The Cost of HUNGER in Egypt

Implications of Child Undernutrition on the Social and Economic Development of Egypt

The Egyptian Cabinet
Information and Decision Support Center
(IDSC)

The Social and Economic Impact of Child Undernutrition in Egypt

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Social and Economic Impacts of Child Undernutrition in Egypt

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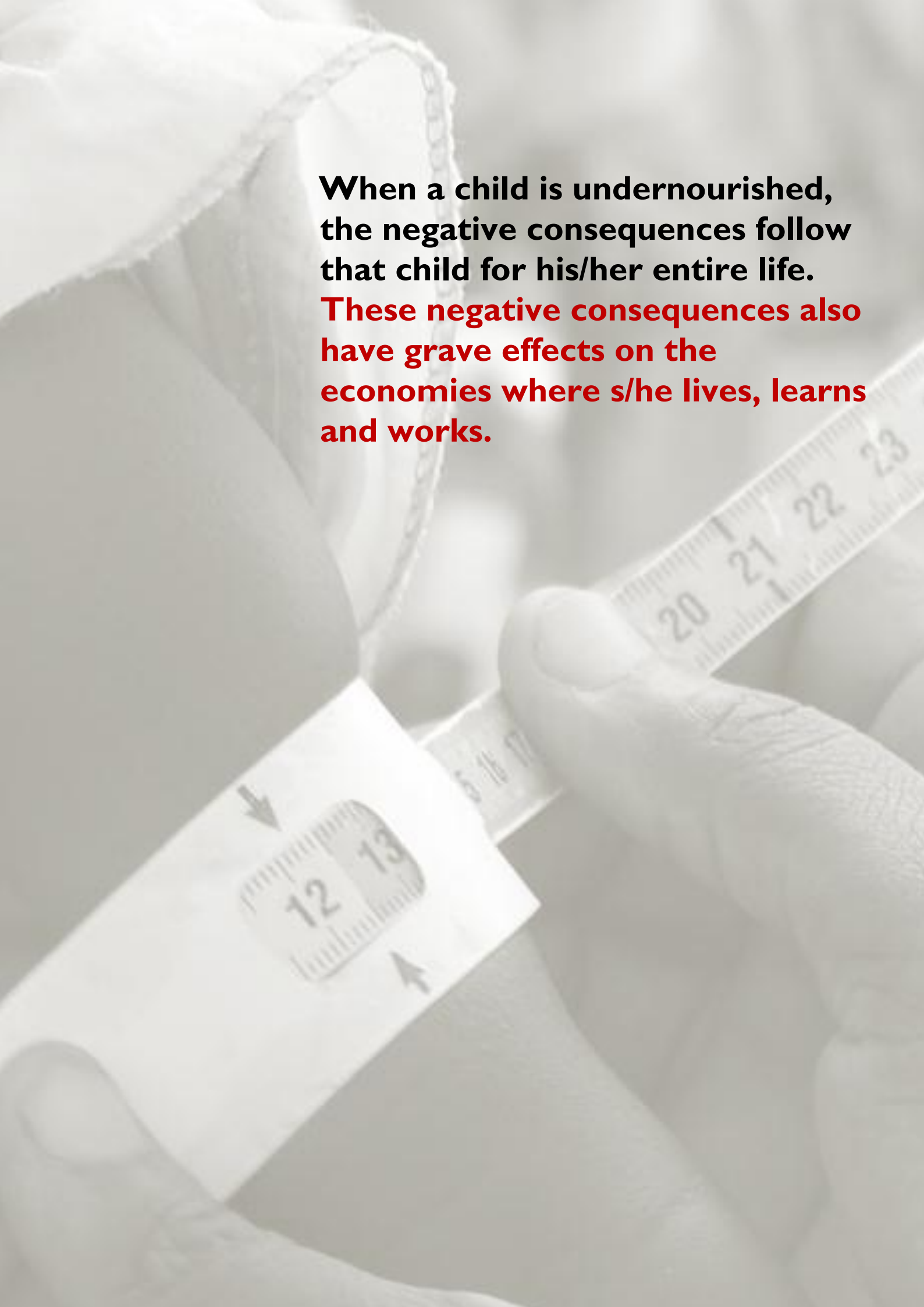

When a child is undernourished, the negative consequences follow that child for his/her entire life. These negative consequences also have grave effects on the economies where s/he lives, learns and works.

Contents

Foreword

Over the past decade, Egypt has faced a series of shocks that have triggered a decline in food security and nutrition trends. Alongside growing poverty and food insecurity, stunting rates due to undernutrition among children under five have increased in the last decade to reach 28.9% in 2008, accompanied by the growing rates of anemia that were estimated at 48.5% in 2005, according to the Demographic Health Survey. Undernutrition and related chronic diseases, such as noncommunicable diseases that follow later in life, create a vicious circle that poses a fundamental challenge to policy making.

According to findings in this study, undernutrition cannot be addressed through the health sector alone but rather through consolidated efforts at the national level, requiring a comprehensive and coordinated multi-sectoral approach. The analysis of the social and economic consequences of child undernutrition revealed a connection between this and increased health care costs due to illness, as well as an increased educational burden due to higher repetition and early drop-out rates which in turn contribute to reduced labour productivity. The study highlights that long term sustainable development cannot happen without effectively combatting undernutrition and the elimination of childhood stunting, as key elements of the social development agenda.

A reduction in the number of stunted children in Egypt will be an indicator of the effectiveness of social protection policies which would contribute to improved living conditions as well as reduce potential cognitive, mental and psychomotor impairment. By removing barriers caused by undernutrition, these children will have the same opportunities for success as their counterparts, who have enjoyed healthy childhoods. Achieving this will serve as an important element for increasing inclusive growth in the country.

This report on The Economic and Social Impact of Child Undernutrition in Egypt is part of a wider regional study on The Cost of Hunger in Africa. We would like to acknowledge its production under the national leadership of the Egyptian Cabinet's Information and Decision Support Center. In the development of this study we would like to thank the African Union Commission, the New Partnership for Africa's Development, the UN Economic Commission for Africa and the World Food Programme for bringing this issue to the centre of the development agenda. This report could not have been prepared without the support of Egypt's Central Agency for Public Mobilization and Statistics, the Ministry of Health and the Ministry of Education.

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WILD ANIMALS
حيوانات الغابة

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The Steering Committee highlights the special contributions by the IDSC in supporting the adaptation of the Model to Estimate the Social and Economic Impact of Child Undernutrition in Africa. Their contributions evidence Egypt's commitment to regional collaboration.

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
AU	African Union
AUC	African Union Commission
CAADP	The Comprehensive Africa Agriculture Development Programme
CAMPAS	Central Agency for Public Mobilization and Statistics
CEN-SAD	Community of Sahel-Saharan States
COHA	Cost of Hunger in Africa
COMESA	Common Market for Eastern and Southern Africa
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
EGP	Egyptian Pound
FAFS	Framework for African Food Security
FAO	Food and Agriculture Organization
FTF	Feed the Future
GDP	Gross Domestic Product
GNI	Gross National Income
HIECS	Household Income, Expenditure and Consumption Survey
ICU	Intensive Care unit
IDSC	Information and Decision Support Centre
IFAD	International Fund for Agricultural Development
IGAD	Intergovernmental Authority for Development
ILO	International Labour Organization
IUGR	Intra Uterine Growth Retardation
LBW	Low Birth Weight
MDGs	Millennium Development Goals
MENA	Middle East and North Africa
NCHS	National Centre for Health Statistics
NEPAD	The New Partnership for Africa's Development
NGO	Non Governmental 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
SADC	Southern African Development Community
SUN	Scaling Up Nutrition
UMA	Union du Maghreb Arabe

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 impact of child undernutrition in a given year. Twelve countries are initially participating in the study. Egypt is part of the four first-phase countries, the first to carry out the study and present results.

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 Egypt is led by the Egyptian Cabinet's Information and Decision Support Centre (IDSC), with support from the Central Agency for Public Mobilization and Statistics (CAPMAS), the Ministry of Health, the Ministry of Education, and the World Food Programme (WFP) Egypt Country Office. At regional level, the COHA project is led by the African Union Commission (AUC) with technical leadership from the United Nations Economic Commission for Africa (UNECA) and support from WFP and NEPAD.

During the process, all data for the study were collected from national data sources including the 2009 CAPMAS Household Income, Expenditure and Consumption Survey (HIECS), 2009 Labour Force Survey, 2008 DHS, the African Centre for Statistics, and primary data collection. The data was collected and processed with support from IDSC and the WFP Egypt Country Office.

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 with undernutrition in children under 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 economic data provided by the National Implementation Team (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

The current levels of child undernutrition evidence the challenges in the reduction of child hunger. Egypt made important progress reducing stunting rates from 35% in the early 90s to just over 20% in 2003. Nevertheless, the data shows that Egypt has fallen back in this progress and that there has been an increase in the prevalence of stunted children from 17.6% (2005) to 28.9% (2008) in the last few years. This would mean that 2.7 of the 9.2 million children under the age of five in 2009 are affected by growth retardation. Additionally, 33% of the school age population, representing 7.4 million children, and 41% of the working age population, representing 20.4 million people, are also suffering from the consequences of childhood stunting.

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

Overall results show that 20.3 billion Egyptian pounds (EGP) were lost in the year 2009 as a result of child undernutrition. This is equivalent to 1.98% of GDP.

- For 2009, there were an estimated 901,440 additional clinical episodes associated with undernutrition in children under five, which incurred a cost of an estimated 1.17 billion EGP. Cases of diarrhoea, respiratory infections and anaemia totalled 126,223 episodes in addition to the 775,217 cases of underweight children. According to the estimated data, only 1 out of every 5 of these episodes received proper health attention.
- Undernutrition was associated with 11% of all child mortalities, which represented over 6,000 child deaths in 2009, and over 28,102 in the period from 2004 to 2009.

[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.

- Stunted children have a higher grade repetition rate, at 7.4% than non-stunted children, at 5.4%. This incremental rate generated 79,396 additional cases of grade repetition in 2009, in which the education system and families incurred a cost of 271 million EGP.
- Stunted children in Egypt are also more likely to drop out of school. Based on information from the 2009 CAPMAS Labour survey, the model estimated that the average schooling achievement for a person who was stunted as a child is 0.2 years lower than for a person who was not stunted. This disadvantage in the labour market is estimated to have generated private costs of 2.7 billion EGP in potential productivity for a single year.
- 40 percent of adults in Egypt are stunted. This represented more than 20 million people of working age that are not able to achieve their potential, as a consequence of child undernutrition. In rural Egypt, where most people are engaged in manual activities, it is estimated that in 2009 alone, 10.7 billion EGP were not produced due to lower physical capacity of this group.
- Lastly, an estimated 857 million working hours were lost in 2009 due to absenteeism from the workforce as a result of nutrition-related mortalities. This represents 5.4 billion EGP which is equivalent to 0.5% 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 different scenarios. These scenarios are constructed based on the estimated net present value of the costs associated with undernutrition 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.

Scenario	**Baseline:** The Cost of Inaction by 2025	**Scenario #1:** Halving the Prevalence of Child Undernutrition by 2025	**Scenario #2.** The 'Goal' Scenario: "10% and 5% by 2025"
Description	Prevalence of stunted and underweight children stops at the level recorded in 2009 (28.9% and 6.8% respectively)	Prevalence of underweight and stunted children would be reduced to half of 2009. (14.5% 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 higher burden on the society	A constant annual reduction of **0.9% points in the prevalence of stunting** is required	A constant annual reduction **1.2% points in the prevalence of stunting** is required
Estimated Change in period	Cost increase of up to 32% by 2025 compared to the values in 2009	Accumulated savings of 11.7 billion EGP for the period from 2009 to 2025	Accumulated savings of 14.5 billion EGP for the period from 2009 to 2025
Annual Average Savings	none	EGP 732 million ($US133 million)	EGP 907 million ($US165 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 in maximizing the economic capacity of Egypt. In Egypt, the results of the study strongly suggest that, in order achieve the national goals of doubling the income, eliminating unemployment, and establishing a sustained annual growth rate, special attention must be given to addressing nutrition in the early stages of an individual's life (in the first 1000 days). The study estimates that child undernutrition generates health costs equivalent to 1.1 billion EGP, and that 11% of all cases of child mortality are associated with the higher risk of undernutrition. With regards to education, the results show that 10% of all grade repetitions in school are associated with the higher incidence of repetition experienced by stunted children. The study estimates

the economic and social cost of child undernutrition at 20.3 billion EGP. Without measures to combat and eliminate undernutrition, this cost is expected to increase by about 32% by 2025 to reach to 26.8 billion EGP.

