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FNRI-DOST

COST OF HUNGER: PHILIPPINES

The Economic Impact of Child Undernutrition on Education and Productivity in the Philippines

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ACRONYMS

ADS	Acute diarrheal syndrome
ARI	Acute respiratory infection
DepEd	Department of Education
DHS	Demographic Health Survey
DOLE	Department of Labor and Employment
FNRI-DOST	Food and Nutrition Research Institute of the Department of Science and Technology
GDP	Gross Domestic Product
IUGR	Intrauterine growth restriction
LBW	Low birth weight
NNS	National Nutrition Survey
PSA	Philippine Statistics Authority
SDGs	Sustainable Development Goals
UN	United Nations
WHO	World Health Organization
WHO-CGS	World Health Organization Child Growth Standards

Executive Summary

Malnutrition should be everyone's business.

The cost of undernutrition is a burden shouldered not only by one third of Filipino children, but by the entire nation. Beyond the health implications for each individual child, malnutrition hinders a child's capability to achieve his/her full potential as a learner and his/her future productivity as a worker and a contributor to the Philippines. Thus, malnutrition has an economic cost to all of us. This report has calculated the economic impact of childhood stunting on the educational system, and also on the overall productivity of the Philippine economy.

Undernutrition puts children's cognitive development and educational performance at risk. Studies show that children who are stunted (low height-for-age) at 12-36 months of age have poorer cognitive performance and lower grade level attainment. By the age of 60 months, the cognitive impact of stunting is irreversible. Children who are stunted in the first two years of life are more likely to repeat grade levels, drop out of school, and delay school entry. They are also more likely not to finish secondary education. Members of the working age population who experienced childhood stunting have lower income levels. In addition, child deaths result in a loss of income for both the family and the country.

How much does child undernutrition cost the Philippines?

The results of this study reveal that education and productivity losses as a result of child undernutrition amounted to a total of PhP328 billion in 2013. This is equivalent to 2.84% of our country's gross domestic product (GDP) of the same year.

Cost to Education

Based on the Department of Education's annual reports, 330,418 students repeated a grade level during the academic year 2013-2014. We found that an estimated 48,597 of these students – 15% of the repeater population – had repeated a grade level as a result of under five stunting. An additional PhP1.23 billion was required to cover the costs of grade level repetitions for these stunted children. Of this cost, 43% was shouldered by the families, while the remaining was shouldered by the public education system.

Cost to Productivity

Stunting costs the Philippines an estimated PhP326.5 billion in lost productivity in the workforce.

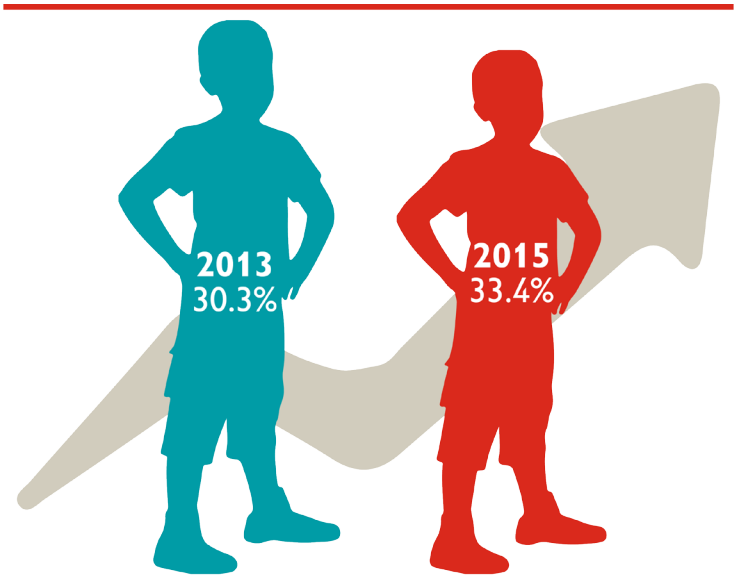
Lost productivity is composed of two elements: reduced productivity among the stunted work force, and the complete loss of productivity due to premature under five child deaths linked to undernutrition.

An estimated 838,000 deaths occurred before the age of five years old among children who would have been members of the 2013 working-age population (15-64 years of age). If these deaths had been averted, the Philippines would have boosted its productivity by PhP160 billion.

Meanwhile, members of the workforce who survived child undernutrition and enrolled in school had higher risk of grade level repetition and lower educational achievement. This means fewer work opportunities and reduced income potential later in life. During the same period, the country lost an estimated PhP166.5 billion of income as a result of lower educational attainment attributed to childhood stunting.

Cost to Health

Childhood undernutrition has significant costs for healthcare, as it causes across-the-board increases in morbidity and mortality due to infectious and chronic diseases as well as pregnancy-related



After more than **25 years** of steady improvement, **stunting prevalence** among Filipino children **below five years old** increased from **30.3%** in **2013** to **33.4%** in **2015**.

complications and deaths. Estimating the complete health costs of undernutrition in the Philippines fell outside the scope of the analysis conducted for this report. It should be noted that the costs in this report do not represent the total impact of stunting on GDP because we did not include economic losses related to healthcare costs. We estimate that if we had modeled the health costs using the methodology that has been previously applied in other countries, the total impact of stunting on GDP of the Philippines would likely be an additional 0.05-1.6%.

Why is this a burden?

After more than 25 years of steady improvement, childhood undernutrition increased by more than 10% from 2013 to 2015. Under five stunting (low height-for-age) increased from 30.3% in 2013 to 33.4% in 2015, and underweight (low weight-for-age) increased from 20% to 21.5%, according to the 2015 National Nutrition Survey conducted by the Food and Nutrition Research Institute of the Department of Science and Technology. This alarming reversal in progress will undoubtedly have long-term impacts on the health, educational attainment, and economic productivity of the Philippines.

Nutrition is an integral focus of the Sustainable Development Goals (SDGs). Out of the 17 SDGs, 12 goals contain indicators relevant to nutrition. Economic investment in nutrition interventions is a key platform for our country's overall progress in health, education, and productivity.

If the Philippines had reached our Millennium Development Goal (MDG) targets, underweight prevalence in children under five would have been reduced from approximately 24% in 2000 to 13.6% by 2015, and stunting prevalence would have been reduced from 36% to 22%. However, in 2015, more than one in five Filipino children under five were underweight and more than one-third were stunted.

