2) Losses in manual activities

Manual activities, mainly in agriculture, employ more than 70 percent of the Ethiopian working-age population. Research shows that stunted workers engaged in manual activities tend to have less lean body mass and are more likely to be less productive in manual activities than those who were never affected by growth retardation. The model estimated that 36.1 million Ethiopians are engaged in manual activities, of whom 24.3 million were stunted as children. This is equivalent to 62 percent of the working-age population and represents an annual loss that surpasses ETB12.8 billion, equivalent to 3.8 percent of the GDP, in potential income lost due to lower productivity (see Table 5.9).

TABLE 5.9
LOSSES IN POTENTIAL PRODUCTIVITY
IN MANUAL ACTIVITIES DUE TO STUNTING, ETHIOPIA, 2009

Age in 2009	Population working in manual labour who were stunted as children *(In thousands)*	Loss in productivity due to stunting *(In millions of ETB)*
15-24	9,053	4,251
25-34	6,062	3,455
35-44	4,307	2,508
45-54	2,867	1,613
55-64	1984	1030
Total	24,273	12,857
% GDP		3.80%

Source: Estimations based on data from EHICES 2010/2011[69] and WHO/NCHS Database information.[70]

(3) Opportunity costs due to mortalities

The model estimated that 3.2 million people of working age were absent from the workforce in 2009 due to child mortality associated with undernutrition. This represents a 8 percent reduction in the current workforce.

Considering the productive levels of the population, by their age and sector of labour, the model estimated that in 2009, the economic losses (measured by working hours lost due to undernutrition-related child mortality) were ETB 40 billion, which represented 11.9 percent of the country's GDP for 2009 (see Table 5.10).

TABLE 5.10
LOSSES IN POTENTIAL PRODUCTIVITY DUE TO MORTALITY ASSOCIATED WITH UNDERNUTRITION, ETHIOPIA, 2009
(all values in millions)

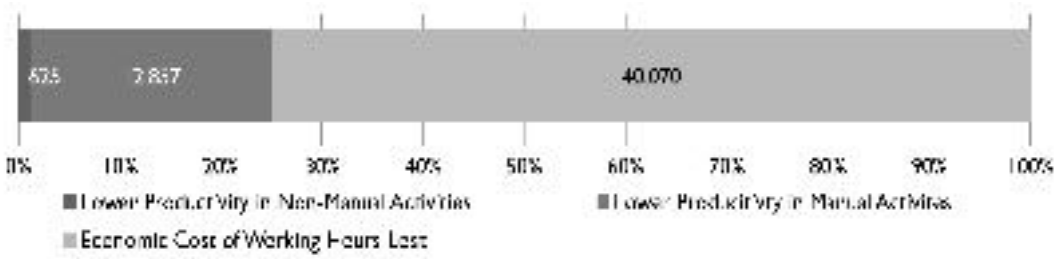
Age groups	Working hours lost	Loss in productivity (ETB)	Loss in productivity (USD)
15-24	1,198.1	9,238.4	782.9
25-34	1,117.5	9,515.9	806.4
35-44	916.8	8,038.9	681.3
45-54	775.7	6,766.6	573.4
55-64	777.8	6,510.3	551.7
Total	4,785.9	40,070.0	3,395.8
% GDP		11.9%	

Source: Model estimations based on EHICES 2010/2011[71]and DHS 2005 and 2011.[72]

(4) Overall productivity losses

The total losses in productivity for 2009 are estimated at approximately ETB53.6 billion, which is

FIGURE 5.12
DISTRIBUTION OF LOSSES IN PRODUCTIVITY BY SECTOR, ETHIOPIA, 2009
(in percentage and millions of ETB)



Source: Model compilation.

equivalent to 16 percent of Ethiopia's GDP. Figure 5.12, below, illustrates the distribution of losses. The largest share of productivity loss, amounting to 75 percent, is due to working hours lost from individuals who died before reaching the age of five, due to high rates of undernutrition.

Lower productivity in manual activities represented 24 percent of the cost, as there is a large proportion of the population in Ethiopia engaged in agriculture. Given the small proportion of the population engaged in non-manual activities, the proportion of losses associated with this sector is estimated at only 1 percent of the total productivity losses.

5.2.D Summary of Effects and Costs

The developed methodology is used to analyse the impact of child undernutrition 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 undernutrition.

TABLE 5.11
SUMMARY OF COSTS, ETHIOPIA, 2009

	Episodes	Cost in millions of ETB	Cost in millions of USD	Percent-age of GDP
Health Costs				
LBW and Underweight	3,139,682	1,256	106.4	
Increased Morbidity	1,270,996	566	48.0	
Total for Health	4,410,678	1,822	154.4	0.54%
Education Costs				
Increased Repetition - Primary	152,488	93	7.9	
Increased Repetition - Secondary	0	0	0.0	
Total for Education	152,488	93	7.9	0.03%
Productivity Costs				
Lower Productivity - Non-Manual Activities	1,938,632	625	53.0	
Lower Productivity - Manual Activities	24,273,274	12,857	1,089.6	
Lower Productivity - Mortality	3,230,218	40,070	3,395.8	
Total for Productivity	29,442,124	53,552	4,538.4	15.97%
TOTAL COSTS		55,468	4,700.5	16.54%

Source: Model estimation.

For Ethiopia, the total losses associated with undernutrition were estimated at ETB55.5 billion (USD4.7 billion) for the year 2009. These losses are equivalent to 16.5 percent of GDP of that year (see Table 5.11). The highest element in these costs relates to the lost working hours due to mortality associated with undernutrition.

5.3 Analysis of Scenarios

The previous chapter showed the social and economic costs that affect Ethiopia in 2009 due to high historical trends of child undernutrition. Most of these costs are already cemented in society and policies must be put in place to improve the lives of those already affected by childhood undernutrition. Nevertheless, there is still room to prevent these costs in the future. Currently, two out of every five children in under-five in Ethiopia is stunted.[73]

The scenarios developed for this report are as follows:

Baseline. The cost of inaction — Progress in reduction of stunting and underweight child stops. For the baseline, progress in the reduction of the prevalence of undernutrition stops at the levels achieved in 2009. 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.

Scenario #1. Cutting by half the prevalence of child undernutrition by 2025. In this scenario, the prevalence of underweight and stunted children would be reduced to half of the 2009 values corresponding to the reference year. In the case of Ethiopia, this would mean a constant reduction of 1.5 percentage points annually in the stunting rate, from 46.4 percent (estimate for 2009) to 23.2 percent in 2025. With the right combination of proven interventions, this scenario would be achievable, as the rate of reduction for stunting between 2001 and 2011 is estimated at 1.1 percentage points, which is close to the progress rate required in achieving this scenario.

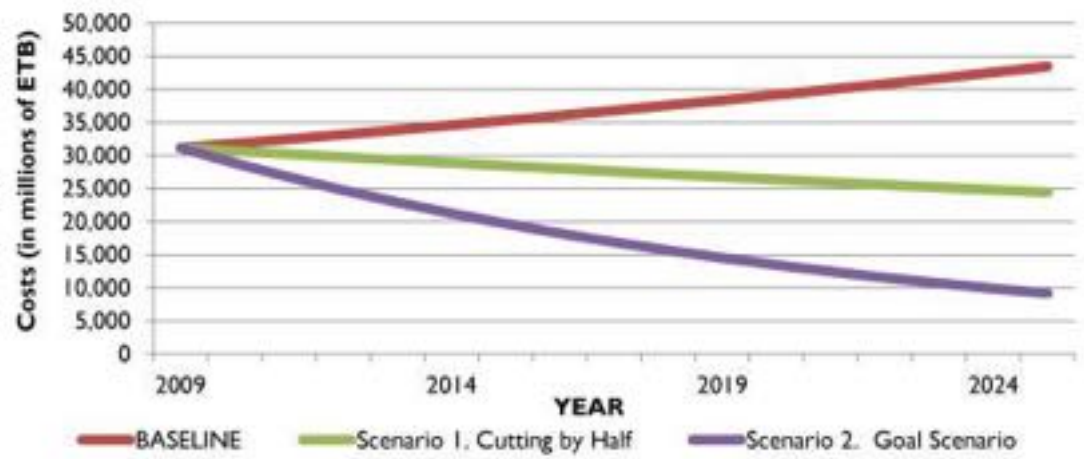
Scenario #2. The goal scenario — Reduce stunting to 10 percent and underweight children to 5 percent, by 2025. In this scenario, the prevalence of stunted children would be reduced to 10 percent and the prevalence of underweight children under the age of 5 to 5 percent. Currently, the global stunting rate is estimated at 26 percent, with Africa having the highest prevalence at 36 percent. This Goal Scenario would require a true call to action, and would represent an important continental challenge in which countries on the continent could collaborate jointly in its achievement. The progress rate required to achieve this scenario would be 2.3 percentage points annual reduction for a period of 16 years, from 2009 to 2025.

This section analyses the impact that a reduction in child undernutrition 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 Ethiopian children would bear in the future. 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 can generate a baseline for various scenarios, based on nutritional goals established in each country. Scenarios are constructed based on the estimated costs of the children born in each year, from 2009 to 2025 (net present value). While the previous section calculated the costs incurred in a single year by historical trends of undernutrition, these costs represent the present values and savings

FIGURE 5.13
TRENDS OF ESTIMATED COSTS OF CHILD UNDERNUTRITION, ETHIOPIA, 2009-2025



Source: Model estimations.

generated by children born during 2009 to 2025.

TABLE 5.12
ESTIMATED SAVINGS FOR EACH SCENARIO, ETHIOPIA, 2009
(All values in millions) [a]

	Baseline		S1. Cutting by Half		S2. Goal Scenario	
	ETB	USD	ETB	USD	ETB	USD
Projected cost in the year 2025	43,445.1	3,681.8	24,436.2	2,070.9	9,170.8	777.2
Total projected savings (2009-2025)	-	-	70,918.3	6,010.0	148,023.3	12,544.3
Annual projected savings (2009-2025)*	-	-	4,432.4	375.6	9,251.5	784.0
Annual percentage points reduction in stunting rates required to achieve scenario (2009-2025)	Progress stops		1.5%		2.3%	

Source: Model estimations.
a/ All values in net present values at an 8% social discount rate.

equivalent to 0.5 percent of the total public budget allocated to health. These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children and the protocols necessary for their treatment. Although this amount might seem relatively small, it is important to note that only 3 out of every 10 children are estimated to be receiving proper health attention. As the health coverage expands to rural areas, there will be an increase of people seeking medical attention; this can potentially affect the efficiency of the system to provide proper care services. This study illustrates that a reduction of child undernutrition could facilitate the effectiveness of this expansion by reducing the incremental burden generated by the health requirements of underweight children.

The GTP also prioritizes the importance of reducing child mortality. The COHA study estimates that 28 percent of all cases of child mortality are associated with the higher risk of undernutrition. Hence, a preventive approach to undernutrition can help reduce this incremental burden to the public sector, and also reduce the costs that are currently being covered by caretakers and families.

One of the key elements of the GTP is the expanding preschool, primary and secondary access and increase enrolment. This represents a particular opportunity in Ethiopia where the population under 15 years is estimated to constitute 40 percent of the current population. These children and youth must be equipped with the skills necessary for competitive labour. Thus, the underlying causes for low school performance and early desertion must be addressed. As there is no single cause for this phenomenon, a comprehensive strategy must be put in place that considers improving in the quality of education and the conditions required for school attendance. This study demonstrates that stunting is one barrier to attendance and retention that must be removed to effectively elevate the educational levels and improve individuals' labour opportunities in the future.

The study estimated that children who were stunted experienced a 3.9 percent higher repetition rate in primary school. As a result, 16 percent of all grade repetitions in primary school are associated to the higher incidence of repetition that is experienced by stunted children. These numbers suggest that a reduction in the stunting prevalence could also support an improvement in schooling results, as it would reduce preventable burdens to the education system. There was not enough information to analyse this aspect for secondary education in Ethiopia.

A critical pillar in the successful implementation of the GTP lays in the capacity of the country to elevate the levels of productivity in the population, both in the rural and urban context. Achieving this in short-term, in a way that also has an impact in the reduction of poverty rates, it requires an important investment in specialized training to continuously build the capacities in the population. This will facilitate the shift of the workforce towards a more skilled labour, as the economy is able to produce new jobs to reduce youth unemployment.

The study estimates that 67 percent of the working-age population in Ethiopia is currently stunted. This population has achieved, on average, lower school levels than those who did not experience growth retardation of 1.1 years of lower schooling. As industries continue to develop increasing number of people participate in skilled employment, this loss in human capital will be reflected in a reduced productive capacity of the population. Thus, it may be a particularly crucial time to address child undernutrition and prepare future youth for better employment by prioritizing the reduction of stunting in the GTP.

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 undernutrition. The model estimates that, in the analysed countries, a reduction of the prevalence to half of the current levels of child undernutrition by the year 2025 can generate annual average savings of ETB4.4 billion (USD376 million). An additional scenario shows that a reduction to 10 percent stunting and 5 percent underweight for that same period could yield annual average savings of ETB9.2 billion (USD784 million). This economic benefit that would result from a decrease in morbidities, lower repetition rates and an increase in manual and non-manual productivity, presents an important economic argument for the incremental investments in child nutrition.

This study is also an important example of how South-South collaboration can work to implement cost effective activities in development and knowledge sharing. Ethiopia's participation as one of the pilot countries of the study, and its feedback in challenges faced in collecting the data at national level was an important element in adapting the COHA methodology to Africa. The contributions of the Ethiopia NIT will serve to facilitate the expansion of this tool in the continent.

Lastly, this study illustrates the valuable role that data and government-endorsed research can play in shedding light on pertinent issues on the continent. This study will help the country engage within global nutrition movements such as the Scaling Up Initiative as programmes and interventions are put in place to address stunting as a national priority.

5.4.B Recommendations of the Study

This study presents some key initial findings of the Cost of Hunger in Ethiopia, as well both challenges and opportunities regarding the reduction of child undernutrition to the country.

The Government of Ethiopia and its development partners have in place a series of activities, which in most cases, are demonstrating results in the reduction of child undernutrition. Nevertheless, an increase in the reduction rate will require scaling-up current interventions that have proved effective. Some of the actions recommended by the NIT include:

Promotion of awareness of the entire population. The government supports awareness activities through various sectors and mechanisms Nutrition awareness remains limited across the whole population including the educated. The demonstrated impact of nutritional deficiencies in most parts of the country requires enhancing the awareness on the importance of nutrition especially in the first 1000 days of a child's life and the school-going age group that has be found to facilitate nutritional catch -up starting from the early childhood care and development centres.

Promote the delivery of nutrition services integrated with other essential services: The government of Ethiopia has in place maternal child health such as ANC, PNC and Young child health services provided through the health delivery system. While these are directed to ensure healthy pregnancies and good birth outcomes while promoting positive health behaviour, the utilization is still limited. Because of this reason, nutrition services delivery at health facility level is low. Therefore utilization of essential health services should be increased and nutrition services should be delivered at all contact points.

Promote optimal complementary feeding practices: Though there is some improvement in

breast feeding practice in the country, the level of appropriate complementary feeding practices is still very low. Therefore it is recommended that best practices observed in some area regarding improving the complementary feeding practice, through improved local food processing should be scaled up and interventions should be employed to enrich food with micronutrients.

Initiate mandatory food fortification programmes: In Ethiopia, consumption of balanced diets is often limited to the affluent population group mostly located in the urban areas. The bigger proportion of Ethiopia's population is located in the rural areas. While access to food may not always be a problem, food diversity is limited and depends on the region. Hence the level of micronutrient deficiency in specific vulnerable group and the general population is high. Therefore it is recommended that mandatory fortification of staple foods with multiple micronutrients should be initiated and scaled up.

Promotion of Public-Private partnerships: Public-private partnerships could be promoted as a strategy of engaging the private sector (especially in the food production and processing industry) to better understand and incorporate the health and nutritional needs of the population in their products, promotions and distribution mechanisms This might also address the constraints (such as tax subsidies on processing technology equipment, fortificants, etc.) of the public sector related to coming up with the right products.

Increase efforts and explore further opportunities in Bio-fortification: Given that most rural communities practice subsistence farming and may not be able to access fortified food products due to either remoteness or affordability, bio fortification of common staple such as bean, maize, sweet potatoes may be promoted through the Ministry of Agriculture and other existing mechanisms in order to allow households practicing subsistence farming access better improved food commodities from own production.

Increase nutrition sensitization in existing sector activities: Sensitization may include developing of a nutrition hand guide that facilitates not only the literate but also educators on the locally available food commodities that could be used, blended, processed to develop a nutritionally enriched food that can be used by the various vulnerable groups. The last version of such a guide for Ethiopia was last updated in 1969.

Promote the nutrition service delivery of adolescents: In a country like Ethiopia where there is high rate of malnourished adolescent which is coupled by high teenage pregnancy, high levels of stunting can be predicted. To break the intergenerational cycle of malnutrition, programmes that address the nutritional needs of adolescents should be implemented.

In order for nutrition intervention to maximize their results, certain elements that are not directly within the scope of the activities themselves must be addressed, in order to achieve a sustained reduction in child undernutrition.

Improvements in the Policy Environment: An enabling policy environment to facilitate planning and implementation of the above recommendations; mandatory large scale industrial fortification of common staples widely consumed such as wheat, maize and vegetable oil; mandatory use of fortified maize flour and vegetable oil in school feeding programmes; tax subsidies on fortificants and other food processing and agricultural technology and equipment.