Some of the key findings of the study indicate the need to review national development frameworks and develop a comprehensive and holistic national economic and health plan that includes nutrition as a key component. Further, it is recommended that nutrition interventions are mainstreamed within the primary health care system, with increased investment into institutional capacity to regularly detect, monitor and address undernutrition, and clearly link findings into prevention interventions. This requires a focus on preventative policies, as well as from therapeutic practices. In order to address some of the consequences of undernutrition, raising awareness of nutrition is critical, particularly through schools. Lastly, it is suggested that facilitating access to healthier food commodities, including through the food subsidy system, amended agricultural policies, and mandatory food fortification be considered.

Section I: Brief Socio-Economic Background

I Brief Socio Economic and Nutritional Background

The Arab Republic of Egypt (hereafter referred to as Egypt) is the largest Arab country and the third largest African country by population. Egypt has a Gross Domestic Product (GDP) estimated at 1.042 trillion EGP[2] (2009) and a per capita Gross National Income (GNI) of approximately $US2,600, which has grown considerably in the last decade. Further, inequality and extreme poverty rates have maintained relatively low levels in the country, with a GINI index of 30 and less than 2% of the population living on under $US1.25 a day; however estimates for people living on under $US2.00 a day are as high as 18% for the population.

TABLE I.1
SOCIO-ECONOMIC INDICATORS

Indicators	2000-2002	2005-2007	2009-2011
GDP, total in billions of EGP[3]	378.9	744.8	1042.2 (08/09)
GNI Per Capita (Atlas Method current $US)	1,370	1,560	2,600
Poverty - $1.25 a day (PPP) (% of population)	1.81	1.99	1.69
Population below the National Line (% of the Population)[4]	16.7	19.6	25.2
GINI Index	32.8	32.1	30.8
Labor Force, total (in millions)	20.7	25.1	27.1
Rural Population, percentage	57%	57%	57%
Percentage of Population in Agriculture	27.5%	31.7%	…
Unemployment, % of total labor force	10.2%	8.9%	12%
Unemployment, youth total (% of total labor force ages 15-24)	27.1%	24.8%	…
Unemployment, youth female (% of female labor force ages 15-24)	40%	47.9%	…
Population Growth (Annual %)	1.85%	1.80%	1.73%
Life expectancy at birth, total (years)	70	72	73

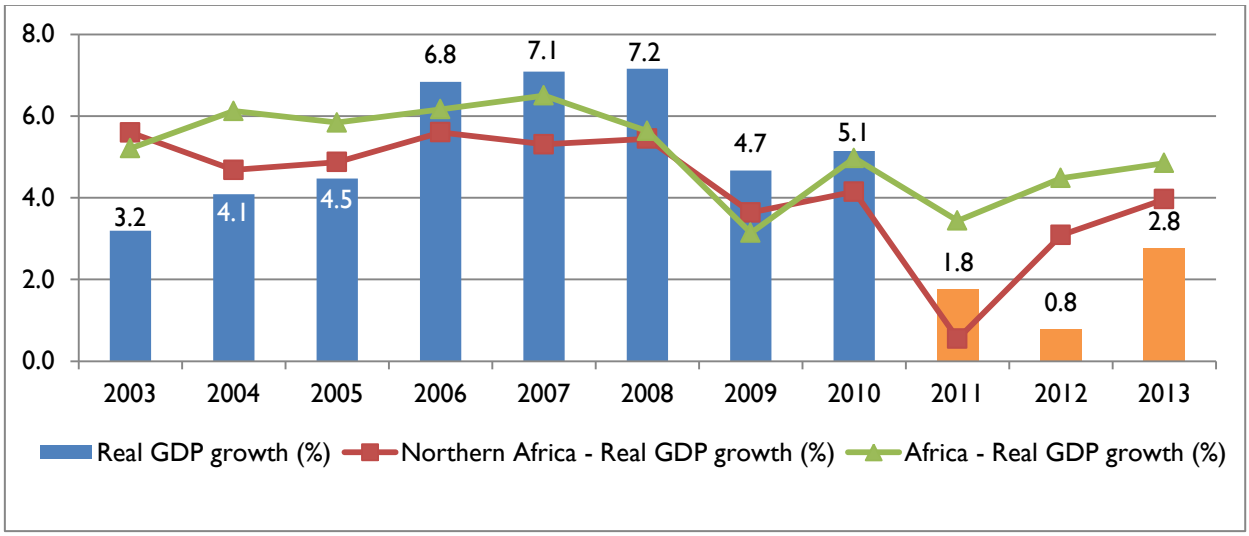
Source if not otherwise noted: World Bank Database[5]

One of Egypt's main socioeconomic challenges centres on youth employment. The national unemployment level is estimated at 12%, nevertheless, youth unemployment is 2 times higher, and nearly half of all women 15-24 are unemployed.

[2] "World Economic Outlook Database October 2012," World Economic Outlook Database, October 2012, http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx.
[3] Ibid
[4] CAPMAS, Statistical Yearbook 2012. (http://www.capmas.gov.eg/book.aspx)
[5] "Egypt" Data accessed March 15, 2013, http://data.worldbank.org/country/egypt.

Egypt has experienced an important period of economic expansion in the last decade, with average growth rates higher than those reported for Africa and the North Africa region. Nevertheless, this performance has slowed in the last years, largely due to political upheaval in the wake of the 2011 revolution. According to data from the African Economic Outlook[6], it is estimated that the real GDP growth rates will range from 0.8% to 2.8% in the next two years.

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



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

Public investment in the social sector has also been maintained in the last decade, but is still below the average, by proportion, compared to the Middle East and North Africa (MENA) region. Public spending in education is estimated at 11.9%, ten percentage points below the regional average of almost 19.9%. Health expenditures are also low compared to the rest of the region, both from a per capita perspective and as a proportion of GDP.

TABLE I.2
SOCIAL INVESTMENT INDICATORS

Indicators	2005-06	2007-08	2009-10	Middle East & North Africa *
Public spending on education, total (% of govern. Exp.)	11.9%	11.9%	…	19.9%
Public spending on education, total (% of GDP)	4.0%	3.8%	…	4.8%
Health expenditure per capita (current $US)	75.24	101.23	123.18	203.18
Health expenditure, total (% of GDP)	5.3%	4.8%	4.6%	5.3%
Health expenditure, public (% of total health expenditure)	44.2%	42.2%	37.4%	50.1%

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

From a nutritional perspective, Egypt has maintained low levels of underweight children for the past decade. Nevertheless, based on the application on the WHO child growth standards[7], the stunting rates for children under five (0-69 months) have increased in the same period from 20.3% to 28.9% as reported in DHS[8] reports. The data reported in this source has a small variation from the reported data on WHO[9] database for child nutrition.

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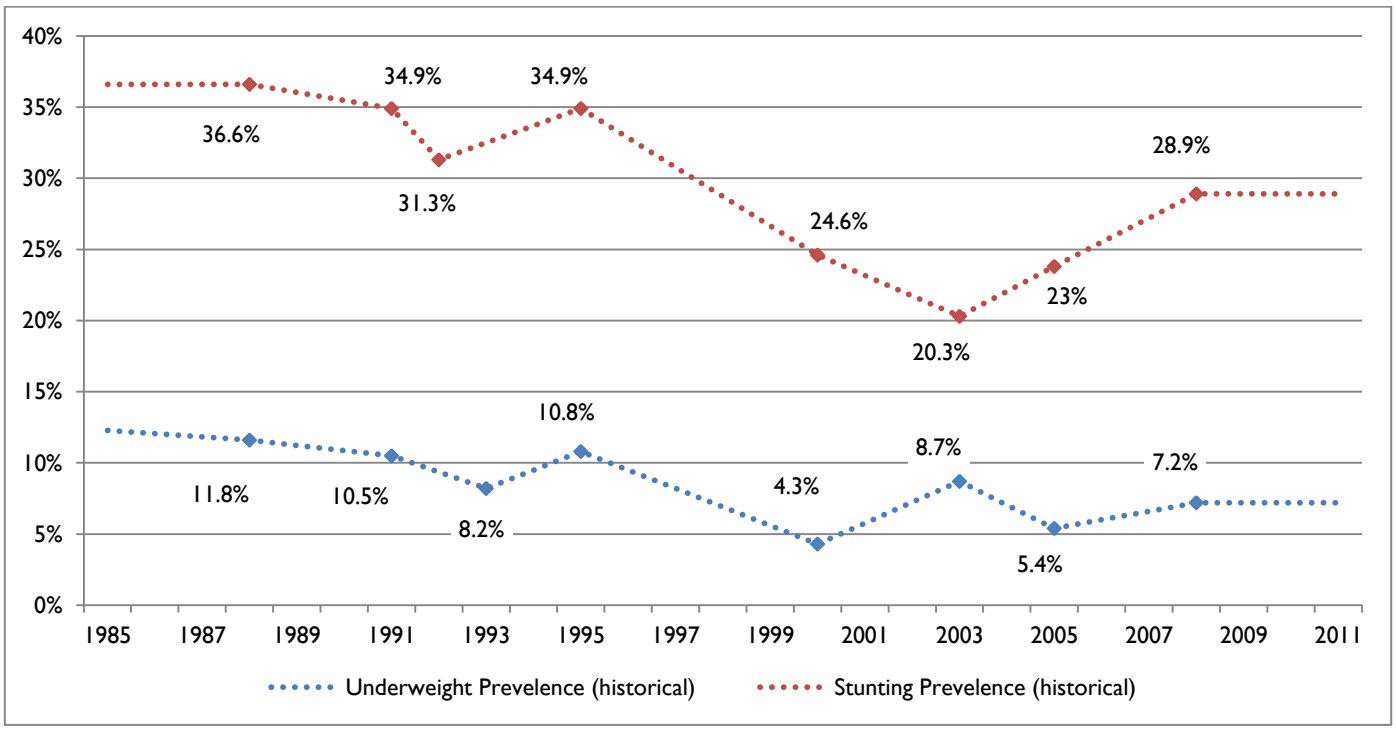
[6] "Egypt" African Economic Outlook, 2012, http://www.africaneconomicoutlook.org/en/countries/north-africa/egypt/

[7] WHO and UNICEF. (2009). WHO child growth standards and the identification of severe acute malnutrition in infants and children A Joint Statement by the World Health Organization and the United Nations Children's Fund.

[8] El-Zanaty, Fatma and Ann Way. 2009. *Egypt Demographic and Health Survey 2008.* Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International

[9] "WHO Global Database on Child Growth and Malnutrition." WHO. Accessed March 13, 2013.

FIGURE 1.2
ESTIMATED UNDERNUTRITION TRENDS IN CHILDREN UNDER-FIVE, 1990-2010
(In percentages)



Source: Prepared in-house based on information from DHS 2008 and national Surveys. Complete list is annexed to report. NOTE: Data prior to 2006, has been updated in line with new Child Growth Standards introduced by WHO in 2006 to replace the 1977 International Growth Reference, formulated by the National Center for Health Statistics (NCHS).

The current levels of child undernutrition illustrate the challenges in the reduction of child hunger. It is estimated that 2.7 of the 9.2 million children under the age of five were affected by growth retardation and 659,000 children were underweight in 2009. This situation is especially critical for children between 12 and 24 months, where one out of every three children is affected by growth retardation[10].

TABLE 1.2
POPULATION AND CHILD UNDERNUTRITION, 2009[c]
(Population in thousands)

Age groups	Population size (2009)	Low Birth Weight		Underweight		Stunting	
		Population affected (2009)	Prevalence (2009)[b]	Population affected (2009)	Underweight prevalence (2009)[b]	Population affected (2009)	Stunting prevalence (2009)[b]
Newborn (IUGR)[a]	1,876	117	6.2%				
0 to 11 months				163	8.7%	370	19.7%
12 to 23 months	1,858			124	6.7%	641	34.5%
24 to 59 months	5,453			371	6.8%	1,734	31.8%
Total	9,187	117	6.2%	659	7.2%	2,744	28.9%

Source: Estimated based on DHS surveys 2008 and demographic projections
a In a given year, the newborn 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.

http://www.who.int/nutgrowthdb/en//.

[10] El-Zanaty, Fatma and Ann Way. 2009. *Egypt Demographic and Health Survey 2008.* Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International

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.[11]

Growth has been 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 an 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.[12] 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, affecting thus 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.[13] At that conference, Nobel Laureate Economist, Vernon Smith noted 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."[14] Improving nutritional 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.

