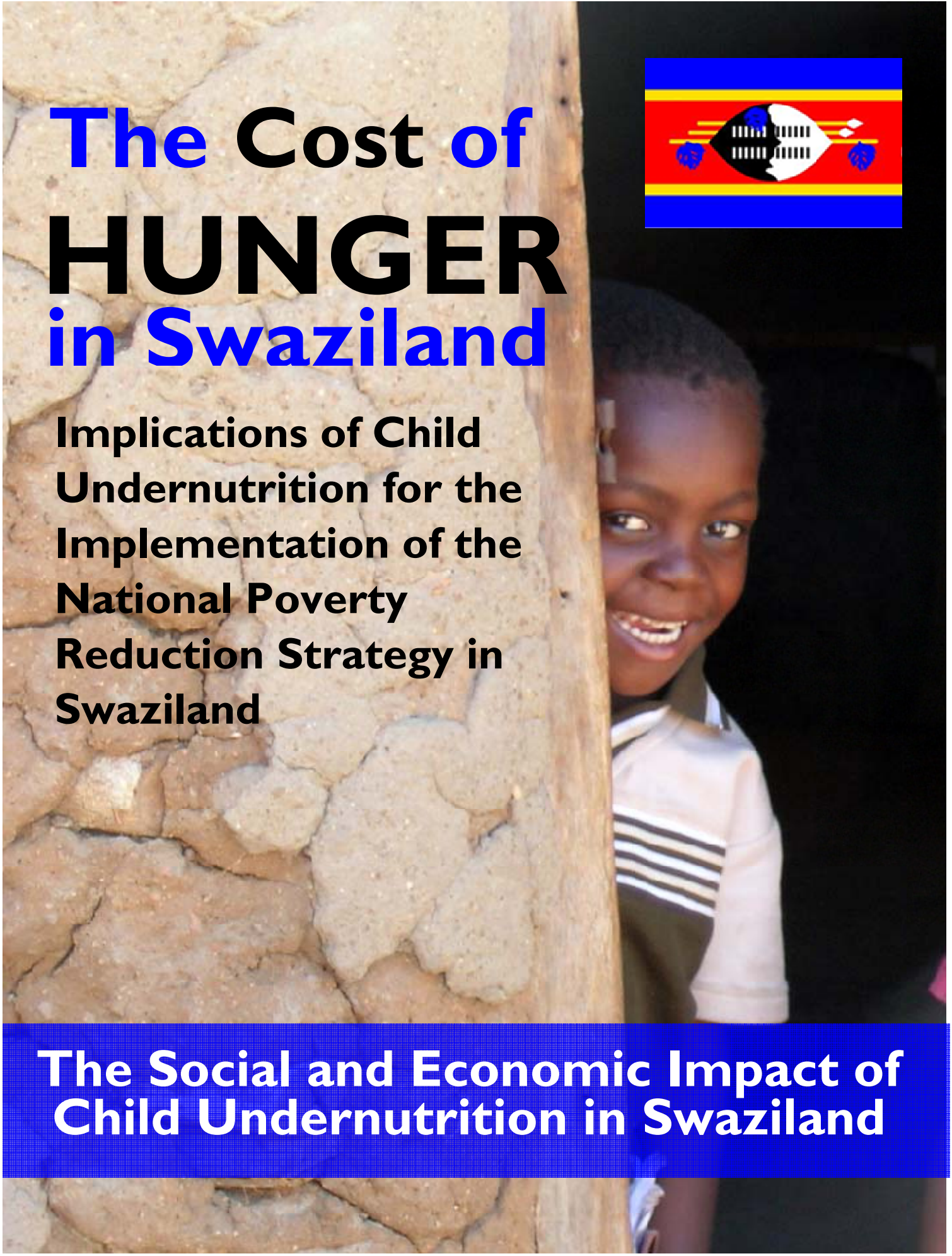
The Cost of HUNGER in Swaziland

Implications of Child Undernutrition for the Implementation of the National Poverty Reduction Strategy in Swaziland



The Social and Economic Impact of Child Undernutrition in Swaziland

Design: Rachel Quint, Addis Ababa, Ethiopia

Initial Funding Provided by

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Social and Economic Impacts of Child Undernutrition in Swaziland

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Foreword

The Government of Swaziland is committed to the eradication of child hunger and undernutrition. Children who are deprived of the necessary nutrients during the most critical period of their growth are condemned to a terrible and irreversible handicap in life. They are more likely to die in the first days or weeks of life than those born with adequate weight and size, They are more vulnerable to infections. Their cognitive and behavioural growth will be affected. If they reach school age, their deficient brain development will limit their capacity to learn, thereby barring access to good jobs. The saddest thing is knowing that this cycle will probably be repeated in their children, perpetuating poverty in generation after generation.

In addition to preventing these children from attaining their full potential, undernutrition also has a negative impact on economic development. It imposes additional costs on society through the added pressure on health and education. For this reason, I welcome the publication of the Cost of Hunger in Swaziland. This study estimates the economic cost of the scourge of undernutrition; it enables us to state without a doubt that, in addition to the ethical and social problems involved in child undernutrition, there are serious economic penalties. These are not limited to the life cycle of each individual, but affect that person's children, who will pass on the tragic legacy to yet another generation.

Eradicating hunger and child undernutrition is, therefore, a tangible and urgent goal. The Cost of Hunger in Swaziland provides an eloquent argument for strengthening alliances among governments, the private sector and civil society with a view to undertaking specific and immediate actions to combat undernutrition. This publication can help generate the political will and the concerted effort to provide universal access for pregnant women and children under five to nutritional food and basic health services. Working together, we can break the cycle of hunger in the space of a generation.

HRH Prince Hlangusemphi

Minister of Economic Planning and Development

Government of the Kingdom of Swaziland

Acknowledgements

The Swaziland Cost of Hunger 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.

Furthermore, we are also grateful to all stakeholders in particular government ministries - Ministry of Health, Swaziland National Nutrition Council, Swaziland Infant Nutrition Action Network, Ministry of Education, Ministry of Agriculture, Ministry of Economic Planning and Development, Central Statistical Office and the Ministry of Finance, as well as the University of Swaziland, Africa Union Commission and NNEC for their contribution and active participation.

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.

This document is based on the report "The Social and Economic Impact of Child Undernutrition in Egypt, Ethiopia, Swaziland and Uganda", prepared within the framework of the Memorandum of Understanding between the UN Economic Commission for Africa (ECA) and the World Food Programme (WFP): "The Cost of Hunger in Africa: The Economic and Social Impact of Child Undernutrition", coordinated by Josué Dioné, Director of the Food Security and Sustainable Development Division at ECA, Steven Were Omamo and Abdoulaye Diop from the WFP Liaison Office to the African Union and ECA, and Mustapha Sidiki Kaloko, Commissioner for Social Affairs at the African Union Commission (AUC).

Special recognition has to be provided to the National Implementation Team in Swaziland responsible for collecting, processing and presenting results, led by the National Children's Coordination Unit in the Office of the Deputy Prime Minister (NCCU/DPMO) and the Swaziland National Nutrition Council (SNNC), particularly to Nhlanhla M. Nhlabatsi and Nombulelo Dlamini (NCCU/DPMO) and Glorius Dlamini, Musa Dlamini, Arlerta Ndlela and Sakhile Mbhamali from the SNNC. Further recognition goes to Robert Fakudze, Bonginkhosi Ginindza and Choice Ginindza from the Central Statistics Office (CSO); Cebsile Kunene and Sandile Ndzimandze from the Dept. of Welfare; Joyce Chanetsa and Thulani Maphosa from International Baby Food Action Network (IBFAN); Thankful Dlamini and Thembumenzi Dube from the Ministry of Agriculture; Thobile Gamedze from the Ministry of Education; Sibongile Mndzebele and Sifiso Ndlovu from the Ministry of Health; Robert Thwala from the Ministry of Labour; Vumile Dlamini-Shabungu and Percy Chipepera from the Swaziland Infant Nutrition Action Network (SINAN); Tsini Mkhatshwa from UNESCO; Makhosini Mamba from UNICEF; Dr. Thoko Sibiya and Dr. Jameson s. Siphepho from the University of Swaziland; and Lungile Mndzebele-Dladla from the Poverty Reduction Monitoring and Evaluation Section of the Ministry of Economic Planning and Development.

The regional support team was originally led by Francisco Espejo from WFP and then led by Carlos Acosta Bermudez from ECA, with the support of Rachel Quint and Yohanan Ermias from WFP and Shewit Aseffa from ECA. Additional technical guidance was also provided from Rodrigo Martinez and Amalia Palma, from the Social Development Division of the Economic Commission for Latin America and the Caribbean (ECLAC).

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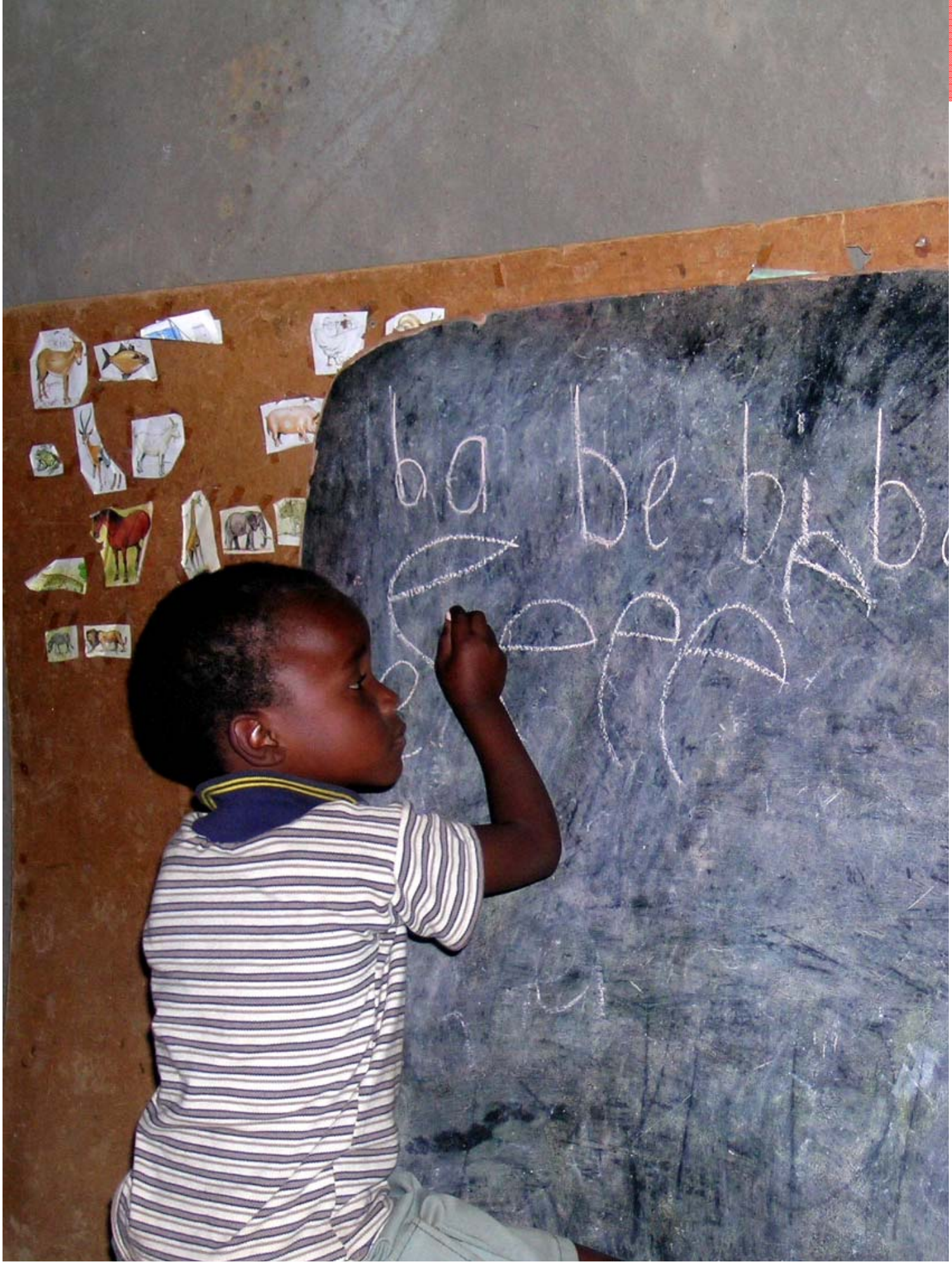
The design and implementation of the study was directed by a Steering Committee jointly led by Menghestab Haile (WFP), Maurice Tankou (ECA), Ademola Olajide and Janet Byaruhanga from the Health, Nutrition and Population Division of the Social Affairs Department at the AUC and Boitshepo Bibi Giyose from the New Partnership for Africa's Development (NEPAD).

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.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Acronyms

ACGSD	African Centre for Gender and Social Development
ACS	African Centre for Statistics
ADFNS	Africa Day for Food and Nutrition
ADS	Acute Diarrheal Syndrome
AfDB	African Development Bank
ARI	Acute Respiratory Infection
ARNS	Africa Regional Nutrition Strategy
ATYS-VMD	Africa Ten Year Strategy for the Reduction of Vitamin and Mineral Deficiencies
AUC	Africa Union Commission
CAADP	The Comprehensive Africa Agriculture Development Programme
CEN-SAD	Community of Sahel-Saharan States
COHA	Cost of Hunger in Africa
COMESA	Common Market for Eastern and Southern Africa
DHS	Demographic and Health Survey
ECCAS	Economic Community of Central African States
ECLAC	Economic Commission for Latin America and the Caribbean
ECOWAS	Economic Community of West African States
EDND	Economic Development and NEPAD Division/ UNECA
EMIS	Education Management Information System
FAFS	Framework for African Food Security
FAO	Food and Agriculture Organization
FTF	Feed the Future
GDP	Gross Domestic Product
GNI	Gross National Income
ICBGM&P	Integrated Community Based Growth Monitoring and Promotion
ICU	Intensive Care Unit
IFAD	International Fund for Agricultural Development
IGAD	Intergovernmental Authority for Development
ILO	International Labour Organization
IMAM	Integrated Management of Acute Malnutrition
IMF	International Monetary Fund
IUGR	Intra Uterine Growth Retardation
LBW	Low Birth Weight
MDGs	Millennium Development Goals
MICS	Multiple Indicator Cluster Survey
MOET	Ministry of Education and Training
MoH	Ministry of Health
NCHS	National Centre for Health Statistics
NEPAD	The New Partnership for Africa's Development
NGO	Non Government Organization
NIT	National Implementation Team
NPCA	NEPAD Planning and Coordinating Agency
OECD	Organization for Economic Cooperation and Development
PANI	Pan- African Nutrition Initiative
P4P	Purchase for Progress
PSS	Public Social Spending
REACH	Renewed Efforts Against Child Hunger
REC	Regional Economic Community

SADC	Southern African Development Community
SHIES	Swaziland Household Income and Expenditure Survey
SNNC	Swaziland National Nutrition Council
SUN	Scaling Up Nutrition
SZL	Swazi Emalangeni
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WAP	Working Age Population
WFP	World Food Programme
WHO	World Health Organization

Executive Summary

The Cost of Hunger in Africa (COHA) is an African Union Commission (AUC)-led initiative through which countries are able to estimate the social and economic impacts of child undernutrition. Twelve countries are participating in the study. Swaziland is part of the four first-phase countries.