Coordination of multi-sectoral nutrition interventions for common objective of addressing undernutrition. In order to successfully implement the NNP, the Office of the Prime Minister (OPM) Nutrition Action Plan secretariat has been developed to coordinate implementation. This secretariat must be supported in the multi-sectoral coordination of the implementation of the national nutrition plan.

A clear recommendation of this study is that Ethiopia must review their national development frameworks to ensure that the reduction of the stunting prevalence is an outcome indicator of their social and economic development policies. Chronic child undernutrition can no longer be considered a sectoral issue, as both its causes and solutions are linked to social policies across numerous sectors. As such, stunting reduction will require interventions from the health, education, social protection, and social infrastructure perspectives. Stunting can be an effective indicator of success in larger social programmes

This study encourages countries not to be content with "acceptable" levels of stunting; equal opportunity should be the aspiration of every country on the continent. In this sense, it is recommended that aggressive targets are set in Ethiopia for the reduction of stunting that go beyond proportional reduction, to establish an absolute value as the goal for the country at 20 percent by the year 2025. This interim value will demonstrate long term commitment and its achievement will set the basis for stronger efforts towards the elimination of child undernutrition in Ethiopia.

The achievement of this aggressive goal cannot be reached from just the health sector. In order to be able to have a decisive impact on improving child nutrition, a comprehensive multi-sectoral policy must be put in place, with strong political commitment and allocation of adequate resources for its implementation. This plan should look to accelerate the actions on the determinants of child undernutrition such as inadequate income, agricultural production, improving gender equality and girls' education, improving water supply and sanitation, but also by addressing deeper underlying determinants such as the quality of governance and institutions and issues relating to peace and security. To ensure sustainability of these actions, whenever possible, the role of international aid must be complementary to nationally led investments, and further efforts have to be done in ensuring the strengthening of national capacity to address child undernutrition.

An important element that must be addressed to enhance the national capacity to address malnutrition is to improve the monitoring and evaluation systems Currently, the assessments of the prevalence of child nutrition are carried-out with a periodicity of between 3 to 5 years. Nevertheless, in order to be able to measure short term results in the prevention of stunting, a more systematic approach with shorter periodicity is recommended, of 2 years between each assessment. As the focus on the prevention of child undernutrition should target children before 2 years of age, these results will provide information to policy makers and practitioners on the results being achieved in the implementation of social protection and nutrition programmes.

Lastly, it is crucial to further the understanding of the determinants of child undernutrition in each context. As an initial step, it is recommended that the assessment of child nutrition also includes information that relates the nutritional status of the children to the livelihoods and economic activities of the households. This information can be used to inform programme design to ensure that interventions effectively reach these vulnerable families with appropriate incentives and innovative

approaches within social protection schemes.

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6. Country Results: Swaziland

6.1 Brief Socio-Economic and Nutritional Background

In the year 2009, the GDP of the Kingdom of Swaziland (hereafter referred to as Swaziland) was estimated at SZL25 billion and the per capita GNI at USD3,300, making it a low middle-income country (see Table 6.1).[1] The country and its population, estimated at 1.068 million, face important development challenges, particularly associated with income inequality, unemployment, food insecurity, and elevated levels of HIV prevalence amongst the population.

In recent years, there have been positive signs of poverty reduction. According to national surveys, the population living under the poverty line has dropped from 69 percent to 63 percent, with an estimated 40.6 percent of people living with under USD1.25 a day.[2] An important contextual factor is that there has been no improvement in the last decade regarding the high levels of income inequality.

Perhaps the most devastating factor impacting development are HIV and AIDS. Swaziland has the highest HIV prevalence rate in the world, at 26 percent among the adult population, and rising to a peak 49 percent among women aged 25 to 29 and an estimated 17 thousand children living with HIV.[3]

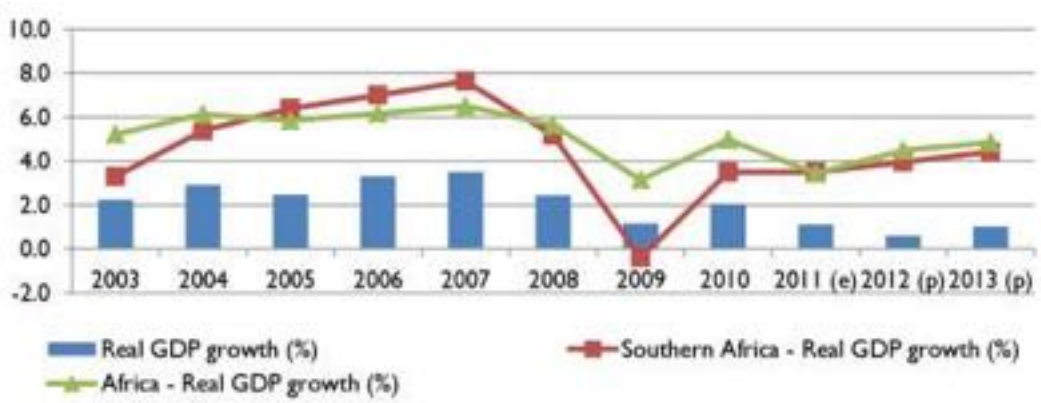
Most growth performance and human development indicators have been falling to the levels and pace of poorer economies.[4] Swaziland's main economic activities are agriculture, textiles and tourism, with over 78 percent of the population living in rural areas and a relatively small active labour force

TABLE 6.1
SOCIO-ECONOMIC INDICATORS, SWAZILAND

Indicators	2000-2002	2005-2007	2009-2011
GDP, (current prices) total in billions of SZL[a/]	12.5	20.8	25 (2009)
GNI per capita (Atlas method, current USD)	1,350	3,030	3,300
Poverty - $1.25 a day (PPP) (% of population)	62.9	40.6	…
Population below the national poverty line (% of the Population)	69	…	63
Gini Index	50.7	…	51.5
Labour Force, total (thousands)	321	342	367
Rural Population, percentage	77.7	78.3	78.7
Unemployment, % of total labour force	22.5	29.1	…
Population Growth (Annual %)	0.13	0.13	1.15
HIV Prevalence, total (% of population ages 15-49)	23.3	25.4	26
Life expectancy at birth, total (years)	46.5	46.8	48.7

Source if not otherwise noted: World Bank Database.[5]
[a/]"World Economic Outlook Database October 2012," World Economic Outlook Database, October 2012.[6]

FIGURE 6.1
TRENDS IN REAL GDP GROWTH, SWAZILAND, 2003-2013
(In percentages)



Source: African Economic Outlook 2012, Figures for 2010 are estimates; for 2011 and later are projections.[7]

comprising approximately one third of the population. Also, the country has experienced very low population growth rates, less than 0.2 percent; more recently, it has increased to over 1 percent annually.[8]

In the 1980s, Swaziland had one of the fastest growing economies in Africa. However, this dynamic has slowed down in recent years (see Figure 6.1). In 2011, the country faced an important fiscal crisis that affected the country's growth and development.[9] This crisis, paired with the possibility of rising food prices in the future, makes the economy vulnerable to inflation.

Public investment in the social sector has also varied in levels in the last 10 years. In the last few years, the proportion of the national budget allocated to education has been reduced from 24.4 percent to 15.9 percent, below the average level of Sub-Saharan Africa of 18.8 percent.[10] Nevertheless, there seems to be an incremental increase in the per capita investment per student, particularly in primary education, which denotes a continued commitment to the improvement on the educational system. Likewise, investments in the health sector have also showed a positive trend with a tendency to

TABLE 6.2
SOCIAL INVESTMENT INDICATORS, SWAZILAND

Indicators	2005-06	2007-08	2009-10	Sub-Saharan Africa *
Public spending on education, total (% of govern. expenditure)	…	24.4	15.9	18.8
Public spending on education, total (% of GDP)	5.5	8.1	7.4	4.6
Expenditure per student, primary (% of GDP per capita)	9.12	14.4	15.8	…
Expenditure per student, secondary (% of GDP per capita)	25.89	36.34	33.1	…
Health expenditure per capita (current USD)	62.25	155.75	203.12	84.32
Health expenditure, total (% of GDP)	5.8	5.9	6.6	6.5
Health expenditure, public (% of total health expenditure)	63.4	62.8	63.6	45.0

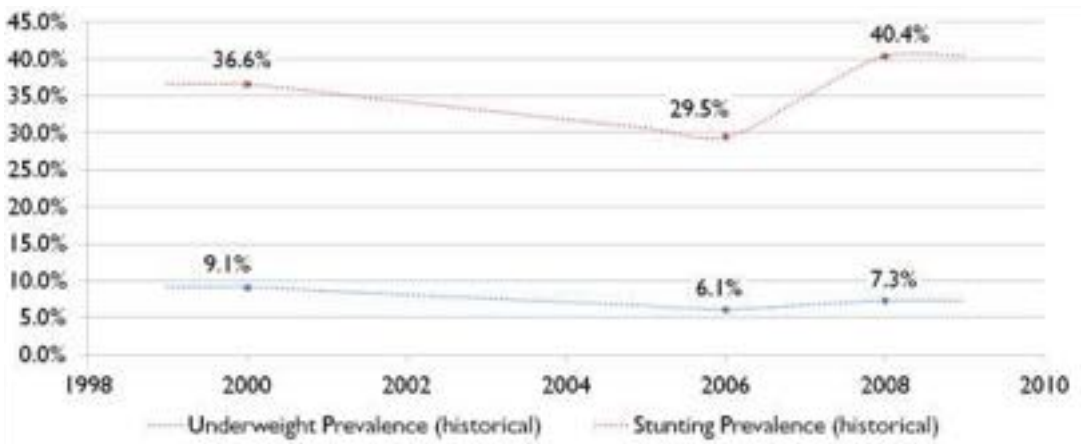
Source: World Bank Database, most recent year available.[11]
* Developing countries only - Latest data available.

increase the proportion on health investment in the national budget (see Table 6.2).

The nutritional situation of the children of Swaziland represents a challenge for the country. A recent nutritional survey led by the Ministry of Health showed an important increase in the prevalence of stunted children by more than 10 percentage points, from 29.5 to 40.4 percent, from the previous DHS survey for 2005-06.[12,13] The cause for this highly unusual increase in prevalence is not clear and it might require a deeper analysis and review of the methodological process carried-out in this last survey, to ensure comparability of the results.

On the other hand, the prevalence of underweight children has maintained a relatively stable trend, between 6 and 9 percent between the years 2000 and 2009 (see Figure 6.2). There is no nationally representative information for child nutrition before the year 2000.[14]

FIGURE 6.2
ESTIMATED UNDERNUTRITION TRENDS IN CHILDREN UNDER-FIVE, SWAZILAND, 1990-2010
(In percentages)



Source: Prepared in-house based on information from DHS 2006[15] and national surveys.[16] NOTE: 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 Center for Health Statistics (NCHS).[17]

The current levels of child undernutrition indicate the potential future challenges ahead for the reduction of child hunger. It is estimated that, in 2009, 45,926 of the 156,418 children under the age of 5 in Swaziland were affected by growth retardation in 2009 and 9,645 were underweight. This situation is especially critical for children from 12 to 23 months, where one out of every three children is affected by growth retardation.

Swaziland has taken important steps to address this situation. An important initiative has been provided by the Swaziland National Nutrition Council (SNNC), established by an Act of Parliament in 1945 and mandated to promote and coordinate food and nutrition activities and to technically advise the government accordingly. The SNNC is obligated to ensure that strategies and policies are developed and implemented to improve the nutritional status of the people of Swaziland. Currently the country has implemented interventions that include: infant and young child feeding (IYCF); integrated

community based growth monitoring and promotion (ICBGM&P); integrated management of acute malnutrition (IMAM); nutrition assessment, counselling and support for people living with HIV and TB; prevention and control of micronutrient deficiencies; and nutrition research and surveillance.[18]

TABLE 6.3
POPULATION AND CHILD UNDERNUTRITION, SWAZILAND, 2009[C]

		Low Birth Weight		Underweight		Stunting	
Age groups	Population size (2009)	Population affected (2009)	Prevalence (2009)[b/]	Population affected (2009)	Prevalence (2009)[c/]	Population affected (2009)	Prevalence (2009)[c/]
New-born (IUGR)	32,665[a/]	2,751	8.4%				
0-11 months				2,450	16%	5,880	18%
12-23 months	31,568			2,494	18%	11,838	39%
24-59 months	92,185			4,701	13%	28,209	40%
Total	156,418	2,751		9,645		45,926	

Source: Estimated based on DHS surveys 2006-07 and demographic projections.[19]
[a/] In a given year, the new-born population is the same as the 0-11 month's age group.
[b/] Estimated on the basis of the equation of De Onis et al, 2003.
[c/] Data estimated from the most recent undernutrition prevalence figure available.

6.2 Effects and Costs of Child Undernutrition

Undernutrition is mainly characterized by wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age). In early childhood, undernutrition has negative life-long and intergenerational consequences; undernourished children are more likely to require medical care as a result of undernutrition-related diseases and deficiencies.[20] 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 leads to a higher risk of mortality.[21] During schooling years, stunted children are more likely to repeat grades and drop out of school,[22] thus reducing their income-earning capability later in life.[23] Furthermore, adults who were stunted as children are less likely to achieve their expected physical and cognitive development, thereby impacting on their productivity.[24]

6.2.A Social and Economic Cost of Child Undernutrition in the Health Sector

Undernutrition at an early age predisposes children to higher morbidity[25] and mortality[26] risks. The risk of becoming ill due to undernutrition has been estimated using probability differentials, as described in the methodology section. Specifically, the study has examined medical costs associated with treating low birth weight (LBW), underweight, anaemia, acute respiratory infections (ARI), acute diarrhoeal syndrome (ADS) and fever/malaria associated with undernutrition in children under the age of five.

(1) Effects on morbidity

Undernourished children are more susceptible to recurring illness.[27] Based on the differential probability analysis undertaken with DHS data in Swaziland, underweight children have a higher risk of anaemia (increased by 17 percentage points), and children under 12 months have a higher incidence of diarrhoea (increased by 15 percentage points) and more risk of acute respiratory infections (increased risk by 15 percentage points). Fever is also more prevalent in underweight children, especially those between 2 and 5 years, which show a higher risk of 3 more percentage points than a child of healthy

weight.[28]

The study estimated that in 2009 in Swaziland, there were 25,446 incremental episodes of illnesses that can be associated with the higher vulnerability of underweight children of becoming sick (see Table 6.14). In addition, pathologies related to calorie and protein deficiencies and low birth weight (associated to intrauterine growth restriction), totalled 19,591 episodes in 2009 as indicated in Table 6.4. Acute and chronic illness due to diseases such as ADS, anaemia, fever and ARI on the other hand represents 5,854 episodes annually. The biggest proportion of episodes is found in diarrhoea with 2,720 incremental episodes for underweight children, followed by acute respiratory infections, with 1,656 annual episodes.

TABLE 6.4
MORBIDITIES FOR CHILDREN UNDER-FIVE ASSOCIATED WITH UNDERWEIGHT, BY PATHOLOGY, SWAZILAND, 2009

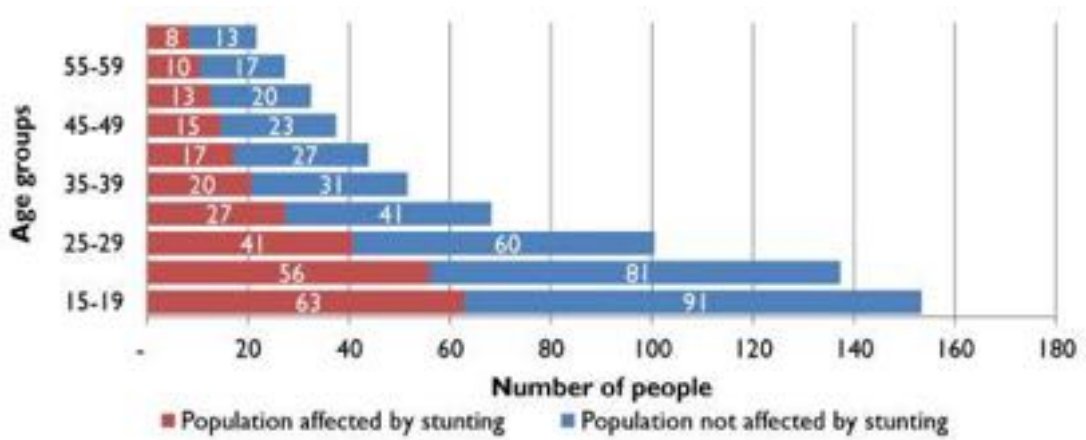
Pathology	Number of episodes	Percentage of events
Anaemia	1,262	22%
ADS	2,720	46%
ARI	1,656	28%
Fever/Malaria	217	4%
Subtotal	5,854	
LBW	2,751	14%
Underweight	16,840	86%
Subtotal	19,591	
Total	25,446	

Source: Model estimations based on DHS 2006-2007.[29]

(2) Stunting levels of the working age population

Undernutrition leads to moderate and severe stunting in children, which can impact their physical productivity in later stages of life.[30] As illustrated in Figure 6.3, this analysis estimated that 270,188

FIGURE 6.3
WORKING AGE POPULATION AFFECTED BY CHILDHOOD STUNTING, BY AGE GROUP, SWAZILAND
(In thousands of people)



Source: Model compilation based on Swaziland Household Income and Expenditure Survey[31] and WHO/NCHS.[32]

working-age adults suffered from growth restriction before reaching the age of five. Currently this represents more than people 40 percent of the population aged 15-64 who are in a disadvantaged position as compared to those who had healthy childhoods.