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[11] "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.

[12] 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.

[13] 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.

[14] *Ibid.*

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 improved nutrition would have a direct impact on school performance and eventually on improving opportunities in the labour market and physical work. Additionally, nutrition is often seen 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)[15], the objectives of the African Task Force on Food and Nutrition Development[16] 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 to generate evidence to inform key decision makers and the general public about the cost societies on the continent 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.

[15] 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.

[16] 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.[17]
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.[18]
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.[19]
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.[20]
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.[21]

Nutrition security thus depends on a person's food security, as well as good health, a healthy environment, and good caring practices. 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."[22] A direct and measurable consequence 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[23].

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

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

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

[19] *Ibid.*

[20] *Ibid.*

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

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

[23] 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.

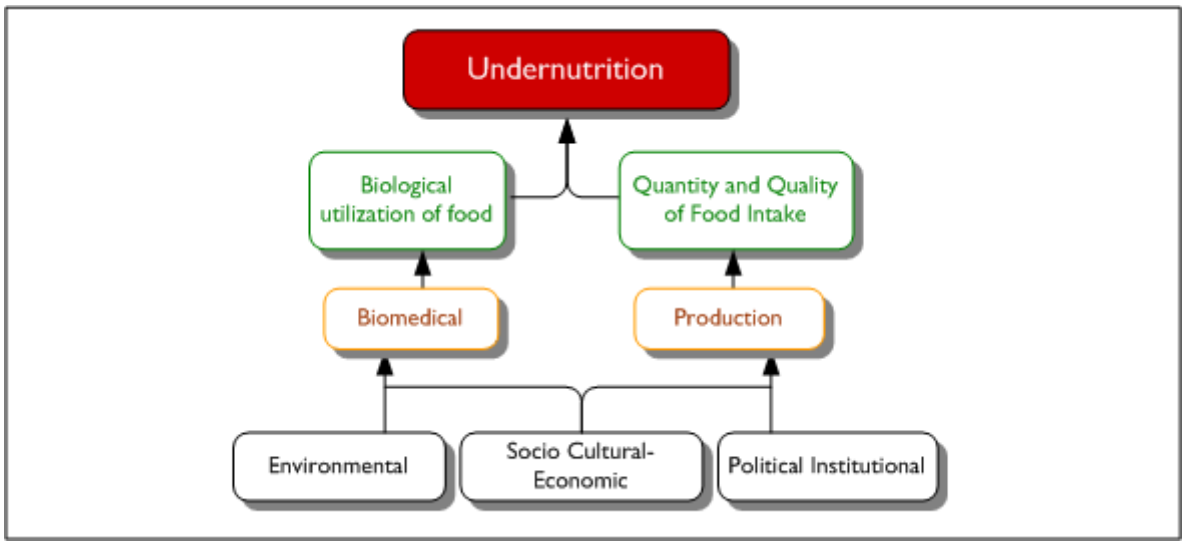
undernutrition. The discussion also describes the dimension of analysis and the principal methodological aspects used to interpret the results.[24]

ii. Causes of undernutrition

The main factors associated with undernutrition, as a public health problem, can be grouped into the following: environmental (natural or entropic causes), sociocultural-economic (linked to poverty and inequality) and political-institutional. Together, these factors increase or decrease biomedical and productivity vulnerabilities, through which they determine the quantity and quality of dietary intake and the absorption capacity, which constitute the elements of undernutrition.[25]

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.[26]

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

Production factors include those directly associated with the production and access to food by the population at risk. The availability and autonomy of each country's dietary energy supply depend directly on the characteristics of production processes, the degree to which they utilize natural resources and the extent to which these processes mitigate or aggravate environmental risks.

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).

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[24] 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.

[25] 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.

[26] *Ibid.*

i. Consequences of undernutrition

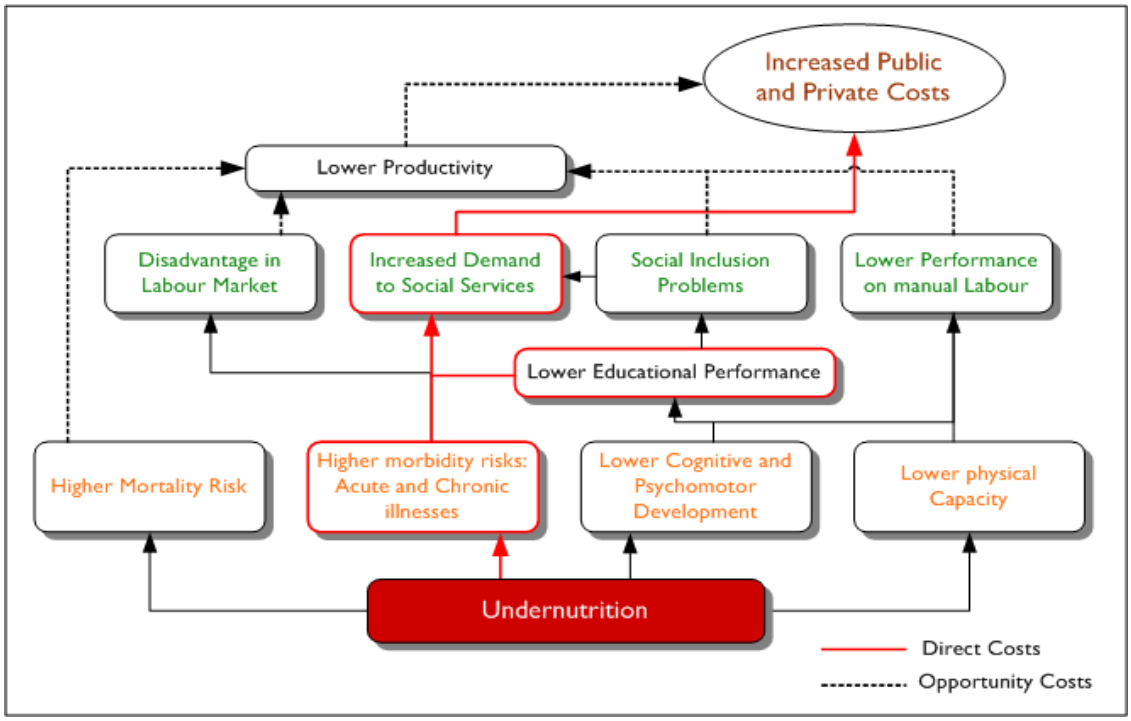
Child undernutrition has long-term negative effects on people's lives[27], most notably in the aspects of health, education, and productivity, quantifiable in costs and expenditures to the public and private sectors. Consequently, these effects exacerbate problems in social integration and increase or intensify poverty. A vicious cycle is perpetuated as vulnerability to undernutrition grows.

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.[28] 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.[29] This translates into a greater probability of starting school at a later age, repeating grades, dropping out of school and ultimately obtaining a lower level of education.

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

FIGURE II.2
CONSEQUENCES OF UNDERNUTRITION



Source: Modified from Rodrigo Martínez 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.[31]

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

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

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

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

[31] 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.

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, leads 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:

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

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.

ii. Dimensions of analysis

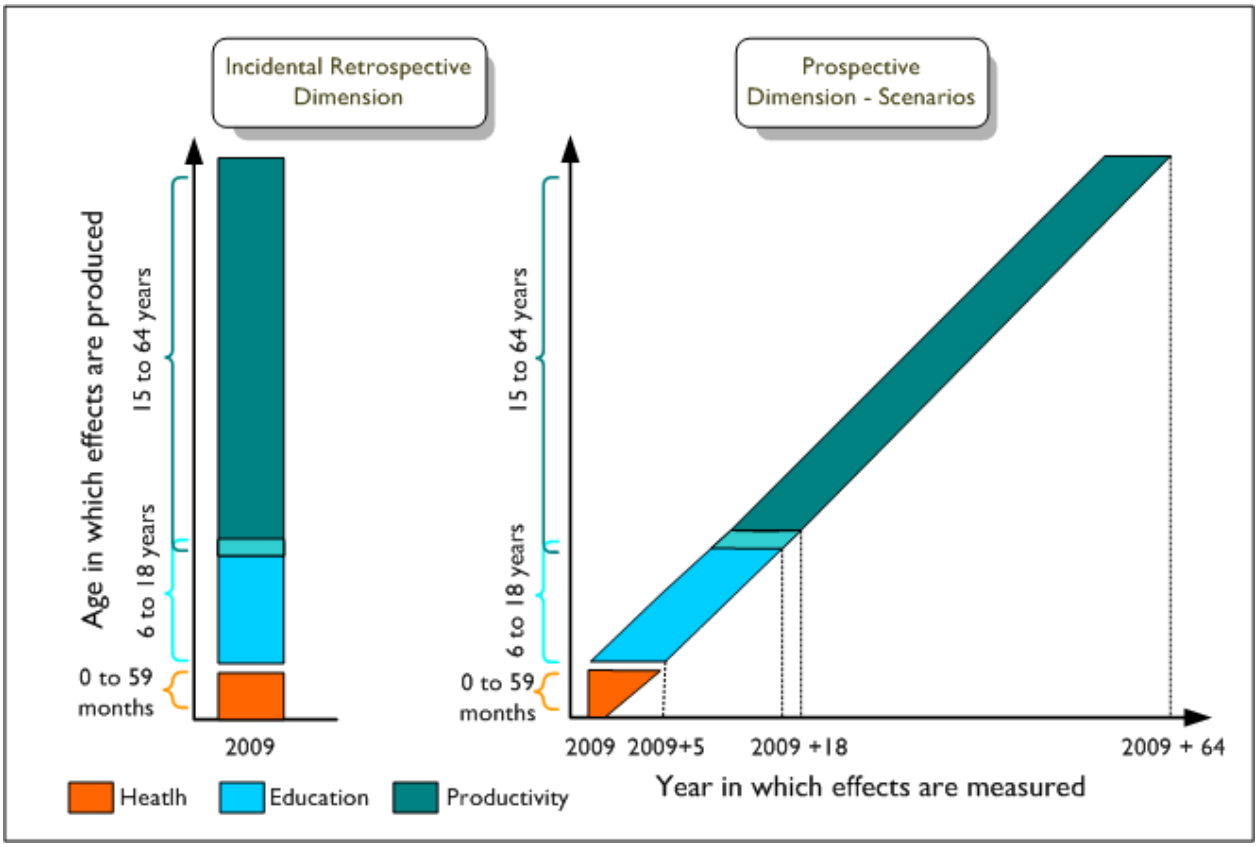
Considering that a country's undernutrition situation and the consequences thereof reflect a specific epidemiological and nutritional transition process, a comprehensive analysis involves estimates of the current situation extrapolated from previous transitional stages as well as estimates of the future 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 IV, 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.[32]

iii. 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.[33] 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

[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] In the original design, the idea of analysing 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.

(weight-for-height scores below -2 standard deviations) are used, with reference, where possible, to the World Health Organization (WHO) distribution for comparison purpose.[34]

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.

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.

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

Section III: Effects and Costs of Child Undernutrition

III Effects and Costs of Child Undernutrition

Undernutrition is mainly characterized by stunting (low height-for-age), wasting (low weight-for-height), 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 results in 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 for 2009. The retrospective dimension of the analysis of education, health and productivity effects is presented below together with costs resulting from undernutrition.

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

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[35]. Based on the differential probability analysis undertaken with DHS data[36], in Egypt, underweight children between 28 days and 11 months are more affected by anaemia (13.4% more), and children between 12 and 24 months have a higher risk of diarrhea (1.42% more).

The study estimated that in 2009 in Egypt, there were more than 901,440 more episodes of illness related to diseases that could be associated to being underweight. The biggest proportion of episodes is found in anaemia with 102,965 incremental episodes for underweight children, followed by diarrhea with 18,342 annual episodes and acute respiratory infections were estimated at 4,915 episodes.

In addition, pathologies related to calories and protein deficiency and low birth weight associated with Intrauterine Growth Restriction (IUGR), totaled more than 775,217 episodes in 2009 as indicated in Table III.1, while acute and chronic illness due to diseases such as ADS, anaemia, fever and ARI, represents 126,223 episodes annually.