The COHA study illustrates that child undernutrition is not only a social but also an economic issue, as countries are losing significant sums of money as a result of current and past child undernutrition. To that end, in March 2012, the regional COHA study was presented to African Ministers of Finance, Planning and Economic Development, who met in Addis Ababa, Ethiopia. The Ministers issued a resolution confirming the importance of the study and recommending it continue beyond the initial stage.

The COHA study in Swaziland is led by the National Children's Coordination Unit in the Office of the Deputy Prime Minister (NCCU/ODPM) with support from the Ministry of Health, Ministry of Agriculture, Ministry of Education, Ministry of Finance, Swaziland National Nutrition Council (SNNC), University of Swaziland and the World Food Programme Swaziland. These departments and ministries make up the National Implementation Team (NIT).

During the process, all data for the study was collected from national data sources including the Swaziland Labour Force Survey 2007, Demographic and Health Survey 2008 and previous DHS studies, Ministry of Health, Ministry of Education, African Centre for Statistics, and primary data collection.

Methodology

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

Trends in child stunting

A recent nutritional survey led by the Ministry of Health showed an important increase in the prevalence of stunted children of more than 10 percentage points, from 29.5% to 40.4%, from the previous DHS survey for 2005-06. 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 9% and 6% between the years 2000 and 2009. This would mean that 46,000 of the 156,000 children under the age of five in 2009 are affected by growth retardation. Additionally, 40% of the school age population and working age population, representing 157,000 and representing 270,000 people respectively, are also suffering from the consequences of childhood stunting.

Initial Results: The social and economic cost of child undernutrition in Swaziland

Overall results in Swaziland show that an estimated SZL 783 million (US$ 92 million) was lost in the year 2009 as a result of child undernutrition. This is equivalent to 3.1% of GDP.

- For 2009, there were an estimated 25 thousand additional clinical episodes associated to undernutrition in children under five, which incurred a cost of an estimated SZL 61 million (US$ 7.1 million). Cases of diarrhea, fever, respiratory infections and anemia totaled 6 thousand episodes in addition to the 19 thousand cases of

[1] The model set 2009 as the base year, given the availability of data for that year and in order to insure the continuity of the study. As it is the most recent possible study year, it is referred to as "current" in this report.

underweight children. According to the data estimated, only 31% of these episodes received proper health attention.

- Underweight in children increased the mortality rates in the country; undernutrition was associated to 8% of all child mortalities in the last 5 years, totaling over 1,300 deaths.
- Stunted children have a higher grade repetition rate, at 18.9% than non-stunted children, at 14%. This incremental rate generated 5,550 additional cases of grade repetition in which the education system and families incurred a cost of SZL 6.0 million (US$ 702,000).
- Stunted children in Swaziland are also more likely to drop out of school. Average schooling achievement for a person who was stunted as a child is 0.77 years lower than for a person who was never undernourished. This disadvantage in the labor market is estimated to have generated private costs of SZL 251 million (US$ 29.5 million) in potential productivity.
- Forty percent of adults in Swaziland are stunted. This represented more than 270,000 people of working age that are not able to achieve their potential, as a consequence of child undernutrition. In rural Swaziland, where most people are engaged in manual activities, it is estimated that in 2009 alone SZL 126 million (US$ 14.8) were not produced due to lower physical capacity of this group.
- Lastly, an estimated 37 million working hours were lost in 2009 due to people who were absent from the workforce as a result of nutrition-related mortalities. This represents SZL 340 million (US$ 40 million), which is equivalent to 1.4% of the country's GDP.

Analysis of scenarios

In addition to calculating a retrospective cost for 2009, the model also can highlight potential savings, based on three scenarios. The three scenarios are described by the chart and graph below. These scenarios are constructed based on the estimated net present value of the costs of the children born in each year, from 2009 to 2025. The methodology follows each group of children and, based on each scenario, estimates a progressive path towards its achievement.

Description	Progress of reduction of the prevalence of undernutrition stops at the level recorded in 2009	Prevalence of underweight and stunted children would be reduced to half of 2009 (to 14.8% and 5% respectively)	Prevalence of stunted children is reduced to 10% and underweight children of less than five years of age, to 5%.
Implications	No increase or decrease in percentage points but an increase in total number of stunted children and a higher burden on the society	A constant annual reduction of **0.9% points in the prevalence of stunting** is required	A constant reduction of **1.2% points annually in the prevalence of stunting** is required
Estimated Change in period	Cost increase of up to 20% by 2025 compared to the values in 2009	Accumulated savings of SZL 402 for the period from 2009 to 2025	Accumulated savings of SZL 511 million for the period from 2009 to 2025
Annual Average Savings	none	SZL 25 million (US$ 3 million)	SZL 32 million (US$ 4 million)

Summary of conclusions and recommendations

The Cost of Hunger in Africa (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. In Swaziland the results of the study strongly suggest that, 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 study estimates that child undernutrition generates health costs equivalent to 0.6% of the total public budget allocated to health, and that only 3 out of every 10 children are estimated to be receiving proper health attention. The study further demonstrates that nearly 1 out of every 10 reported deaths of children is associated to undernutrition. With regards to education, the results show that 18.9% of all grade repetitions in school are associated to the higher incidence of repetition experienced by stunted children.

Some of the key findings of the study indicate the need for scaling-up current interventions and developing innovative solutions to fight child undernutrition in Swaziland. Going forward, it is recommended that the Government of Swaziland reviews their national development frameworks to ensure that the reduction of the stunting provenance is an outcome indicator of their social and economic development policies; sets aggressive targets for the reduction of stunting; puts in place a comprehensive multi-sectoral policy in which the role of international aid is complementary to nationally led investments; implements a more systematic approach with shorter periodicity in order to measure short term results in the prevention of stunting; and include information in the assessment that relates the nutritional status of the children to the livelihoods and economic activities of the households.

Section I: Brief Socio-Economic Background

I Brief Socio-Economic and Nutritional Background

In the year 2009 the Gross Domestic Product (GDP) of the Kingdom of Swaziland (hereafter referred to as Swaziland) was estimated at SZL 25 billion, and the per capita Gross National Income (GNI) at US$ 3,300, making it a low middle-income country.[2] The country and its population, estimated at 1.068 million, face important development challenges, particularly associated to high inequality in income, unemployment, food insecurity and elevated levels of HIV prevalence amongst the population.[3]

TABLE I.1
SOCIO-ECONOMIC INDICATORS

Indicators	2000-2002	2005-2007	2009-2011
GDP, (current prices) total in billions of SZL[4]	12.5	20.8	25 (2009)
GNI Per Capita (Atlas Method current US$)	1,350	3,030	3,300
Poverty - $1.25 a day (PPP) (% of population)[5]	62.9	40.6	…
Population below the National 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[6]

In recent years, positive tendencies in the reduction of poverty are beginning to show. According to national surveys, the country has reduced the population living under the poverty line from 69 to 63%, and the proportion of people living with under

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

[3] "Statistical Databases," African Centre of Statistics, accessed March 15, 2013, http://ecastats.uneca.org/acsweb/Databases.aspx.

[4] "World Economic Outlook Database," IMF, accessed March 15, 2013, http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx.

[5] *Swaziland National Nutrition Survey*, report (Mbabane: Swaziland National Nutrition Council, Ministry of Health, 2008), http://www.infocenter.nercha.org.sz/sites/default/files/NutritionSurveyRep.pdf.

[6] "Swaziland," Data, accessed March 15, 2013, http://data.worldbank.org/country/swaziland.

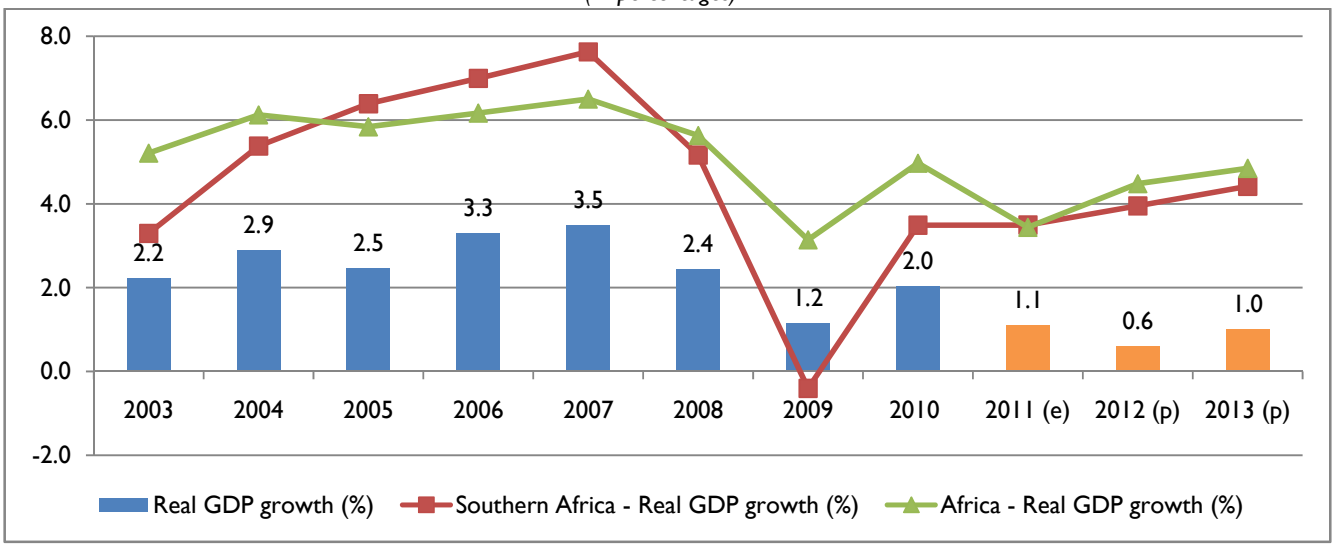
US$ 1.25 a day is estimated at 40.6%.[7] An important contextual factor is that there has been no improvement in the last decade regarding the high levels of income inequality.

Perhaps the most devastating impact of all has come from HIV and AIDS. Swaziland has the highest HIV prevalence rate in the world, at 26% among the adult population, and rising to a peak 49% among women aged 25 to 29 and an estimated 17 thousand children living with HIV.[8]

Most growth performance and human development indicators have been falling to the levels and pace of poorer economies.[9] Swaziland's main economic activities are agriculture, textiles and tourism, with over 78% of the population living in rural areas, and a relatively small active labour force that is approximately one third of the population. Also, the country has experienced very low population growth rates, less than 0.2%, but more recently, it has increased to over 1% annually.[10]

In the 1980s Swaziland had one of the fastest growing economies in Africa; however, this dynamic has slowed down in recent years. In 2011 the country faced an important fiscal crisis that affected the growth and development capacity of the country. This crisis, paired with the possibility of rising food prices in the future, makes the economy vulnerable to inflation. The African Economic Outlook illustrates limited growth through 2013, as shown by Figure I.1, below.[11]

FIGURE I.1
TRENDS IN REAL GDP GROWTH, 2003-2013
(In percentages)



Source: African Economic Outlook, Figures for 2010 are estimates; for 2011 and later are projections

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% to 15.9%, below the average level of Sub-Saharan Africa of 18.8%.[12] 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 increase the proportion on health investment in the national budget (Table I.2).

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[7] *Swaziland Household Income and Expenditure Survey*, report (Central Statistics Office, Ministry of Economic Planning and Development, 2010).

[8] *Report on the Global AIDS Epidemic*, report (UNAIDS, 2012), http://www.unaids.org/.

[9] *Complimentary Country Analysis: The Kingdom of Swaziland.* (Mbabane: Office of the UN Resident Coordinator, 2011).

[10] Ibid

[11] "Swaziland," African Economic Outlook, accessed March 15, 2013, http://www.africaneconomicoutlook.org/en/countries/southern-africa/swaziland/.

[12] "Public Spending on Education, Total (% of GDP)," Data, accessed March 13, 2013, http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS.

TABLE I.2
SOCIAL INVESTMENT INDICATORS

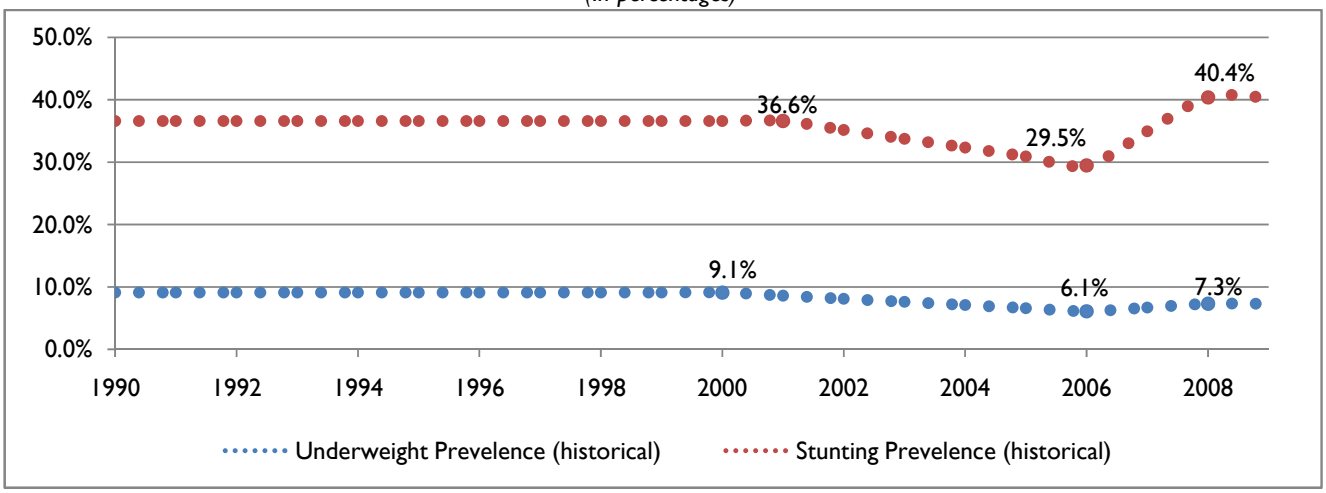
Indicators	2005-06	2007-08	2009-10	Sub-Saharan Africa *
Public spending on education, total (% of govern. expenditure)	…	24.4	15.9	18.8
Public spending on education, total (% of GDP)	5.5	8.1	7.4	4.6
Expenditure per student, primary (% of GDP per capita)	9.12	14.4	15.8	…
Expenditure per student, secondary (% of GDP per capita)	25.89	36.34	33.1	…
Health expenditure per capita (current US$)	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[13], most recent year available * Developing countries only - Latest data available

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 of more than 10 percentage points, from 29.5% to 40.4%, from the previous DHS survey for 2005-06. [14,15] 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% between the years 2000 and 2009. There is no nationally representative information for child nutrition before the year 2000.[16]

Figure I.2
ESTIMATED UNDERNUTRITION TRENDS IN CHILDREN UNDER-FIVE, 1985-2010
(In percentages)



Source: Prepared in-house based on information from DHS 200617 and MICS 200018 & National Survey 200819.

[13] "Swaziland," Data, accessed March 15, 2013, http://data.worldbank.org/country/swaziland.