(3) Effects on mortality

Child undernutrition can lead to increased cases of mortality, most often connected to episodes of diarrhoea, pneumonia and fever/malaria.[33] Nevertheless, when the cause of death is determined, it is rarely attributed to the nutritional deficit of the child but rather to the associated illness. Given this limitation in attribution, the model utilizes relative risk factors to estimate the higher risk of increased child mortality as a result of child undernutrition. Higher mortality risk associated with undernutrtion was calculated using these factors, combined with mortality rates information calculated from abridged life tables[34] and data provided by the Swaziland Central Statistical Office (CSO).[35]

In the last 5 years alone, it is estimated that 1,351 child deaths in Swaziland were directly associated with undernutrition. These deaths represent 8 percent of all child mortalities for this period. Thus, it is evident that undernutrition 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 6.5
IMPACT OF UNDERNUTRITION ON CHILD MORTALITY, ADJUSTED BY SURVIVAL RATE, SWAZILAND, 1945-2009
(In number of mortalities)

Period	Number of child mortalities associated with undernutrition
1945-1994	16,019
1995-2004	3,833
2005-2009	1,351
Total	21,203

Source: ECA on the basis of life tables provided by UN Population Division.[36]

These mortality rates, witnessed over the years, have an impact on national productivity. The model estimated that an equivalent of 2.4 percent of the current workforce was lost due to the impact of undernutrition on child mortality in between 1945 to 2009. This represents 16,019 people who would have been 15 to 64 years old and part of the working-age population of Swaziland in 2009.

(4) Estimation of public and private health costs

The treatment of undernutrition and related illnesses due to disease is a critical recurrent cost for the health system. Treating a severely underweight child for example, requires a comprehensive protocol that is often in excess of the cost and effort of preventing undernutrition, as multiple protocols would require to be administered.[37] The economic cost of each episode is often increased by inefficiencies when such cases are treated without proper guidance from a health-care professional, or due to lack of access to proper health services. These costs generate a significant important burden not just to the public sector, but to society as a whole.

It is estimated that 25,446 clinical episodes recorded in Swaziland in 2009 were associated to undernutrition. These generated an estimated cost of more than SZL60.7 million (see Table 6.6). Most

TABLE 6.6
HEALTH COSTS OF UNDERNUTRITION-RELATED PATHOLOGIES, SWAZILAND, 2009
(In millions of SZL)

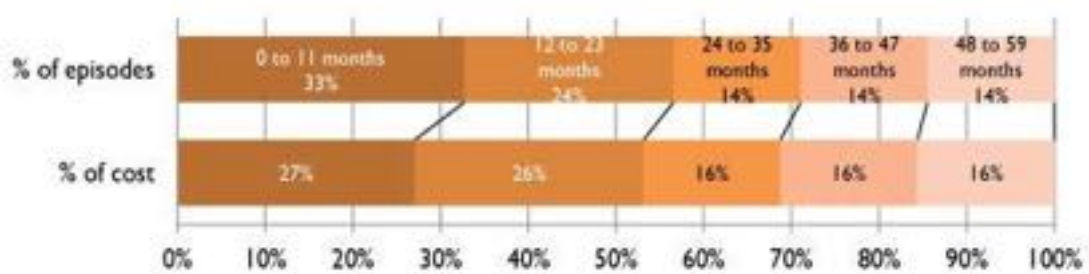
Pathology	Cost	% of episodes	% of cost
LBW/IUGR	5.6	11%	9%
Anaemia	1.1	5%	2%
ADS	1.7	11%	3%
ARI	0.8	7%	1%
Underweight	51.3	66%	85%
Fever/Malaria	0.2	1%	0%
Total Cost	60.7		

Source: Estimations based on data provided by DHS 2006,[39] and cost analysis carried-out by NIT (for details see Annex 4).

of the incurred costs were associated to the protocol required to bring an underweight child back to a proper nutritional status, which often involves therapeutic feeding.[38]

Most episodes of incremental illness associated to undernutrition happen before the first year of life; 33 percent of all episodes are experienced by children under 12 months, which represents 27 percent of all costs (see Figure 6.4). This is the period of the first thousand days of life, where children are most threatened due to the age-specific vulnerabilities.[40] This seems to indicate that preventing undernutrition and focusing on the mothers' health and nutritional education might generate important savings by reducing the incidence of episodes.

FIGURE 6.4
DISTRIBUTION OF INCREMENTAL EPISODES OF ILLNESS ASSOCIATED WITH UNDERNUTRITION BY AGE GROUP, SWAZILAND
(in percentages)



Source: Model estimations based on DHS 2006/2007 and demographic information.[41]

A large proportion of costs related to undernutrition are met by the families themselves as often these children are not provided with proper health care. Based on the information collected by the NIT, the model estimated that only 31 percent of the episodes presented in these children receive proper health care.

This disproportion is also reflected in the distribution of the health costs. Figure 6.5 summarizes the institutional (public system) costs and costs to caretakers of treating pathologies associated with undernutrition. In Swaziland, it is estimated that families carry more 88 percent of the costs

representing SZL54 million. On the other hand, the health system covered SZL7 million, corresponding to 12 percent of the total costs attributed to the health system.

FIGURE 6.5
DISTRIBUTION OF PRIVATE AND PUBLIC HEALTH COSTS, SWAZILAND
(in percentages and millions of SZL)

Source: Model estimations based on demographic information[43] and DHS.[44]

Even when the families of the undernourished children are covering most of the health costs of undernutrition, the burden of these costs is still an important expenditure component in the public sector. In 2009-2010 the annual estimated cost related to undernutrition was equivalent to 0.6 percent of the total budget allocated to health.[42] As a whole, the economic impact of undernutrition in health-related aspects was equivalent to 0.24 percent of the GDP of that year.

6.2.B Social and Economic Cost of Child Undernutrition in the Education Sector

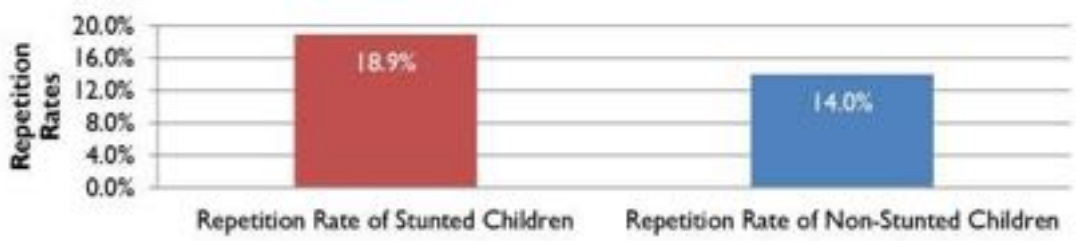
There is no single cause for repetition and dropout in school. However, there is substantive research showing that students who were stunted before the age of 5 are more likely to underperform in school.[36]

The number of repetition and dropout cases considered in this section are estimated using a differential risk factor associated to stunted children, as well as to the official government information on grade repetition and dropouts in the educational system in 2009. The cost estimations are based on the average cost of a child to attend primary and secondary school in Swaziland in 2009 provided by the Ministry of Education as well as estimations of costs incurred by families to support child schooling.[45]

(1) Effects on repetition

Children who suffered from undernutrition before five years of age are more likely to repeat grades, compared to those were not afflicted by undernutrition.[46] In Swaziland in 2009, enrolment rates were relatively high, with an enrolment rate of 95 percent in primary education.[47] In 2009, there were an

FIGURE 6.6
REPETITION RATES IN PRIMARY EDUCATION BY NUTRITIONAL STATUS, SWAZILAND, 2009
(In percentages)

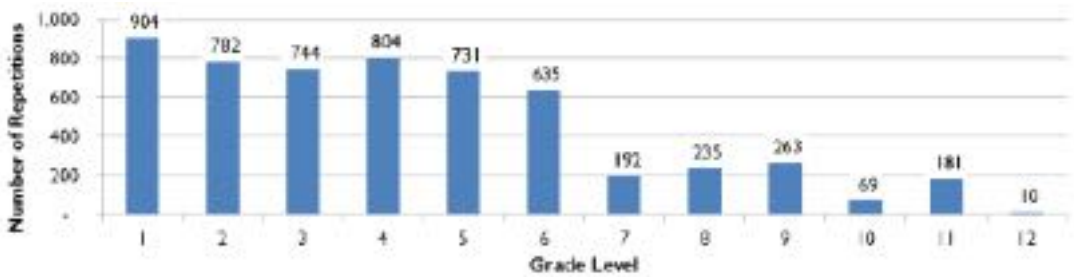


Source: Estimations based on data from Ministry of Education.[48]

estimated 168,228 stunted children of school age, which represents 40 percent of the total population aged between 6 and 18 years in the country.

Based on official information provided by the Ministry of Education and Training, 47,371 children repeated grades in 2009 (15.1 percent). Using data on the increased risk of repetition among stunted students, the model estimated that the repetition rate for stunted children was 18.9 percent, while the repetition rate for non-stunted children was 14.1 percent (see Figure 6.6). Given these rates and the proportion of stunted students, the model estimated that 5,550 repetitions, or 10.1 percent of all repetitions in 2009 were associated with undernutrition (see Figure 6.7).

FIGURE 6.7
GRADE REPETITION OF STUNTED CHILDREN IN SCHOOL, BY GRADE, SWAZILAND, 2009



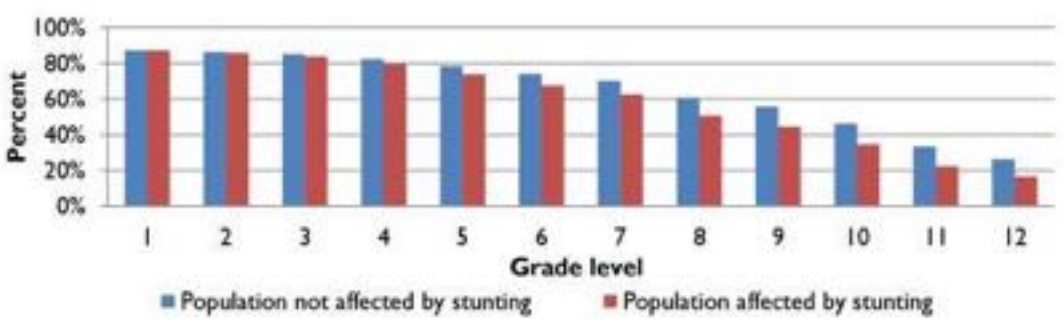
Source: Estimations based on data provided by NIT.[49]

These children generate an incremental cost to the education system, as they require twice as many resources, since they repeat the year. In addition, caretakers have to cater to their educational cost for an extra year.

(2) Effects on retention

Stunted people, on average, have achieved fewer years of schooling than non-stunted people.[50] According to available data and relative risks of the consequences of stunting in education, it can be

FIGURE 6.8
GRADE ACHIEVEMENT BY NUTRITIONAL STATUS, SWAZILAND, 2009
(In percentages of grade achieved)



Source: Estimations based on data provided by NIT.[51]

estimated that 70.3 percent of the non-stunted population completed primary school, compared to only 63 percent of stunted children. Similar trends are observed in secondary school, where an estimated 26 percent of non-stunted people and less than 17 percent of the stunted people completed secondary school. 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, particularly in non-manual activities.

(3) Estimation of public and private education costs

Repetition in school has direct cost implications to families and the school system. Consequently, in 2009, the 5,550 students who repeated grades (and whose repetition was associated with undernutrition) incurred a cost of SZL6 million (see Table 6.7). The largest proportion of repetitions occurred in primary school, where the cost burden mostly falls on the education system. However, unit costs are significantly higher for repetitions in secondary school.

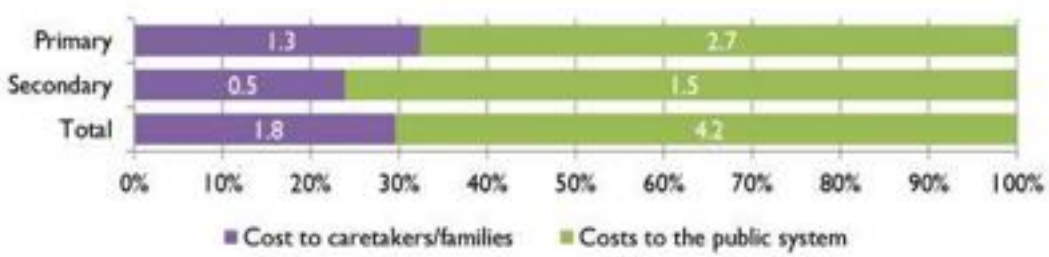
TABLE 6.7
COST OF GRADE REPETITIONS ASSOCIATED WITH STUNTING, SWAZILAND, 2009

	Primary	Secondary	Total
Number of repetitions	4,792	758	5,550
Public costs per student (SZL)	560	2,000	
Private costs per student (SZL)	269	628	
Total public costs (millions of SZL)	2.7	1.5	4.2
Total private costs (millions of SZL)	1.3	0.5	1.8
Total (millions of SZL)	4.0	**2.0**	6.0
% Social expenditure on education			0.34%

Source: Estimations based on education statistics of Ministry of Education.[52]

As in the case of health, the social cost of undernutrition in education is shared between the public sector and the families. Of the total costs, a total SZL1.8 million (30 percent) was covered by the caretakers, while SZL4.2 million (70 percent), was borne by the public education system. Nevertheless, the distribution of this cost varies depending on whether the child repeated grades at primary or secondary level. In primary education, the caretakers cover 32 percent of the associated costs of repeating a year, whereas in secondary education the burden on the families was 24 percent, and the public systems covers a larger proportion of the costs (see Figure 6.9).

FIGURE 6.9
DISTRIBUTION OF COSTS IN EDUCATION, SWAZILAND, 2009
(In percentages and millions of SZL)



Source: Estimations based on education statistics of Ministry of Education (2009).[53]

6.2.C Social and Economic Cost of Child Undernutrition in the Productivity Sector

As described in the health section of this report, the model estimated that 40 percent of the working-age population in Swaziland were stunted during childhood. 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.[54] This represents 270,188 people in 2009 whose productive potential was affected by undernutrition.

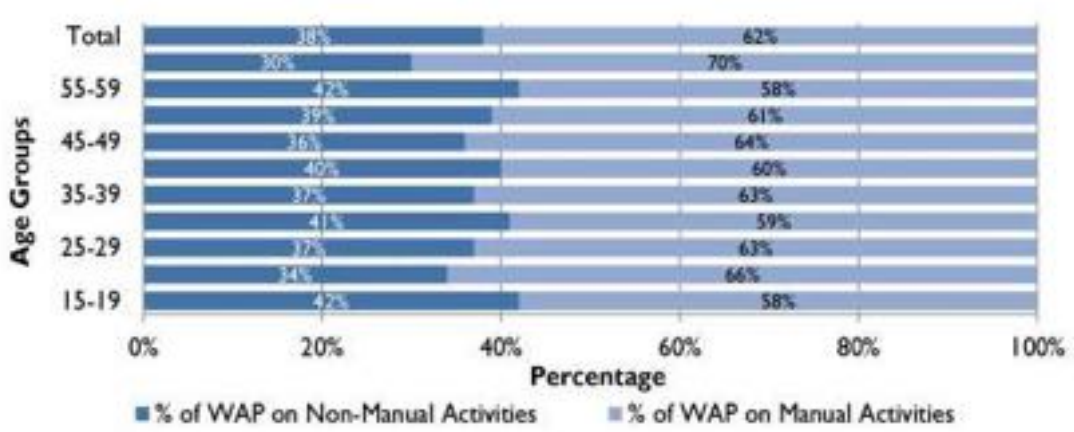
Child undernutrition affects human capital and productivity in several ways. Stunted people, on average, have achieved fewer years of schooling than non-stunted people.[55] In non-manual activities, higher academic achievement is directly correlated with higher income.[56] Research shows that stunted workers engaged in manual activities tend to have less lean body mass[57] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[58] Moreover, Undernutrition-related mortalities contribute to losses in potential national productivity.

The estimations for the population whose labour productivity was affected by child undernutrition was based on historical nutritional information, in-country demographics projections and incomes reported in the Swaziland National Household Survey (SHIES) 2009-2010.[59]

The cost estimates for labour productivity were calculated based on differential income associated to lower schooling in non-manual activities and the lower productivity associated to stunted children 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 2009.

The distribution of the labour market is an important contextual element in determining the impact of undernutrition on national productivity (see Figure 6.10). Although the proportion of population working in non-manual activities is relatively small, the average income of this population is higher than that of the population working in manual activities, and constitutes a relevant sector of the economically active population (see Figure 6.10).

FIGURE 6.10
MANUAL AND NON-MANUAL LABOUR DISTRIBUTION, BY AGE GROUP, SWAZILAND, 2009
(In percentages)



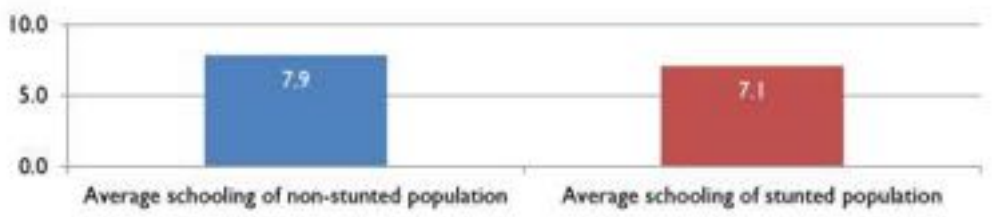
Source: Swaziland Labour Force Survey (2007).[60]

(1) Losses in non-manual activities

As described in the education section of this report, the stunted population completes on average fewer years of schooling than students who were adequately nourished as children. This situation affects mostly people who are engaged in non-manual activities, in which a higher academic education leads to improved income. In the case of Swaziland, 38 percent of the working-age population is engaged in non-manual activities.[61] The average schooling of the non-stunted population is estimated at 7.9 years, while people who suffered from childhood stunting achieved only 7.1 years (see Figure 6.11).