We have to act urgently if we want to help our country's children grow up to become healthy, educated, and productive adults. Child undernutrition directly affects the economic growth of the Philippines. A child's first 1000 days, from conception until the second birthday, is the most important time in a child's growth and development. Nutrition interventions must be included in the new Early Childhood Care and Development Intervention Package for the First 1000 Days (ECCD IP/1000 Days) to improve maternal and child health and nutrition.

Any investment in reducing childhood undernutrition will reduce suffering and poverty, and will ultimately stimulate economic growth for all Filipinos.

Background

A comparison between what a balanced meal for one person looks like (plate on right), and what a minimum wage earner in the Philippines can actually afford to buy based on his food allocation budget (plate on the left).

What do we mean by "undernutrition"?

Undernutrition is the underlying cause in 45% of child deaths worldwide (Black, et al., 2013). Chronic undernutrition leads to stunted growth, which is irreversible and is associated with impaired cognitive ability and reduced school performance, as well as poor work capacity and productivity. Undernutrition increases the frequency and severity of common infections, and puts children at greater risk of dying from such infections. It also increases life-long risk to chronic illnesses such as obesity, cardiovascular diseases, diabetes and cancer (Hoddinott, Alderman, Behrman, Haddad, & Horton, 2013).

Child undernutrition is measured by three anthropometric indicators: underweight (low weight-for-age, including low birth weight), wasting (low weight-for-height), and stunting (low height-for-age). Stunting or small stature is the most prevalent manifestation of undernutrition, and has chronic effects on a child's growth and development (Daniels, 2004; Victora, et al., 2008). Stunting is more predictive of economic outcomes like productivity and income than other indicators (Hoddinott, et al, 2013).

The First 1000 Days

The first 1000 days of a child's life, from conception up to the second birthday, is a unique window of opportunity for growth and development. Undernutrition during the first 1000 days of a child's life manifests as stunting when she is 24 to 59 months old. At this point, the damage to a child's health and development is already long-term and irreversible.

A landmark 54-country study of maternal and child undernutrition published in *The Lancet* in 2010 found that height-for-age at two years was the best predictor of human capital, and that undernutrition is associated with lower human capital (Victora et al. 2010). The study also emphasized that it is during the child's first 1000 days when the most pronounced growth reduction is observed compared to other stages in a child's development (see Figure 1).

The consequences of stunting in the early years of a child's life are particularly pronounced in

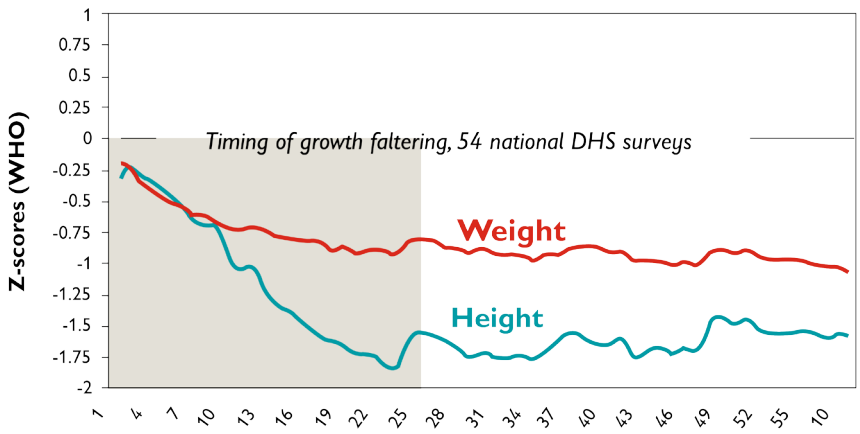


Figure 1. *Growth Faltering in the Child's First 1000 Days. Source:Victora et. al. (2010)*

Table 1. *Population and Child Undernutrition, 2013. Source: FNRI-DOST's 8th National Nutrition Survey*

Age Group	LBW (IUGR)[2]		Underweight		Stunting	
	%	No. ('000)	%	No.('000)	%	No.('000)
0-28 days	9.91	228				
0-11 months			13.7	293	14.7	313
12-23 months			16.4	358	31.5	689
24-59 months			21.7	1,452	34.5	2,313
Total			19.9	2,195	30,3	3,343

children's cognitive abilities. Children who are stunted before their first birthday are often delayed in schooling at age eight, and score lower on cognitive tests compared to those who were not stunted (Crookston, Schott, Cueto, Dearden, Engle, Georgiadis, et al., 2013).

Intervention during the first 1000 days is essential and will have life-long effects on educational achievement and on earning potential later in life.

Undernutrition among Filipino children

In the Philippines, 95 child deaths every day are attributable to undernutrition (UNICEF, Unite for Children, 2015). Based on the National Nutrition Survey results of the Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST), there was a steady and gradual decrease in the prevalence of underweight and stunting among children aged 0-5 years old from 1989 to 2013 (see Figure 2). This trend reversed in 2015 when stunting and underweight both began to increase among Filipino children. According to the 2016 Global Nutrition Report, the Philippines is among the top 50 countries with highest rates of wasting and stunting (ranked 38th and 45th, respectively) (International Food Policy Research Institute, 2016).

The 2013 FNRI-DOST data used in the analysis indicated that one in three Filipino children below five years old was stunted, while one in five Filipino children was underweight. Table 1 shows that while more than 90% of Filipino babies are born within a normal weight range, as children get older, the prevalence of underweight and stunting increases. This trend demonstrates the cumulative effect of undernutrition over time.