[14] *Swaziland National Nutrition Survey*, report (Swaziland National Nutrition Council, Ministry of Health, 2008), http://www.infocenter.nercha.org.sz/sites/default/files/NutritionSurveyRep.pdf.

[15] *Swaziland Demographic and Health Survey 2006-07*, report (Mbabane: Central Statistical Office, 2008), http://www.measuredhs.com/pubs/pdf/FR202/FR202.pdf.

[16] The National Implementation Team decided not to use the survey carried-out in 2008 in the analysis due to the high variability in the results.

[17] *Swaziland Demographic and Health Survey 2006-07*, report (Mbabane: Central Statistical Office, 2008), http://www.measuredhs.com/pubs/pdf/FR202/FR202.pdf.

[18] *Multiple Indicator Cluster Survey Model Full Report*, report (Mbabane: Central Statistical Office, 2000).

[19] *Swaziland National Nutrition Survey*, report (Swaziland National Nutrition Council, Ministry of Health, 2008), http://www.infocenter.nercha.org.sz/sites/default/files/NutritionSurveyRep.pdf.

The current levels of child undernutrition indicate the challenges lying ahead in the reduction of child hunger. It is estimated that 46,000 of the 156,000 children under the age of five in Swaziland were affected by growth retardation in 2009 and nearly ten thousand were underweight. This situation is especially critical for children between 12 and 24 months, where almost two out of every five children are affected by growth retardation.

TABLE I.3
POPULATION AND CHILD UNDERNUTRITION, 2009[c]
(Population in numbers)

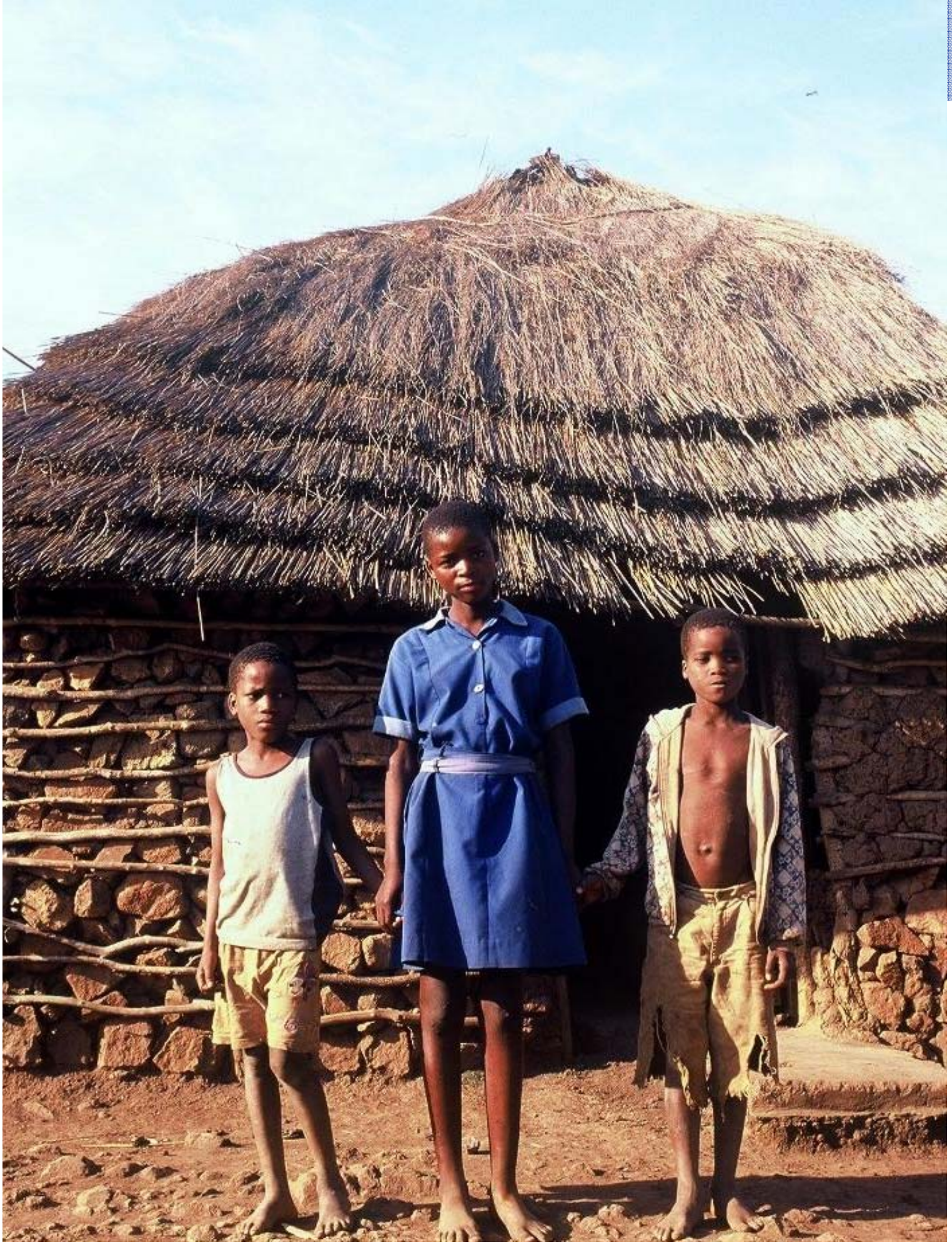
Age groups	Population size (2009)	Low Birth Weight		Underweight		Stunting	
		Population affected (2009)	Prevalence (2009)[b]	Population affected (2009)	Underweight prevalence	Population affected	Stunting prevalence
New-born (IUGR)[a]	32,665	2,751	8.4%				
0 to 11 months				2,450	16%	267	18%
12 to 23 months	31,568			2,494	18%	546	39%
24 to 59 months	92,185			4,701	13%	1,469	40%
Total	156,418	2,751		9,645		2,282	

Source: Data is estimated based on DHS surveys 2006 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.

[c] Data estimated from the most recent undernutrition prevalence figure available.



Section II: Cost of Hunger in Africa Methodology

II Cost of Hunger in Africa Methodology

A. Introduction: Why is it 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 GDP growth on the continent has doubled in the last decade and six of the world's fastest growing economies are in Africa.[20]

Growth has been recorded despite some of the highest rates of child undernutrition in the world.

Human capital is the foundation of economic development. Improved nutritional status of people has a direct impact on economic performance through increased productivity and enhanced national comparative advantage. In order for Africa to maximize its present and future economic 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.[21] 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. The World Bank estimates that undernourished children are at risk of losing more than 10 per cent of their lifetime earning potential, thus affecting national productivity. Recently, a panel of expert economists at a Copenhagen Consensus Conference concluded that fighting malnourishment should be the top priority for policy makers and philanthropists. [22] At that conference, Nobel Laureate Economist, Vernon Smith described that, "One of the most compelling investments is to get nutrients to the worlds undernourished. The benefits from doing so – in terms of increased health, schooling, and productivity – are tremendous."[23] 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 interventions, investments with apparent shorter term returns are prioritized in social budgets. 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 do not continue to suffer from undernourishment in Africa.

Positioning nutrition interventions as a top priority for development and poverty reduction is often difficult, partly due to the lack of credible country-specific data on short-term returns. There is not enough country-specific evidence to demonstrate how

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

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

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

[23] Ibid.

improved nutrition would have a direct impact on school performance and eventually in improving opportunities in the labour market and physical work. Additionally, nutrition is often looked at as a health issue, without considering the rippling social impact that it has on other areas of development.

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*, the *Comprehensive Africa Agriculture Development Programme* (CAADP), especially CAADP Pillar III, which focuses on reducing hunger and improving food and nutrition security, the *Pan African Nutrition Initiative* (PANI), *Framework for African Food Security* (FAFS), *Africa Ten Year Strategy for the Reduction of Vitamin and Mineral Deficiencies* (ATYS-VMD), and African Day for Food and Nutrition Security (ADFNS). At the global level, initiatives include *REACH*, *Purchase for Progress* (P4P), *Scaling Up Nutrition* (SUN), *Feed the Future* (FTF), the "1,000 Days" partnership, as well as the *Abuja Food Security Summit* of 2006. All these efforts are designed to reduce hunger, malnutrition and vulnerability, in a bid to also achieve the MDGs.

Within the framework of the African Regional Nutrition Strategy (2005-2015)[24], the objectives of the African Task Force on Food and Nutrition Development[25] and CAADP, the African Union and the New Partnership for Africa's Development (NEPAD) Planning and Coordinating Agency (NPCA), the United Nations Economic Commission for Africa (UNECA), and the World Food Programme (WFP) 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.

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

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

B. Brief description of the model

i. Conceptual framework

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

DEFINITION OF TERMS

1. Chronic Hunger: The status of people, whose food intake regularly provides less than their minimum energy requirements leading to undernutrition.[26]
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.[27]
3. Malnutrition: A broad term for a range of conditions that hinder good health caused by inadequate or unbalanced food intake or from poor absorption of food consumed. It refers to both undernutrition (food deprivation) and over nutrition (excessive food intake in relation to energy requirements).[28]
4. Food insecurity: Exists when people lack access to sufficient amounts of safe and nutritious food, and therefore are not consuming enough for an active and healthy life. This may be due to the unavailability of food, inadequate purchasing power or inappropriate utilization at household level.[29]
5. Food vulnerability: Reflects the probability of an acute decline in food access or consumption, often in reference to some critical value that defines minimum levels of human wellbeing.[30]

Nutrition security therefore, depends on a person's food security or insecurity. Specifically, nutrition security can be described as, "appropriate quantity and combination of food, nutrition, health services and care taker's time needed to ensure adequate nutrition status for an active and healthy life at all times for all people."[31] A direct and measurable consequence of nutrition insecurity is low birth weight, underweight and/or lower than normal height-for-age.

Levels of nutrition security in a country are related to epidemiological and nutritional transitions, which can be evaluated to assess the population's nutritional situation. Further, a person's nutritional situation is part of a process that is expressed differently depending on the stage of the life cycle: intrauterine and neonatal life, infancy and pre-school, school years or adult life. This is because the nutrient requirements and the needs are different for each stage[32].

Below is the discussion of the 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.[33]

ii. Causes of undernutrition

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

[27] "Hunger statistics", FAO Hunger Portal, Undernutrition, FAO, accessed March 14, 2013, http://www.fao.org/hunger/en/.

[28] Ibid.

[29] Ibid.

[30] WFP, *VAM Standard analytical framework*, World Food Programme, 2002.

[31] USAID, *USAID Commodities reference guide*, Annex I: Definitions, January 2006, , http://transition.usaid.gov/our_work/humanitarian_assistance/ffp/crg/annex-1.htm.

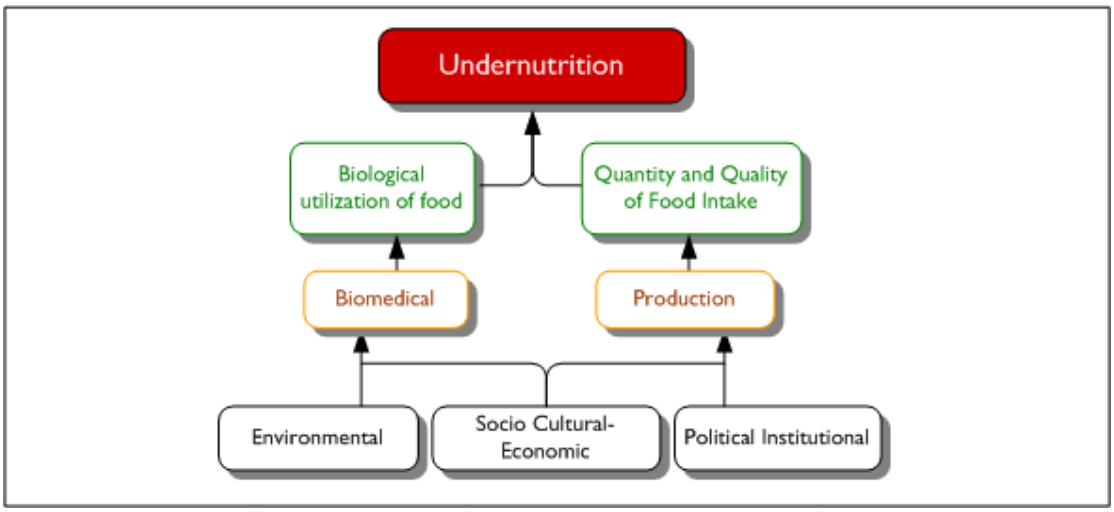
[32] Rodrigo Martínez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America,* Naciones Unidas, CEPAL, Social Development Division, Santiago De Chile, 2007.

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

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 and productivity vulnerabilities, through which they determine the quantity and quality of dietary intake and the absorption capacity, which constitute the elements of undernutrition.[34]

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

FIGURE II.1
CAUSES OF UNDERNUTRTION



Source: Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America* (see footnote) based on consultations carried out by authors.[35]

Environmental factors define the surroundings in which the subject and his or her family live, including the risks stemming from the natural environment itself and its cycles (from floods, droughts, frosts, earthquakes, and other phenomena), and those produced by humans themselves (such as the contamination of water, air, and food, the expansion of agriculture into new territories, etc.). The socio-cultural-economic determinants include elements associated with poverty and equality, education and cultural norms, employment and wages, access to social security, and coverage of aid programmes. The political-institutional factors encompass government policies and programmes aimed specifically at solving the population's food and nutritional problems.

Production factors include those directly associated with the production of food, as well as the access that the at-risk population has to them. 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.

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).

iii. Consequences of undernutrition

Child undernutrition has long-term negative effects on people's lives[36], most notably in the aspects of health, education, and productivity, which lead to quantifiable in costs and expenditures to the public and private sectors. Consequently, these effects exacerbate problems in social integration and increase or intensify poverty. A vicious cycle is perpetuated as vulnerability to undernutrition grows.

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[34] 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.

[35] Ibid.