It is important to note that over time there has been an improvement in the average number of years people remained in the education system. Whereas the cohort of 60-64 years schooled on average 3.4 years, the cohort aged 20-24 recorded an average of 8.6 years of education, demonstrating an important improvement of the educational level of the population.

FIGURE 6.11
AVERAGE SCHOOLING YEARS
FOR STUNTED AND NON-STUNTED POPULATION, SWAZILAND, 2009
(In years of education)



Source: Estimated from 2009-10 Swaziland Household Income and Expenditure Survey,[62] CSO.[63]

Data from the SHIES 2009-10 shows a progressive increase in income associated to higher schooling achievement, particularly in non-manual activities.[64] In this sense, the lower educational achievement of the stunted population has an impact on the expected level of income a person would earn as an adult.

The model estimates that 108,187 people engaged in non-manual activities in 2009 suffered from childhood stunting. This represents 16 percent of the country's labour force that is currently less productive due to lower schooling levels associated with stunting. As shown in Table 6.8, the estimated annual losses in productivity for this group amounted to SZL 251 million, which is equivalent to 1 percent of the GDP in 2009.

TABLE 6.8
REDUCED INCOME IN NON-MANUAL ACTIVITIES
DUE TO STUNTING, SWAZILAND, 2009

Age in 2009	Population working in non-manual sectors who were stunted as children *(In thousands of people)*	Income losses in non-manual labour *(In millions of SZL)*
15-24	46,773	43.4
25-34	27,423	89.2
35-44	15,427	56.6
45-54	11,002	43.6
55-64	7,562	18.1
Total	108,187	250.9
% GDP		1.00%

Source: Model estimations based on SIECS 2009[65] and DHS 2008.[66]

(2) Losses in manual activities

Manual activities are mainly observed in the agricultural, forestry and fishing subsectors, employing more than 62 percent of the population. In these types of activities, people who were stunted as children are have less lean body mass[67] and are therefore less physically capable than those who did not suffer from growth retardation. As such, they are expected to be less productive.[68] The model estimated that 416,702 people in Swaziland work in manual activities, of whom 175,432 were stunted as children, equivalent to 26 percent of the active labour force. This generated annual losses surpassing SZL126 million, equivalent to 0.5 percent of GDP, in potential income lost due to lower productivity (see Table 6.9).

TABLE 6.9
LOSSES IN POTENTIAL PRODUCTIVITY IN MANUAL ACTIVITIES DUE TO STUNTING, SWAZILAND, 2009

Age in 2009	Population working in manual labour who were stunted as children (In thousands)	Loss in productivity due to stunting (In millions of SZL)
15-24	75,603	26,947.6
25-34	43,591	32,709.1
35-44	24,769	25,677.2
45-54	18,420	24,673.6
55-64	13,048	16,168.8
Total	175,431	126,176.4
% GDP		0.5%

Source: Estimations based on data from DHS 2005-6[69] and WHO/NCHS database information.[70]

(3) Opportunity cost due to mortality

As indicated in the health section of this report, there is an increased risk of child mortality associated to undernutrition. The model estimates that the 16,019 people of working-age population who would have been part of the economy in 2009 (but died before the age of 5 from causes associated with undernutrition) could have increased national productivity by over 37 million working hours.

TABLE 6.10
LOSSES IN POTENTIAL PRODUCTIVITY DUE TO MORTALITY ASSOCIATED WITH UNDERNUTRITION, SWAZILAND, 2009

Age in 2009	Working hours lost (in thousands of working hours)	Loss in productivity (Thousands of SZL)	Loss in productivity (Thousands of USD)
15-24	8,364.8	28,488.9	3,351.6
25-34	8,251.2	65,534.7	7,710.0
35-44	7,852.4	82,236.0	9,674.8
45-54	6,746.8	87,775.6	10,326.5
55-64	6,269.0	75,565.0	8,890.0
Total	37,484.3	33,600.2	39,953.0
% GDP		1.4%	

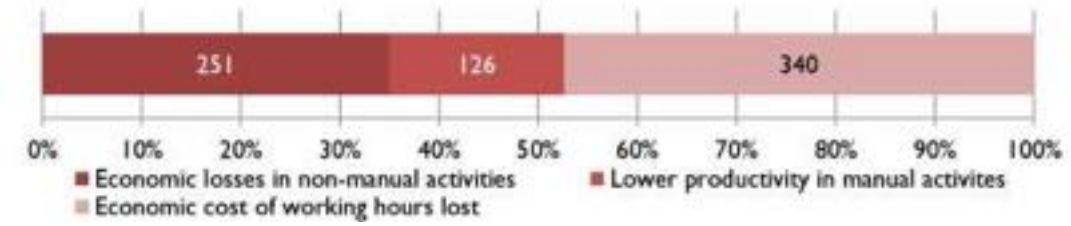
Source: Estimations based on data from SHIES[71] and WHO/NCHS Database information.[72]

Considering the productive levels of the population, by their age and sector of labour, the model estimated that in 2009, the economic losses (measured by working hours lost due to undernutrition-related child mortality) are SZL 340 million, which represented 1.4 percent of the country's GDP.

(4) Overall productivity losses

The total losses in productivity for 2009 are estimated at approximately SZL717 million, which is equivalent to 2.9 percent of Swaziland's GDP. Figure 6.12, below, illustrates the distribution of losses. The largest share of productivity loss, at 47 percent, is due to working hours lost of individuals who died because of undernutrition. Due to the distribution of labour market of the population in Swaziland, lower productivity in non-manual activities represents an important element of the cost at 35 percent. For manual activities, the costs seem relatively low, at 18 percent, due to the lower income of this group.

FIGURE 6.12
DISTRIBUTION OF LOSSES IN PRODUCTIVITY, BY SECTOR, SWAZILAND, 2009
(In percentages and millions of SZL)



Source: Model Estimations.

6.2.D Summary of Effects and Costs

The methodology is used to analyse the impact of child undernutrition 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 undernutrition.

For Swaziland, the total losses associated with undernutrition are estimated at SZL783 million, or USD92 million for the year 2009, as presented in Table 6.11 (next page). These losses are equivalent to 3.1 percent of GDP of that year. The highest element in these costs relates to the lost working hours due to mortality associated to undernutrition. Due to the multi-causal phenomenon of grade repetition, the direct costs in education tend to be the lowest of the three sectors. Nevertheless, the potential gains in productivity for maintaining children in school are currently 32 percent of the total cost which still indicates an important productivity gain to be made from investments in school retention mechanisms.

TABLE 6.11
SUMMARY OF COSTS, SWAZILAND, 2009

	Episodes	Cost in millions of SZL	Cost in millions of USD	Percent-age of GDP
Health Costs				
LBW and Underweight	19,591	57	6.7	
Increased Morbidity	5,854	4	0.4	
Total for Health	25,446	61	7	0.2%
Education Costs				
Increased Repetition - Primary	4,792	4	0.5	
Increased Repetition - Secondary	758	2	0.2	
Total for Education	5,550	6	0.7	0.02%
Productivity Costs				
Lower Productivity - Non-Manual Activities	108,187	251	29.5	
Lower Productivity - Manual Activities	175,431	126	14.8	
Lower Productivity - Mortality	16,019	340	40.0	
Total for Productivity	299,638	717	84	2.9%
TOTAL COSTS		784	92	3.1%

Source: Model estimation

6.3 Analysis of Scenarios

The previous chapter showed the social and economic costs that affected Swaziland in 2009 due to high historical trends of child undernutrition. 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 undernutrition. Nevertheless, there is still room to prevent these costs in the future.

Currently, nearly one out of every three children under the age of five in Swaziland is stunted.[73] This section analyses the impact that a reduction in child undernutrition could have on the future socioeconomic 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 children would bear in the future. They also indicate 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 scenarios developed for this report are as follows:

Baseline: The cost of inaction — Progress in reduction of stunting and underweight child stops

For the baseline, the progress of reducing the prevalence of undernutrition stops at the level achieved in 2009. 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.

Scenario #1: Cutting by half the prevalence of child undernutrition by 2025

In this scenario, the prevalence of underweight and stunted children would be reduced to half of the 2009 values corresponding to the reference year. In the case of Swaziland this would mean a constant reduction of 0.9 percent points annually in the stunting rate, from 29.5 percent (estimate for 2009) to 14.8 percent in 2025. With the right combination of proven interventions, this scenario would be achievable, as the average rate of reduction for stunting between 2000 and 2006 was estimated at 0.9 percentage points, which is higher than the progress rate required in achieving this scenario. Nevertheless, in 2008, a national survey appeared to show an important increase in the prevalence rate, which might indicate the need for a new survey to validate the current levels of stunting in the country.

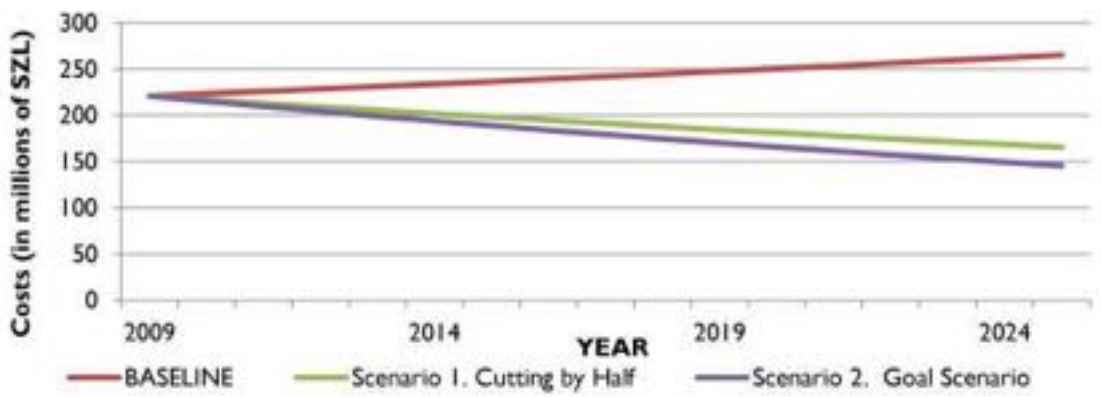
Scenario #2: The goal scenario — Reduce stunting to 10 percent and underweight children to 5 percent by 2025

In this scenario, the prevalence of stunted children under 5 would be reduced to 10 percent, and the prevalence of underweight children under the age of 5, 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 continental challenge towards which countries on the continent could collaborate to achieve. The progress rate required to achieve this scenario would be a 1.2 percentage points annual reduction over 16 years, from 2009 to 2025.

The model can generate various baseline scenarios, based on nutritional goals established in each country. Scenarios which were agreed upon with the national implementation team in Swaziland, can be used to advocate for increased investments in proven nutritional interventions.

These scenarios are constructed based on the estimated costs of the children born in each year, from 2009 to 2025 (net present value). While the previous section calculated the costs incurred in a single year by historical trends of undernutrition, these costs represent the present values and savings

FIGURE 6.13
TRENDS OF ESTIMATED COSTS OF CHILD UNDERNUTRITION, SWAZILAND, 2009-2025



Source: Model estimations.

generated by children born during 2009 to 2025.

As Figure 6.13 shows, the progressive reduction of child undernutrition generates a similar reduction in the cost associated with it. The distances between the trend lines indicate the savings that would be achieved on each scenario.

In the baseline, where the progress of reduction of child undernutrition would stop at the level of 2009, the cost in 2025 would reach SZL265.3 million (USD31.2 million) (see Table 6.12).

TABLE 6.12
COSTS AND SAVINGS BY SCENARIO, SWAZILAND
(All values in millions)[a]

	Baseline		S1. Cutting by Half		S2. Goal Scenario	
	SZL	USD	SZL	USD	SZL	USD
Projected cost in the year 2025	265.3	31.2	165.6	19.5	145.5	17.1
Total projected savings (2009-2025)			401.7	47.3	511.2	60.1
Annual projected savings (2009-2025)*			25.1	3.0	31.9	3.8
Annual percentage points reduction in stunting rates required achieve scenario (2009-2025)	Progress stops		0.9%		1.2%	

Source: Model estimations.
a/ All values in net present values at an 8% social discount rate.

In Scenario #1 in which a reduction of half of the current prevalence is achieved, the cost in 2025 would reduce to SZL165.6 million (USD19.5 million). For the full period between 2009 to 2025, this would represent a total savings of SZL401.7 million (USD47.3 million). Although the tendency of savings would not be linear, as they would increase over time as progress was achieved, a simple average of the annual savings would represent SZL25.1 million (USD3.0 million) per year.

In the case of the goal scenario, the cost in 2025 would be reduced to SZl145 million (USD17.1 million). This translates into an increase in total savings to SZL511.2 million, (USD60.1 million), which represents SZL31.9 million (USD3.8 million) per year, for the same 16-year period.

6.4 Conclusions and Recommendations

6.4.A Implications for Implementation of the National Poverty Reduction Strategy

The COHA study is an important step forward to better understand the role that child nutrition and human development can play as a catalyser, or as a constraint, in the social and economic transformation. This report marks the first analysis on the social and economic impact of child undernutrition specific for Swaziland, opening the way for increased understanding of its consequences.

Its results strongly suggest that in order for the country to achieve inclusive human and economic growth, special attention must be given to the early stages of life as the foundation of human capital. The results of the study are supported by a strong-evidence base, and a model of analysis specially adapted for Africa, which demonstrates the depth of the consequences of child undernutrition in health

education and labour productivity. This study further quantifies the potential gains of addressing child undernutrition as a priority. Now, stakeholders have, not only the ethical imperative to address child nutrition as a main concern, but a strong economic rationale to position stunting in the centre of the development agenda.

The study estimates that child undernutrition generates health costs ranging to an equivalent of 0.6% of the total public budget allocated to health. These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children and the protocols necessary for their treatment. Although this amount might seem relatively small, it is important to note that only 3 out of every 10 children are estimated to be receiving proper health attention. As the health coverage expands to rural areas, there will be an increase of people seeking medical attention; this can potentially affect the efficiency of the system to provide proper care services. This study illustrates that a reduction of child undernutrition could facilitate the effectiveness of this expansion by reducing the incremental burden generated by the health requirements of underweight children.

Further, the study estimates that 1 out of every 10 cases of child mortality is associated with the higher risk of undernutrition. Hence, a preventive approach to undernutrition can help reduce this incremental burden to the public sector, and also reduce the costs that are currently being covered by caretakers and families. Increasing the educational level of the population, and maximizing the productive capacity of the population dividend, is a key element to increase competitiveness and innovation. This represents a particular opportunity in Swaziland where the population under 15 years is estimated to be 38 percent of the total population. These children and youth must be equipped with the skills necessary for competitive labour. Thus, the underlying causes for low school performance and early desertion must be addressed. As there is no single cause for this phenomenon, a comprehensive strategy must be put in place that considers improving in the quality of education and the conditions required for school attendance. This study demonstrates that stunting is one barrier to attendance and retention that must be removed to effectively elevate the educational levels and improve individuals' labour opportunities in the future.

The study estimated that children who were stunted experienced a 4.9 percent higher repetition rate in school. As a result, 12 percent of all grade repetitions in school are associated to the higher incidence of repetition that is experienced by stunted children. 86 percent of these cases of grade repartition occur in primary school. These numbers suggest that a reduction in the stunting prevalence could also support an improvement in schooling results, as it would reduce preventable burdens to the education system.

On the continent, more than half of the population is expected to live in cities by 2035.[74] An important component to prepare for this shift is to ensure that the workforce is ready to make a transition towards a more skilled labour, and economies are able to produce new jobs to reduce youth unemployment. By preventing child stunting thus avoiding the associated loss in physical and cognitive capacity that hinders individual productivity, people can be provided with a more equal opportunity for success.

The study estimates that 40 percent of the working age population in Swaziland is currently stunted. This population has achieved on average lower school levels than those who did not experience growth retardation of 0.8 years of lower schooling. As the country continues to urbanize, and an increasing

number of people participate in skilled employment, this loss in human capital will be reflected in a reduced productive capacity of the population. Thus, it may be a particularly crucial time to address child undernutrition and prepare future youth for better employment by prioritizing the reduction of stunting in Africa's transformation agenda.

The COHA model also provides and important prospective analysis that sheds light on the potential economic benefits to be generated by a reduction in the prevalence of child undernutrition. The model estimates that, in the analysed countries, a reduction of the prevalence to half of the current levels of child undernutrition by the year 2025 can generate annual average savings of SZL 25 million (USD3 million). An additional scenario shows that a reduction to 10 percent stunting and 5 percent underweight for that same period could yield annual average savings of SZL 32 million (USD4 million). This economic benefit that would result from a decrease in morbidities, lower repetition rates and an increase in manual and non-manual productivity, presents an important economic argument for the incremental investments in child nutrition.

This study is also an important example of how South-South collaboration can work to implement cost effective activities in development and knowledge sharing. Swaziland's participation as one of the pilot countries of the study, and its feedback in challenges faced in collecting the data at national level was an important element in adapting the COHA methodology to Africa. The contributions of the Swaziland NIT will serve to facilitate the expansion of this tool on the continent.