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

[36] El-Zanaty, Fatma and Ann Way. 2009. *Egypt Demographic and Health Survey 2008.* Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International

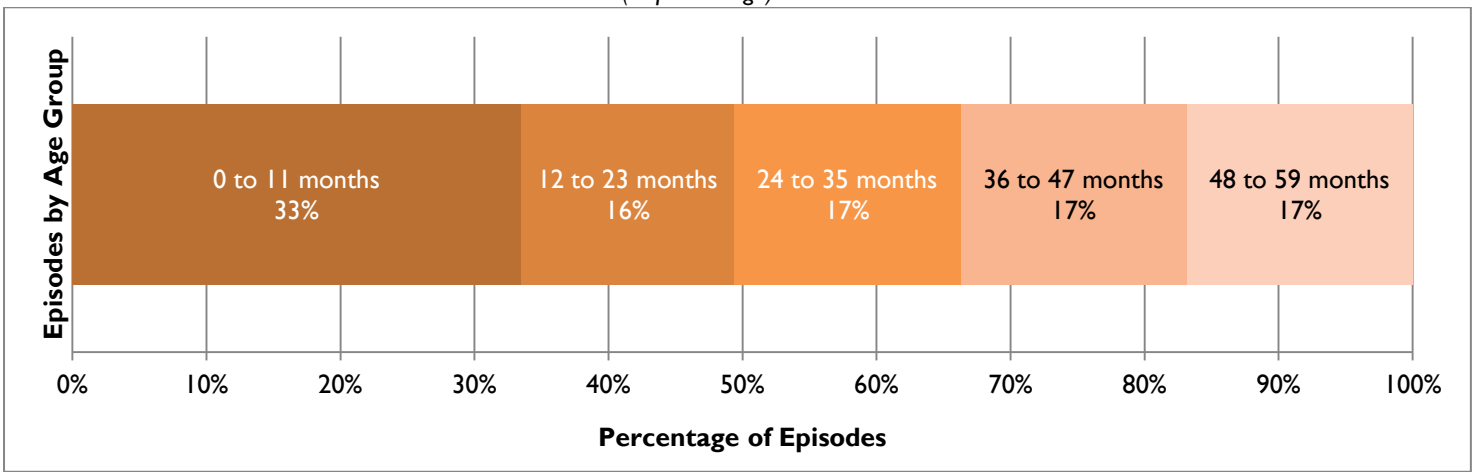
TABLE III.1
MORBIDITIES FOR CHILDREN UNDER-FIVE ASSOCIATED WITH UNDERWEIGHT, BY PATHOLOGY, 2009

Pathology	Number of Episodes	Percentage of Events
Anaemia	102,965	82%
ADS	18,342	15%
ARI	4,915	4%
	126,223	
LBW	116,702	15%
Underweight	658,516	85%
	775,217	
Total	**901,440**	

Source: Model estimations based on DHS 2008, and Demographic information.

Most episodes of incremental illness associated with undernutrition happen before the first year of life. This is the period, of the first thousand days of life, where children are most threatened due to age-specific vulnerabilities. In Egypt, the 33% of all incremental episodes occur in children under 12 months, with more than one third of those episodes associated with 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 2008, and demographic information.

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

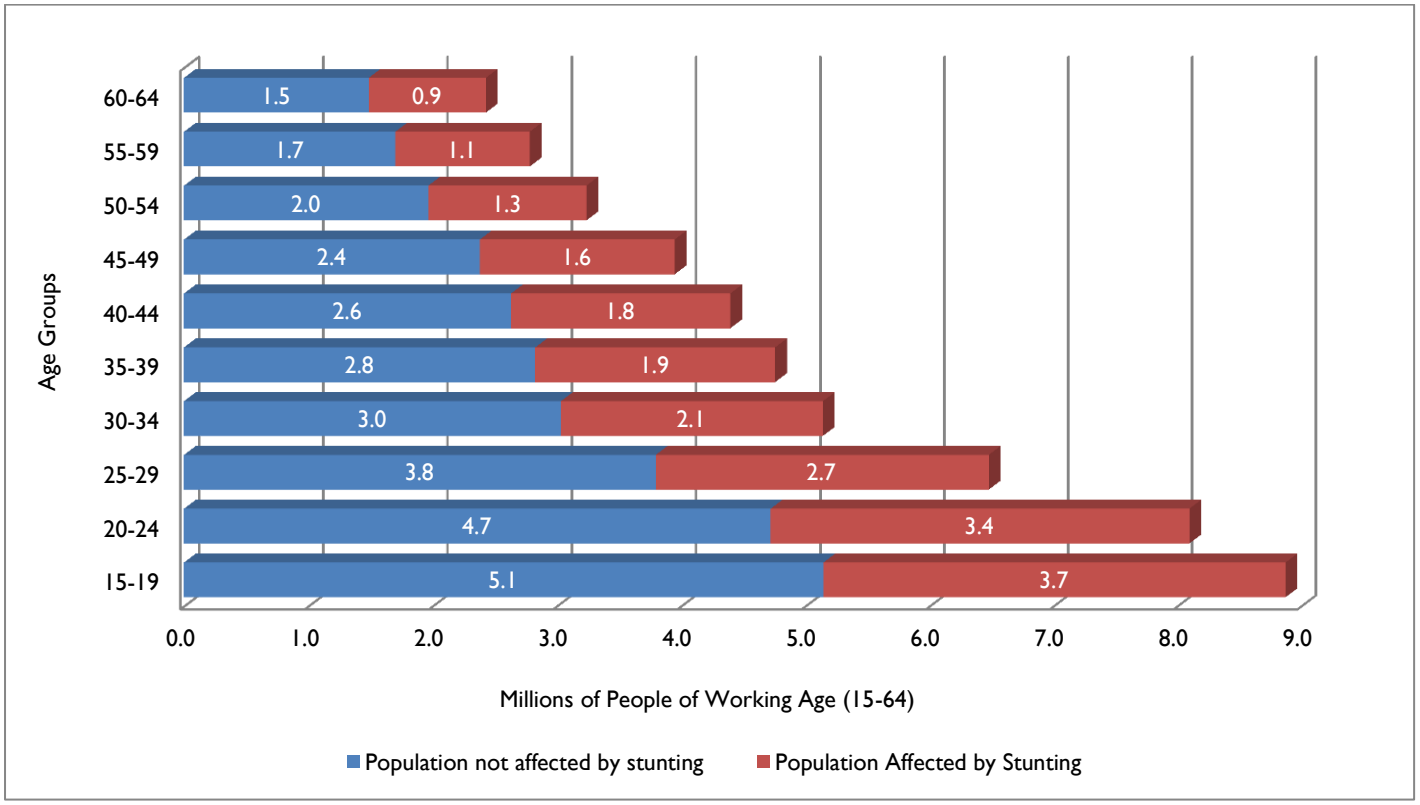
ii. Stunting levels of the working age population

Undernutrition leads to stunting in children, which can impact on their productivity at later stages in life[37]. Egypt has made important historical progress in reducing stunting in children; nevertheless, there has been a reported recent increase in the

[37] K.G. Dewey and K. Begum, *Long-term consequences of stunting in early life*. Maternal and Child Nutrition (2011), 7 (Suppl. 3), pp. 5–18

prevalence of chronic undernutrition. As illustrated in Figure III.2 below, the model estimates that 20.5 million adults in the working-age population suffered from growth retardation before reaching five years. Currently this would represent more than over 40% of the population aged 15-64, who are in a disadvantaged position as compared to those who were not undernourished as children.

FIGURE III.2
WORKING AGE POPULATION AFFECTED BY CHILDHOOD STUNTING, BY AGE
(In millions of people)



Source: Model estimations based on demographic information and WHO/NCHS/DHS nutritional surveys.

According to the information from the CAPMAS Labour Survey, two thirds of the working-age population in Egypt is involved in manual activities. The physical consequences of childhood stunting have affected these adults by reducing their productive capacity in manually intensive activities, as compared to people who were not affected by growth retardation as children. Additionally, the proportion of the population involved in non-manual activities, who were also affected by undernutrition, tends to have a lower educational level, and hence a lower productive level, than those who were properly nourished as children. The effect of these stunting levels on the productive capacity of the country will be analysed in the productivity section of the report.

iii. Effects on mortality

Child undernutrition can lead to increased cases of mortality most often associated with incidences of diarrhoea, pneumonia and malaria[38]. Nevertheless, when the cause of death is determined, it is rarely attributed to the nutritional deficit of the child, but to the illness that the child manifested. Given this limitation in attribution, the model utilizes relative risk factors[39] to estimate the risk of increased child mortality as a result of child undernutrition. Using these factors, abridged life tables[40] were used to estimate the incidence of higher mortality risk due to undernutrition.

[38] 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.

[39] *Ibid.*

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

Undernutrition makes children significantly more vulnerable to mortality; in the last 5 years alone, it is estimated that 28,102 child deaths in Egypt were directly associated with undernutrition. These deaths represent 11% of all child mortalities for this period. Thus, it is evident that undernutrition significantly exacerbates the rates of death among children and limits the country's capacity to achieve the MDGs, especially the goal to reduce child mortality.

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

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

Source: ECA on the basis of life tables provided by UN Population Division[41] and population data provided by CAPMAS.

This historical mortality rates will also have an impact on national productivity. The model estimates that an equivalent of 0.92% of the current workforce has been lost due to the impact of undernutrition in increasing child mortality rates. This represents some 353,000 people who would have between 15-64 years old, and part of the working age population of the country. In effect, besides this problematic reality, these 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 is a critical recurrent cost for the health system. Treating a severely underweight child for example, requires a comprehensive protocol[42] that is often most costly than the monetary value and effort needed to prevent undernutrition, especially when other diseases are present in parallel. The economic cost of each episode is often increased by inefficiencies when such cases are treated without proper guidance from a health-care professional or due to lack of access to proper health services. These costs generate a significant important burden not just to the public sector but to society as a whole.

It is estimated that 901,440 clinical episodes in Egypt in 2009, were associated with the higher risk present in underweight children. A indicates in Table III.3[43], these episodes generated an estimated cost of 1.14 billion EGP.

TABLE III.3
HEALTH COSTS OF UNDERNUTRITION-RELATED PATHOLOGIES, 2009
(In millions of EGP)

Pathology	Cost in millions of EGP	% of events	% of Cost
LBW/IUGR	515.8	13.7%	45.2%
Anaemia	447.7	11.3%	39.3%
ADS	32.3	2.2%	2.8%
ARI	3.0	0.6%	0.3%
Underweight	141.4	72.3%	12.4%
Total Cost	**1,140**		

Source: Estimations based of data provided by the National Implementation Team, DHS 2008, and cost analysis carried out by NIT.

[41] "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.

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

[43] Estimations based on data provided by the NIT, DHS 2008, and cost analysis carried-out by NIT

Most of these costs incurred were associated with the protocol required to bring an underweight child back to a proper nutritional status, which often requires therapeutic feeding[44]. An important element to highlight is the particular costs generated by the treatment of low birth weight children. These cases represented 14% of all the episodes but generated 45% of the total cost, making it the highest per capita element analysed. This is due to the special management protocol required by LBW children; implying hospitalization and often requiring time in intensive care[45].

A large proportion of costs related to undernutrition are borne 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 less than 20% of the episodes presented in these children receive proper health care. This disproportion in the distribution of episodes that do not receive proper health care is also reflected in the distribution of the health costs. Table III.4 summarizes the institutional (public system) and costs to caretakers of treating pathologies associated with undernutrition. In Egypt, it is estimated that families bear around 72% of the costs associated with undernutrition, 849 million EGP, while the cost to the health system was 321 million EGP, for a total of 1.17 billion EGP.

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

Pathology	Cost to families	Cost to system	Total Cost
Underweight	123	26	149
LBW/IUGR	222	294	516
ADS	32	0	32
Anaemia	470	0	470
ARI	3	0	3
Total Cost	**849**	**321**	**1,170**
% Total Cost	**73%**	**27%**	

Source: Estimations based on data provided by DHS 2008

Although the families of undernourished children are incurring most of the health costs related to undernutrition, the burden of this phenomenon is still an important expenditure component in the public sector. In 2009-2010, the annual estimated cost to the public sector was equivalent to 1.62% of the total budget allocated to health[46]. As a whole, the economic impact of undernutrition in health-related aspects was equivalent to 0.11% 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[47] that shows that students who were stunted before the age of five are more likely to underperform in school. As a result, undernourished children are faced with the challenge of competing favourably in school due to their lower cognitive and physical capacities than children who were able to stay healthy in the early stages of life.