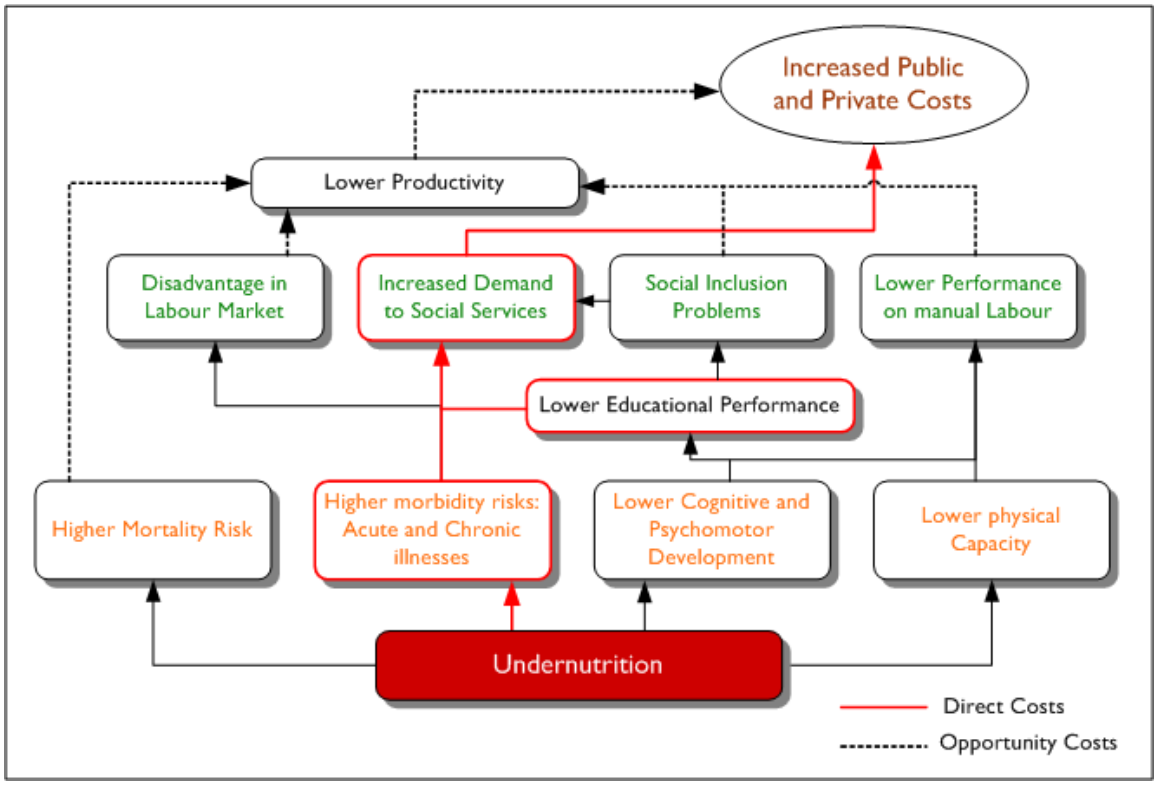
[36] Alderman H., et al., "Long-term consequences of early childhood malnutrition", FCND Discussion Paper No. 168, IFPRI, 2003.

Undernutrition may have immediate or evolving impacts throughout a person's lifetime, although individuals who suffered from undernutrition during early years of their life cycle (including intrauterine) are more likely to be undernourished later in life. 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.[37] The nature and intensity of the impact of undernutrition on pathologies depends 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.[38] This translates into a greater probability of starting school at a later age, repeating grades, dropping out of school and ultimately obtaining a lower level of education.

Later in life, individuals may experience lower physical capacity in manual labour as a result of stunting.[39] 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.

FIGURE II.2
CONSEQUENCES OF UNDERNUTRITION



Source: Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America* (see footnote) based on consultations carried out by authors.[40]

Undernutrition and its effects on health and education also translate into heavy economic costs for society at large. Each of the negative impacts in health, education and productivity described above, lead to a social, as well as an economic, loss to the individual or the society.

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:

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

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

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

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

[40] Ibid.

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 the 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). 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). 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 malnourished individuals (ELC^U), a lower productivity in manual labour experienced by individuals who suffered from stunting (MLC^U) and the loss of productive capacity resulting from a higher number of deaths caused by undernutrition (MMC^U). In the model these costs are reflected as losses in potential productivity (PC^U). Thus:

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

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

iv. Dimensions of analysis

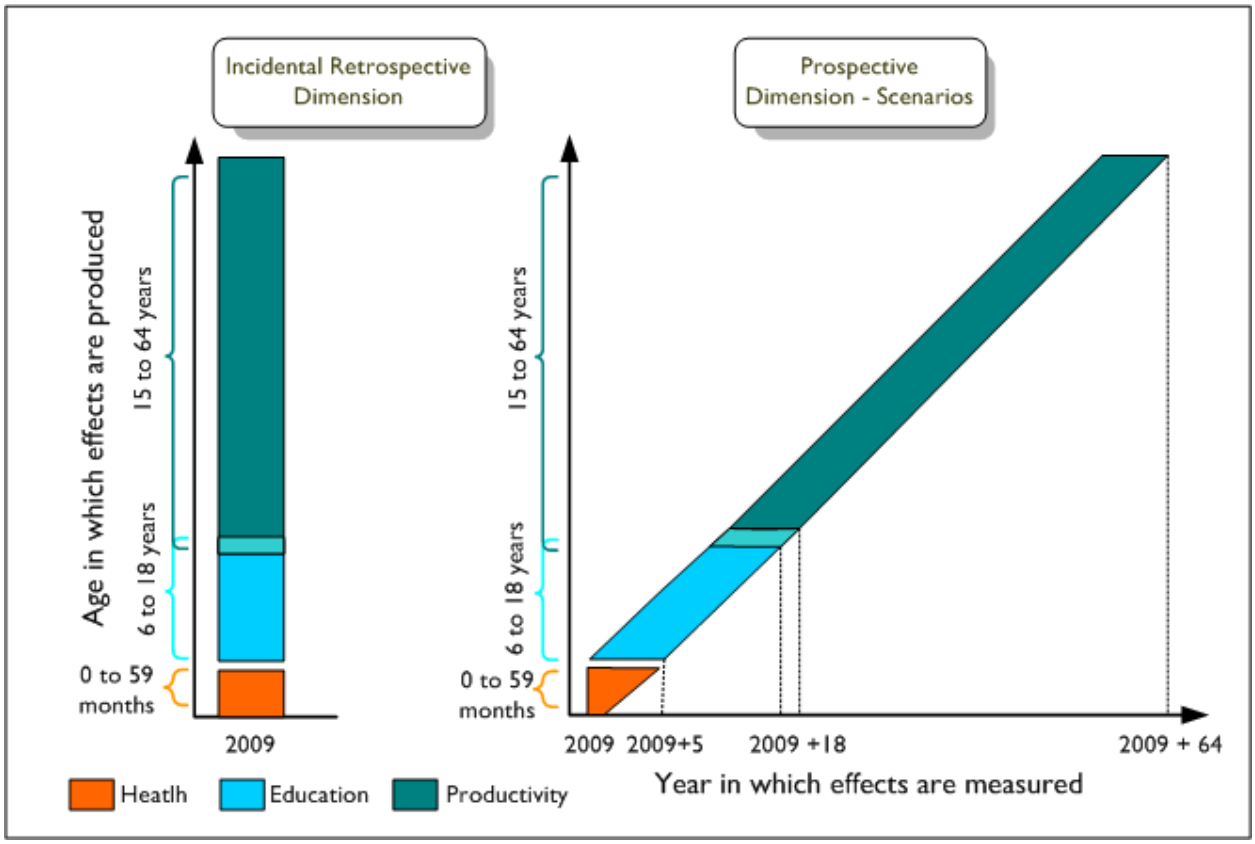
Considering that a country's undernutrition situation and the consequences thereof reflect a specific epidemiological and nutritional transition process, a comprehensive analysis involves estimates of the current situation extrapolated from previous transitional stages as well as estimates of the future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

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

1. ***Incidental retrospective dimension*** focuses on the population in the study year, including mortality cases of those who would have been alive in the study year. The retrospective dimension estimates the nutritional situation of individuals under the age of five to identify the related economic costs in the study year. Thus, it is possible to estimate the health costs of pre-school boys and girls who suffer from 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.
2. ***Prospective, or potential savings, dimension***. This dimension focuses on children under five in a given year and allows analysis of the present and future losses incurred as a result of medical treatment, repetition of grades in school and lower productivity. Based on this analysis, potential savings derived from actions taken to achieve nutritional objectives can be estimated.

As shown in Figure II.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 economic and social savings of an improved nutritional situation.

FIGURE II.3
DIMENSIONS OF ANALYSIS BY POPULATION AGE AND YEAR WHEN EFFECTS OCCUR



Source: Rodrigo Martinez and Andrés Fernández, *Model for analysing the social and economic impact of child undernutrition in Latin America* (see footnote) based on consultations carried out by authors.[41]

v. 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.[42] 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 (weight-for-height scores below -2 standard deviations) are used, with reference, where possible, to the World Health Organization (WHO) distribution for comparison purpose.[43]

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, as its application has specific characteristics in each case, they are detailed separately in this document.

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

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

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

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

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

Section III: Effects and Costs of Child Undernutrition

III Effects and Costs of Child Undernutrition

Undernutrition is mainly characterized by wasting - a low weight-for-height, stunting - low height-for-age and underweight - low weight-for-age. In early childhood, 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. 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. During schooling years, stunted children are more likely to repeat grades and drop out of school, reducing thus, their income-earning capability later in life. Furthermore, adults who were stunted as children are less likely to achieve their expected physical and cognitive development, thereby impacting on their productivity.

In addition to identifying the physical, psychological, and social effects of undernutrition, the economic costs for the direct consequences of undernutrition have been estimated. The retrospective dimension of the analysis of the education, health and productivity effects is presented below together with costs resulting from undernutrition in 2009.

A. Social and economic cost of child undernutrition in the health sector

Undernutrition at an early age predisposes children to higher morbidity and mortality risks. 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), acute diarrheal syndrome (ADS) and fever/malaria associated with undernutrition in children under the age of five.

i. Effects on morbidity

Undernourished children are more susceptible to recurring illness[44]. Based on the differential probability analysis undertaken with DHS data[45] in Swaziland, underweight children have a 17% higher risk of anaemia, and children under 12 months have a 15% higher incidence of diarrhoea and for suffering from acute respiratory infections. Fever is also more prevalent in underweight children, especially those between 2 and 5 years, which show a 3% higher risk than a child of healthy weight.

The study estimated that in 2009 in Swaziland there were more than 25,000 incremental episodes of illnesses that can be associated to the higher vulnerability of underweight children of becoming sick. The biggest proportion of episodes is found in diarrhoea with 2,700 incremental episodes for underweight children, followed by acute respiratory infections with over 1,600 annual episodes.

In addition, pathologies related to calorie and protein deficiencies and low birth weight associated to Intrauterine Growth Restriction (IUGR), totalled more than 19,000 episodes in 2009 as indicated in Table III.1, Acute and chronic illness due to diseases such as ADS, anaemia, fever and ARI on the other hand represents almost 6,000 episodes annually.

[44] Ramachandran P. & Gopalan H., *"Undernutrition & risk of infections in preschool children"*. Indian J Med Res 130, November 2009, pp 579-583

[45] *Swaziland Demographic and Health Survey 2006-07*, report (Mbabane: Central Statistical Office, 2008), http://www.measuredhs.com/pubs/pdf/FR202/FR202.pdf.

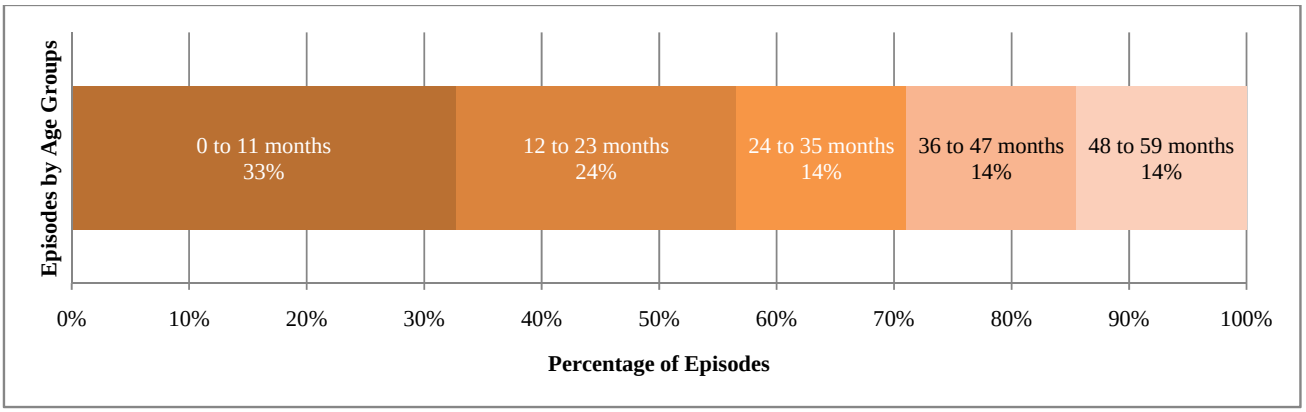
TABLE III.1
UNDER-FIVE CHILD MORBIDITY ASSOCIATED WITH UNDERWEIGHT, BY PATHOLOGY, 2009

Pathology	Number of Episodes	Distribution of Episodes
Anaemia	1,262	22%
ADS	2,720	46%
ARI	1,656	28%
Fever	217	4%
Sub-Total	5,854	
LBW	2,751	14%
Underweight	16,840	86%
Sub-Total	19,591	
Total	**25,446**	

Source: Model estimations based on DHS 2006-2007[46]

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 the age-specific vulnerabilities. In Swaziland, the 33% of all incremental episodes occur in children under 12 months, with one third of those episodes being associated to children being born with low birth weight. 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 III.1.
NUMBER OF INCREMENTAL EPISODES DUE TO UNDERNUTRITION BY AGE GROUP
(In percentage)



Source: Model estimations based on DHS 2006/2007[47] and demographic information.

The number of episodes is estimated based on the differential probability that a child has of becoming ill due to undernutrition. To estimate the costs of the pathologies, data from epidemiological follow-up studies and official health statistics on Swaziland have been consulted. In addition, interviews with national specialists provided further information. A complete list of assumptions and sources has been annexed to this report.

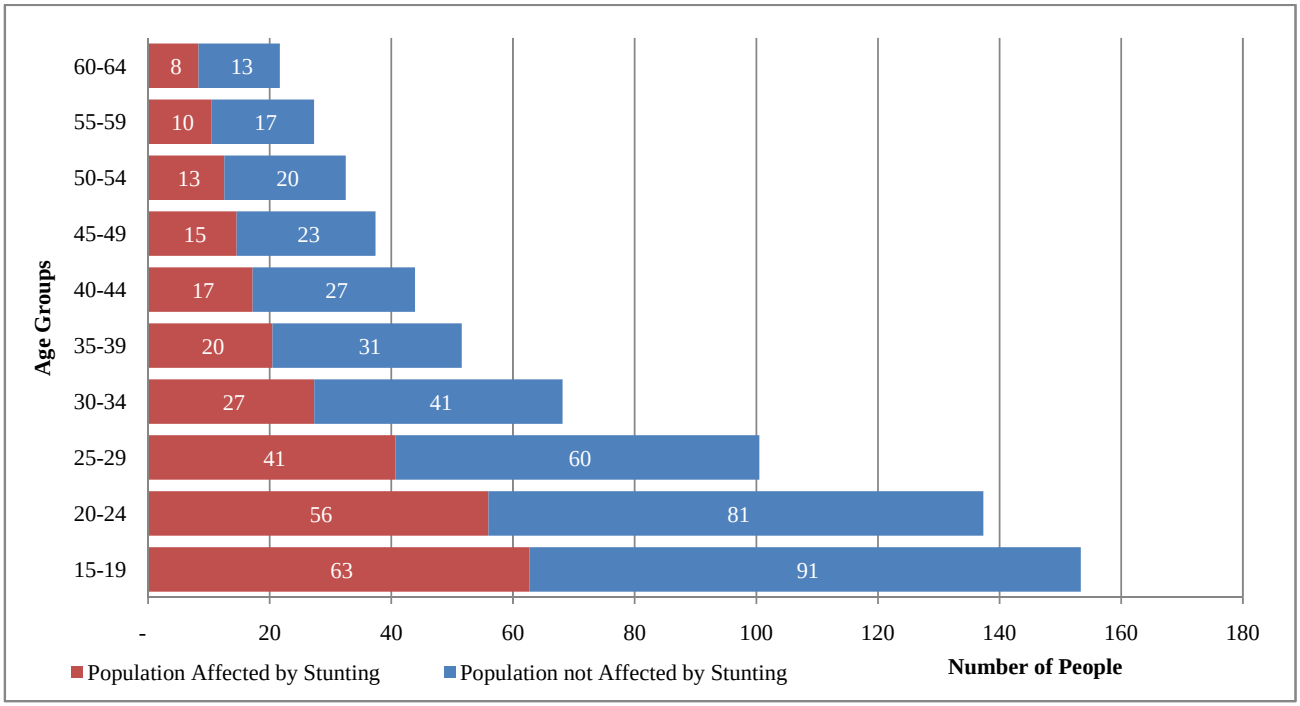
ii. Stunting levels of the working age population

[46] *Swaziland Demographic and Health Survey 2006-07*, report (Mbabane: Central Statistical Office, 2008), http://www.measuredhs.com/pubs/pdf/FR202/FR202.pdf.