Lastly, this study illustrates the valuable role that data and government-endorsed research can play in shedding light on pertinent issues on the continent. This study will help the country engage within global nutrition movements such as the Scaling Up Nutrition Initiative as programmes and interventions are put in place to address stunting as a national priority.

6.4.B Recommendations of the Study

This study presents some key initial findings of the Cost of Hunger in Swaziland, as well both challenges and opportunities regarding the reduction of child undernutrition to the country.

A clear recommendation of this study is that Swaziland must review their national development frameworks to ensure that the reduction of the stunting provenance is an outcome indicator of their social and economic development policies. Chronic child undernutrition can no longer be considered a sectoral issue, as both its causes and solutions are linked to social policies across numerous sectors. As such, stunting reduction will require interventions from the health, education, social protection, and social infrastructure perspectives. Stunting can be an effective indicator of success in larger social programmes.

1. This study encourages countries not to be content with "acceptable" levels of stunting; equal opportunity should be the aspiration of every country the continent. In this sense, it is recommended that aggressive targets are set in Swaziland for the reduction of stunting that go beyond proportional reduction, to establish an absolute value as the goal for the region at 10 percent.
2. The achievement of this aggressive goal cannot be reached from just the health sector. In order to be able to have a decisive impact on improving child nutrition, a comprehensive multi-

sectoral policy must be put in place, with strong political commitment and allocation of adequate resources for its implementation. This plan should look to accelerate the actions on the determinants of child undernutrition such as inadequate income, agricultural production, improving gender equality and girls' education, improving water supply and sanitation, but also by addressing deeper underlying determinants such as the quality of governance and institutions and issues relating to peace and security. To ensure sustainability of these actions, whenever possible, the role of international aid must be complementary to nationally led investments, and further efforts have to be done in ensuring the strengthening of national capacity to address child undernutrition.

3. An important element that must be addressed to enhance the national capacity to address malnutrition is to improve the monitoring and evaluation systems. Currently, the assessments of the prevalence of child nutrition are carried-out with a periodicity of between 4 to 5 years. Nevertheless, in order to be able to measure short term results in the prevention of stunting, a more systematic approach with shorter periodicity is recommended, of 2 to 3 years between each assessment. As the focus on the prevention of child undernutrition should target children before 2 years of age, these results will provide information to policy makers and practitioners on the results being achieved in the implementation of social protection and nutrition programmes.
4. Another important element is to further the understanding of the determinants of child undernutrition in each context. As an initial step, it is recommended that the assessment of child nutrition also includes information that relates the nutritional status of the children to the livelihoods and economic activities of the households. This information can be used to inform programme design to ensure that interventions effectively reach these vulnerable families with appropriate incentives and innovative approaches within social protection schemes.

6.5 Acknowledgments

The Swaziland COHA report is a result of collaborative efforts from government sectors and development partners who contribute to the nutrition, economic and the social wellbeing of the population. The Deputy Prime Minister's office, as the coordinating office, would like to express appreciation to the African Union, the World Food Programme, and the Economic Commission for Africa for the financial and technical support in the implementation of the study.

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Finally appreciation is expressed to the National Children's Coordination Unit (NCCU) and other members of the National Implementation Team (WFP, CSO, SNNC) for their commitment to ensuring that this report reflects the nutrition situation in Swaziland and for their on-going advocacy to strengthen nutrition actions across all sectors.

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The Steering Committee highlights the special contributions by the NCCU/ODPM and NNC in supporting the adaptation of the Model to Estimate the Social and Economic Impact of Child Undernutrition in Africa. Their contributions indicate Swaziland's commitment to regional collaboration.

Citations

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7. Country Results: Uganda

7.1 Brief Socio-Economic and Nutritional Background

In the year 2009 the GDP of the Republic of Uganda (here after referred to as Uganda) was UGX 32,505.34 billion.[1] The per capita GNI was approximately USD510.0 and had doubled in the last decade.[2] There were also high levels of inequality (with a Gini index of 44.3)[3] and food insecurity (with a Global Hunger Index categorized at "serious") due to undernourishment, child undernutrition and child mortality, which presented important challenges for the country's development (see Table 7.1).[4]

Poverty remains a significant challenge for Ugandans. In 2009-2010, approximately 7.5 million Ugandans living in 1.2 million households were considered poor, representing 24.5 percent of the country's population. The incidence of poverty is higher in rural areas where approximately 27.2 percent of the population lives below the poverty line, as compared to 9.1 percent in urban areas.[5] This illustrates a higher burden of poverty on rural communities; rural populations represent 85 percent of the population, but a disproportionate 94 percent of the national poverty burden.[6]

TABLE 7.1
SOCIO-ECONOMIC INDICATORS, UGANDA

Indicators	2000-2002	2005-2007	2009-2011
GDP, total in billions of Uganda shillings[a/]	11,672	22,854	32,505 (2009)
GNI per capita, Atlas method (current US$)[a/]	250	380	510
Poverty - $1.25 a day (PPP) (% of population)	57.4	51.5	38
Population below the National Poverty Line (% of the population)	…	31.1	24.5
Gini Index	45.8	42.6	44.3
Labour force, total (in millions)	10.7	12.1	13.4
Rural population, percentage	87.5	86	84.4
Percentage of population in agriculture	66	72	66
Unemployment, % of total labour force	3.5	2	4.2
Unemployment, youth total (% of total labour force ages 15-24)	…	4.4	5.4
Population growth (Annual %)	3.19	3.25	3.19
Life expectancy at birth, total (years)	47.5	51.7	54.1

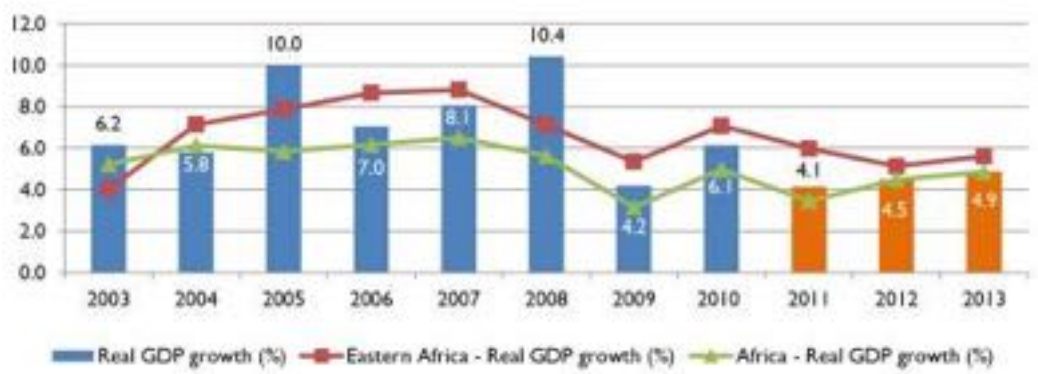
Source if not otherwise noted: World Bank Database[8]
[a/]"World Economic Outlook Database October 2012.[9]

Uganda's labour market is highly dependent on self-employment, with only 21 percent of the population working as paid employees. Although the contribution of agriculture to total GDP has been declining over the years, the sector has continued to dominate the Ugandan economy.[7] According to official estimates, agriculture contributed approximately 21 percent of the total GDP in 2009 and 90

percent of the total export earnings, with coffee remaining the predominantly exported cash crop. Furthermore, more than one third of the working population is engaged in manual activities, such as agriculture, forestry and fishing.[11] Although the country has been able to maintain relatively low levels of unemployment, the rate for youth labour is higher than that of the general population, which presents a challenge to providing quality employment for young people.[12]

Uganda's economy has experienced a positive trend in the last decade, with growth rates that exceeded 10 percent in 2008 (see Figure 7.1). Nevertheless, recently the economy has experienced a slowdown with high inflation rates and currency depreciation. Even with these constraints, there is a positive outlook for 2012 and 2013, driven in part by the oil sector.[13]

FIGURE 7.1
TRENDS IN REAL GDP GROWTH, UGANDA, 2003-2013
(In percentages)



Source: African Economic Outlook 2012, Figures for 2010 are estimates; Orange bars for 2011 and later are projections.[10]

Social investment levels have also been consistent in the last few years, contributing to a positive social outlook. Investments in health have been well above the regional average, with levels as high as 9% of the GDP in recent years (see Table 7.2).[14] On the other hand, investments in education have decreased proportionally from 3.8 percent to 3.2 percent of the GDP, below the regional average, which is 4.6 percent for Sub Saharan Africa.[15]

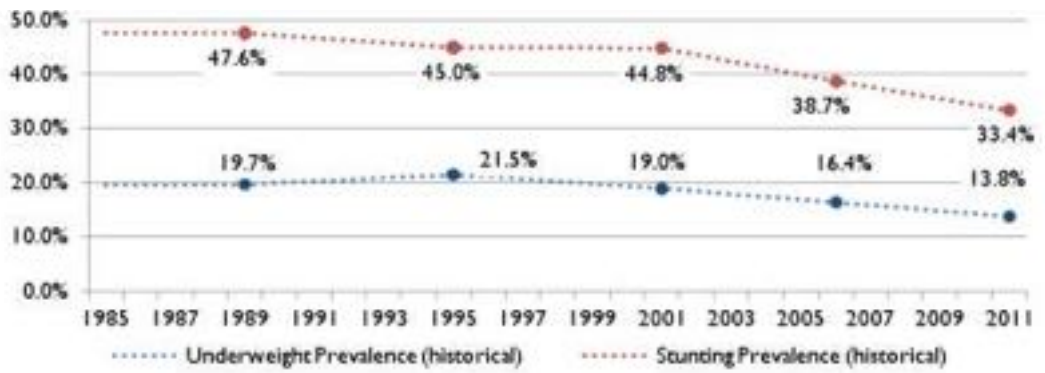
TABLE 7.2
SOCIAL INVESTMENT INDICATORS, UGANDA

Indicators	2005-06	2007-08	2009-10	Sub-Saharan Africa *
Public spending on education, total (% of Gov. expenditure)	…	18.9	15	18.8%
Public spending on education, total (% of GDP)	…	3.8	3.2	4.6%
Expenditure per student, primary (% of GDP per capita)	…	8.39	7.21	…
Expenditure per student, secondary (% of GDP per capita)	…	26.00	20.47	…
Health expenditure per capita (current USD)	33.35	45.32	46.72	84.3
Health expenditure, total (% of GDP)	8.9	8.6	9	6.5%
Health expenditure, public (% of total health expenditure)	21	17.2	21.7	45%

Source: World Bank Database[16], most recent year available.
* Developing countries only - Latest data available.

The recent improvement in poverty rates has been accompanied by a reduction in child undernutrition, particularly in stunting. According to the 2011 Demographic and Household Survey (DHS), approximately 33.4 percent of Ugandan children under the age of 5 were suffering from low height for their age (stunting), which represents an important improvement from the 38.1 percent reported by DHS in 2006. Additionally, the prevalence of underweight children has also improved from 16.4 percent to 13.8 percent (see Figure 7.2). For that same period, the level of low birth weight prevalence in children has also remained steady, at around 10 percent.[17]

FIGURE 7.2
ESTIMATED UNDERNUTRITION TRENDS IN CHILDREN UNDER-FIVE, UGANDA,1990-2010



Source: Prepared based on information from DHS 2000/2005/2011.[18]
NOTE: Data prior to 2006, has been updated in line with new Child Growth Standards introduced by WHO in 2006[19] to replace the 1977 International Growth Reference, formulated by the National Center for Health Statistics (NCHS).[20]

The current levels of child undernutrition illustrate the continuing challenges for reduction of child hunger. It is estimated that 2.3 million of the 6.6 million children under the age of five in Uganda were affected by stunting in 2009 and almost one million of children were underweight (see Table 7.3). This

TABLE 7.3
POPULATION AND CHILD UNDERNUTRITION, UGANDA, 2009[C]
(Population in thousands)

Age groups	Population size (2009)[/b]	Low Birth Weight		Underweight		Stunting	
		Population affected (2009)	Prevalence (2009)[/c]	Population affected (2009)	Prevalence (2009)[/c]	Population affected (2009)	Prevalence (2009)[/c]
New-born (IUGR)[/a]	1,515	83	5.5%				
0-11 months				246	16%	267	18%
12-23 months	1,405			251	18%	546	39%
24-59 months	3,667			478	13%	1,469	40%
Total	6,587	83		975		2,282	

Source: Estimated based on DHS surveys 2006/2011 and demographic projections.[22]
[a] In a given year, the new-born population is the same as the 0-11 month's age group.
[b] Estimated on the basis of the equation of De Onis et al, 2003.
[c] Data estimated from the most recent undernutrition prevalence figure available.

situation is especially critical for children between 24 and 59 months, where two out of every five children are affected by stunting.[21]

7.2 Effects and Costs of Child Undernutrition

Undernutrition is mainly characterized by wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age). In early childhood, undernutrition has negative life-long and intergenerational consequences; undernourished children are more likely to require medical care as a result of undernutrition-related diseases and deficiencies.[23] 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 a higher risk of mortality.[24] During schooling years, stunted children are more likely to repeat grades and drop out of school,[25] reducing thus, their income-earning capability later in life.[26] Furthermore, adults who were stunted as children are less likely to achieve their expected physical and cognitive development, thereby impacting on their productivity.[27]

7.2.A Social and Economic Cost of Child Undernutrition in the Health Sector

Undernutrition at an early age predisposes children to higher morbidity[28] and mortality risks.[29] The COHA model estimated risk of becoming ill due to undernutrition using probability differentials, as described in the methodology section. Specifically, the study has examined medical costs associated with treating low birth weight (LBW), underweight, anaemia, acute respiratory infections (ARI), acute diarrhoeal syndrome (ADS) and fever/malaria associated with undernutrition in children under the age of five (see Table 7.4).

(1) Effects on morbidity

Undernourished children are more susceptible to recurring illness.[30] Based on the differential probability analysis undertaken with DHS data in Uganda,[31] underweight children are more affected by diarrhoea (an increased risk of 18 percentage points) and fever (10 more percentage points) than healthy children. Acute respiratory infections are also more common in underweight children, particularly during the first 12 months of life at an incremental rate of 7 more percentage points. Despite a higher incidence of anaemia in underweight children aged 24 to 59 months, the risk of children under five years of age having anaemia is high regardless of their nutritional status.

TABLE 7.4
MORBIDITIES FOR CHILDREN UNDER-FIVE ASSOCIATED WITH UNDERWEIGHT, BY PATHOLOGY, UGANDA, 2009

Pathology	Number of episodes	Percentage of events
Anaemia	55,923	11%
ADS	289,994	59%
ARI	27,462	6%
Fever/Malaria	121,943	25%
Subtotal	495,322	
LBW	82,635	8%
Underweight	975,450	92%
Subtotal	1,058,085	
Total	1,553,407	

Source: Model estimations based on DHS 2006 and 2011,[32] and demographic information from UBOS.[33]

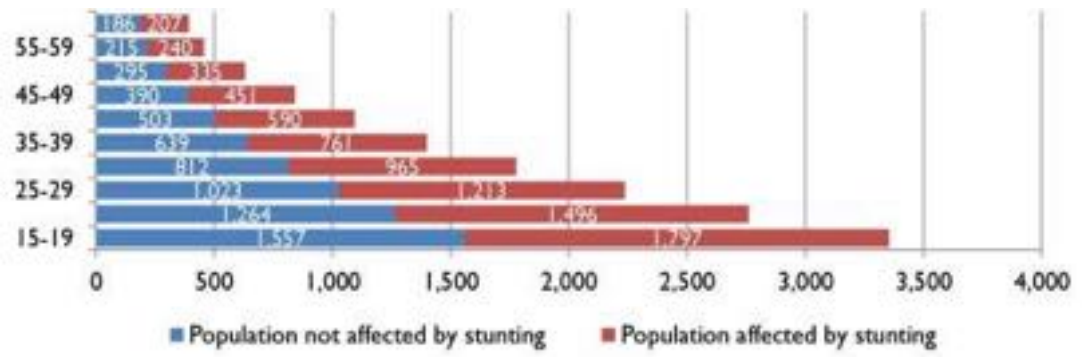
The study estimated that in 2009 in Uganda there were almost 1.6 million more episodes of illness related to diseases associated with being underweight. The highest occurrence of episodes was with diarrhoea, with almost 289,994 more episodes in underweight children, followed by fever, with over 121,943 annual episodes.

(2) Stunting levels of the working-age population

Undernutrition leads to stunting in children, which can impact on their productivity at later stages in life.[34] Although Uganda has made significant progress in reducing the levels of stunted children, a large proportion of the adult population is currently living with the life-long consequences of childhood stunting rates that had reached almost half of the population in the late 1980s.

As illustrated in Figure 7.3 below, this analysis estimated that over 8 million adults in the working-age population suffered from growth restriction before reaching the age of five. Currently this represents more than 54% of the population aged 15-64, who are in a disadvantaged position as compared to those who had healthy childhoods.

FIGURE 7.3
WORKING AGE POPULATION AFFECTED BY CHILDHOOD STUNTING, BY AGE GROUP, UGANDA
(In thousands of people)



Source: Model estimations based on demographic information[35] and WHO/NCHS nutritional surveys.[36]

(3) Effects on mortality

Child undernutrition can lead to increased cases of mortality most often associated with incidences of diarrhoea, pneumonia and malaria.[37] Nevertheless, when the cause of death is determined, it is rarely attributed to the nutritional deficit of the child but rather to the related illness. Given this limitation in attribution, the model utilizes relative risk factors to estimate the risk of increased child mortality as a result of child undernutrition. Using these factors, abridged life tables[38] are used to estimate the incidence of higher mortality risk due to undernutrition.