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

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

[45] WHO. Integrated Management of Pregnancy and Childbirth. ISBN 92 4 159084 X. 2009

[46] WHO, National Health Accounts, Egypt

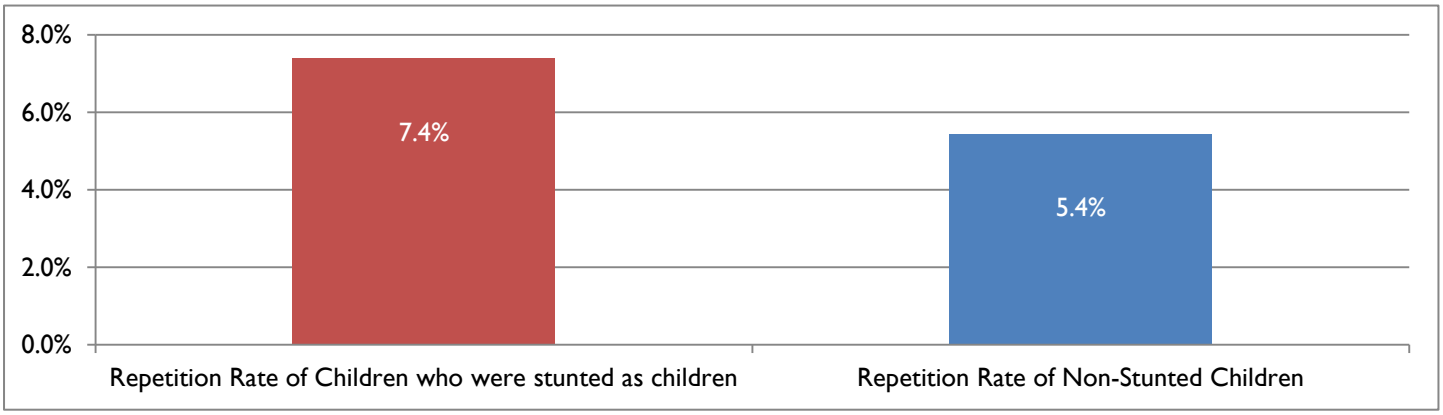
[47] Daniels M, Adair L., Growth in Young Filipino Children Predicts Schooling Trajectories through High School, 2004.

i. Effects on repetition

Children who suffered from undernutrition before five years of age are more likely to repeat grades, compared to those were not afflicted by undernutrition[48]. In Egypt in 2009, enrolment rates were relatively high, with an enrolment rate of 95% at primary education and 68%[49] for secondary education. Currently, there are an estimated 6.3 million stunted children of school age, equivalent to 33% of the total population aged between 6 and 18 years in the country.

Based on information provided by the Ministry of Education, the effective average repetition rate for public schools in the country was estimated at 6%, with over 830,603 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 7.4%, while the repetition rate for non-stunted children was estimated at 5.4%, establishing a differential risk of 2% for stunted children to repeat.

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



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

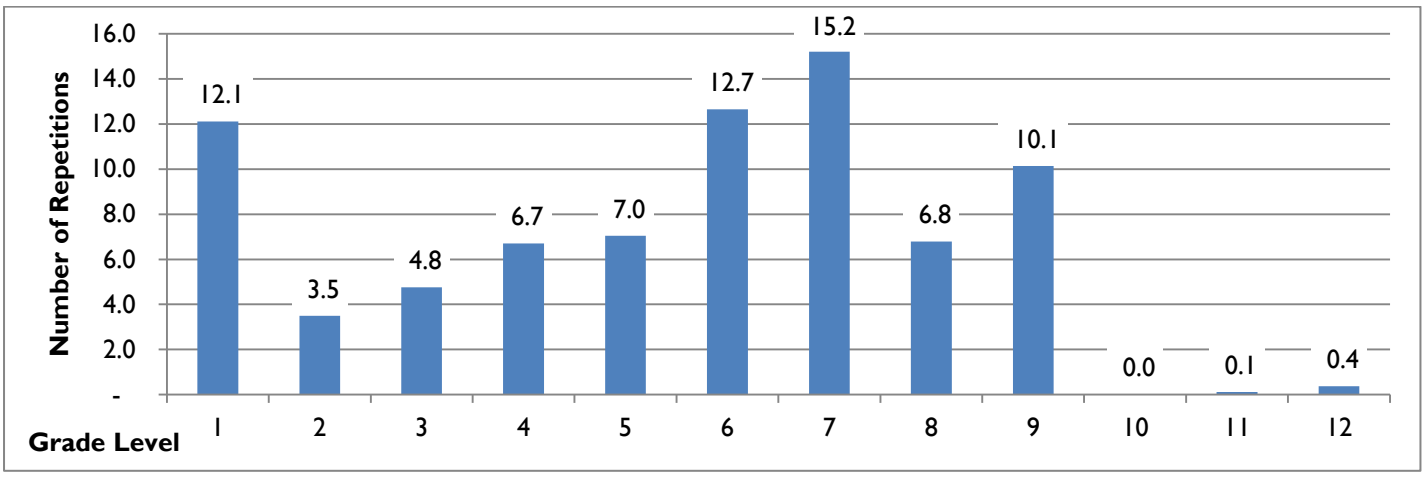
As a result, from the 830,603 cases of grade repetition reported by the Ministry of Education in the year 2009, 79,396 (9.6% of all cases), are estimated to be associated with the higher risk of stunted children of repeating grades. These children are currently generating an incremental cost to the education 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.

As shown in Figure III.4, most of these grade repetitions happen during the period of primary and preparatory school. There are far fewer children who repeat grades in secondary school. This is largely due to the fact that many stunted children would have dropped out of school before reaching secondary education.

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

[49] UNESCO, Institute of Statistics, 2010.

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



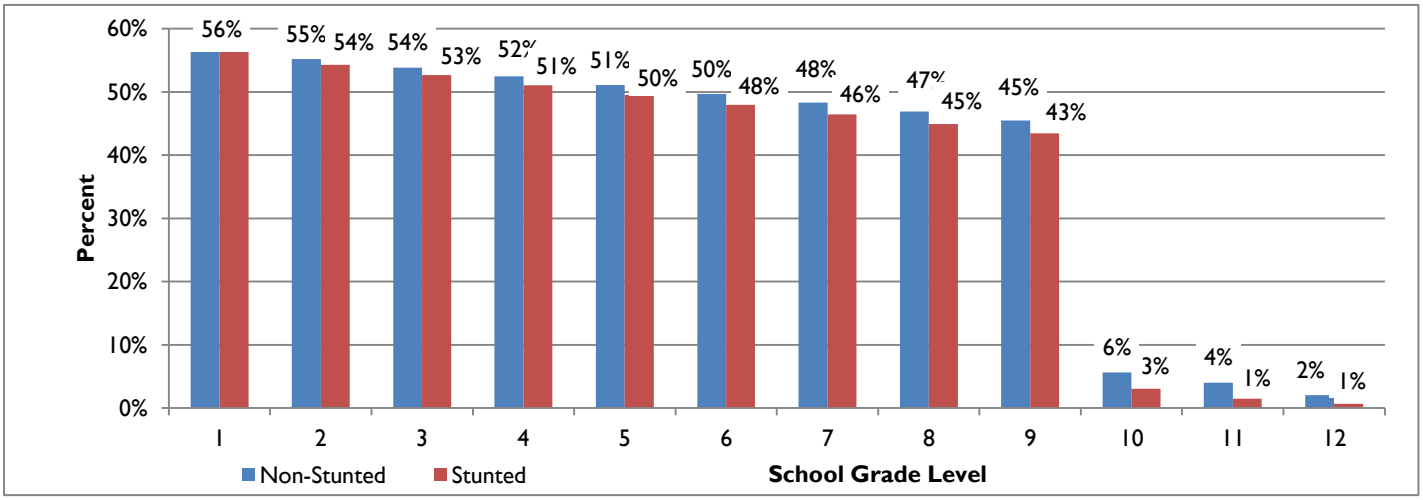
Source: Estimations based on data provided by NIT (Ministry of Education – Education Management Information System for 2009

ii. Effects on retention

The costs associated with school dropouts are reflected in the productivity losses experienced by individuals searching for opportunities in the labour market. As such, the impact is not reflected in the school age population, but in the Working Age Population (WAP), particularly in non-manual activities. Hence, in order to assess the social and economic costs in 2009, the analysis required focus on the differential in schooling levels achieved by the population who suffered from stunting as children and the schooling levels of the population who was never stunted.

Among the population of students who suffered from child stunting, fewer children reached secondary school. According to available data and relative risks of the consequences of stunting on education, it can be estimated that 6% of non-stunted children reached secondary school, while only 3% of stunted children enrolled in secondary school. Similar trends are observed in secondary school, where an estimated 2% of non-stunted children completed secondary school, while less than 1% of stunted students completed secondary school. Figure III.5 below shows the estimated grade achievement, based on students' nutritional status.

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



Source: Estimations based on data provided by NIT[50]

[50] CAPMAS, Household Income, Expenditure and Consumption Survey (HIECS) 2010/2011, February 2012.

iii. Estimation of public and private education costs

Repetition in schooling years has direct cost implications to families and the school system. Consequently, in 2009, the 79,396 students who repeated grades due to undernourishment incurred a cost of 271 million EGP. The largest proportion of repetitions occurred at primary school level, where the cost burden falls mostly on the public education system. However, unit costs are significantly higher for repetitions in secondary school. The following chart summarizes the public and private education costs associated with stunting.

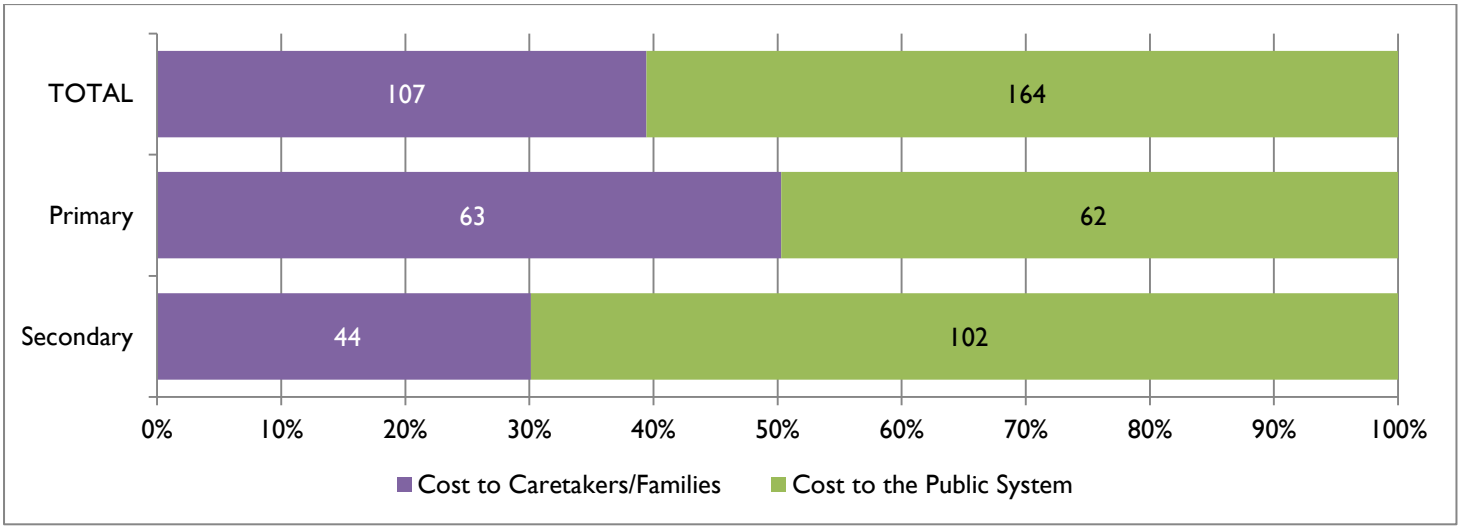
TABLE III.5
COSTS OF GRADE REPETITION ASSOCIATED WITH STUNTED CHILDREN, 2009

	Primary	Secondary	Total
Public Costs per student (EGP)	1,329.4	3,118.4	
Private Costs per student (EGP)	1,344.8	1,344.8	
Number of repetitions	46,762	32,634	79,396
Total Public Costs (millions of EGP)	62.2	101.8	163.9
Total Private Costs (millions of EGP)	62.9	43.9	106.8
Total (millions of EGP)			270.7
% Social expenditure on education			0.0006%

Source: Estimations based on education statistics of Ministry of Education (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 overall costs, a total of 106 million EGP (39%) are being covered by the care takers, while 163.9 million EGP (61%) is borne by the public education system. Nevertheless, the distribution of this cost varies depending on whether the child repeated grades in primary or secondary education. In primary education, the families cover over 50% of the associated costs of repeating a year, whereas in secondary the burden on the families is reduced to 30%, and the government carries the biggest proportion (70%) of the associated cost to education.