Nutrition's role in sustainable development

Nutrition plays a key role in a country's development. Of the 17 Sustainable Developmental Goals (SDGs), indicators related to nutrition are reflected in 12 SDGs (International Food Policy Research Institute,

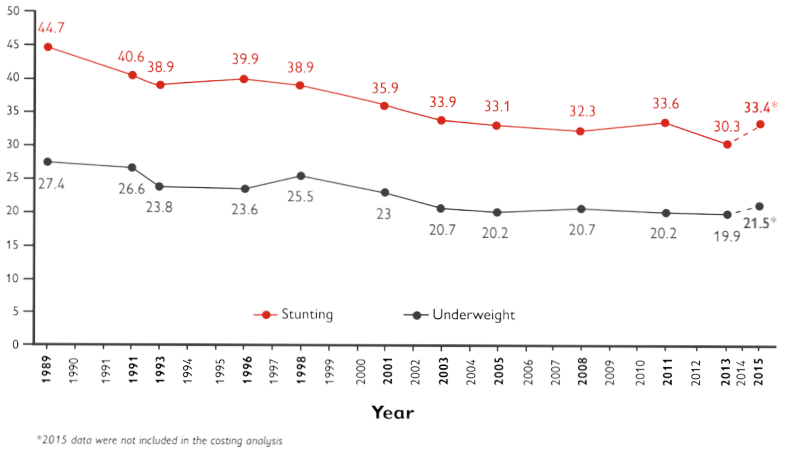


Figure 2. *Prevalence of Stunting and Underweight Based on the World Health Organization Child Growth Standards (WHO-CGS). Source: FNRI-DOST.*

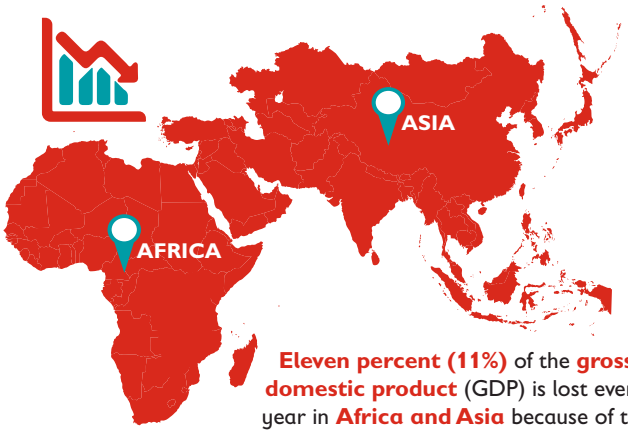
Young children from a family of 10 in the province of Leyte settle for a meal composed of mostly rice. Both parents have no stable source of income, so having a balanced diet serves as a big challenge for their whole family.

2016). Global leaders are promoting interventions focused on eradicating hunger and malnutrition, which will contribute to the achievement of the SDGs by 2030. In order for policymakers to implement these programs, they need to have an accurate representation of the short-term costs of the interventions and the long-term costs of malnutrition for a country's economic growth.

> "In the Philippines, Indonesia, and Vietnam, one US dollar spent on nutrition interventions to avert stunting in children below 24 months of age could save US$102.99 in health, education, and lost productivity costs."

Eleven percent (11%) of the gross domestic product (GDP) is lost every year in Africa and Asia because of the economic consequences of child undernutrition (International Food Policy Research Institute, 2016). In the Philippines, Indonesia and Vietnam, one US dollar spent on nutrition interventions to avert stunting in children below 24 months of age could save US$102.99 in health, education, and lost productivity costs (Hoddinott, et al., 2013), which indicates that spending on nutrition is cost-effective in terms of the return on investment. The Philippines' investment in nutrition programs is very low compared to the global average. The Global Nutrition Report estimated that, across 24 countries with available data, the average allocation for nutrition-specific interventions is 2.1% of general government expenditure (0.06% to 9.23%). However, the Philippines allocates only 0.52% of general government expenditures to nutrition (International Food Policy Research Institute, 2016).

To help understand the costs of child undernutrition in the Philippines in relation to the country's GDP, this study analyzes the impact of undernutrition in terms of losses in educational attainment and workforce productivity across different life stages. Specifically, it analyzes the effects of child underweight and stunting on child morbidity, mortality and school repetition as well as workforce productivity losses.



Eleven percent (11%) of the **gross domestic product** (GDP) is lost every year in **Africa and Asia** because of the **economic consequences of child undernutrition**.

INDICATORS OF UNDERNUTRITION

STUNTING

33.4% of Filipino children under the age of five are stunted.

Stunting is defined as having *height-for-age* is below minus two standard deviations (moderate and severe stunting) and minus three standard deviations (severe stunting) from the median of the WHO Child Growth Standards (WHO-CGS). Small stature among children is a reflection of chronic undernutrition in the child's early growth and development stages. In a study on nutritional status and diarrhea among Filipino children less than five years old, it was found that children who were stunted are 1.5 times at risk of developing diarrhea compared to non-stunted children (Dico, 2002).

INTRAUTERINE GROWTH RESTRICTION

9.1% of Filipino newborns have low birth weight due to intra-uterine growth restriction

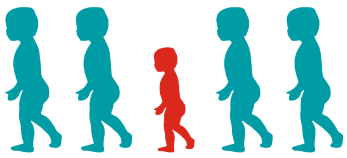
Low birth weight (LBW) is defined as having a *weight at live birth below 2,500 grams* and is a measure of intrauterine nutrition. LBW is not always caused by poor growth, it can also be a result of premature delivery (children born before 37th week of gestation). Another indicator, **intrauterine growth restriction (IUGR)** measures a baby's size compared to its gestational age, it is defined as being below the 10th percentile of the recommended gender-specific birth weight for gestational age reference curves. This analysis uses a standardized formula to estimate the proportion of LBW due to nutritional deficit/IUGR (Fernandez & Martinez, 2007; De Onis M, 1998).

WASTING

7.1% of Filipino children under the age of five have wasting, meaning they are too thin for their height.

Wasting is defined as having *weight-for-height* below minus two standard deviations (moderate and severe wasting) and minus three standard deviations (severe wasting) from the median of the WHO-CGS (UNICEF, 2013). While stunting suggests chronic undernutrition, wasting indicates acute undernutrition.

UNDERWEIGHT



21.5% of Filipino children under the age of five are underweight.

Underweight is defined having *weight-for-age* below minus two standard deviations (moderate and severe underweight) and minus three standard deviations (severe underweight) from the median of the WHO-CGS. Underweight is an indicator of undernutrition that incorporates elements of stunting, small stature, and wasting, severe malnutrition (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, et al., 2008).

*Source: FNRI-DOST 2015

Framework

According to the UNICEF conceptual framework, there are three levels of causal factors leading to undernutrition: immediate, underlying, and basic (see Figure 3).

Immediate causes of undernutrition occur at the individual level and may be a result of inadequate dietary intake and/or diseases and infections that prevent the body's absorption of nutrients. In general, inadequate nutrition predisposes an individual to higher risk of infection due to weakened immunity. Infection, on the other hand, can result to poor nutritional intake and absorption.