The model estimates that in Uganda nearly one out of every seven reported child deaths (under five) is associated with undernutrition. As indicated in Table 7.5 below, in the last 5 years alone, it is estimated there would be 110,220 child mortalities in this age group associated with undernutrition. These deaths represented 15 percent of all child mortalities for this period. Thus, it is evident that undernutrition 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 7.5
IMPACT OF UNDERNUTRITION ON CHILD MORTALITY, ADJUSTED BY SURVIVAL RATE, UGANDA, 1945-2009
(In number of mortalities)

Period	Number of child mortalities associated with undernutrition
1945-1994	567,048
1995-2004	207,935
2005-2009	110,220
Total	885,203

Source: ECA on the basis of life tables provided by UN Population Division.[39]

These historical mortality rates will also have an impact on national productivity. The model estimated that between 1945 and 2009, an equivalent of 3.8 percent of the current workforce has been lost due to the impact of undernutrition in increasing child mortality rates. This represents 567,048 people who would have between 15-64 years old, and part of the working age population of the country.

(4) Estimation of public and private health costs

The treatment of undernutrition and related illnesses is a critical recurrent cost for the health system. Treating a severely underweight child, for example, requires a comprehensive protocol that is often more costly than the monetary value and effort needed to prevent undernutrition.[40] These costs generate a significant burden not just to the public sector, but to society as a whole.

It is estimated that 1.6 million clinical episodes recorded in Uganda in 2009 were associated with undernutrition. These generated an estimated cost of more than UGX525 billion, as indicated in Table 7.6 below. Most of the incurred costs were associated to the protocol requiring bringing an underweight child back to a proper nutritional status, which often involves therapeutic feeding. An important element to highlight is the particular costs generated by the treatment of low birth weight children. These cases represented 5 percent of all the episodes but generated 26 percent of the total cost, making it the highest per capita element analysed. This is due to the special management protocol

TABLE 7.6
HEALTH COSTS OF UNDERNUTRITION-RELATED PATHOLOGIES, UGANDA, 2009
(In millions of UGX)

Pathology	Cost	% of episodes	% of cost
LBW/IUGR	134,342	5%	26%
Anaemia	1,313	4%	0%
ADS	4,778	19%	1%
ARI	1,971	2%	0%
Underweight	369,477	63%	70%
Fever/Malaria	13,955	8%	3%
Total Cost	525,835	100%	100%

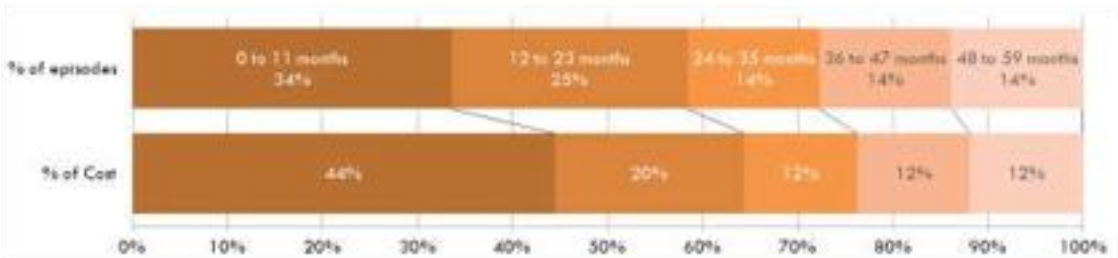
Source: Estimations based on data from DHS 2006 and 2011,[41] and cost analysis carried-out by NIT (for more details see Annex 5).

applied to LBW children, which often includes hospitalization and time in intensive care.

A large proportion of costs related to undernutrition are met by the families themselves, as often these children are not provided with proper health care. Based on the information collected by the NIT, the model estimated that only about 15 percent of underweight children under the age of five are attended at the health facilities. However, this number increases to 25 percent when the child presents an additional pathology such as diarrhoea, anaemia, fever/malaria or acute respiratory infection. This may indicate that caretakers may not react quickly enough to loss in weight, hence increasing the risk for health complications.

Most episodes of incremental illness associated to undernutrition happen before the first year of life. This is the period of the first thousand days of life, where children are most threatened due to age-specific vulnerabilities. In Uganda in 2009, 34 percent of all incremental episodes occurred in children under 12 months, representing 44 percent of costs (see Figure 7.4).

FIGURE 7.4
DISTRIBUTION OF INCREMENTAL EPISODES OF ILLNESS ASSOCIATED WITH UNDERNUTRITION BY AGE GROUP, UGANDA



Source: Models estimations based on DHS 2006 and 2011,[42] and demographic information from UBOS.[43]

The discrepancy in the distribution of episodes that do not receive proper health care is also reflected in the distribution of the health costs. In Uganda, it is estimated that families bear around 87% of the health costs associated to undernutrition, representing UGX456 billion, while 13% of the total costs were attributed to the health system (see Figure 7.5).

FIGURE 7.5
DISTRIBUTION OF PRIVATE AND PUBLIC HEALTH COSTS, UGANDA
(In percentages and billions of UGX)

Source: Estimations based on data provided by DHS 2006 and 2011,[44] and data collected by NIT.

Although the families of undernourished children incur most of the health costs related to undernutrition, the burden of this phenomenon is still an important component in public sector expenditure. In 2009-2010 the annual estimated cost related to undernutrition was equivalent to 11% of the total budget allocated to health. In total, the economic impact of undernutrition in health-related aspects was equivalent to 1.6% of the GDP of that year.

7.2.B Social and Economic Cost of Child Undernutrition in the Education Sector

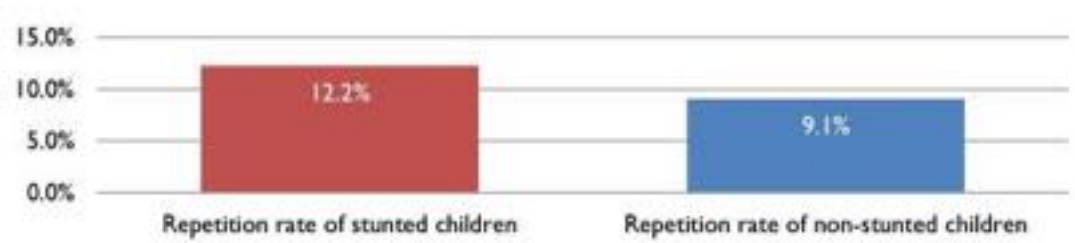
There is no single cause for repetition and dropout; however, there is substantive research that shows that students who were stunted before the age of 5 are more likely to underperform in school.[45] As a result, undernourished children are faced with the challenge of competing favourably in school due to their lower cognitive and physical capacities than children who were able to stay healthy in the early stages of life.

The number of repetition and dropout cases considered in this section of the report result from applying a differential risk factor associated to stunted children, as well as to the official government information on grade repetition and dropouts in the educational system in 2009. The cost estimations were based on the average cost of a child to attend primary and secondary school in Uganda in 2009 provided by the Ministry of Education, as well as estimations of costs incurred by families to support child schooling.

(1) Effects on repetition

Children who suffered from undernutrition before 5 years of age are more likely to repeat grades, compared to those were not afflicted by undernutrition.[46] According to official information provided by the Ministry of Education, over 1.8 million children repeated grades in 2009 (10.7 percent). Given the increased risk of repetition among stunted students, the model estimated that the repetition rate for was 12.2 percent while the repetition rate for non-stunted children was estimated at 9.1 percent (see Figure 7.6). Based on these rates and the proportion of stunted students, the model estimated that 128,970 repetitions, or 7.3 percent of all repetitions in 2009 were associated with undernutrition.

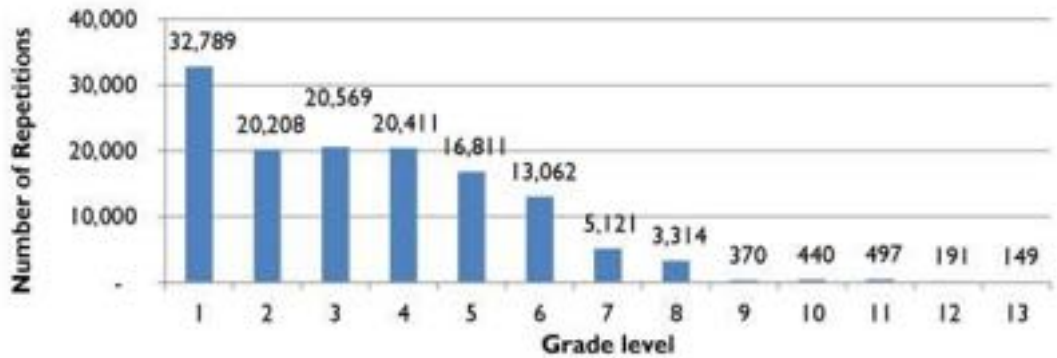
FIGURE 7.6
REPETITION RATES IN PRIMARY EDUCATION BY NUTRITIONAL STATUS, UGANDA, 2009
(In percentages)



Source: Estimations based on data from EMIS (Ministry of Education – Education Management Information System for 2009 provided by NIT.[47]

As shown in Figure 7.7, most of these grade repetitions happen during primary school. There are far fewer children who repeat grades during secondary school; this largely due to the fact that many underperforming students would have dropped out of school before reaching secondary education.

FIGURE 7.7
GRADE REPETITION OF STUNTED CHILDREN IN SCHOOL, BY GRADE, UGANDA, 2009



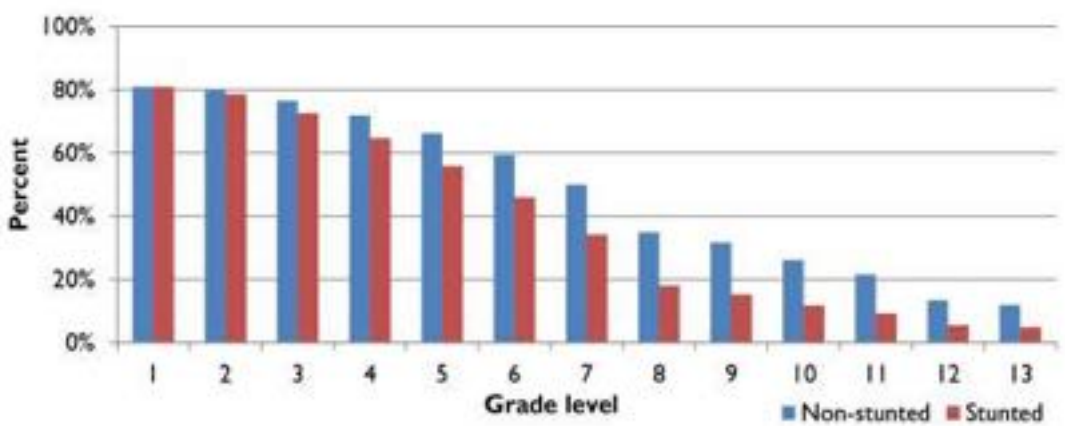
Source: Estimations based on data from EMIS Ministry of Education – Education Management for 2009 provided by NIT.[49]

Additionally, it is important to note that while Uganda does have a policy of automatic promotion,[48] official statistics provided by the ministry of education indicate that for various reasons, repetitions still occur.

(2) Effects on retention

According to the available data and relative risks of stunting on education, it can be estimated that 50 percent of the non-stunted population completed primary school, compared to only 34.2 percent of stunted children. Similar trends are observed in secondary school, where an estimated 11.9 percent of non-stunted children and less than 4.8 percent of stunted children completed secondary school (see Figure 7.8).

FIGURE 7.8
GRADE ACHIEVEMENT BY NUTRITIONAL STATUS, UGANDA, 2009
(In percentages)



Source: Model estimations based from Uganda Bureau of Statistics (UBOS).[50]

The costs associated with school dropouts are reflected in the productivity losses experienced by individuals who are searching opportunities in the labour market. As such, the impact is not reflected in the school-age population, but in the working-age population, particularly in non-manual activities.

(3) Estimation of public and private education costs

Repetition in school has direct cost implications to families and the school system. Consequently in 2009, the 133,931 students, who repeated grades (and whose repetition was associated with undernutrition), incurred a cost of UGX19.7 billion (see Table 7.7). The largest proportion of repetitions occurred in primary school, where the cost burden mostly falls on the public education system. However, unit costs are significantly higher for repetitions in secondary school. The following chart summarizes the public and private education costs associated with stunting.

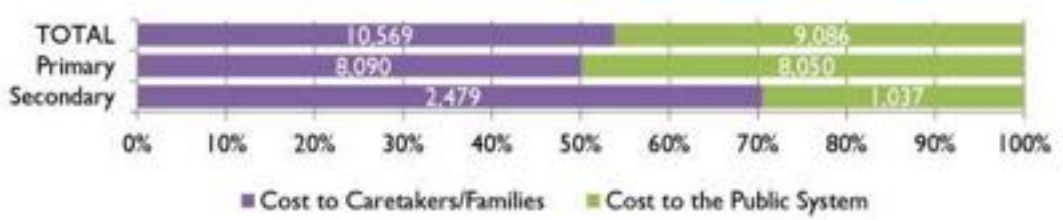
TABLE 7.7
COST OF REPETITIONS, UGANDA

	Primary	Secondary	Total
Public Costs per student (UGX)	62,415	208,952	
Private Costs per student (UGX)	62,731	499,616	
Number of repetitions	128,970	4,961	133,931
Total Public Costs (millions of UGX)	8,050	1,037	9,086
Total Private Costs (millions of UGX)	8,090	2,479	10,569
Total (millions of UGX)	16,140	3,516	19,655
% Social expenditure on education			1.8%

Source: Estimations based on official education statistics from EMIS Ministry of Education – Education Management Information System for 2009.[51]

As in the case of health, the social cost of undernutrition in education is shared between the public sector and the families. Of the overall costs, a total of UGX10.5 billion (46 percent) was covered by the caretakers, while UGX9.1 billion (54 percent) was borne by the public education system (see Figure 7.9). Nevertheless, the distribution of this cost varies depending on whether the child repeated grades at primary or secondary level. In primary education, the families cover 50 percent of the associated costs of repeating a year, whereas in secondary education the burden on the families is as high as 71 percent. This could also be a contributing factor to the higher dropout rates found in secondary education.

FIGURE 7.9
DISTRIBUTION OF COSTS IN EDUCATION, UGANDA
(In millions of UGX*)*



Source: Estimations based on official education statistics from EMIS Ministry of Education – Education Management Information System for 2009.[52]

7.2.C Social and economic cost of child undernutrition in productivity

As described in the health section of this report, the model estimated that 54 percent of the working-age population in Uganda 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.[53] This represents more than 8 million people in Uganda whose productive potential is affected by undernutrition.

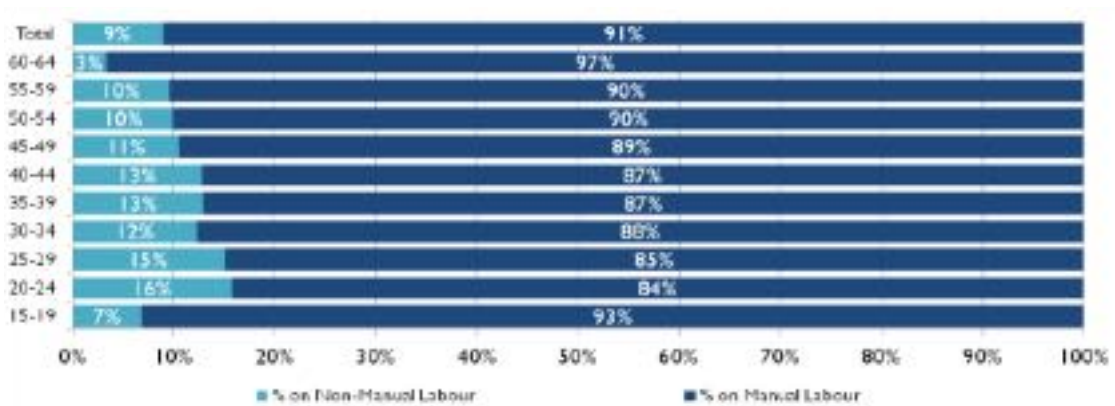
Child undernutrition affects human capital and productivity in several dimensions. Stunted workers, on average, have achieved fewer years of schooling than non-stunted workers. In non-manual activities, higher academic achievement is directly correlated with higher income. Research shows that stunted workers engaged in manual activities tend to have less lean body mass[54] and are more likely to be less productive in manual activities than those who were never affected by growth retardation.[55] Moreover, undernutrition-related mortalities contribute to losses in potential national productivity.

The estimation of the population whose labour productivity is affected as a consequence of child undernutrition is based on historical nutritional information, in-country demographic projections and income reported in the Uganda National Household Survey 2009-2010. The workforce lost due to higher mortality risk of undernourished children is based on adjusted mortality rates estimated in the health section of this report.

The cost estimates for labour productivity are based the differential income associated to lower schooling in non-manual activities and the lower productivity associated to stunted children 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 2009.