[47] Ibid

Undernutrition leads to moderate and severe stunting in children, which can impact their physical productivity in later stages of life.[48] Although Swaziland 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 more than one third of the population[49]. As illustrated in Figure III.2, below, this analysis estimates that over 270,000 adults in the working-age population suffered from growth restriction before reaching the age of five. Currently this represents more than people 40% of the population aged 15-64, who are in a disadvantaged position as compared to those who had healthy childhoods.

FIGURE III.2
WORKING-AGE POPULATION AFFECTED BY CHILDHOOD STUNTING, BY AGE
(In thousands)



Source: Model compilation based on Swaziland Household Income and Expenditure Survey[50] and WHO/NCHS.

The population in Swaziland is predominantly involved in manual activities, with over 70% of the population working in agriculture[51]. The physical consequences of childhood stunting have affected these adults by reducing their productive capacity in manual intensive activities, as compared to people who were not affected by growth retardation as children. On the other hand, the proportion of the population involved in non-manual activities, who was affected by undernutrition, tends to have a lower educational level and hence, a lower productive level than those who were nourished as children. The effect of these stunting levels on the productive capacity of the country will be analysed in the productivity section of this report.

iii. Effects on mortality

Child undernutrition can lead to increased cases of mortality, most often connected to episodes of diarrhoea, pneumonia and fever[52]. Nevertheless, when the cause of death is determined, it is rarely attributed to the nutritional deficit of the child but

[48] See "The Impact of Nutritional Status Agricultural Productivity: Wage Evidence from the Philippines," by Lawrence J. Haddad and Howarth E. Bouis, 1991, and "Preschool Stunting, Adolescent Migration, Catch-Up Growth, and Adult Height in Young Senegalese Men and Women of Rural Origin," by Aminata Ndiaye Coly et al, 2006.

[49] "WHO Global Database on Child Growth and Malnutrition," WHO, accessed March 13, 2013, http://www.who.int/nutgrowthdb/en//.

[50] *Swaziland Household Income and Expenditure Survey*, report (Central Statistics Office, Ministry of Economic Planning and Development, 2010).

[51] African Development Bank. Kingdom of Swaziland Country Strategy Paper, 2009-2013 Mid-Term Review. October 2011.

[52] Robert E. Black et al., "Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences," *The Lancet* 371, no. 9608 (2008), doi:10.1016/S0140-6736(07)61690-0.

often to the illness that the child manifested. Given this limitation in attribution, the model utilizes relative risk factors[53] to estimate the higher risk of increased child mortality as a result of child undernutrition. Using these factors, combined with mortality rates information calculated from abridged life tables[54] and data provided by the Swaziland Central Statistical Office (CSO), estimates for the higher mortality due to undernutrition were calculated.

The model estimates that in Swaziland nearly once out of every 10 reported deaths of children is associated to undernutrition. In the last 5 years alone, it is estimated that 3,171 child deaths have occurred in children whose diminished nutritional condition made them more vulnerable to mortality. Thus, it is evident that undernutrition significantly exacerbates the rates of death among the most vulnerable and limits the country's capacity to reach the goals for the reduction of child mortality agreed upon on the MDGs.

TABLE III.2
IMPACT OF UNDERNUTRITION ON CHILD MORTALITY, ADJUSTED BY SURVIVAL RATE, 1945-2009
(In number of mortalities)

Period	Number of child mortalities associated to undernutrition
1945-1994	16,019
1995-2004	3,833
2005-2009	3,171
Total	23,023

Source: ECA on the basis of life tables provided by UN Population Division[55]

These mortality rates, witnessed over the years have an impact on national productivity. The model estimated that an equivalent of 2.4% of the current workforce was lost due to the impact of undernutrition on child mortality in between 1945 to 2009. This represents more than 16,000 people who would have currently been 15 to 64 years old and part of the working-age population of the country. In effect, besides this problematic reality, the findings suggest that undernutrition reduces the productivity and the development potential of the country.

iv. Estimation of public and private health costs

The treatment of undernutrition and related illness due to disease is a critical recurrent cost for the health system. Treating a severely underweight child for example, requires a comprehensive protocol[56] that is often in excess of the cost and effort of preventing undernutrition, especially when other diseases present in parallel, as multiple protocols would require to be administered. 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 25,000 clinical episodes recorded in Swaziland in 2009 were associated to undernutrition. These generated an estimated cost of more than SZL 61 million as indicated in Table III.3 below.[57] Most 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[58].

[53] Black et al, "Maternal and child undernutrition: global and regional exposures and health consequences." Lancet 2008; 371: 243-60.

[54] Data provided by the UN Population Division, http://www.un.org/esa/population/unpop.htm.

[55] "World Population Prospects, the 2010 Revision," World Population Prospects, the 2010 Revision, accessed March 13, 2013, http://esa.un.org/wpp/Model-Life-Tables/download-page.html.

[56] WHO. Management of severe malnutrition: a manual for physicians and other senior health workers. ISBN 92 4 154511 9 (NLM Classification: WD 101). 1999.

[57] Estimations based of data provided by the National Implementation Team, DHS 2006/2011, and cost analysis by NIT

[58] WHO. Management of severe malnutrition: a manual for physicians and other senior health workers. ISBN 92 4 154511 9 (NLM Classification: WD 101). 1999.

TABLE III.3
HEALTH COST OF UNDERNUTRITION-RELATED PATHOLOGIES, 2009

Pathology	Cost in millions SZL	% 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	**61**	**100%**	**100%**

Source: Estimations based on data provided by DHS 2006[59], and cost analysis carried-out by NIT.

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% of the episodes presented in these children receive proper health care.

This disproportion is also reflected in the distribution of the health costs. Table III.4 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% of the costs representing SZL 54 million. On the other hand, the health system covered SZL 7 million, corresponding to 12% of the total costs attributed to the health system.

TABLE III.4
DISTRIBUTION OF HEALTH COST OF UNDERWEIGHT, 2009
(In millions of SZL)

Pathology	Cost to families	Cost to system	Total Cost
Underweight	49.6	1.7	51.3
LBW/IUGR	1.9	3.7	5.6
Fever/Malaria	0.1	0.1	0.2
ADS	0.6	1.0	1.7
Anaemia	1.0	0.1	1.1
ARI	0.4	0.4	0.8
Total Cost	54	7	61
% Total Cost	88%	12%	

Source: Estimations based on data provided by DHS 2006

Even when the families of the undernourished children are covering most of the health costs of undernutrition, the burden of this phenomenon 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% of the total budget allocated to health. As a whole, the economic impact of undernutrition in health-related aspects was equivalent to 0.24% of the GDP of that year.

B. Social and economic cost of child undernutrition in education

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 five are more likely to underperform in school.[60] As a result, undernourished children are faced with

[59] *Swaziland Demographic and Health Survey 2006-07*, report (Mbabane: Central Statistical Office, 2008), http://www.measuredhs.com/pubs/pdf/FR202/FR202.pdf.

[60] Daniels M, Adair L. Growth in Young Filipino Children Predicts Schooling Trajectories through High School, 2004.

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.

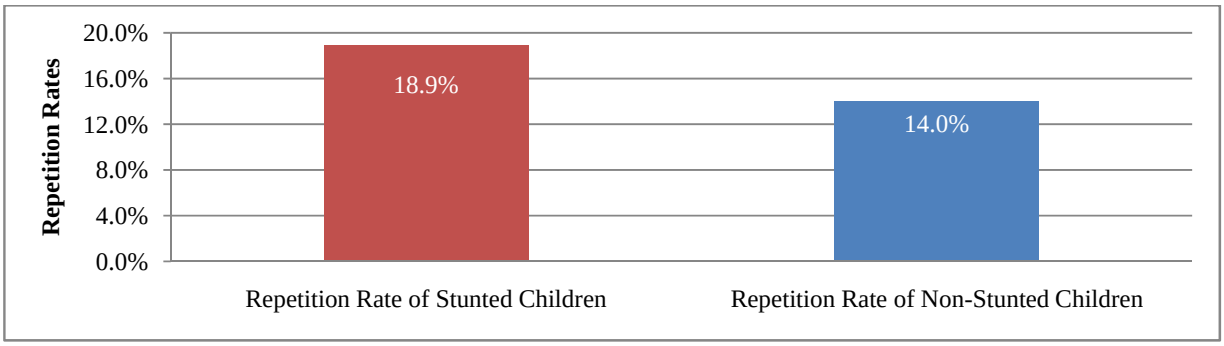
The number of repetition and dropout cases considered in this section of the report result from applying a differential risk factor associated to stunted children, as well as to the official government information on grade repetition and dropouts in the educational system in 2009. The cost estimations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

i. Effects on repetition

Children who suffered from undernutrition before the age of five are more likely to repeat grades, compared to those who were not afflicted by undernutrition.[61] Currently, an estimated 168,000 children of school age are stunted, which represents 40% of the total population aged between 6 and 18 years in the country.

Based on official information provided by the Ministry of Education & Training (MOET)[62], the effective average repetition rate in primary for public schools in the country was estimated at 15%, with 47,000 children having repeated grades in 2009. Considering the higher risk of undernourished children to repeat grades, the model distributed the stunted and non-stunted school aged population and calculated the specific repetition rates for both groups. It is estimated that the repetition rate for stunted children was higher than the national average at 18.9%, while the repetition rate for non-stunted children was estimated at 14%, establishing a differential risk of 4.9% for stunted children to repeat.

FIGURE III.3
REPETITION RATES IN PRIMARY EDUCATION BY NUTRITIONAL STATUS, 2009
(In percentages)



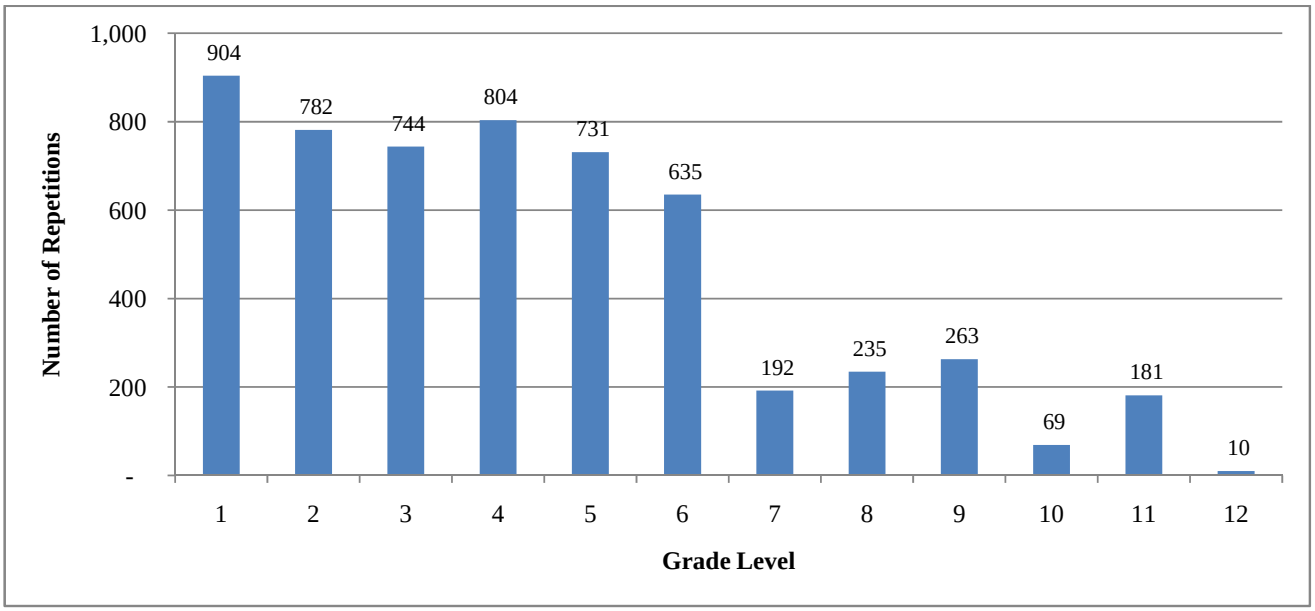
Source: Estimations based on data from NIT (Ministry of Education – Education Management Information System for 2009

As a result, from the reported 47,000 cases of grade repetition reported by the MOET in the year 2009, 5,500, or 12% of all cases are estimated to be repetition cases induced by stunting. These children are currently generating an incremental cost to the education system, as they require twice as many resources having to repeat the year. In addition, the caretakers also have to cater to their educational cost for an extra year.

Most of these grade repetitions happen during the first four years of schooling, particularly in grade once, in which the highest rate of repetition is reported. There are far fewer children who repeat grades during secondary school, largely due to the fact that many stunted children would have dropped out of school before reaching secondary education.

[61] Daniels M, Adair L. Growth in Young Filipino Children Predicts Schooling Trajectories through High School, 2004.
[62] MOET planning data provided to the NIT.