Underlying causes of malnutrition occur at the household level. These underlying causes include: household food insecurity or the unavailability and lack of access to sufficient quantity and quality of food, poor caring and feeding practices (i.e. not breastfeeding, inadequate complementary feeding, poor sanitation and hygiene), unhealthy environment and poor water and sanitation facilities, and limited access to quality basic public health services.

Basic causes include unavailability of resources (human, financial, structural) and social, economic and political contexts that can prevent families from achieving proper nutrition. These are the structural, political, and economic drivers of malnutrition (UNICEF, 2013).

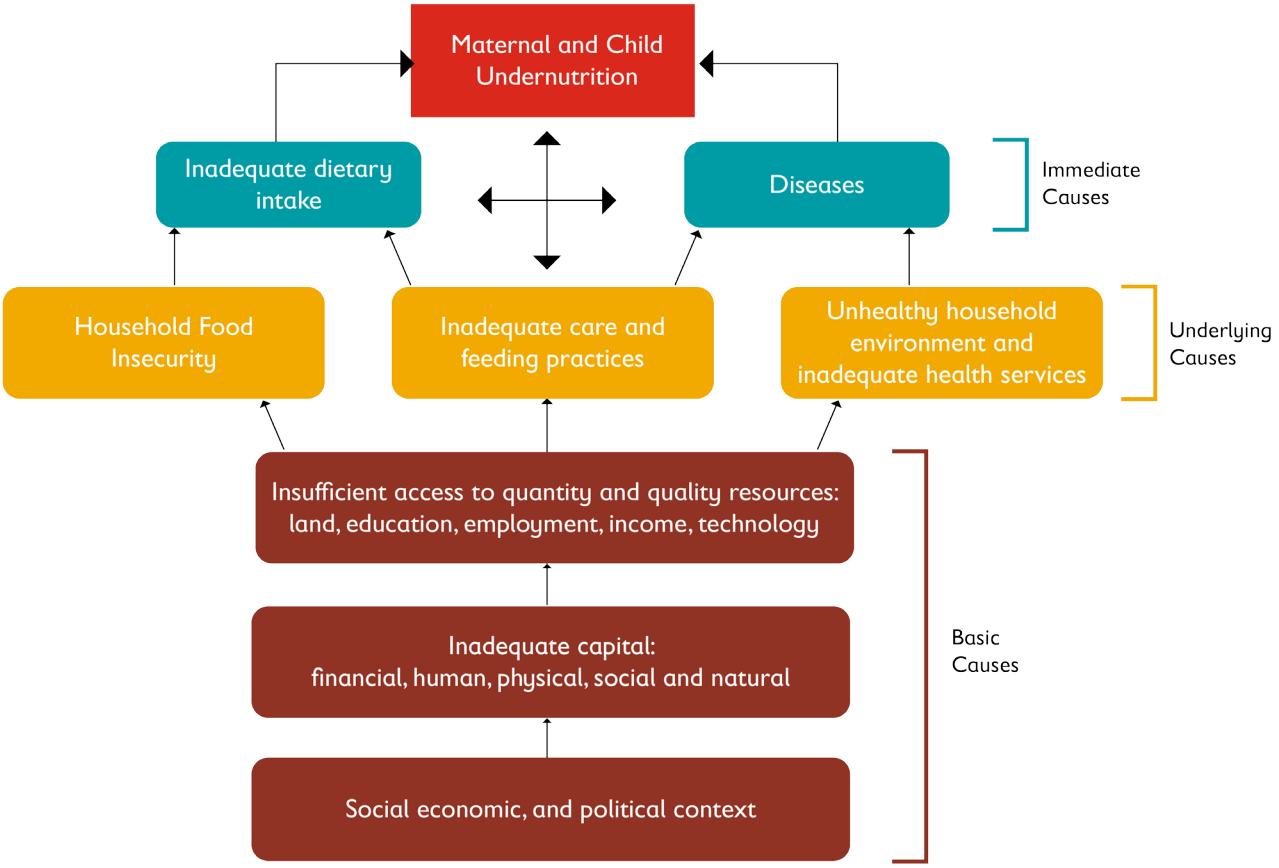


Figure 3. *Causes of Undernutrition. Framework from the report on Improving Child Nutrition (UNICEF, 2013)*

A snapshot of Market 3, a small but densely populated community in Navotas City, Philippines.

Undernutrition, if unaddressed, increases the risk of acute and chronic diseases and mortality. It also impedes cognitive and psychomotor development. Furthermore, undernutrition is linked to lower educational attainment as well as poor productivity and earning potential later in life. Lower productivity and decreased income lead to higher demand for public services and increased public and private costs (see Figure 4).

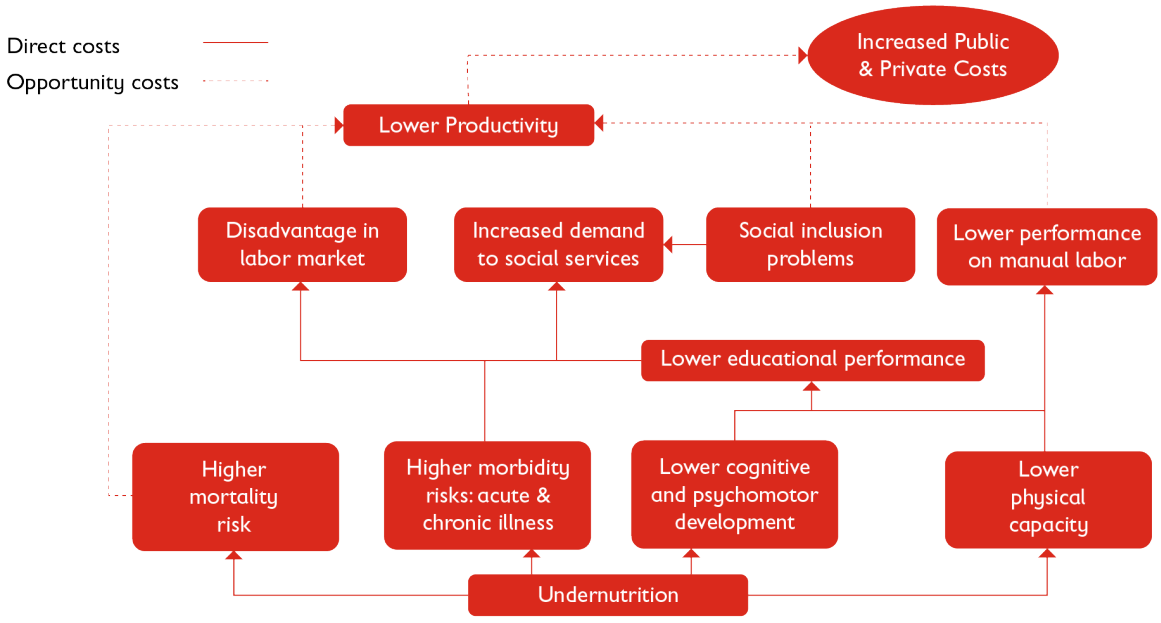


Figure 4. *Effects of Undernutrition. Framework obtained from the Cost of Hunger in Africa (African Union Commission, NEPAD Planning and Coordinating Agency, UN, 2014).*