The distribution of the working population in the labour market is an important contextual element in determining the impact of undernutrition on national productivity. Although the proportion of the population engaged in non-manual activities is relatively small, the average income of this population is

FIGURE 7.10
MANUAL AND NON-MANUAL LABOUR DISTRIBUTION, BY AGE GROUP, UGANDA, 2009
(In percentages)



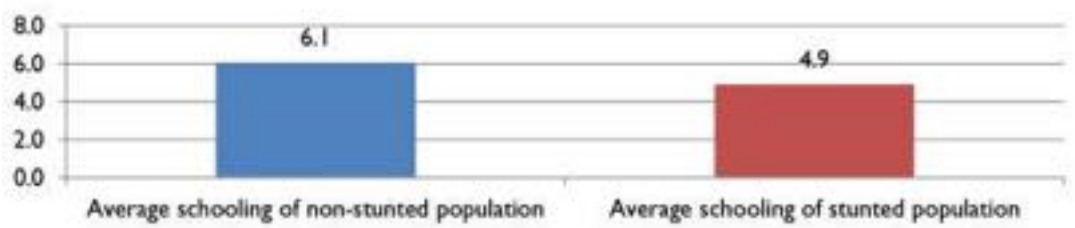
Source: Uganda National Household Survey (2009-2010) UBOS.[56]

higher than that of the population working in manual activities. As shown in Figure 7.9, the trend of non -manual labour seems to be higher in the younger group (20 to 29 years of age) and manual activities seems to be more predominant among 30 to 59 year olds. In 2009, 1.7 million of working-age people were involved in non-manual activities.

(1) Losses in non-manual activities

As described in the education section of this report, stunted people complete, on average, fewer years of schooling than students who were adequately nourished as children. This situation affects mostly people who are engaged in non-manual activities, in which a higher academic education leads to improved income. In the case of Uganda, 9 percent of the working-age population is engaged in non-manual activities.[57] The average schooling of the non-stunted population is estimated at 6.1 years, while people who suffered from childhood stunting achieved only 4.9 years (see Figure 7.11).

FIGURE 7.11
AVERAGE SCHOOLING YEARS
FOR STUNTED AND NON-STUNTED POPULATION, UGANDA
(In years of education)



Source: Model estimations, based on UNHS 2009-2010 UBOS[58] and DHS 2006 and 2011.[59]

It is important to note that over time there has been an improvement in the average number of years people remained in the education system, whereas the cohort of 60-64 years schooled on average 3.5 years, the cohort aged 20-24 recorded an average of 6.5 years of education, demonstrating an important improvement of the educational level of the population (see Table 7.8).[60]

TABLE 7.8
LOWER PRODUCTIVITY IN NON-MANUAL ACTIVITIES
DUE TO STUNTING, UGANDA, 2009

Age in 2009	Population working in non-manual sectors who were stunted as children *(In numbers of people)*	Income Losses in non-manual labour *(In millions of UGX)*
15-24	359,786	51,549
25-34	300,931	60,246
35-44	174,098	59,834
45-54	80,777	56,046
55-64	29,962	13,389
Total	945,554	241,064
% GDP		0.7%

Source: Model estimations based on income UNHS 2009/2010 UBOS[62] and DHS 2006/2011.[63]

Data from the UNHS 2009/10 shows a progressive increase in income associated to higher schooling achievement, particularly in non-manual activities.[61] In this sense, the lower educational achievement of the stunted population has an impact on the expected level of income a person would earn as an adult.

The model estimated that 945,554 people engaged in non-manual activities suffered from childhood stunting. This represents 6.3 percent of the country's labour force that is currently less productive due to lower schooling levels associated with stunting. As shown in Table 7.8 the estimated annual losses in productivity for this group amount to UGX 241 billion, which are equivalent to 0.7 percent of the GDP in 2009.

(2) Losses from manual activities

Manual activities are mainly observed in the agricultural, forestry and fishing subsectors, employing more than 93 percent of the population.[64] In these type of activities, people who were stunted as children have less lean body mass[65] and are therefore less physically capable than those who did not suffer from growth retardation. As such, they are expected to be less productive.[66] The model estimated that 13.1 million people in Uganda work in manual activities, of which 7.1 million were stunted as children. This represented annual losses surpassing UGX 417 billion, equivalent to 1.28 percent of GDP, in potential income lost due to lower productivity (see Table 7.9).

TABLE 7.9
LOSSES IN POTENTIAL PRODUCTIVITY IN MANUAL ACTIVITIES DUE TO STUNTING, UGANDA, 2009

Age in 2009	Population working in manual labour who were stunted as children *(In thousands)*	Loss in productivity due to stunting *(In millions of UGX)*
15-24	2,934	140,094
25-34	1,877	133,737
35-44	1,177	72,160
45-54	705	55,700
55-64	417	15,241
Total	7,110	416,932
% GDP		1.28%

Source: Estimations based on data from UNHS 2009-2010 UBOS[67] and WHO/NCHS Database information.[68]

(3) Opportunity costs due to mortality

As indicated in the health section of this report, there is an increased risk of child mortality associated to undernutrition. The model estimates that the 567,048 people of working-age population who would have been part of the economy in 2009 could have increased national productivity by over 943 million working hours.

Considering the productive levels of the population by their age and sector of labour, the model estimated that in 2009 the economic losses (measured by working hours lost due to undernutrition-related child mortality) amounted to UGX 656.6 billion, which represented 2 percent of the country's GDP (see Table 7.10).

TABLE 7.10
LOSSES IN POTENTIAL PRODUCTIVITY DUE TO MORTALITIES, UGANDA, 2009

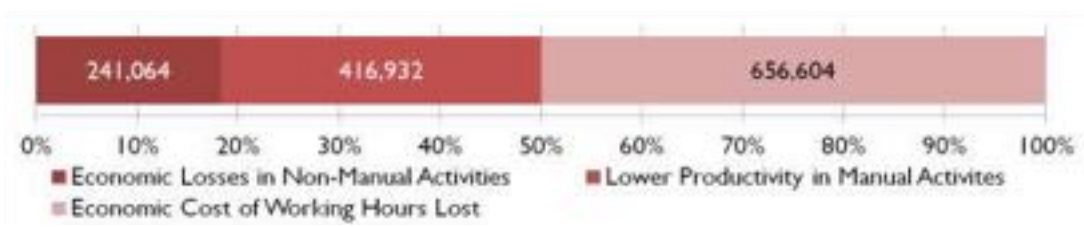
Age in 2009	Working hours lost due to higher mortality of underweight children (in millions of Working Hours)	Loss in productivity (in millions of UGX)
15-24	298	163,984
25-34	236	180,188
35-44	175	127,031
45-54	125	126,985
55-64	108	58,416
Total	943	656,604
		2.0%

Source: Model estimations based on UNHS 2009/2010 UBOS[69] and DHS 2006/2011.[70]

(4) Overall productivity losses

The total losses in productivity for 2009 are estimated at approximately UGX1.2 trillion, which is equivalent to 3.91 percent of Uganda's GDP. As presented in Figure 7.12, the largest share of productivity loss is due to the working hours lost from individuals who died because of undernutrition. Reduced productivity in manual activities represents 29 percent of the total loss, as there is a large proportion of the population in Uganda engaged in manual activities. For non-manual activities, the loss seems relatively low, although the per capita losses in this sector are higher than the losses in manual activities.

FIGURE 7.12
DISTRIBUTION OF LOSSES IN PRODUCTIVITY, BY SECTOR, UGANDA, 2009
(In percentages and millions of UGX)



Source: Model Estimations.

7.2.D Summary of Effects and Costs

The developed methodology allowed the study to analyse the impact of child undernutrition 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 undernutrition.

For Uganda, the total losses associated with undernutrition are estimated at UGX1.86 trillion, or USD899 million for the year 2009. These losses are equivalent to 5.6 percent of GDP of that year (see Table 7.11). The highest element in these costs relates to the lost working hours due to mortality associated to undernutrition. Nevertheless, the costs incurred in the health sector also constitute an important element of analysis, representing nearly 30 percent of the total cost.

TABLE 7.11
SUMMARY OF COSTS, UGANDA, 2009

	Episodes	Cost in billions of UGX	Cost in millions of USD	Percent-age of GDP
Health Costs				
LBW and Underweight	1,058,084	503.8	243.5	
Increased Morbidity	495,322	22.0	10.6	
Total for Health	1,553,407	525.8	254.1	1.6%
Education Costs				
Increased Repetition - Primary	128,970	16.1	7.8	
Increased Repetition - Secondary	4,961	3.5	1.7	
Total for Education	133,931	19.7	9.5	0.05%
Productivity Costs				
Lower Productivity - Non-Manual Activities	945,554	241.1	116.5	
Lower Productivity - Manual Activities	7,110,178	416.9	201.5	
Lower Productivity - Mortality	567,048	656.6	317.3	
Total for Productivity	8,622,781	1,314.6	635.4	3.95%
TOTAL COSTS		1,860.1	899	5.6%

Source: Model estimations.

Due to the multi-causal phenomenon of grade repetition, the direct costs in education tend to be the lowest of the three sectors. Nevertheless, the potential gains in productivity for maintaining children in school are currently 13 percent of the total cost, which still indicates an important productivity gain to be made from investments in school retention mechanisms.

7.3 Analysis of Scenarios

The previous chapter showed the social and economic costs that affected Uganda in 2009 due to high historical trends of child undernutrition. 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 undernutrition. Nevertheless, there is still room to prevent these costs in the future. Currently, one out of every three children under the age of five in Uganda is stunted.

This section analyses the impact that a reduction in child undernutrition 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 Ugandan children would bear in the future. They also indicate 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 can generate a baseline for various scenarios, based on nutritional goals established in each country. Scenarios, which were agreed upon with the national implementation team in Uganda, can then be used to advocate for increased investments in proven nutritional interventions.

Scenarios are constructed based on the estimated net present value of the costs of the children born in each year, from 2009 to 2025. While the previous section calculated the costs incurred in a single year

by historical trends of undernutrition, these costs represent the present values and savings generated by children born during 2009 to 2025.

The scenarios developed for this report are as follows:

Baseline: The cost of inaction — Progress in reduction of stunting and underweight child stops

For the baseline, the progress of reducing the prevalence of undernutrition stops at the levels achieved in 2009. 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.

Scenario #1: Cutting by half the prevalence of child undernutrition by 2025

In this scenario, the prevalence of underweight and stunted children would be half of the 2009 values corresponding to the reference year. In the case of Uganda this would mean a constant reduction of 1.11% percentage points annually in the stunting rate from 35.5 (estimate for 2009) to 17.8 percent in 2025. With the right combination of proven interventions, this scenario would be achievable, as the average rate of reduction for stunting between 2001 and 2011 was estimated at 1.14 percentage points, which is higher than the progress rate required in achieving this scenario. Nevertheless, for the period 2006-2011, a minor slowdown in the reduction rate (1.06 percentage points) was registered, which appears to indicate that stronger investments are required to continue the downward trend.

Scenario #2: The goal scenario — Reduce stunting to 10 percent and underweight children to 5 percent 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 5, 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 continental challenge, in which countries on the continent could collaborate jointly in its achievement. The progress rate required to achieve this scenario would be 1.6 percentage points annual reduction for a period of 16 years, from 2009 to 2025.

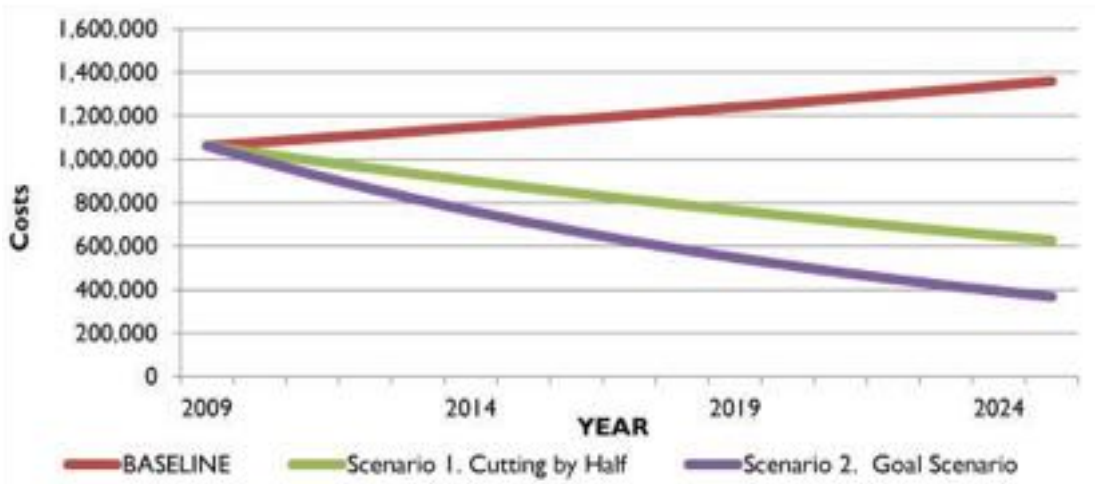
As Figure 7.13 shows, the progressive reduction of child undernutrition generates a similar reduction in the cost associated with it. The distances between the trend lines would indicate the savings that would be achieved on each scenario.

In the baseline, where the progress of reduction of child undernutrition would stop at the level of 2009, the cost in 2025 would reach UGX 1.4 billion (USD670.0 million).

In Scenario #1 in which a reduction of half of the current prevalence is achieved, the cost in 2025 would reduce to UGX627.7 million (USD309.1 million). For the full period between 2009 to 2025, this

would represent a total savings of UGX2.9 billion (USD1.4 billion). Although the tendency of savings would not be linear, as they would increase over time as progress was achieved, a simple average of the annual savings would represent UGX179.3 million (USD88.3 million) per year.

FIGURE 7.13
TRENDS OF ESTIMATED COSTS OF CHILD UNDERNUTRITION, UGANDA, 2009-2025
(In millions of UGX)



Source: Model estimations.

In the case of the goal scenario, the cost in 2025 would be reduced to UGX368.0 million (USD181.2 million). This translates into an increase in total savings to UGX4.3 billion (USD2.1 billion), which represents UGX266.9 million (USD131.5 million) per year, for the same 16-year period (see Figure 7.13 and Table 7.12).

TABLE 7.12
COSTS AND SAVINGS BY SCENARIO, UGANDA

	Baseline		S1. Cutting by Half		S2. Goal Scenario	
	UGX	USD	UGX	USD	UGX	USD
Projected cost in the year 2025	1,359.8	669.7	627.7	309.1	368.0	181.2
Total projected savings (2009-2025)			2,869.2	1,413.1	4,270.6	2,103.2
Annual projected savings (2009-2025)*			179.3	88.3	266.9	131.5
Annual percentage points reduction in stunting rates required achieve scenario (2009-2025)	Progress stops		1.14%		1.6%	

Source: Model estimations.

7.4 Conclusions and Recommendations

7.4.A Conclusions

The COHA study presents an opportunity to better understand the role that child nutrition can play as a catalyst for social and economic transformation, and human development. This report marks an important step forward for Uganda, serving as a gateway for policy-makers to understand the socio-economic consequences of child undernutrition on Uganda's economy and population.

The results of the study strongly suggest that, in order for Uganda to achieve sustainable human and economic growth, special attention must be given to addressing nutrition in the early stages of an individual's life. The results of the study are supported by a nationally representative evidence-base, and a model of analysis specially adapted for the African context. The model uses nationally collected data to estimate the additional costs in health, education and productivity that are incurred as a result of child undernutrition. This study further quantifies the potential gains of addressing child undernutrition as a priority. As a result of this study, stakeholders now not only have the ethical imperative to address child nutrition, but a strong economic rationale to position nutrition the centre of Uganda's development agenda.

The study estimates that child undernutrition generates health costs equivalent to 11 percent of the total public budget allocated to health. These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children and the protocols necessary for their treatment. It is also important to note that only 1 out of every 5 children is estimated to be receiving proper health attention. As the health coverage expands to rural areas, there will be an increase of people seeking medical attention; this can potentially affect the efficiency of the system to provide proper care services. This study illustrates that a reduction of child undernutrition could facilitate the effectiveness of this expansion by reducing the incremental burden generated by the health requirements of underweight children.

Further, the study estimates that 15 percent of all cases of child mortality are associated with the higher risk of undernutrition. Hence, a preventive approach to undernutrition can help reduce this incremental burden to the public sector, and also reduce the costs that are currently being covered by caretakers and families.

Increasing the educational level of the population, and maximizing the productive capacity of the population dividend, is a key element to increase competitiveness and innovation. This represents a particular opportunity in Uganda where the population under 15 years is estimated to be 48 percent of the total population. These children and youth must be equipped with the skills necessary for competitive labour. Thus, the underlying causes for low school performance and early desertion must be addressed. As there is no single cause for this phenomenon, a comprehensive strategy that considers improving in the quality of education and the conditions required for school attendance must be put in place. This study demonstrates that stunting is one barrier to attendance and retention, and to effectively elevate the educational levels and improve individuals' labour opportunities in the future, this barrier must be removed.

The study estimated that children who were stunted experienced a 3.1 percent higher repetition rate in school. As a result, 7 percent of all grade repetitions in school were associated to the higher

incidence of repetition that is experienced by stunted children. 96 percent of these grade repartitions occur in primary school, suggesting that a reduction in the stunting prevalence could also support an improvement in schooling results, as it would reduce preventable burdens to the education system.

On the continent, more than half of the population is expected to live in cities by 2035.[71] An important component to prepare for this shift is to ensure that the workforce is ready to make a transition towards a more skilled labour, and economies are able to produce new jobs to reduce youth unemployment. By preventing child stunting thus avoiding the associated loss in physical and cognitive capacity that hinders individual productivity, people can be provided with a more equal opportunity for success.

The study estimates that 54 percent of the working age population in Uganda is currently stunted. This population has achieved on average, lower schooling levels than those who did not experience growth retardation of 1.2 years of lower schooling. As the country continues to urbanize, and an increasing number of people participate in skilled employment, this loss in human capital will be reflected in a reduced productive capacity of the population. Thus, it may be a particularly crucial time to address child undernutrition and prepare future youth for better employment by prioritizing the reduction of stunting in Africa's transformation agenda.