FIGURE III.4
GRADE REPETITION OF UNDERWEIGHT CHILDREN, BY GRADE, 2009
(In number of grade repetitions)



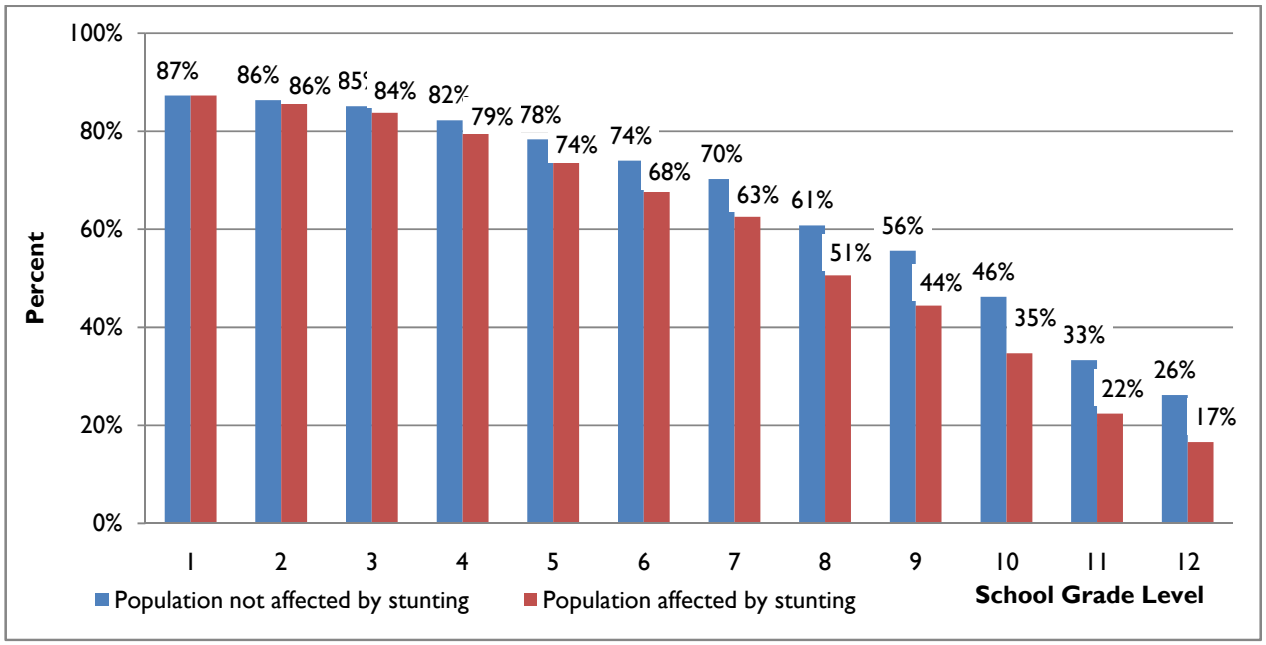
Source: Estimations based on data from EMIS Ministry of Education – Education Management Information System for 2009 provided by NIT.

ii. Effects on retention

The costs associated to school dropouts are derived from the differential in achievements between stunted and non-stunted working-age population. These costs are reflected in the productivity losses experienced by individuals searching for opportunities in the labour market. As such, the impact is not evident in the school-age population but in the working-age population (WAP), particularly in non-manual activities. Hence, in order to assess the social and economic costs for 2009, the analysis needs to focus on the differential in schooling levels achieved by the population who suffered from stunting as children and the education levels achieved by the non-stunted population.

Among the population who suffered from child stunting, significantly fewer reached secondary school. According to the available data and relative risks of stunting on education, it can be estimated that 61% of the non-stunted population completed primary school, compared to only 51% of stunted children. Similar trends are observed in secondary school, where an estimated 26% of non-stunted children and less than 17% of the stunted children completed secondary school. Figure III.5 below shows the estimated grade achievement based on their nutritional status. These differences in education become notable when considering gaps in labour and income opportunities, specifically for non-manual labour.

FIGURE III.5
GRADE ACHIEVEMENT BY NUTRITIONAL STATUS, 2009
(In percentages)



Source: Estimations based on data provided by NIT[63]

iii. Estimation of public and private education costs

Repetition in schooling years repeated has direct cost implications to families and the school system. Consequently, in 2009, the 5,549 students who repeated grades following their state of being undernourished incurred a cost of SZL 6 million. 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. The following chart summarizes costs.

TABLE III.5
COSTS OF GRADE REPETITION ASSOCIATED TO STUNTED CHILDREN, 2009

	Primary	Secondary	Total
Number of repetitions	4,791	758	5,549
Public Costs per student	560	2,000	
Total Public Costs (in millions of SWL)	**2.7**	**1.5**	**4.2**
Private Costs per student	269	628	
Total Private Costs (in millions of SWL)	**1.3**	**0.5**	**1.8**
Total Costs		**4.0**	**2.0**
% Social expenditure on education			0.34%

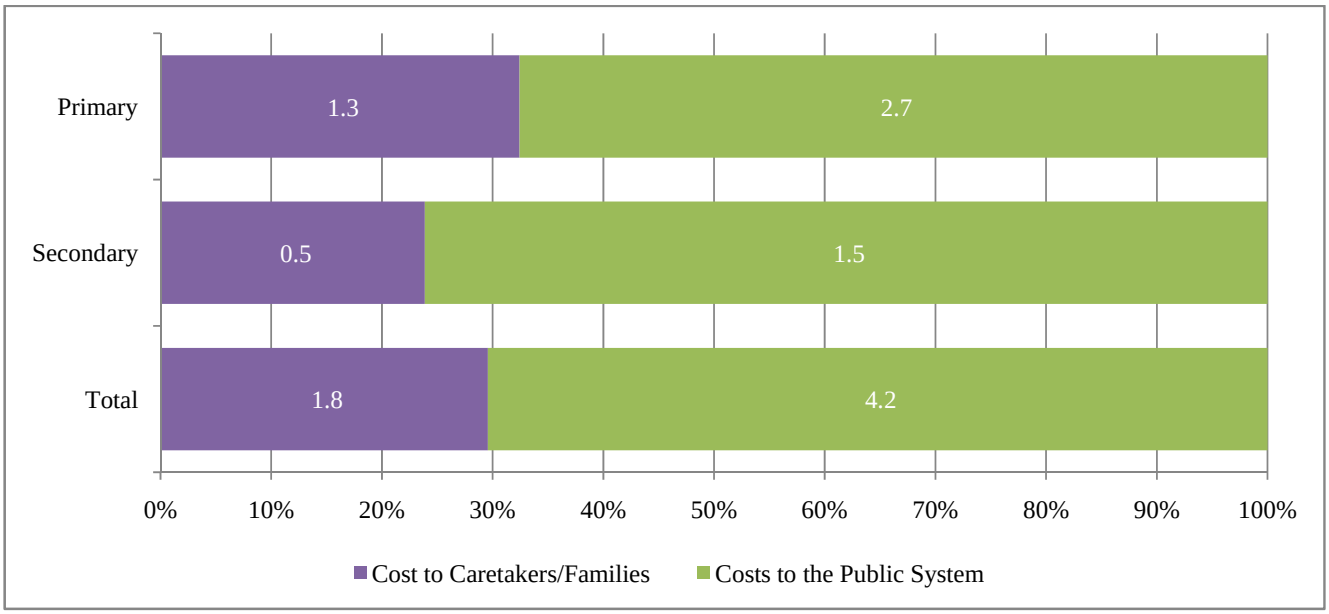
Source: Estimations based on data provided by MOET (2009).

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 SZL 1.8 million (30%) was covered by the caretakers, while SZL 4.2 million (70%), was borne by the public education system. Nevertheless, the distribution of this cost varies depending on whether the child repeated grades at primary

[63] Data provided to the NIT from Education Management Information Systems Unit (EMIS), 2009, http://www.gov.sz/

or secondary level. In primary education, the caretakers cover 32% of the associated costs of repeating a year, whereas in secondary education the burden on the families was 24%, and the public systems covers a larger proportion of the costs.

FIGURE III.6
DISTRIBUTION OF COSTS FOR REPETITIONS, PRIMARY EDUCATION
(In millions of SZL)



Source: Estimations based on data provided by MOET (2009).

C. The social and economic cost of child undernutrition in productivity

Child undernutrition affects human capital and productivity in several ways. Children who suffered from undernutrition are more likely to achieve lower educational levels than healthy children. The low education levels attained often makes them less qualified for work, thus reducing their income-earning potential for non-manual work. Adults who suffered from stunting as children tend to have less lean body mass and are therefore more likely to be less productive in manual intensive activities than those who were never affected by growth retardation. Moreover, the population lost due to child mortality hinders economic growth, as they could have been healthy productive members of the society.

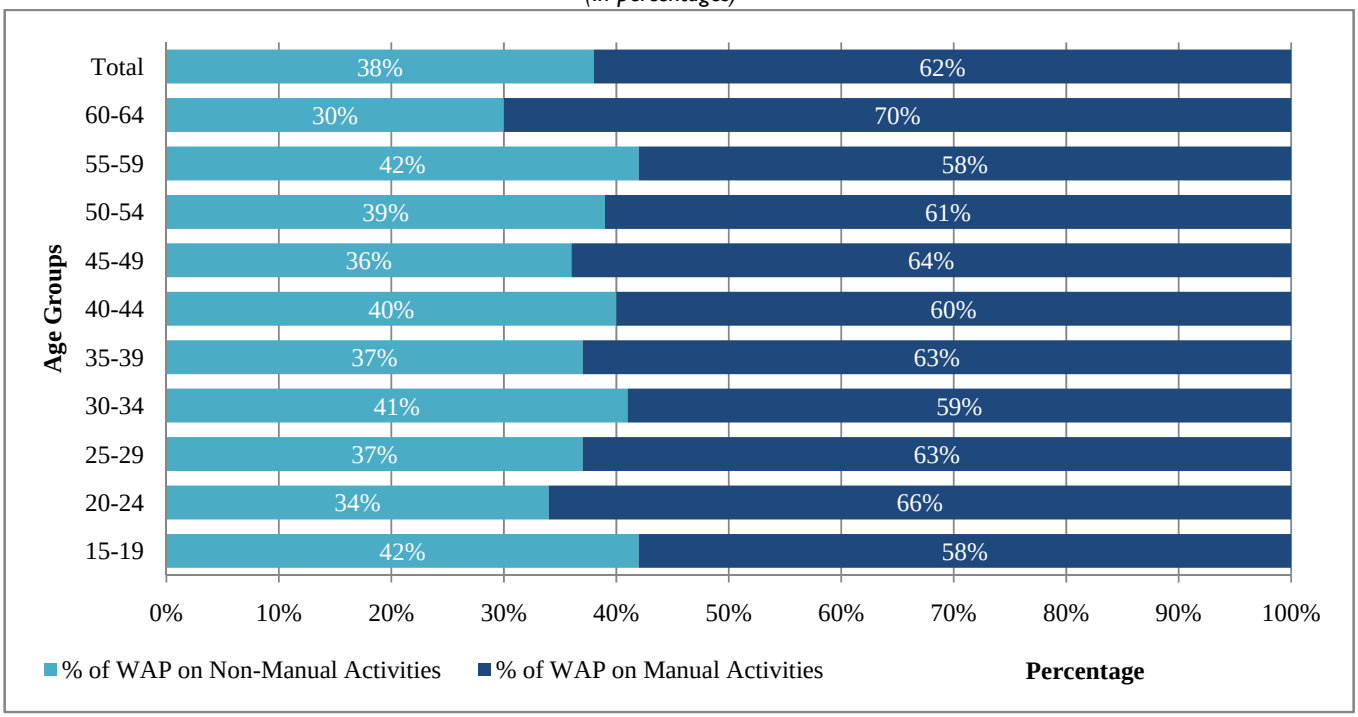
The estimation of the population whose labour productivity is affected as a consequence of child undernutrition is based on historical nutritional information, in-country demographics projections and incomes reported in the Swaziland National Household Survey 2009-2010.[64] The workforce lost due to 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 a result of the differential income associated to lower schooling in non-manual activities and the lower productivity associated to stunted children in manual intensive 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/she been part of the workforce in 2009.

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

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

FIGURE III.7
MANUAL AND NON-MANUAL LABOUR DISTRIBUTION, BY AGE, 2009
(In percentages)



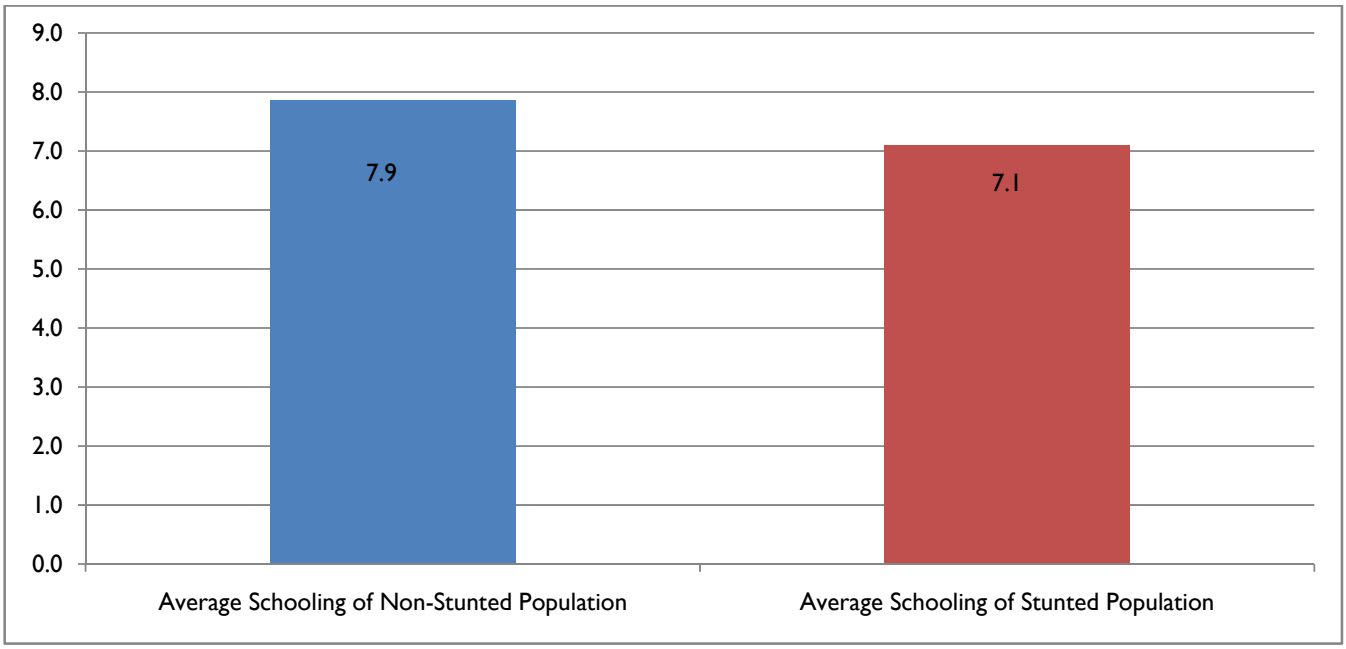
Source: Swaziland Labour Force Survey (2007).

[64] *Swaziland Household Income and Expenditure Survey*, report (Central Statistics Office, Ministry of Economic Planning and Development, 2010).

For this group, of over 267,000 people, 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 on average.

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% of the working-age population is engaged in non-manual activities[29]. 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. Figure III.8 below demonstrates the average schooling years for stunted and non-stunted population in Swaziland as at 2009-10.

FIGURE III.8
AVERAGE SCHOOLING YEARS FOR STUNTED AND NON-STUNTED POPULATION
(In years of education)



Source: Estimated from 2009 / 10 Swaziland Household Income and Expenditure Survey,[65] CSO[66], and relative risk ratios.

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.

Data from the SHIES 2009-10 shows a progressive increase in income associated to higher schooling achievement, particularly in non-manual activities. 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 108,000 people engaged in non-manual activities suffered from childhood stunting. This represents 16% of the country's labour force that is currently less productive due to lower schooling levels associated with stunting.

As showed in Table III.6, the estimated annual losses in productivity for this group amount to 251 million SLZ, which are equivalent to 1% of the GDP in 2009.

TABLE III.6
REDUCED INCOME IN NON-MANUAL INTENSIVE ACTIVITIES DUE TO STUNTING, 2009

Age in 2009	Population working in non-manual sectors who were stunted as children	Income Losses in non-manual labour *(In millions of SZL)*

[65] *Swaziland Household Income and Expenditure Survey*, report (Central Statistics Office, Ministry of Economic Planning and Development, 2010).

[66] Data provided to the NIT from the *Swaziland Central Statistical Office* (*CSO*), http://www.gov.sz/.