Methods

Analytic Model

The cost of child undernutrition in the Philippines was estimated using an adaptation of the analytical model developed by the Economic Commission for Latin America and the Caribbean (ECLAC) for analyzing the social and economic impact of child undernutrition in Latin America (Martinez, Fernandez, Palma, & Flores, 2007). The ECLAC's model has also been applied extensively in African countries (African Union Commission, NEPAD Planning and Coordinating Agency, UN, 2014).

The economic impact of child undernutrition manifests in: higher expenditure on health in terms of patient diagnoses, treatments, medications, health center visits, waiting time; higher expenditure on education brought about by repeated grades, delayed schooling and school drop outs; and lower work force productivity due to loss of human capital and reduction in capacity (Martinez, Fernandez, Palma, & Flores, 2007). The model estimates the effects on health, education and productivity based on relative risks, specifically the differential risks or the difference in the probability of an event (e.g. morbidity, mortality, education outcomes) between individuals who suffered from undernutrition and individuals who did not suffer from undernutrition before the age of five years old. This difference represents the incremental or the additional events associated with child undernutrition (see Figure 5).

Risk differential may be directly computed from the local data sets. In the absence of local data, the odds ratio (OR) or risk ratio (RR) may be used to estimate the probability of an event in children with and without undernutrition (see ANNEX A). The step-by-step procedures for the calculations of incremental costs in health, education and productivity are explained in detail in the Operational Manual for the use of Model for Analyzing the Social and Economic Impact of Child Undernutrition (Martinez R, 2008).

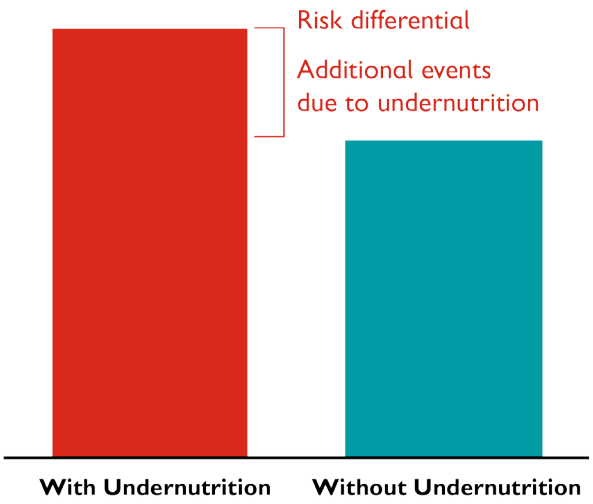


Figure 5. *A Graphical Representation of the Probability of an Event Between Children With and Without Undernutrition to Compute for the Risk Differential*

Estimations were carried out based on calculations derived from raw and consolidated data of government institutions such as the FNRI-DOST, the Department of Education, the Department of Labor and Employment (DOLE), and the Philippine Statistics Authority (PSA); international estimations from the World Health Organization (WHO), the United Nations (UN), and UNICEF; and projections based on national survey databases such as the Philippines' National Demographic Health Survey (DHS). Local data were used whenever available and accessible. A summary of the assumptions and data sources is presented in ANNEX B.

The year of analysis used is 2013, the most recent year for which data were available from FNRI-DOST on underweight prevalence, stunting prevalence, and related pathologies (acute diarrheal syndrome or ADS, acute respiratory infection or ARI, and anemia). Results of the 2015 National Nutrition Survey were not included in the analysis because, at the time of analysis, key information on important model parameters including morbidities and mortalities were still not publicly accessible.

The adapted analytic model we applied used a retrospective analysis to estimate the social and economic cost associated with undernutrition in the year 2013:

a. Morbidity and mortality among children under five years old as a result of stunting and underweight, respectively;

b. Education costs among 6- to 18-year-old learners as a result of stunting before the age of five years old using data on education from grades 1 to 12 in terms of incremental school repetition; and

c. Productivity losses among the 15- to 64-year-old population as a result of undernutrition before the age of five years old that affected survival and educational achievement.

Estimation of Effects and Costs of Child Undernutrition

Consequences of Child Undernutrition for Morbidity and Mortality

Morbidity: For morbidity-related estimates, we included major nutrition-related health issues (United Nations System, Standing Committee on Nutrition, 2010) anemia, low birth weight due to IUGR and stunting, and leading causes of child mortality such as ARI, pneumonia and ADS (Department of Health, 2010).

The difference in the probability (or differential probability) of having the anemia, diarrhea or ADS, or ARI between those with and without stunting/ LBW due to IUGR in different age groups (0-28 days old, 1-11 months old, 12-23 months old and 24-59 months old) were estimated using the data from FNRI-DOST.

Mortality: For mortality-related estimates associated with child undernutrition, underweight rates were used. We used underweight as the key indicator because among the three indicators of undernutrition, underweight captures aspects of both wasting and stunting, and results in highest child mortality (Black, et al., 2008).

The mortality risk differential, or the difference in probability of death from all causes between children

Children from Caloocan City during their free play and drawing session.

who are underweight and not underweight, was computed based on the mortality odds ratio (OR) of 2.5 and 9.7 for moderate and severe undernutrition (underweight), respectively (Black et al., 2008; Fernandez & Martinez, 2007).

The health costs associated with undernutrition are not included in this study due to the limited availability of data measured and reported by the government health agencies. However, it is worth noting that cost of hunger studies using the ECLAC methodology conducted in Latin America showed that health costs associated with undernutrition in a single year were equivalent to 0.05% to 1.04% GDP (Martinez, R. and Fernandez, A., 2008), while in African countries, health costs were equivalent to 0.11% to 1.6% GDP (African Union Commission, NEPAD Planning and Coordinating Agency, UN, 2014). These costs are 2% to 10% and 3.2% to 29% of total costs of health, education and productivity combined in Latin America and Africa, respectively.