FIGURE III.6
SOCIAL DISTRIBUTION OF COSTS FOR REPETITIONS
(In millions of EGP)



Source: Model estimations.

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

Child undernutrition affects human capital and productivity in several dimensions[51]. 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 manually intensive activities than those have not been affected by growth retardation. Moreover, the population lost due to child mortality hinders economic growth, as these people could have been healthy productive members of the society.

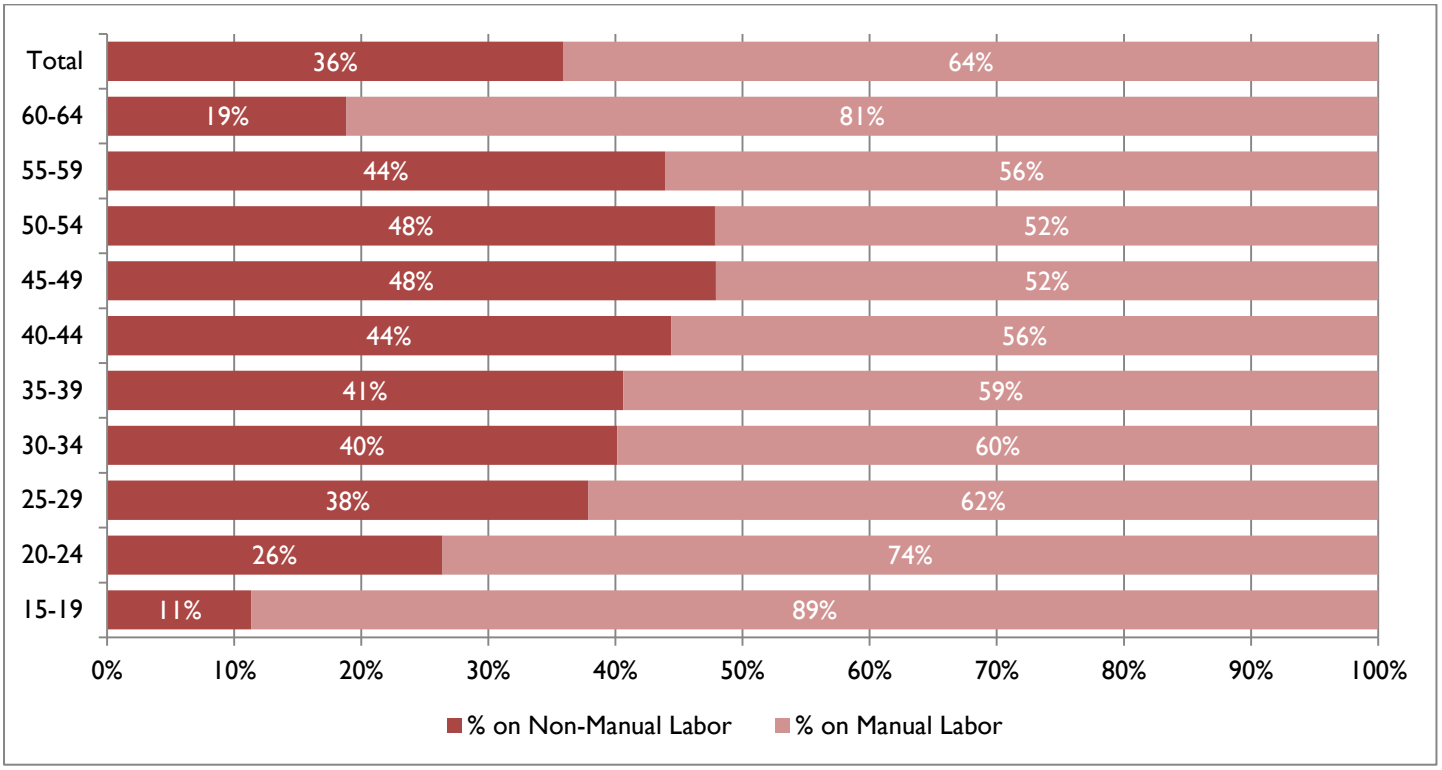
The estimation of the population whose labor productivity is affected as a consequence of having suffered from child undernutrition is based on historical nutritional information, in-country demographic projections, and data reported in the Egypt Household Income, Expenditure and Consumption Survey (HIECS) from 2009. 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 in labor productivity are the result of the differential income associated with lower schooling in non-manual activities, and the lower productivity associated with stunted children in manually 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. Loss from non-manual activities due to reduced schooling

The distribution of the labor market is an important contextual element in determining the impact of undernutrition on national productivity. As shown in Figure III.7, engagement in manual labor seem to be more common amongst younger groups (15 to 24 years), while non-manual activities seem to be more common amongst those aged 25 to 59 years old. Overall, the proportion engaged in non-manual activities is consistently lower; in 2009, 16.7 million people were involved in non-manual activities.

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



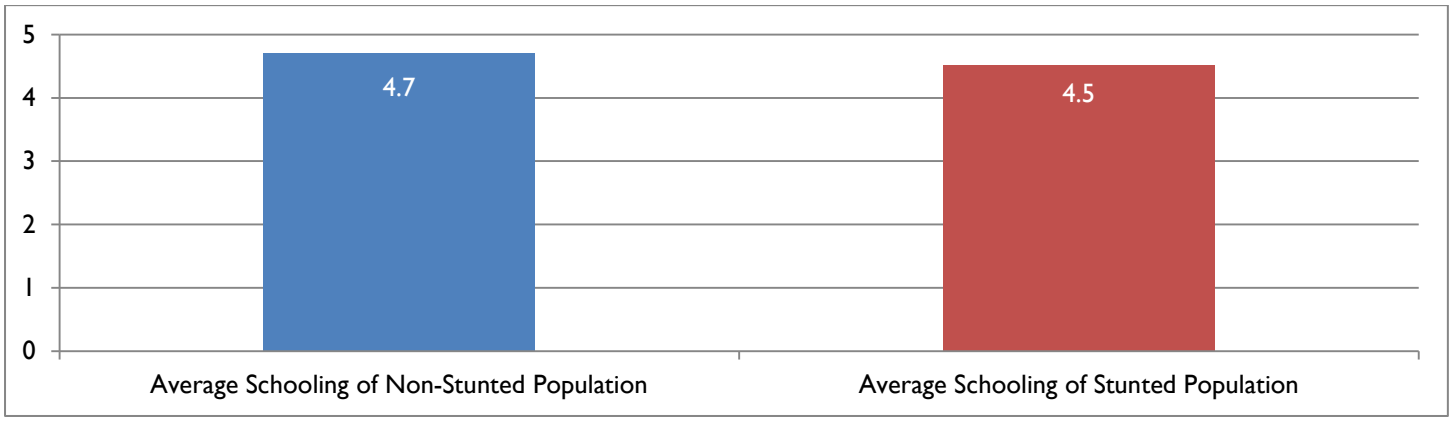
Source: Estimated from Egypt Labour Force Survey 2009, CAPMAS

[51] Alderman H., et al. Long-Term Consequences of Early Childhood Malnutrition. FCND Discussion Paper No. 168 IFPRI, 2003.

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

Based on information from the HIECS, it is estimated that the educational gap between the stunted and non-stunted population is 0.2 years. As shown in Figure III.8, the average schooling level of a person who has not suffered from stunting is 4.7 years, compared to a person who suffered from childhood stunting, who would achieve on average 4.5 years of schooling. It is important to note that the data shows that over time there has been an improvement in the average years of schooling of the population. Whereas the cohort from 60-64 years shows an average level of school education of 1.8 years, the cohort aged 20-24 shows an average of 7 years of education.

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



Source: Estimated from Egypt HIECS 2009, CAPMAS and relative risk ratios.

The lower educational achievement of the stunted population has an impact on the expected level of income a person would earn as an adult. A presented in table III.6, the model estimates that 7.2 million people engaged in non-manual activities suffered from childhood stunting. This represents 6.3% of the country's labour force that is currently less productive due to lower schooling levels associated with stunting. The estimated annual losses in productivity for this group are 2.7 billion EGP, equivalent to 0.3% 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 *(In thousands of people)*	Income Losses in non-manual labour *(In millions of EGP)*
15-24	1,354	685
25-34	1,947	1,003
35-44	1,674	715
45-54	1,483	230
55-64	724	26
Total	**7,182**	**2,659**
% GDP		**0.3%**

Source: Model estimations based on HIECS 2009 CAPMAS and DHS 2008.

ii. Losses in manual intensive activities

Manually intensive activities are mainly observed in the agricultural, forestry and fishing subsectors, which employ more than 64% of the population. In these types of activities, people who were stunted as children are less physically capable than those who did not suffer from growth retardation. As such, those who were stunted as children are expected to be less productive[52].

The model estimates that 33.5 million Egyptians are engaged in manual activities, of which 13.7 million were stunted as children. This represented an annual loss that surpasses 10.7 billion EGP, equivalent to 1.03% of the GDP, in potential income lost due to lower productivity (Table III.7).

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

Age in 2009	Population working in manual labour who were stunted as children *(In thousands)*	Loss in productivity due to stunting *(In millions of EGP)*
15-24	5,791	4,793
25-34	2,928	2,719
35-44	2,128	1,594
45-54	1,481	964
55-64	1,372	662
Total	**13,701**	**10,732**
% GDP		**1.03%**

Source: Estimations based on data from CAPMAS and WHO/NCHS Database information and relative risk information.

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 with undernutrition. The model estimates that the 352,813 people from the working-age population that could have been part of the economy in 2009, could have increased national productivity by over 857 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) are 5.4 billion EGP, which represented 0.52% of the country's GDP.

TABLE III.8
PRODUCTIVITY LOSSES DUE TO INCREMENTAL CHILD MORTALITY

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

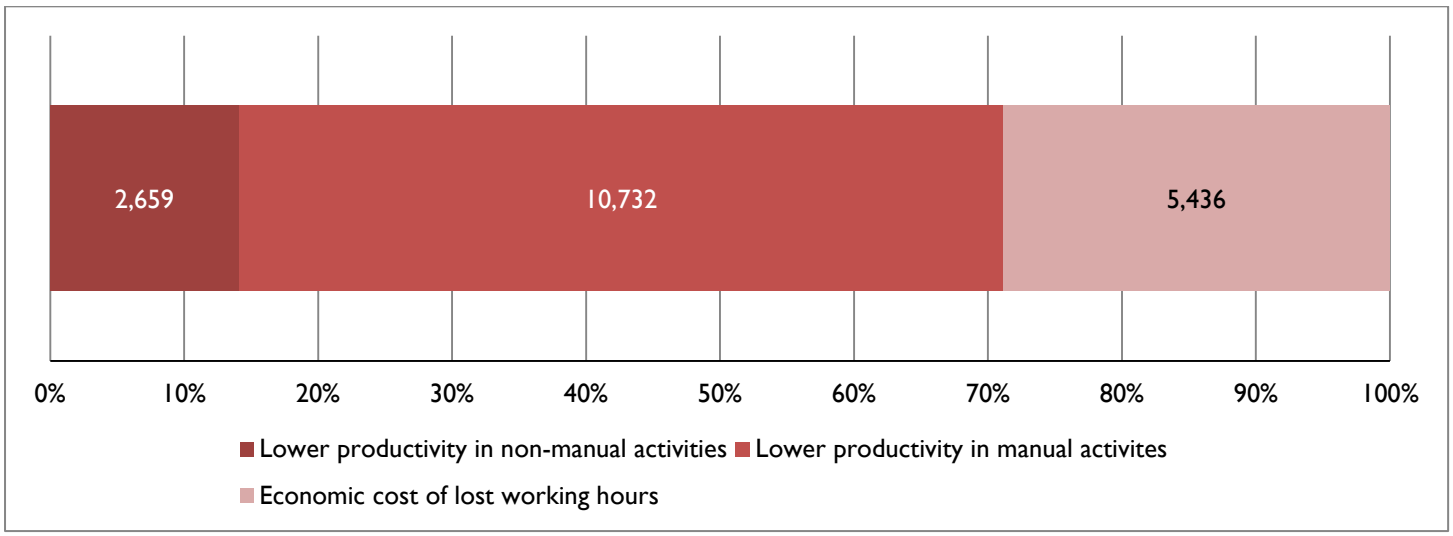
Source: Model estimations based on data from CAPMAS and DHS Health surveys.