The COHA model also provides and important prospective analysis that sheds light on the potential economic benefits to be generated by a reduction in the prevalence of child undernutrition. The model estimates that in Uganda, a reduction of the prevalence to half of the current levels of child undernutrition by the year 2025 can generate annual average savings of UGX174 billion (USD86 million). An additional scenario shows that a reduction to 10 percent stunting and 5 percent underweight for that same period could yield annual average savings of UGX260 billion (USD128 million). This economic benefit that would result from a decrease in morbidities, lower repetition rates and an increase in manual and non-manual productivity, presents an important economic argument for the incremental investments in child nutrition.

This study is also an important example of how South-South collaboration can work to implement cost effective activities in development and knowledge sharing. Uganda's participation as one of the pilot countries of the study, and its feedback in challenges faced in collecting the data at national level was an important element in adapting the COHA methodology to Africa. The contributions of the Uganda NIT will serve to facilitate the expansion of this tool in the continent.

Lastly, this study illustrates the valuable role that data and government-endorsed research can play in shedding light on pertinent issues on the continent. This study will help the country engage within global nutrition movements such as the Scaling Up Initiative as programmes and interventions are put in place to address stunting as a national priority.

7.4.B Recommendations

This study presents some key findings of the Cost of Hunger in Uganda, as well as, both challenges and opportunities regarding the reduction of child undernutrition to the country.

(1) Recommendations for on-going interventions

The Government of Uganda and its development partners a series of activities in place, which in most cases, are demonstrating results in the reduction of child undernutrition. Nevertheless, an improvement in the reduction rate will require a scaling-up in current interventions that have proved effective. Some of the actions recommended by the NIT in for this include the following.

- Promotion of access to and utilization of essential services. The Government of Uganda has put in place maternal child health services such as Pre Natal Care (PNC), Ante Natal Care (ANC), and young child health services provided through the health delivery system. These are directed at ensuring healthy pregnancies and good birth outcomes are achieved while promoting positive health, seeking the coverage and utilization still remains limited. To increase the rate of reduction of child stunting in Uganda, it is recommended that the health system outreach services coupled with logistics and supplies management be strengthened and supported to facilitate access and promotion of the utilization at community and household level.
- Scaling up of food fortification for school going children and children above 6 months. In Uganda, consumption of balanced diets is often limited to the affluent population group mostly located in the urban areas. The bigger proportion of Uganda's location is located in the rural areas. While access to food may not always be a problem, food diversity is limited and food consumed depends on the region. Worse still, the complementary foods used for children above six months of age are often starch-based and of low nutrient value. Children in primary school face similar challenges of limited diversity. Given the strong link between micronutrient deficiencies and stunting, it is recommended that flour fortification is scaled up to facilitate mandatory use of fortified food in school meals and ensure increased nutrient intake for school going children.
- Promotion of the consumption of fortified complementary food especially in populations most affected by micronutrient deficiencies and stunting. This could include exploring home fortification using Micronutrient powders as a strategy for improving the quality of complementary food for children above 6 months of age.
- Promotion of Public-Private partnerships. Encouraging public-private partnerships can serve as a way to engage the private sector (especially in the food production and processing industry), and better incorporate the health and nutritional needs of the population in their products, promotions and distribution mechanisms This might also assist in addressing the constraints (such as tax subsidies on processing technology equipment, fortificants, etc) of the public sector related to coming up with the right products.
- Increase efforts and explore further opportunities in bio-fortification. Given that most rural communities practice subsistence farming and may not be able to access fortified food products due to either remoteness or affordability, bio fortification of common staple

such as bean, maize, sweet potatoes may be promoted through the Ministry of Agriculture and other existing mechanisms in order to allow households practicing subsistence farming access better improved food commodities form own production.

- Promotion of awareness of the entire population. The government supports awareness activities through various sectors and mechanisms. Nutrition awareness remains limited across the whole population including the educated. The demonstrated impact of nutritional deficiencies in most parts of the country requires enhancing the awareness on the importance of nutrition especially in the first 1000 days of a child's life and the school-going age group that has be found to facilitate nutritional catch-up starting from the early childhood care and development centres.
- An important mechanism to help raise this awareness is to increase nutrition sensitization actions on existing sector activities. These may include developing of a nutrition hand guide that facilitates not only the literate but also educators on the locally available food commodities that could be used, blended, processed to develop a nutritionally enriched food that can be used by the various vulnerable groups. The last version of such a guide for Uganda was last updated in 1969. An updated on the takes into account foods that have since been introduced into country (as imports or locally grown) may be considered.

(2) Recommendations for addressing bottlenecks

In order for nutrition intervention to maximize their results, certain elements that are not directly within the scope of the activities themselves must be addressed, in order to achieve a sustained reduction in child nutrition.

From the policy environment perspective.

- An enabling policy environment to facilitate planning and implementation of the above recommendations.
- Mandatory large-scale industrial fortification of common staples widely consumed such as wheat, maize and vegetable oil.
- Mandatory use of fortified maize flour and vegetable oil in school feeding programmes.
- Tax subsidies on fortificants and other food processing and agricultural technology and equipment.

Coordination of multi-sectoral nutrition interventions for common objective of addressing undernutrition

- Support the OPM Uganda Nutrition Action Plan (UNAP) secretariat in their coordination role of ensuring the different sectors play their role in contributing to the implementation of the national nutrition plan.
- A clear recommendation of this study is that Uganda must review their national development frameworks to ensure that the reduction of the stunting provenance is an outcome indicator of their social and economic development policies. Chronic child undernutrition can no longer be considered a sectoral issue, as both its causes and solutions are linked to social policies across numerous sectors. As such, stunting reduction will require interventions from

the health, education, social protection, and social infrastructure perspectives. Stunting can be an effective indicator of success in larger social programmes

- This study encourages countries not to be content with "acceptable" levels of stunting; equal opportunity should be the aspiration of every country the continent. In this sense, it is recommended that aggressive targets are set in Uganda for the reduction of stunting that go beyond proportional reduction, to establish an absolute value as the goal for the region at 10%.
- The achievement of this aggressive goal cannot be reached from just the health sector. In order to be able to have a decisive impact on improving child nutrition, a comprehensive multi-sectoral policy must be put in place, with strong political commitment and allocation of adequate resources for its implementation. This plan should look to accelerate the actions on the determinants of child undernutrition such as inadequate income, agricultural production, improving gender equality and girls' education, improving water supply and sanitation, but also by addressing deeper underlying determinants such as the quality of governance and institutions and issues relating to peace and security. To ensure sustainability of these actions, whenever possible, the role of international aid must be complementary to nationally led investments, and further efforts have to be done in ensuring the strengthening of national capacity to address child undernutrition.
- An important element that must be addressed to enhance the national capacity to address malnutrition is to improve the monitoring and evaluation systems Currently, the assessments of the prevalence of child nutrition are carried-out with a periodicity of between 3 to 5 years. Nevertheless, in order to be able to measure short term results in the prevention of stunting, a more systematic approach with shorter periodicity is recommended, of 2 years between each assessment. As the focus on the prevention of child undernutrition should target children before 2 years of age, these results will provide information to policy makers and practitioners on the results being achieved in the implementation of social protection and nutrition programmes.
- Another important element is to further the understanding of the determinants of child undernutrition in each context. As an initial step, it is recommended that the assessment of child nutrition also includes information that relates the nutritional status of the children to the livelihoods and economic activities of the households. This information can be used to inform programme design to ensure that interventions effectively reach these vulnerable families with appropriate incentives and innovative approaches within social protection schemes.

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PART III:

Conclusions and Recommendations

8. Conclusions

The Cost of Hunger in Africa Study is an important step forward to better understand the role the child nutrition and human development can play as a catalyser, or as a constraint, in the social and economic transformation of Africa. Its results strongly suggest that in order to achieve this agenda, special attention must be given to the early stages of life as the foundation of human capital. The results of the study are supported by a strong evidenced base, and a model of analysis was specially adapted for Africa. The results demonstrate the deep impacts of child undernutrition in health, education and labour productivity. This study further quantifies the potential gains of addressing child undernutrition as a priority. Therefore, stakeholders have not only the ethical imperative to address child nutrition as a main concern, but also a strong economic rationale to position stunting at the centre of the development agenda.

The conclusions of this study highlight specific linkages between child undernutrition and the efforts to reduce inequalities in health, maximize the benefits of the population dividend and prepare for the rapid urbanization and industrialization process of the continent. All of these issues are key elements of Africa's transformation agenda.

Eliminating the inequality in access to health care is a key element of the social transformation agenda in Africa, which requires, as a precondition, a reduction of rural/urban gap in coverage. As the health coverage expands to rural areas, there will be an increase of people seeking medical attention; this can potentially affect the efficiency of the system to provide proper care services. This study illustrates that a reduction of child undernutrition could facilitate the effectiveness of this expansion by reducing the incremental burden generated by the health requirements of underweight children.

The study estimated that child undernutrition generates health costs ranging from an equivalent of 1 percent to 11 percent of the total public budget allocated to health. These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children and the protocols necessary for their treatment. Additionally, the study estimates that the larger proportion of these episodes, 69 percent to 81 percent, do not seek medical attention and are treated at home, thus increasing even further the risk for complications and evidence of an unmet demand for health care. Further, the study estimated that between 8 percent and 28 percent of all child mortalities are associated with the higher risk of undernutrition. Hence, a preventive approach to undernutrition can help reduce this incremental burden to the public sector and also reduce the costs that are currently being covered by caretakers and families.

Increasing the educational level of the population and maximizing the productive capacity of Africa's population dividend are key elements to increase competitiveness and innovation on the continent. This represents a particular opportunity in sub-Saharan Africa, where the population under 15 years of age is estimated to be 40 percent of the total population.[1] These children and youth must be equipped

with the skills necessary for competitive labour. Thus, the underlying causes for low school performance and early desertion must be addressed. As there is no single cause for this phenomenon, a comprehensive strategy that considers improving the quality of education and the conditions required for school attendance must be put in place. This study demonstrates that stunting is one barrier to attendance and retention that must be removed to effectively elevate the educational levels and improve individuals' future labour opportunities.

In each analysed country, children who were stunted experienced higher repetition rates in school ranging from 2 percent to 4.9 percent. As a result, 7 percent to 16 percent of all grade repetitions in school are associated with the higher incidence of repetition that is experienced by stunted children. 90 percent of the cases of grade repetition occur in primary school. These numbers suggest that a reduction in the stunting prevalence could also support an improvement in schooling results, as it would reduce preventable burdens to the education system.

By 2035, more than half of the population in Africa is expected to live in cities.[2] An important component to prepare for this shift is to ensure that the workforce is ready to make a transition towards a more skilled labour and the economies are able to produce new jobs to reduce youth unemployment. By preventing child stunting and by thus avoiding the associated loss in physical and cognitive capacities that hinder individual productivity, people can be provided with a more equal opportunity for success.

The study estimates that 52 percent of the working age population in the analysed countries is currently stunted. This population has achieved on average lower school levels than those who did not experience growth retardation, ranging from 0.2 to 1.2 years of lower schooling. As African countries continue to urbanize and an increasing number of people participate in skilled employment, this loss in human capital will be reflected in a reduced productive capacity of the population. Thus, it may be a particularly crucial time to address child undernutrition and prepare future youth for better employment by prioritizing the reduction of stunting in Africa's transformation agenda.

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 undernutrition. The model estimates that a reduction in the prevalence of the current levels of child undernutrition by half by the year 2025 can generate annual average savings from USD3 million to USD376 million in the analysed countries. An additional scenario shows that a reduction to 10 percent stunting and 5 percent underweight for that same period could yield annual average savings from USD4 million to USD784 million. Such economic benefits that would result from a decrease in morbidity and lower repetition rates and an increase in manual and non-manual productivity, present an important economic argument for the incremental investments in child nutrition.

This study is also an important example of how South-South collaboration can work to implement cost effective activities in development and knowledge sharing. It demonstrates the feasibility of developing and implementing tools that are sensitive to the particular conditions of the continent. The applied methodology, constructed with regional expertise, in strong collaboration between ECA and ECLAC, could not have been effectively implemented without the support of the regional specialized bodies such as WFP and NEPAD and the field expertise of national experts from the governments. This partnership was built based on the comparative advantage of each contributing partner and

demonstrates the potential for global collaboration on this issue.

Lastly, this study illustrates the valuable role that data and government-endorsed research can play in shedding light on pertinent issues on the continent. Although the availability of uniform and readily-available data in Africa is limited, the COHA results have shown that the undertaken analysis has potential to bring the issue of child nutrition to forefront of the development arena. In this sense, in order to support African governments to develop appropriate transformation policies, it is crucial to emphasize the importance of collecting and analysing data to better understand the determinants of current situations and track progress.

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9. Recommendations

9.1 Policy Recommendations

Stunting is a useful indicator to evaluate effective social policies. The causes of and solutions for chronic undernutrition are linked to social policies across numerous sectors. As such, stunting reduction will require interventions from the health, education, social protection and social infrastructure perspectives. Stunting can be an effective indicator of success in larger social programmes.

Strong political will can be reflected in aggressive goals. This study encourages countries not to be content with "acceptable" levels of stunting; equal opportunity should be the aspiration of the continent. In this sense, it is recommended that aggressive targets are set in Africa for the reduction of stunting that go beyond proportional reduction, to establish an absolute value as the goal for the region at 10%. Countries with high and very high levels of stunting, of over 35%, might pursue an interim goal of reduction to 20%, but for countries that have been able to achieve progress enough to reduce stunting to below 35%, the establishment this target would be acceptable and desirable.

A multi-causal problem requires a multi-sectoral response. The achievement of this aggressive goal cannot be reached from just the health sector. To have a decisive impact on improving child nutrition, a comprehensive multi-sectoral policy must be put in place, with strong political commitment and allocation of adequate resources for its implementation.

Efficient rural economies and effective social protection schemes are key drivers for the sustained reduction of child undernutrition. Fostering rural economies, by enhancing the productivity of agricultural activities and expanding the non-agricultural support activities, is a key element in accelerating the reduction rate of malnutrition. Efforts carried out by CAADP and the development of value chains of strategic agricultural commodities can be key elements to focus efforts on in the coming years. Additionally, it is important to consider the role of social protection programmes in reducing hunger and malnutrition, in order to achieve the appropriate combination of transfers and services that is adequate for each context.

Sustainability requires strong national capacity. To ensure sustainability of these actions, whenever possible, the role of international aid must be complementary to nationally led investments, and further efforts have to be made in ensuring the strengthening of national capacity to address child undernutrition.

Monitoring is needed for progress. To measure short-term results in the prevention of stunting, a more systematic approach with shorter periodicity is recommended, such as two years between each assessment. As prevention of child undernutrition should target children before two years of age, these results would provide information to policy makers and practitioners on effectiveness of social

protection and nutrition programmes.

Long-term commitment is necessary to achieve results. The COHA initiative represents a valuable opportunity to place nutrition within a strategy to ensure Africa's sustainable development. As the deadline for Millennium Development Goals nears, new priorities and targets will be set that will serve as a guide for development policies in years to come. It is recommended that the prioritization of the elimination of stunting be not only presented in the traditional forums, but also included in the wider discussions of development, as a concern for the economic transformation of Africa.

Interventions must address both the current effects of stunting that are affecting society today, as well as address the future rates of stunting. As the study demonstrates, a large proportion of African population is currently stunted. Thus, a comprehensive response must also include targeted actions to address its consequences. One of the elements that can have an impact in the educational context is school feeding. These interventions, within a wider framework of social protection, have proven to contribute to raising enrolment rates (particularly for girls), attendance, educational achievement and cognition of students. Its implementation has to be analysed within specific contexts of each situation and within the scope of nutrition sensitive interventions.

The prevention of stunting is the most effective way of reducing its prevalence, as addressing children who are already stunted is very challenging. This is due to the already impaired physical and cognitive development, which typically happens before the age of two. In this sense, national actions should be directed towards proven interventions that address the nutritional status of pregnant and lactating mothers and newborn children

As the National Implementation Teams carried out the study, particular challenges were faced in obtaining specific information on child nutrition, especially in the health sector. These challenges might result from a gap in the information systems and/or the need to increase the relevance of nutrition in the current health systems. As aggressive goals are set to reduce stunting, improvements in data system can be proposed as a direct result of the specific efforts of this study. The data will allow the formulation of specific policies focusing on children, especially under the age of two.

9.2 Pending questions and research opportunities

The COHA represents an important step forward in shedding light on the importance of nutritional investments, as a fundamental basis for human development. Nevertheless, the process also served as an important exercise to identify gaps in knowledge that can help increase the dimensions of the analysis, that include:

Sub-national differences in the social and economic impacts of child undernutrition. There is an opportunity to raise the advocacy on sub-regional and local actions by developing a model to distribute the cost of hunger by region and further engage local governments and communities in the implementation of local actions to improve nutrition.

The impact of early child malnutrition on women's contributions to the household. As most women in Africa are responsible for household chores and caring activities, their contributions are not accurately measured by proxy of labour productivity, rather, by their capacity to provide wellbeing in the household. Nevertheless, the intensity in which this capacity is affected as a consequence of child malnutrition in not comprehensibly address in current literature.

There are still gaps of region-specific risk analysis in Africa, particularly in educational outcomes and labour productivity. A comprehensive analysis of a longitudinal study in Africa, can also serve as an important source of information to update further the relative risks faced by undernourished children, in different aspects of their lives.

Complementary analysis could be carried out to further understand the sectoral consequences of undernutrition. Additional multi-variable analysis could also help to explain variations across countries.

PART IV:

Annexes