General procedures and formulae for the calculation of health costs are presented in ANNEX C.

Consequences and Costs of Child Undernutrition for Education

Data on number of enrolments, dropout rate, passing rate, number of repeaters and costs of spending in primary and secondary grade levels were obtained from the Department of Education. These data were used to model the following outcomes, based on the formulae in ANNEX D:

a. The number of students repeating a grade level who suffered from undernutrition;

b. The costs associated with the repetition of students because of undernutrition for families; and

c. The costs associated with the repetition of students because of undernutrition for educational system.

The cost of repetition was estimated using the risk differential computed from the relative risk (RR) ratio of grade repetition of 1.35 and a relative risk ratio of dropping out of 1.61, based on the results of the Cebu Longitudinal Health and Nutrition Survey or CLHNS (Daniels, 2004). Average family cost was obtained from a study that included both direct (i.e. tuition fee, books, school supplies, uniforms, transportation, Parents Teacher Association related fees, other school fees, other instructional materials) and indirect costs (i.e. costs measured in terms of additional time spent by the parents) of keeping a child in school (de Vera & Tan, 2010).

Consequences and Costs of Child Undernutrition for Productivity

The effects of undernutrition on the productivity of the working-age population were estimated by computing the following outcomes, based on the formulae in ANNEX E:

a. Reduction in potential income as a result of lower level of education achieved by those who suffered from undernutrition before the age of five years old;

b. Loss of annual income due to death associated with undernutrition before reaching the age of five years old; and

c. The total productivity cost, which is the sum of indicators a. and b.

Total Cost of Undernutrition

The complete economic cost of undernutrition is the sum of the health cost, education cost, and productivity cost. Since the study does not include the health cost, a partial cost was computed based on the estimated education and productivity losses. The total cost of undernutrition was not estimated.

Results

Table 2. *Episodes of Undernutrition and Undernutrition-related Morbidity, 2013*

Pathology	FNRI-DOST Incremental episodes
Anemia	171,741
Diarrhea	9,497
ARI	61,555
Sub-total	242,793
Low Birth Weight (IUGR)	174,636
Stunting	3,317,201
Sub-total	3,491,938
Total	3,734,731

Social Cost of Child Undernutrition *on Health*

Children who are suffering from undernutrition are more likely to die from all causes, and much more likely to acquire diseases like diarrhea, respiratory infections, and anemia. These increases in morbidity and mortality have vast economic impacts on both the family and the country's health system.

Effects on Mortality

In 2013, approximately 31,000 deaths among children under five years old in the Philippines were associated with underweight. This number represents 45% of the total child deaths in the country (see Figure 6), a figure which is on par with the global estimate for deaths associated with child undernutrition (Black, Victora, Walker, Bhutta, Christian, de Onis, et al., 2013).

Effects on Morbidity

Undernutrition caused 3.7 million episodes of incremental morbidity in 2013. These are cases of illness that would not have happened in the presence of proper nutrition (see Table 2). This estimate includes 3.5 million episodes of stunting and low birth weight due to IUGR, and 243,000 cases of anemia, diarrhea, and acute respiratory infection.

These 3.7 million cases come at a significant economic cost to families and to the health system. However, estimation of the full costs fell outside of the scope of this report because the data requirements were not readily available in the Philippines.

Social and Economic Costs of Child Undernutrition *on Education*

Children who were stunted before the age of five are more likely to repeat grade levels and drop out of school earlier. The study modeled the effects of undernutrition on educational outcomes among children in grades 1 to 10.

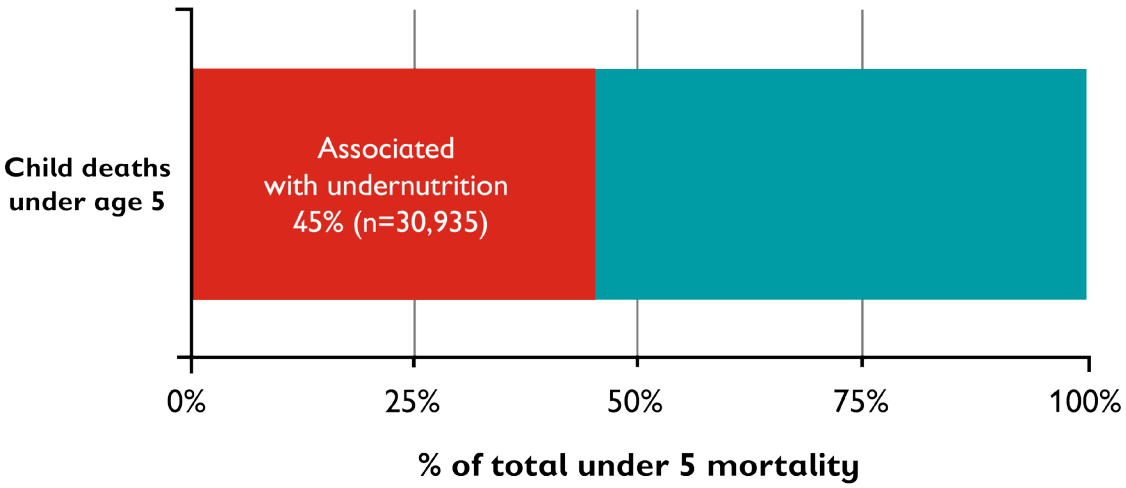


Figure 6. *Number of Child Deaths Associated with Undernutrition (Underweight), 2013*

> The grade-level repetition rate was 33% higher among students who suffered from undernutrition (stunting) before the age of five years old than those who did not.