52 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.

iv. Overall Productivity Losses

The total losses in productivity for 2009 are estimated at approximately 18.8 billion EGP, which is equivalent to 1.8% of Egypt's GDP. As presented in Figure III.9, the largest share of productivity loss is due to reduced productivity in manual activities which represents 57% of the total cost. The lost working hours due to the higher mortality risk of underweight children, represents 29% of the cost, and the income differential in manual labourdue to the lower physical and cognitive capacity of people who suffered from growth retardation as children represents 14% of the total costs.

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



Source: Model Estimations

D. Summary of effects and costs

The methodology adopted in this study, allowed for an analysis of the impact of child undernutrition at different stages in the life cycle, without generating overlaps. As a result, the individual sectoral costs can be aggregated to establish a total social and economic cost of child undernutrition.

For Egypt, the total losses associated with undernutrition are estimated at 20.3 billion EGP, or $US 3.6 billion for the year 2009. These losses are equivalent to 1.9% of GDP for that year. The highest element in this cost is the loss in potential productivity in manual activities associated with stunting.

Due to the multi-causal phenomenon of grade repetition, the direct costs to education tend to be the lowest of the 3 sectors. Nevertheless, the potential gains in productivity for maintaining children in school are currently 13% of the total cost which still indicates an important productivity gain to be made from investment in school retention mechanisms.

TABLE III.9
SUMMARY OF COSTS, 2009

	Episodes	Cost in millions of EGP	Cost in millions of $US dollars	Percentage of GDP
Heath Costs				
LBW and Underweight	775,217	665	120.9	
Increased Morbidity	126,223	505	91.8	
Total for Health	901,440	1,170	213	0.11%
Education Cost				
Increased Repetition - Primary	46,762	125	22.7	
Increased Repetition - Secondary	32,634	146	26.5	
Total for Education	79,396	271	49.2	0.03%
Productivity Costs				
Non-Manual Activities	7,182,482	2,659	483.5	
Manual Activities	13,700,990	10,732	1,951.3	
Lost Working Hours	352,813	5,436	988.4	
Total for Productivity	21,236,285	18,827	3,423	1.81%
TOTAL COSTS		**20,268**	**3,685**	**1.9%**

Source: Model estimations

Section IV: Analysis of Scenarios

IV Analysis of Scenarios

The previous chapter showed the social and economic costs that affected Egypt in 2009 due to high historical trends of child undernutrition. Many of these costs are already cemented in society and policies must be put in place to improve the lives of those already affected by childhood undernutrition. However, it is even more important to prevent such costs in the future by putting in place mechanisms prevent them. Currently, three out of every ten children under-five in Egypt are stunted.

This section analyses the impact that a reduction in child undernutrition could have on the socio-economic context of the country. The results presented in this section project the additional costs to the health and education sectors as well as losses in productivity that Egyptian children would bear in the future, and the potential savings that could 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 society.

The model can generate a baseline for various scenarios, based on nutritional goals established in each country. These scenarios, which are agreed upon with the NIT in Egypt, can be used to advocate for increased investment in proven nutritional interventions.

These scenarios are constructed based on the estimated net present value of the costs of undernutrition related to the numbers of 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.

The scenarios developed for this report are as follows:

1. **Baseline. The Cost of Inaction. No action taken to halt recent rises in stunting over the last 10 years.**

   In this scenario, the prevalence of undernutrition remains at 2009 levels. According to the 2008 DHS the stunting rate in children under five Egypt is 28.9% (where stunting prevalence of 20–29% is "medium", 30–39% is "high" and 40% is "very high" according to WHO cut-off values for public health significance). Although highly unlikely, it serves as a basis for estimating the saving for scenarios of change.

2. **Scenario #1. Cutting by Half the Prevalence of Child Undernutrition by 2025.**

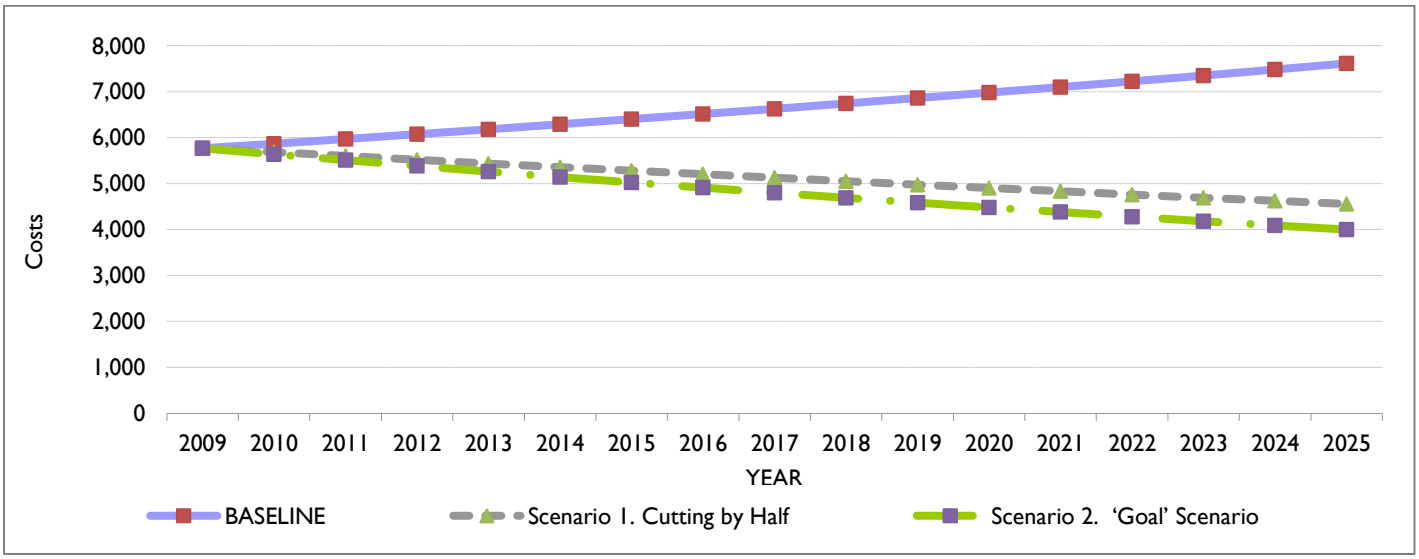
   In this scenario, the prevalence of underweight and stunted children would be reduced to half of the 2009 value. In the case of Egypt this would mean a constant reduction of 0.96% points annually in the stunting rate, from 30.7% (estimate for 2009) to 15.4% in 2025. With the right combination of proven interventions, this scenario would be achievable, as the prior rate of reduction for stunting is estimated at 0.76%, which is very close to the progress rate required in achieving these scenarios. Nevertheless, for the period 2005-2008, the country has faced a setback in progress at a rate of -2.3%, which appears to indicate the stronger investments are required to go back to a positive trend.

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 would be reduced to 10% and the prevalence of 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 constant reduction of 1.2% annually to be achieved. Considering the progress that Egypt has achieved in the past, it might be a feasible goal for the near future.

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

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



In the baseline, where child undernutrition would remain at the level of 2009, the associated cost would increase by 32% from 5.76 to 7.6 billion EGP, in the period up to 2025, as shown in Table IV.1. In Scenario #1, in which a reduction of half of the current prevalence is achieved, the cost would reduce to by some 20% to 4.56 billion EGP, and in the case of the Goal Scenario, there would be just over a 30% reduction in the estimated costs, to some 3.99 billion EGP.

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

	2009	Scenarios for the Year 2025		
		Baseline	S1. Cutting by Half	S2. Goal Scenario
Heath Costs				
Increased Morbidity	553	742	452	452
Education Cost				
Increased Grade Repetition	75.8	100.0	49.8	34.5
Productivity Costs				
Lower Productivity in Non-Manual Activities	845	1,115	453	299
Lower Productivity in Manual Activities	1,920	2,534	1,267	877
Lower Productivity due to Mortality	2,365	3,122	2,335	2,335
Total Costs	**5,759**	**7,613**	**4,557**	**3,997**

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 reduction in clinical cases in the health system, lowered grade repetition and improved educational performance as well as physical capacity are elements that contribute directly to the national productivity.

As presented in Table IV.2, cutting undernutrition by half by 2025 would represent a reduction in costs of 11.7 billion EGP, equivalent to $US2.1 billion 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 as progress in being achieved, a simple average of the annual savings would represent $US133 million per year. In the case of the Goal Scenario, the savings would increase to 14.5 billion EGP, or $US2.6 billion, which represents a simple average of $US165 per year.

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

	Cutting Undernutrition by Half by 2025	Goal Scenario
Heath Costs		
Reduced Morbidity	1,091	1,091
Education Cost		
Reduced Grade Repetition	195	270
Productivity Costs		
Higher Productivity in Non-Manual Activities	2,655	3,484
Higher Productivity in Manual Activities	4,917	6,817
Increased Working Hours	2,850	2,853
Total Savings	**11,709**	**14,515**
Total Savings in millions of $US	**2,129**	**2,639**

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

Section V:
Conclusions and Recommendations

V Conclusions and Recommendations

A. Child Undernutrition: Implications for Egypt's social and economic development

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 to Egypt, opening the way for increased understanding of its consequences.

Its results strongly suggest that in order for the country to achieve sustainable human and economic growth, special attention must be given to the early stages of life as the foundation of human capital. The results of the study are supported by a strong evidence base, and a model of analysis 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 equivalent 1.1 billion EGP (USD 213 million). These costs are due to episodes directly associated with the incremental quantity and intensity of illnesses that affect underweight children and the protocols necessary for their treatment. It is also important to note that only 1 out of every 5 children is estimated to be receiving proper health attention. As health coverage expands to rural areas, there will be an increase in people seeking medical attention; this can potentially affect the efficiency of the system to provide proper care services. This study illustrates that a reduction of child undernutrition could facilitate the effectiveness of this expansion by reducing the incremental burden generated by the health requirements of underweight children.

Furthermore, the study estimates that **11% of all cases of child mortality in Egypt are associated with the higher risk of undernutrition.** Hence, a preventive approach to undernutrition can help reduce this 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 in increase competitiveness and innovation. This represents an interesting opportunity in Egypt where the population under 15 years is estimated to be 31% 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 dropout must be addressed. As there is no single cause for this phenomenon, a comprehensive strategy must be put in place that looks at improving the quality of education and the conditions required for school attendance. The study demonstrates that stunting is one of the major contributing factors to impaired cognitive and physical development that negatively impacts academic performance, which when addressed efficiently can improve scholastic achievements and hence individuals' future labour opportunities.

The study estimates that children who were stunted experienced a 2% higher repetition rate in school. As a result, 10% of all grade repetitions in school are associated to the higher incidence of repetition that is experienced by stunted

children. 59% of these cases of grade repetition occur in primary school. These numbers suggest that a reduction in the stunting prevalence could also support an improvement in schooling results, as it would reduce preventable burdens to the education system.

On the 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 and thus avoiding the associated loss in physical and cognitive capacity that hinders individual productivity, people can be provided with a more equal opportunities for success.

The study estimates that 41% of the working age population in Egypt is stunted. This population has achieved on average 0.2 years of lower schooling levels than those who did not experience growth retardation. As the country continues to urbanize, and an increasing number of people participate in skilled employment, this loss in human capital will be reflected in a reduced productive capacity of the population. Thus, it may be a particularly crucial time to address child undernutrition and prepare future youth for better employment by prioritizing the reduction of stunting in Egypt'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 EGP 732 million (USD 133 million).** An additional scenario shows that a **reduction to 10% stunting and 5% underweight for that same period could yield annual average savings of EGP 907 billion (USD 165 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. Egypt'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 for Africa. The contributions of the Egypt National Implementation Team (NIT) will serve to facilitate the expansion of this tool in the continent.

Although the Cost of Hunger study is an important step forward in this type of analysis, there are still important questions left unanswered. Egypt is currently facing **an increased prevalence of non-communicable diseases**, such as strokes, heart attacks, and diabetes (which is also affecting children) which in many cases are a consequence of malnutrition, particularly obesity. These consequences have not been addressed as part of this analysis which implies that the health cost of undernutrition could have been underestimated in this framework and that the actual impact is indeed higher than the values presented.