Age in 2009	Population working in non-manual sectors who were stunted as children	Income Losses in non-manual labour *(In millions of SZL)*
15-19	27,117	10.9
20-24	19,656	32.5
25-29	15,657	37.9
30-34	11,766	51.3
35-39	8,034	30.3
40-44	7,393	26.3
45-49	5,668	23.6

Source: Model estimations based on Income SHIES 2009-2010[67] and DHS 2006-2007[68]

ii. Losses in manual intensive activities

Manual intensive activities are mainly observed in the agricultural, forestry and fishing subsectors, employing more than 62% of the population. In this type of activities, people who were stunted as children are less physically capable than those who did not suffer from growth retardation. As such, they are expected to be less productive[69].

The model estimates that 417,000 people work in manual activities, of which 175,000 were stunted as children. This represented annual losses surpassing SZL 126 million, equivalent to 0.5% of GDP, in potential income lost due to lower productivity.

TABLE III.7
LOSSES IN POTENTIAL PRODUCTIVITY MANUAL INTENSIVE ACTIVITIES DUE TO STUNTING, 2009

Age in 2009	Population working in manual labour who were stunted as children	Loss in productivity due to stunting *(In millions of SLZ)*
15-19	37,447	11
20-24	38,156	16
25-29	26,659	18
30-34	16,932	15
35-39	13,680	14
40-44	11,089	12
45-49	10,077	14
50-54	8,344	11
55-59	6,664	10
60-64	6,384	6
Total	175,431	126
% GDP		0.5%

Source: Estimations based on Income SHIES 2009/2010[70] and WHO Database information[71]

[67] *Swaziland Household Income and Expenditure Survey*, report (Central Statistics Office, Ministry of Economic Planning and Development, 2010).

[68] *Swaziland Demographic and Health Survey 2006-07*, report (Mbabane: Central Statistical Office, 2008), http://www.measuredhs.com/pubs/pdf/FR202/FR202.pdf.

[69] Lawrence J. Haddad and Howarth E. Bouis, "The Impact of Nutritional Status On Agricultural Productivity: Wage Evidence From The Philippines," *Oxford Bulletin of Economics and Statistics* 53, no. 1 (February 1991), doi:10.1111/j.1468-0084.1991.mp53001004.x.

[70] *Swaziland Household Income and Expenditure Survey*, report (Central Statistics Office, Ministry of Economic Planning and Development, 2010).

iii. Opportunity cost due to higher mortality of undernourished children

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 16,000 people of working-age population who could have been part of the economy in 2009 could have increased national productivity by over 37 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 SZL 340 million, which represented 1.4% of the country's GDP.

TABLE III.8
PRODUCTIVITY LOSSES DUE TO INCREMENTAL CHILD MORTALITY
(In millions)

Age in 2009	Working Hours Lost due to Higher mortality of underweight children *(In Hours)*	Loss in productivity *(in SZL)*
15-19	4.2	11.1
20-24	4.2	17.4
25-29	4.1	26.5
30-34	4.1	39.0
35-39	4.0	41.8
40-44	3.8	40.4
45-49	3.5	44.3
50-54	3.2	43.5
55-59	3.1	47.7
60-64	3.1	27.8
Total	37	340
% GDP		1.4%

Source: Model estimations based on SHIES[72] and DHS 2006/2011.[73]

iv. Overall productivity losses

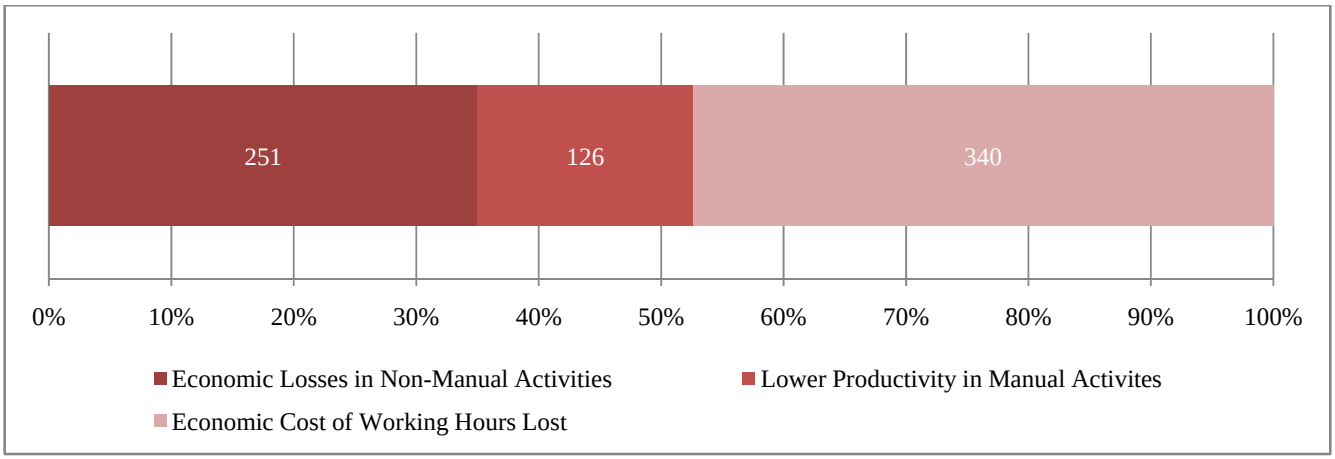
The total losses in productivity for 2009 are estimated at approximately SZL 717 million, which is equivalent to 2.9% of Swaziland's GDP. Figure III.9, below, illustrates the distribution of losses. The largest share of productivity loss, at 47%, is due to working hours lost of individuals who died because 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%. For manual intensive activities, the costs seem relatively low, at 18%, due to the lower income of this group.

[71] "WHO Global Database on Child Growth and Malnutrition," WHO, accessed March 13, 2013, http://www.who.int/nutgrowthdb/en//.

[72] *Swaziland Household Income and Expenditure Survey*, report (Central Statistics Office, Ministry of Economic Planning and Development, 2010).

[73] "WHO Global Database on Child Growth and Malnutrition," WHO, accessed March 13, 2013, http://www.who.int/nutgrowthdb/en//.

FIGURE III.9
DISTRIBUTION OF LOSSES IN PRODUCTIVITY, BY SECTOR, 2009
(In millions of SZL)



Source: Model estimations

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 Swaziland, the total losses associated with undernutrition are estimated at SZL 783 million, or US$ 92 million for the year 2009, as presented in Table III.9. These losses are equivalent to 3.1% 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% of the total cost which still indicates an important productivity gain to be made from investments in school retention mechanisms.

TABLE III.9
SUMMARY OF COSTS OF CHILD UNDERNUTRITION, 2009
(In millions)

	Episodes	Cost *(in SZL)*	Cost *(in US Dollars)*	Percentage of GDP
Heath 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 Cost				
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				
Non-Manual Activities	108,187	251	29.5	
Manual Activities	175,431	126	14.8	
Lost Working Hours	16,019	340	40.0	
Total for Productivity	299,638	717	84	2.9%
TOTAL COSTS FOR SWAZILAND		**783**	**92**	**3.1%**

Source: Model compilation.

Section IV: Analysis of Scenarios

IV 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. 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 model generates a baseline that allows developing various scenarios, based on nutritional goals established in each country using the prospective dimension. The generated outcomes can be used to advocate for increased investments in proven nutritional interventions such as the Lancet series[74] and other interventions prioritized by Swaziland's multisectoral stakeholders. These scenarios are constructed based on the estimated net present value of the costs of the children born in each year, between 2009 and 2025. The methodology follows each group of children and, based on each scenario, estimates a progressive path towards achieving the set nutritional goals.

The scenarios developed for this report are as follows:

1. **Baseline. The Cost of Inaction. Progress in reduction of stunting and underweight child stops.**

   For the baseline, the progress of 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.

2. **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% points annually in the stunting rate, from 29.5% (estimate for 2009) to 14.8% 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 1.2%, 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.

3. **Scenario #2: The 'Goal' Scenario. Reduce Stunting to 10% and Underweight children to 5%, by 2025.**

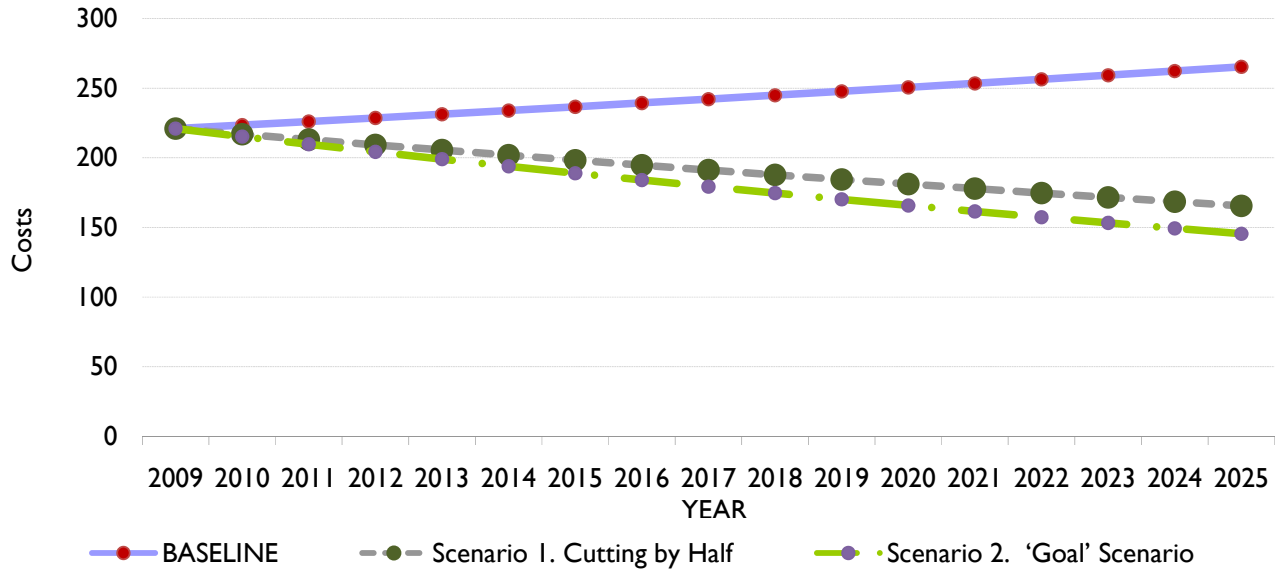
   In this scenario, the prevalence of stunted children under 5 would be reduced to 10% and the prevalence of

[74] Zulfiqar A. Bhutta et al., "What works? Interventions for maternal and child undernutrition and survival," *The Lancet* 371, no. 9610 (2008), doi:10.1016/S0140-6736(07)61693-6.

underweight children under the age of five, to 5%. Currently, the global stunting rate is estimated at 26%, with Africa having the highest prevalence at 36%. This Goal Scenario, would require a true call for action, and would represent an important regional challenge for which countries of the region could collaborate jointly to achieve. The progress rate required to achieve this scenario would be a 1.2% annual reduction for a period of 16 years, from 2009 to 2025.

As shown in Figure IV.1, the progressive reduction of child undernutrition generates a similar reduction in the costs associated to it. The distances between the trend lines would indicate the savings that would be achieved in each scenario.

FIGURE IV.1
TRENDS OF ESTIMATED COSTS OF CHILD UNDERNUTRITION, 2009-2025
(In millions of SZL)



In the baseline, where the progress of reduction of child undernutrition would stop at the levels of 2009, the total costs would increase by 20%, from SZL 221 to 265 million annually, during the period leading to 2025. Nevertheless, as presented in Table IV.1, in Scenario #1, in which a reduction by half of the current prevalence is achieved, the annual cost would reduce by 42% to SZL 166 million annually by 2025. In the case of the Goal Scenario on the other hand, there would be a 66% reduction in the estimated annual costs, amounting to SZL 146 million over that same period.

TABLE IV.1
ESTIMATED TOTAL COSTS OF CHILD UNDERNUTRITION, BY SCENARIO, 2009
(In millions of SZL)[a]

	2009	Scenarios for the Year 2025		
		Baseline	S1. Cutting by Half	S2. Goal Scenario
Heath Costs				
Increased Morbidity	30	36	29	29
Education Cost				
Increased Grade Repetition	1	1	1	0
Productivity Costs				
Lower Productivity in Non-Manual Activities	92	110	46	30

	2009	Scenarios for the Year 2025		
		Baseline	S1. Cutting by Half	S2. Goal Scenario
Lower Productivity in Manual Activities	18	21	11	7
Lower Productivity due to Mortality	81	97	80	79
Total Costs	221	265	265	166

Source: Model estimations

a/ All values in net present values at an 8% social discount rate

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

As presented in Table IV.2 cutting undernutrition by half by 2025 would represent a reduction in costs of over SZL 402 million, equivalent to US$ 47 million for the period of 16 years, from 2009 to 2025. Although the tendency of savings would not be linear, as they would increase over time with the achieved progress, a simple average of the annual savings would represent US$ 3 million per year. In the case of the Goal Scenario, the savings would increase to SZL 511 million, or US$ 60 million, which represents a simple average of US$ 4 million dollars per year.

TABLE IV.2
ESTIMATED SAVINGS FOR EACH SCENARIO, 2009
(In millions of SZL) a/

	Cutting Undernutrition by Half by 2025	Goal Scenario
Heath Costs		
Reduced Morbidity	26	26
Education Cost		
Reduced Grade Repetition	3	4
Productivity Costs		
Higher Productivity in Non-Manual Activities	267	357
Higher Productivity in Manual Activities	43	61
Increased Working Hours	63	64
Total Savings	402	511
Total Savings in millions of US$	47	60

Source: Model estimations

* All values in net present values at an 8% social discount rate

Section V:
Conclusions and Recommendations

V Conclusions and Recommendations

A. Conclusions

The Cost of Hunger 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 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-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% 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% higher repetition rate in school. As a result, 12% of all grade repetitions in school are associated to the higher incidence of repetition that is experienced by stunted children. 86% 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 2050. 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% 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 (US$ 3 million). An additional scenario shows that a reduction to 10% stunting and 5 % underweight for that same period could yield annual average savings of SZL 32 million (US$ 4 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 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 Nutrition Initiative as programmes and interventions are put in place to address stunting as a national priority.

B. Recommendations

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.

1. 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 programs.

2. 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%**.

3. 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**.

4. 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.

5. 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.

Section VI: Annexes

VI Annexes

Annex 1. Glossary of Terms

1. **Average number of days require for hospitalization:** The average number of days a child needs to stay in a hospital when hospitalized, to receive adequate care.
2. **Average number of days required for ICU:** The average number of days a child needs to stay in the ICU when put in ICU care, to receive adequate care.
3. **Average number of primary care visits per episode:** When a child experiences a given pathology, he/she may require medical care multiple times. This variable is the average number of primary (outpatient) medical care visits a child requires per episode.
4. **Average waiting time spent at primary care:** When a caretaker brings a child to a primary care facility, the time the parent and child spend at the facility for waiting and receiving care.
5. **Cost of medical inputs per event during hospitalization:** This variable includes the medical materials (medicines, procedures) that are covered by the hospital for treatment of each pathology case.
6. **Cost of medical inputs per event in ICU:** This variable includes the medical materials (medicines, procedures) that are covered by the hospital for treatment of each pathology case in ICU.
7. **Cost of medical inputs per event in primary care:** This variable includes the medical materials (medicines, procedures) that are covered by the health facility for treatment of each pathology case.
8. **Costs not covered by the health system:** This variable includes the value of the inputs (i.e. medications) that are paid for by the family.
9. **Daily cost of hospital bed during hospitalization:** This variable includes the total cost to the hospital calculated per day per patient staying in the hospital. This value includes the cost of staff, facilities and equipment, as a unit cost per patient.
10. **Daily cost of hospital bed in ICU:** This variable includes the total cost to the hospital calculated per day per patient staying in the ICU. This value includes the cost of staff, facilities and equipment, as a unit cost per patient.
11. **Daily hours lost due to hospitalization:** The number of hours the caretaker spends at the hospital each day with the child when he/she brings a child to a primary care facility.
12. **Differential Probability (DP):** Refers to the difference between the probability of occurrence of a consequence (i.e., disease, grade repetition and lower productivity) given a specific condition. The model uses this variable specifically to determine the risk among those suffering from undernutrition and those who are not (ECLAC).