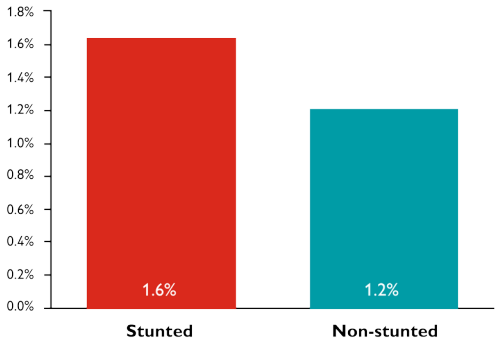


Figure 7. *Repetition Rate in Primary and Secondary Education (grade levels 1 to 10) Between Those Who Were Stunted and Non-stunted Before the Age of Five Years Old, 2013*

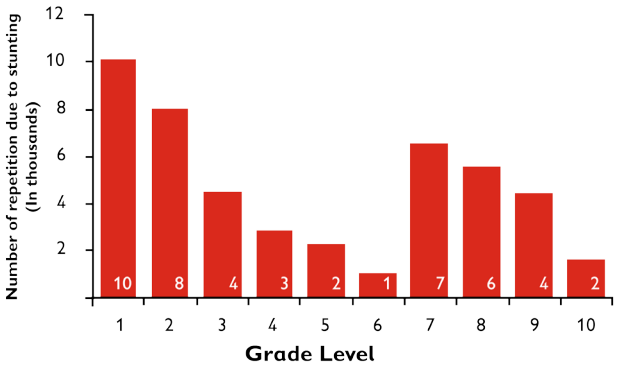


Figure 8. *Grade Repetition of Students Who Were Stunted Before the Age of Five Years Old by Grade Level (in thousands), 2013*

Effects of Undernutrition on Repetition

Based on Department of Education data for the academic year 2013-2014, an estimated 48,597 students in primary and secondary school repeated their grade levels due to stunting. Stunting was the cause of grade-level repetition for 15% of the 330,418 repeater students during 2013-2014.

The grade-level repetition rate was 33% higher among students who suffered from undernutrition (stunting) before the age of five years old than those who did not. Repetition was 1.6% among children who were undernourished, while it was only 1.2% for those who did not suffer undernutrition (see Figure 7).

More than half (60%) of the repetitions associated with undernutrition occurred at the primary school level (see Figure 8). Fewer students repeat at the secondary level because many stunted students have already dropped out of school during primary education (African Union Commission, NEPAD Planning and Coordinating Agency, UN, 2014).

Table 3. *Costs of Grade Repetition Associated with Stunting, 2013*

Type of cost	Primary	Secondary	
Public cost per student who repeats (per capita spending PhP)[a]	12,485	17,463	
Private cost per student who repeats (Family, PhP)[b]	10,709	10,937	
Number of repetitions associated with stunting	28,754	19,843	
Cost to public system for overall repetitions associated with stunting (PhP)	358,991,628	346,523,953	705,515,581
Cost to families for overall repetitions associated with stunting (PhP)	307,938,458	217,017,887	524,956,345
Total (PhP)	666,930,086	563,541,841	1,230,471,927

[a] Souce: Department of Education

[b] Souce: de Vera and Tan, 2010. Private Costs and Benefits of adding two years to the Philippine Basic Education System (unpublished) 11th National Convention on Statistics

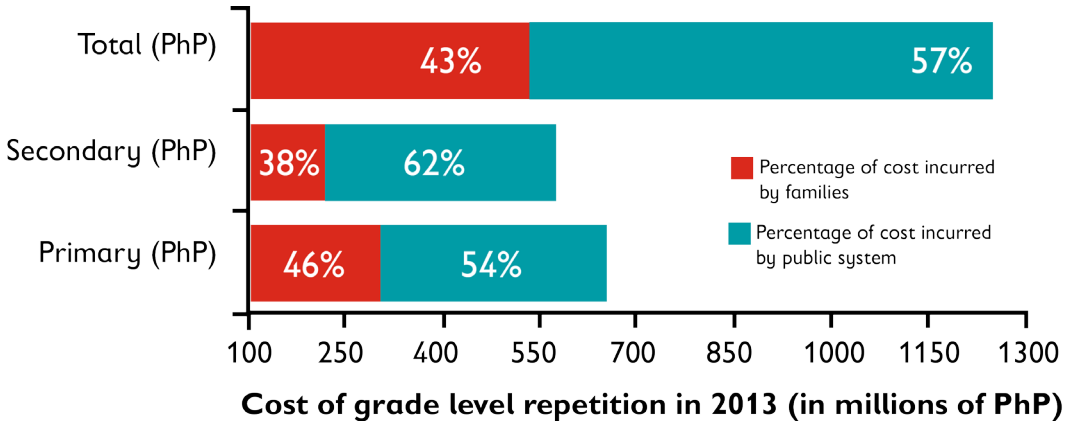


Figure 9. *Distribution of the Costs for Repetitions (in millions of PhP) in Primary and Secondary Education*

Public and Private Costs of the Effects of Undernutrition on Education

These excess repetitions caused by child stunting cost families and government a total of PhP1.23 billion per year (see Table 3). Of the total cost to keep these students in school, 43% was shouldered by the families (see Figure 9).

Social and Economic Costs of Child Undernutrition *on Productivity*

Premature child deaths due to undernutrition cause direct losses to the Philippines' human resources and productivity. Members of the workforce who survived child undernutrition and enrolled in school have lower educational achievement, affecting work opportunities and reducing income potential.

To estimate these long-term effects, the number of working-age population (15 to 64 years old) who suffered from undernutrition before the age of five years old was computed using the historical prevalence of stunting from past FNRI-DOST reports. Disparity in educational achievement was used as the basis for the calculation of reduction

Marvy and Marvin suffer from birth defects that occurred as a result of undernourishment. Their mother, Mailyn, tends to their daily needs while her husband juggles contractual jobs in their town.

> 32.6 Million (53%) of working-age Filipinos (15 to 64 years old) suffered from undernutrition (stunting) when they were less than five years old.

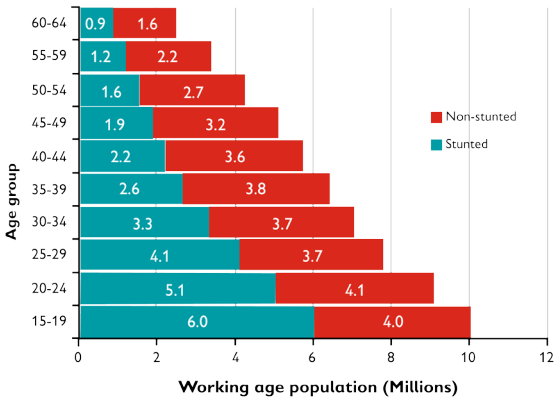


Figure 10. *Working-age Population Affected by Childhood Stunting by Age Group, 2013*

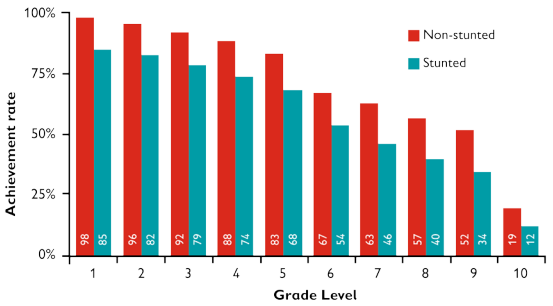


Figure 11. *Percentage of 20 to 64 Years Old Population that Achieve Each Grade Level by Undernutrition Status, 2013*

in potential income, while differential childhood mortality was used as the basis for estimating loss of income brought about by the lower number of the economically productive population.