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

B. Recommendations of the study

This study presents some key initial findings of the Cost of Hunger in Egypt, as well as both challenges and opportunities to the country regarding the reduction of child undernutrition. **The study estimates the economic and social cost of child undernutrition at 20.3 billion EGP**. Without measures to combat and eliminate undernutrition, this cost is expected to increase by **about 32% by 2025 to reach to 26.8 billion EGP**. That is an additional cost of an estimated 6.5 billion EGP of not taking any steps to address undernutrition among children under five; a situation that requires urgent and systematic response, prioritizing malnutrition in the national health agenda and within the context of a broader development framework.

A clear recommendation of this study is that **Egypt must review its national development frameworks to ensure that the reduction of the stunting prevalence is a key outcome indicator for social and economic development policies**. Chronic child undernutrition can no longer be considered a sectoral issue, as both its causes and solutions are linked to social policies across numerous sectors. As such, stunting reduction will require interventions from the health, education, social protection and social infrastructure perspectives. Reducing stunting can be an effective indicator of success in larger social programs. **To target stunting and ensure evidence-based responses, a better understanding of its underlying causes is required**. Stunting reduction can be an effective indicator of success in larger social programs. This study encourages countries not to be content with "acceptable" levels of stunting; equal opportunity should be the aspiration of every country on the continent. In this sense, it is **recommended that aggressive targets are set in Egypt for the reduction of stunting that go beyond proportional reduction, to establish an absolute value as the goal at 10%**. More specifically, **investment should be increased in combatting undernutrition during the first 1000 days of a child's life**, including through improved availability and access to nutrient-dense complementary foods for children aged 6 to 23 months old.

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

A priority area for enhancing the national capacity to address malnutrition is **to improve monitoring and evaluation systems and clearly link these to prevention interventions**. Currently, assessments of the prevalence of child nutrition are carried-out periodically, between every 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 under 2 years of age, these results will provide information to policy makers and practitioners on the results being achieved in the implementation of social protection and nutrition programmes. In practical terms, this may be achieved by strengthening a national nutrition surveillance system that facilitates evidence-based interventions, and is complemented by ensuring that the effectiveness of preventative interventions is adequately evaluated.

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

A key element of addressing stunting is prevention. It is important to consider, in high prevalence areas, **increasing focus on precautionary and prevention policies**, alongside therapeutic support, to reduce the prevalence of child undernutrition. From the health perspective, there are several actions that can be implemented or expanded to achieve this goal. Particular attention can be given to mothers and caretakers that might improve care practices, such as providing health awareness programs for females, particularly before marriage and pregnancy, and increasing the role of female health enumerators in rural areas to ensure that that they transfer health and nutrition awareness for women in the pregnancy age, to protect them from malnutrition and provide them with necessary information to prepare healthy complete meals for their families. An important

action can be investing in a communication strategy and programmes for behaviour change by the Ministry of Health, that also include messages to inform vulnerable families of nutritious low budget foods. Infant and young feeding practices should also be considered as part of a complete health package.

Schools can also serve as good platform for behaviour change communication for future generations through nutrition and health education, as well as for health check-ups and screening. Nutritional awareness materials can be introduced into the school curriculum, while strengthening health and nutrition training for teachers will be key to delivering this. More specifically, targeting school girls in this area is critical, as those girls will be future mothers and shall bear much of the responsibility of raising a family and overseeing feeding practices for them. Additionally, periodic check-ups and screening by health professionals on the nutritional status of children in schools, particularly for anaemia, can also help determine the effectiveness of the interventions and the need to adjust activities. The national school feeding programme overseen by the Ministry of Education that currently reaches 5.3 million of an estimated 17 million students, serves as a good incentive for school enrolment and retention, as well as a safety net in food insecure communities.

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

From a market perspective, there are also policies that can be analysed and potentially contribute to an enabling environment for the elimination of child undernutrition. One option to address the poor access to a diverse diet to pregnant and lactating women in geographical areas of high vulnerability, is the provision of healthier food commodities that supply a portion of the nutritional intake required. This could be done through monetary top-up to existing subsidized commodities that are made available in-kind. Innovative targeting approaches should be considered including categorizing the subsidy system to offer food baskets by beneficiary/age group, noting however that this would add an additional financial and administrative burden to the existing subsidy system; instead index-linked cash and voucher options could be considered as a complementary option. In a context of high volatility in the market and macroeconomic instability, mechanisms that limit the variation of food prices can be considered, particularly for healthy foods, such as fruits, vegetables, dairy products and pulses. As part of efforts to combat stunting during the first 1000 days of a child's life, these market policies must consider actions to emphasize the importance of exclusive breastfeeding for children under 6 months, and continued to 2 years, and avoid its replacement with milk formula. A parallel focus on strengthening health education for optimal child weaning practices is critical.

From an agricultural and production perspective, it is important to **revise the agriculture policies and food commodities that are consumed by children, including ensuring basic standards are complied with in food fortification, particularly better control in salt iodization**. Outreach-oriented interventions should be encouraged and monitored in order to assess efficiency and scalability, as well as analyse lessons learnt from programmes with food intervention components; particularly those targeted by geographic areas, i.e. Upper Egypt, or special population groups, i.e. pregnant and lactating mothers.

The level of engagement of the private sector in eliminating stunting can also be a factor of success. Special incentives can be analysed to **encourage Corporate Social Responsibility** in supporting NGOs that are implementing effective nutrition interventions. Additionally, encouraging the private sector and the media to develop nutrition awareness campaigns can have an important impact in improving overall care practices. Such campaigns need to be properly guided to ensure proper messaging and targeting for different beneficiary groups. Finally, interaction with the private sector to agree on making mandatory, by law, the fortification of specific commodities can also represent an important mechanism to reduce vitamin and mineral deficiencies.

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

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

Index	Source
First Economic data	
Gross Domestic Product	International monetary fund data for 2009.
$US exchange rate	International monetary fund data for 2009.
Purchasing power parity	International monetary fund data for 2009.
Social Expenditure	Ministry of finance, Egyptian Economic Monitor, December 2010.
Health Expenditure	World Health Organization.
Education Expenditure	Ministry of finance, Egyptian Economic Monitor, December 2010.
Average transport cost (two public transportation tickets in urban areas in local currency)	Central Agency for Public Mobilization and Statistics (CAPMAS), Household Income, Expenditure and Consumption Survey (HIECS) 2008/ 2009, Table 2-2.
Minimum wage per hour	Egyptian Cabinet, Information and Decision Support Center, Egyptian Food Observatory, the vulnerable household's survey.
Average wage per hour	CAPMAS, Labour Force Survey (LFS), 2009.
Annual Consumer price index	CAPMAS data, (data were obtained by special request).
Average income per years of schooling	CAPMAS, LFS, 2009.
Annual average income related to productive work, manual intensive activities (Agriculture, Forestry, Fishery, Mining) by age	Calculated based on CAPMAS, HIECS 2008/ 2009, and LFS 2009 data.
Annual average income related to productive work, NON manual intensive activities (Excluding Agriculture, Forestry, Fishery, Mining) per years of schooling and age	Calculated based on CAPMAS, HIECS 2008/ 2009, and LFS 2009 data.
Average working hours per week	Calculated from LFS 2009 data.
Annual worked hours per age group	Calculated from LFS 2009 data based on average working hour per week multiplied by number of weeks in the year.
Employment rate	Calculated based on CAPMAS LFS 2009 data.
Second Demographic Data	
Volume of Births	CAPMAS, births and deaths bulletin.
Death rate	CAPMAS, births and deaths bulletin.
Distribution of workers by Manual and Non-Manual Labor per age group	Calculated from CAPMAS LFS 2009 data.
Distribution of workers by educational status	Calculated from CAPMAS LFS 2009 data.
Working age population (WAP) by educational level	Calculated from CAPMAS LFS 2009 data.
Third Health Data	
Underweight prevalence for the year of analysis or last available.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Stunting prevalence for the year of analysis or last available.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.

Index	Source
Underweight prevalence of children under 5 years old	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Underweight mode prevalence	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Stunting prevalence of children under 5 years old	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Stunting mode prevalence	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Number of annual disease events (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group	Estimated by health specialists and experts through in-depth interview.
Average number of primary care visits for each pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group	Estimated by health specialists and experts through in-depth interview.
Proportion of events of pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group requiring hospitalization	Estimated by health specialists and experts through in-depth interview.
Average number of days of hospital treatment for each event (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group	Estimated by health specialists and experts through in-depth interview.
Proportion of events of pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group requiring intensive treatment (ICU)	Estimated by health specialists and experts through in-depth interview.
Average number of days of intensive treatment UTI / UCI for each event (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group	Estimated by health specialists and experts through in-depth interview.
Average waiting time spent at primary care attention (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group	Estimated by health specialists and experts through in-depth interview.
Daily hours lost due to hospitalization (anaemia, ADS, ARI, Stunting, Underweight, Wasting) by Age group	Estimated by health specialists and experts through in-depth interview.
Average unit cost for attention in primary care by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.
Average cost of medical inputs for event in primary care by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.
Average unit cost for attention in hospital by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.
Average cost of medical inputs for event in hospital by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.
Average unit cost for attention in hospital intensive care unit by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.
Average cost of medical inputs for event in hospital intensive care unit by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.

Index	Source
Average unit private cost by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.
Average private cost of medical inputs for event by age group and pathology (anaemia, ADS, ARI, Stunting, Underweight, Wasting), for the year of analysis (x) in local currency,	Estimated by health specialists and experts through in-depth interview.
Percentage of low birth weight children	Egypt Demographic Health survey 2008
Proportion of events of LBW requiring/access hospitalization	Estimated by health specialists and experts through in-depth interview.
Average number of days of hospital treatment	Estimated by health specialists and experts through in-depth interview.
Proportion of events of LBW requiring intensive treatment UTI / UCI	Estimated by health specialists and experts through in-depth interview.
Average number of days of intensive treatment	Estimated by health specialists and experts through in-depth interview.
Average waiting time (in hours) spent by an adult accompanying a child patient requiring hospitalization	Estimated by health specialists and experts through in-depth interview.
Fourth Education Data	
Initial enrolment by years of education	Data were obtained from Ministry of Education.
Final enrolment by years of education	Data were obtained from Ministry of Education.
Number of passes by years of education	Data were obtained from Ministry of Education.
Number of dropouts (rate) by years of education	Data were obtained from Ministry of Education.
Number of population repeating grades (rate) by years of education	Data were obtained from Ministry of Education.
Private cost per student / year by educational grade	Data were obtained from CAPMAS HIECS 2008/ 2009 data and were assumed constant for different grades.
Total Number of students year 2009	Ministry of Education, Statistical Yearbook.
Public cost per student	Estimated based on "Education Public Expenditure Tracking Survey (PETS)" prepared by ministry of finance, ministry of education and the European Union, December 2009.
Morbidity differential probability for anaemia among healthy versus underweight children by age groups.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Morbidity differential probability for ADS among healthy versus underweight children by age groups.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Morbidity differential probability for ARI among healthy versus underweight children by age groups.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Morbidity differential probability for anaemia among healthy versus stunted children by age groups.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Morbidity differential probability for ADS among healthy versus stunted children by age groups.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Morbidity differential probability for ARI among healthy versus stunted children by age groups.	Calculated from Egypt Demographic Health Survey data, 2005 and 2008.
Probability ratio of death between those who suffered from undernutrition	Calculated from Egypt Demographic Health Survey data 2008.

Index	Source
Probability ratio of death between those who suffered from stunting.	Calculated from Egypt Demographic Health Survey data 2008.
Higher Probability (relative risk) of stunted of repeating grades.	Calculated from SYPE 2009 data.
Higher Probability (relative risk) of stunted of dropping out.	Calculated from SYPE 2009 data.
Monthly hours worked.	Calculated based on Working hour average per week which was calculated from CAPMAS LFS 2009 data.
Average travel time for ambulatory care.	Calculated from SYPE 2009 data.

Annex 3. Brief Description of COHA Data Collection Process

The process of the COHA in Egypt was initiated with a training of the National Implementation Team, held in Cairo in January 2011, with the participation of experts from IDSC, the National Nutrition Institute, Ministry of Agriculture and Ministry of Health. The data collection, processing and analysis were led by IDSC in collaboration with CAMPAS, and with support from the WFP Country Office. Most of the data was collected from secondary data sources; however, a survey amongst health practitioners was conducted for the health protocols and costs portion of the model.

The data used in the study and the preliminary results were validated and nationally specific recommendations were produced, by high-level national stakeholders at a validation workshop held in February 2013, in Cairo.

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