13. **Discount rate:** The interest rate used to assess a present value of a future value by discounting (FAO). In the model it is utilized to obtain the present value in the scenario section.
14. **Dropout rate per grade:** Percentage of students who drop out of a grade in a given school year (UNESCO).
15. **Episodes:** It is the number of disease events occurring for a given pathology. In the model it is based on a 1 year period, i.e. the number of times a specific pathology occurs in 1 year (ECLAC).
16. **Food insecurity:** Exists when people lack access to sufficient amount of safe and nutritious food and therefore, are not consuming enough for an active and healthy life. This may be due to the unavailability of food, inadequate purchasing power or inappropriate utilization at household level (FAO).
17. **Food vulnerability:** Reflects the probability of an acute decline in food access or consumption, often in reference to some critical value that defines minimum levels of human wellbeing (WFP).
18. **Hunger:** The status of persons, whose food intake regularly provides less than their minimum energy requirements, i.e. about 1800 kcal per day. It is operationally expressed by the undernourishment indicator (FAO).
19. **Incidental retrospective dimension:** Used to estimate the cost of undernutrition in a country's population in a given year. The model applies it by looking at the health costs of pre-school children (0 to 5-year-olds) suffering from undernutrition, the education costs of school-age children (6 to 18-year-olds) and the economic costs resulting from lost productivity by working-age individuals (15 to 64-year-olds) (ECLAC).
20. **Intrauterine growth restriction (IUGR):** Refers to the foetal weight that is below the 10th percentile for gestational age (WHO). In the model, this is the only type of condition considered in the estimation of cost for low birth weight children.
21. **Low Birth Weight (LBW):** A newborn is considered to have low birth weight when he/she weighs less than 2,500 grams (WHO).
22. **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 over nutrition (excessive food intake in relation to energy requirements) (FAO).
23. **Mortality rate:** The proportion of deaths per year in a given population, usually multiplied by a 10th population size so it is expressed as the number per 1,000, 10,000, 100,000, individuals per year.
24. **Percentage of cases that attend health services:** The proportion of episodes for which a caretaker brings a child to a primary health facility for treatment.
25. **Productivity/Labour productivity:** Measures the amount of goods and services produced by each member of the labour force or the output per unit of labour (ILO). In the model, it refers to the average contribution that an individual can make to the economy, measured by consumption or income, depending on data availability.
26. **Proportion of episodes requiring hospitalization:** When a child experiences pathology, he/she may require in-patient care. This variable identifies the proportion of the episodes by pathology, for which a child requires hospitalization.
27. **Proportion of episodes requiring ICU:** When a child experiences pathology, he/she may require care in an ICU facility. This variable identifies the proportion of the episodes by pathology, for which a child requires ICU care.
28. **Prospective or potential savings dimension:** This dimension makes it possible to project the present and future losses incurred as a result of medical treatment, repetition of grades in school and lower productivity caused by undernutrition among children under the age of five in each country, in a specific year (ECLAC).
29. **Public social spending:** Social expenditure is the provision by public (and private) institutions of benefits to, and financial contributions targeted at, households and individuals in order to provide support during circumstances, which adversely affect their welfare, provided that the provision of the benefits and financial contributions constitutes neither a direct payment for a particular good or service nor an individual contract or transfer (OECD).

30. **Relative risk:** Refers to the risk of an event occurring, given a specific condition. It is expressed as a ratio of the probability of the event occurring in the exposed group versus a non-exposed group. In the model it is used to establish the risk level of disease, lower educational performance or lower productivity relative to exposure to undernutrition.
31. **Repetition rate per grade:** Number of repeaters in a given grade in a given school year, expressed as a percentage of enrolment in that grade in the previous school year (UNESCO).
32. **Stunting:** Reflects shortness-for-age; an indicator of chronic malnutrition, calculated by comparing the height-for-age of a child with a reference population of well-nourished and healthy children (WFP). The model uses it as the indicator to analyse the impact on educational performance and productivity.
33. **Survival rate:** A rate calculated for a given geographic area that presents the likelihood of a person surviving in a given period of time.
34. **Undernourishment:** Food intake that is continuously insufficient to meet dietary energy requirements. This term is used interchangeably with chronic hunger, or, in this report, hunger (FAO).
35. **Undernutrition:** The result of prolonged low levels of food intake and/or low absorption of food consumed (undernourishment). It is generally applied to energy (or protein and energy) deficiency, but it may also relate to vitamin and mineral deficiencies (FAO).
36. **Underweight:** Measured by comparing the weight-for-age of a child with a reference population of well-nourished and healthy children (WFP). The model utilizes it to analyse the impact of child undernutrition on health.
37. **Unit cost per attention in primary care:** This variable includes the total cost to the health facility per attention, comprising the cost of staff, facilities and equipment, as a unit cost per patient.
38. **Wasting:** Reflects a recent and severe process that led to substantial weight loss, usually associated with starvation and/or disease. Wasting is calculated by comparing weight-for-height of a child with a reference population of well-nourished and healthy children (WFP).

Annex 2. Methods and assumptions

The following information gives more detail on the methods and assumptions made about health protocols and costs of healthcare.

The information here was obtained mainly from expert interviews with senior health officials:

- Ms. Maria Dlamini, IMCI Coordinator, Ministry of Health
- Ms. Danisile Vilakati, Director, Swaziland National Nutrition Council, Ministry of Health
- Mr. Thulane Maphosa, Chief Programmes Officer, International Breast Feeding Action Network
- Ms.Fortunate Fakudze, Pharmacist, Central Medical Stores, Ministry of Health
- Dr. Mazibuko, Senior Medical Officer, Mbabane Government Hospital
- Dr. T. Fynn, Medical Officer, Manzini Clinic (private)
- Ms. Phililе Shabangu, EPI Programme Manager, MOH
- Ms. Nomsa Dube, EPI Surveillance Officer, MOH
- Ms. Zanele Simelane, Health Management Information Systems Unit , MOH
- Ms. Bonisile Nhlabatsi, PMTCT Coordinator, MOH
- Ms. Teclar Maphosa, Malaria Health Promotion Officer, MOH

The NIT also consulted and extracted information from health protocols and policies such as:

- National Health Strategic Plan
- Integrated Management of Childhood Illness (IMCI) Clinical Guidelines
- Sexual and Reproductive Health Strategic Plan
- Paediatric HIV and AIDS Guidelines
- Integrated Management of Acute Malnutrition (IMAM) Guidelines

Secondary data was extracted from:

- DHS 2006-2007
- National Nutrition Survey 2008
- MICS 2000
- HIV Sentinel Surveillance reports (2010)
- HIV Projection and Estimates reports (2010)

Underweight and stunting prevalence by age were extracted from DHS 2006, MICS 2000 and the National Nutrition Survey 2008.

Pathologies are defined in Table 1:

Pathology	Source	Definition
Anaemia	IMCI guidelines	Symptoms include palmor pallor. This refers to unusual paleness of the skin on the hands.
ADS (acute diarrhoeal syndrome)	WHO Recommended Surveillance Standards, 2nd Edition/IMCI guidelines	Diarrhoea is defined as the passage of three or more loose or watery stools in the past 24 hours, with or without dehydration and with or without blood in the stool. The DHS defines a case of ADS as a mother's estimation of whether the child has had diarrhoea in the previous two weeks.
ARI (acute respiratory infection)	WHO Recommended Surveillance Standards, 2nd edition/IMCI guidelines	Symptoms include cough or difficult breathing, and rapid short breathing.

Underweight	IMAM guidelines	Is a condition in which a child fails to get enough of the nutrients that the body needs to stay healthy and function properly. Underweight is a composite of low weight for height (acute malnutrition or wasting) and low weight for height (chronic malnutrition or stunting), and is defined as weight for age is below the third percentile (NCHS references) or the Z-score for weight for age is below two standard deviations of the median (WHO standards).
Malaria	IMCI guidelines	Parasitic disease that involves high fevers, shaking chills, flu-like symptoms, and anaemia.
HIV	WHO Recommended Surveillance Standards, 2nd edition/IMCI guidelines	Human Immunodeficiency Virus (HIV) is the virus that causes AIDS. WHO guidelines recommend laboratory confirmation of HIV positive serology. IMCI guidelines recommend using DNA PCR testing to in infants whenever possible.
Measles	EPI Protocols	Problems or infections that occur during or after measles. Some examples of measles complications are: diarrhoea, pneumonia, stridor, mouth ulcers, ear infection, and eye infection. A less common complication is encephalitis, an inflammation of the brain.
Other 2	n/a	The NIT excluded the 'other' category, no pathologies were included.

Treatment assumptions: Table 2 defines the assumptions made about medicines and treatment requirements for each pathology as laid out in respective guidelines.

Pathology	**Source**	**Treatment assumptions**
Anaemia	IMCI guidelines	- Children with severe palmar pallor are hospitalized and given the relevant treatment - Children who are not severely anaemic are given supplements and relevant drugs at outpatient and are followed up in 14 days.
ADS	IMCI guidelines	- Diarrhoea is treated at the ORS and IV therapy and re-assessed in health facilities according to IMCI guidelines and if no improvement refers to hospital for further management.
ARI	IMCI guidelines	- Children are managed according to IMCI guidelines. If severe pneumonia refer to hospital for further management.
Under-nutrition	IMAM guidelines	- Severely acutely malnourished children are hospitalized and given therapeutic food and appropriate medical treatment according to IMAM guidelines. - Moderately malnourished children are given therapeutic food and medical treatment at out-patient according to guidelines.
Malaria	IMCI guidelines	- Children with severe malaria are hospitalized and treated with quinine according to IMCI protocols and Malaria guidelines
HIV	Paediatrics guidelines	- Children who have tested HIV positive are given prophylaxis and are treated for opportunistic infections according to Paediatric guidelines
Measles	IMCI guidelines	- For uncomplicated measles children are treated according to IMCI guidelines. - For severe complicated measles children are hospitalized and treated according to IMCI guidelines.
Other 2	n/a	The NIT excluded the 'other' category, no pathologies were included.

Health cost estimations

1. The NIT interviewed health care workers to estimate average number of disease episodes per year. One episode of for example, anaemia, is defined as the likelihood of a child having that pathology (anaemia) once in a period of one year. If the child has the same condition multiple times, each instance is counted as one episode.
2. For average number of primary care visits for each pathology, the NIT asked primary care physicians from Mbabane Government Hospital Public Health Unit to estimate number of visits associated with each pathology.
3. The proportion of events of pathology requiring hospitalization was estimated using health records from Mbabane Government Hospital. The denominator is the number of clients with a particular condition; the numerator is the number of clients admitted/hospitalized as a result of that condition.
4. Average number of days of hospital treatment for each event was calculated using the average length of stay in the hospital for each condition, also using health records from Mbabane Government Hospital.
5. Estimations of proportions of pathologies requiring Intensive care treatment were also taken from health records from Mbabane Government Hospital.

Estimations of Health Costs in Hours

Waiting times were determined by expert interviews with health staff, and interviewing patients' parents at Mbabane Government Hospital. The health facilities do not differentiate between pathology or age group for primary care visit wait times, so the NIT assumed the same wait times across all pathologies and age groups. This estimation does not include wait times estimates from emergency room visits, only primary health care visits.

Newborns with Low Birth Weight

Low birth weight prevalence was estimated from inpatient maternity records from Mbabane Government Hospital for the year 2011.

Average Cost per Type of Attention, Age Group and Pathology

Estimates of the cost of care for primary visits only include cost of medication and staff time, estimated from health care records. For hospitalization costs, the NIT used the previously calculated length of stay as well as cost of medicines, bed, food and average staff time, collected through expert interviews with the Central Medical Store and physicians. All examples are from Mbabane Government Hospital. NIT triangulated these estimates of length of stay and medicines with IMCI guidelines for treatment. ICU care cost estimates included hospital costs with the addition of extra inputs from more advanced equipment, additional staff time and increased costs related to more rigorous measures for infection control.

Private sector costs included charges for doctor fees, medication costs, and similar costs from the public sector. These charges were calculated using health records from Manzini Clinic, a private clinic and an expert interview with Dr. Fynn.

Methods and Assumptions for Education Data

All data except absenteeism and private costs were collected from the Ministry of Education's Education Management Information System (EMIS) using 2009 as the reference year. Final enrolment is the number of students approved in the system at the end of the term. Absenteeism reports were followed-up at school level. Basic education includes primary education. Secondary education includes students up to Form 5. The direct public cost of education includes salaries, utilities in schools, infrastructure expenses, taken from the Ministry of Education budget estimate reports for 2010, which give actual expenditure in Swazi emalangeni for 2009.

Public expenditures on school supplies was limited to orphans and vulnerable children. In 2009 the Government did not yet offer free primary education to orphans and vulnerable children so these costs are not included. Public expenditure on the OVC education programme was calculated through information from the Deputy Prime Minster's Office, including grant funding from the European Union.

Private costs of education include basic supplies, transportation, and a school uniform. These costs were estimated to be the same across primary and secondary students.

Annex 3. Brief Description of COHA Data Collection Process

The National Implementation Team was composed of representatives from the Deputy Prime Minister's Office National Children's Coordination Unit, Ministry of Health Swaziland National Nutrition Council, Central Statistics Office, the Swaziland Vulnerability Analysis Committee and the World Food Programme Swaziland country office. Secondary data was collected from national and international reports and national information systems such as the Health Management Information System and the Education Management Information System (EMIS). Primary data collection was necessary for several aspects of health costing, done through expert interviews with clinicians at Mbabane Government Hospital, patient interviews, consultations with experts from the Central Medical Stores and Ministry of Health, and triangulation with local and international clinical guidelines. As private health services are not included in the Health Management Information Systems in Swaziland, interviews with a large national private health facility, the Manzini Clinic, were complete to collect information about private health services, treatment assumptions, and costs.

All primary and secondary data were reviewed by stakeholders from Government, academic institutions, UN agencies, and non-governmental organizations in a data validation workshop in December 2012, and final review of the results was done by the National Implementation Team. The review and data validation process included representatives from the Deputy Prime Minister's Office, the Ministry of Education, Ministry of Health, Ministry of Finance, Ministry of Economic Planning and Development, Central Statistics Office Swaziland Infant Nutrition Action Network, International Breastfeeding Action Network, UNICEF, and the University of Swaziland.

A national data validation workshop was carried-out in December 2012, in which the initial data collected was analysed and discusses with the national team.

Annex IV. Consulted Resources

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