Stunting Levels of the Working Population

In 2013, 32.6 million (53%) of working-age Filipinos (15 to 64 years old) had suffered from undernutrition (stunting) when they were less than five years old. This means that more than half of the working-age population had higher risk of mortality and lower educational attainment and economic productivity (see Figure 10).

Schooling Achievement among the Working Population

School achievement of those who suffered from stunting before the age of five years old was consistently lower than those who did not among Filipinos aged 20-64 years old (see Figure 11).

Members of the working-age population who were stunted as children completed 5.74 years of schooling on average, and those who were not stunted completed 7.16 years (see Figure 12). This indicates that stunted children generally did not reach the important milestone of completing

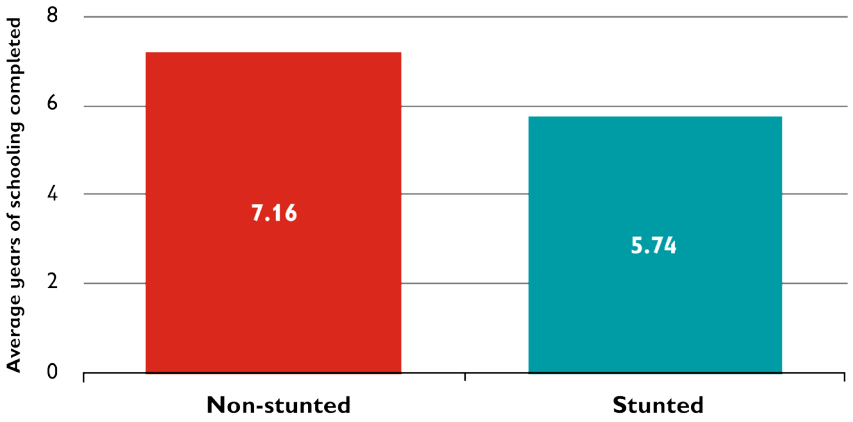


Figure 12. *Average Schooling in Years of the Working-age Population by Childhood Undernutrition Status*

primary education (grade 6), while their non-stunted counterparts were likely to reach the first level of secondary education (grade 7).

Economic Productivity Losses Associated with Child Stunting

In 2013, members of the workforce who suffered from stunting before the age of five lost approximately PhP166.5 billion worth of income as a result of the lower level of education they achieved on average.

National productivity was reduced by PhP160 billion due to premature child mortality caused by malnutrition. An estimated 838,000 deaths occurred before the age of five years old among children who would have been members of the 2013 working-age population.

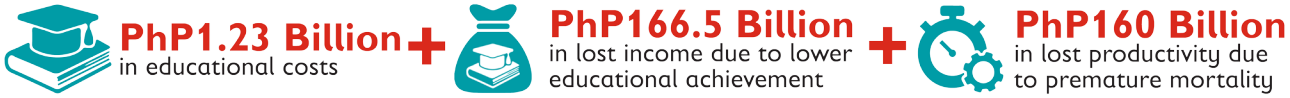
The total losses in productivity in 2013 is approximately PhP326.5 billion (see Table 4).

Table 4. *Loss in Potential Income Due to Lower Education Associated with Childhood Undernutrition, 2013*

Age Group	Population (000) who suffered from undernutrition [a]	Reduction in income (million PhP)	Deaths (000) associated with undernutrition before 5 years old [b]	Loss of potential income (million PhP)	Total income loss (million PhP)
15-24	8,101	48,689	109	23,504	72,193
25-34	7,422	28,590	161	31,457	60,047
35-44	7,332	37,162	180	40,544	77,705
45-54	5,934	32,424	184	32,589	65,014
55-64	3,838	19,654	205	31,914	51,568
Total	32,627	166,519	838	160,008	326,527

[a]Stunting [b]Underweight

TOTAL COST OF HUNGER



Summary of Effects and Costs

The combined costs of education and productivity losses associated with childhood undernutrition in the year 2013 is approximately PhP328 billion, which is equivalent to 2.84% of the 2013 Philippine GDP.

The breakdown of this total cost is as follows:

a. A total of PhP1.23 billion cost to education due to grade-level repetition among primary and secondary students, which is equivalent to 0.01% of the Philippines' GDP in 2013; and

b. Productivity losses caused by childhood undernutrition amounting to PhP326.5 billion, or 2.83% of the Philippines' GDP. This figure includes the annual reduction in potential income of 1.44% of the national GDP (PhP166.5 billion), and the annual loss in potential income due to premature child mortality of 1.39% of GDP (PhP160 billion).

This cost does not include health costs which could have added an additional 0.05-1.6% of the GDP to the cost of childhood undernutrition.

Table 5 provides a summary of the impacts of undernutrition on health, education and productivity.

Table 5. *Summary of Effects and Costs of Childhood Undernutrition, 2013*

Outcomes associated with undernutrition	Episodes	Cost in millions PHP	Cost in millions USD	GDP Equivalent (%)
Health costs				
Low birth weight (IUGR) and stunting	3,491,938			
Incremental morbidity (anemia, ARI and diarrhea)	242,973			
Sub-total	3,734,731			
Educational costs				
Increased repetition - Primary level	28,754	667	37.1	0.006%
Increased repetition - Secondary level	19,843	564	31.4	0.005%
Sub-total	48,597	1,230	68.5	0.011%
Productivity costs				
Reduction in potential income due to undernutrition	32,627,139	166,519	9,271.7	1.44%
Loss of potential income due to mortality	838,262	160,008	8,909.1	1.39%
Sub-total	33,465,402	326,527	18,180.8	2.83%

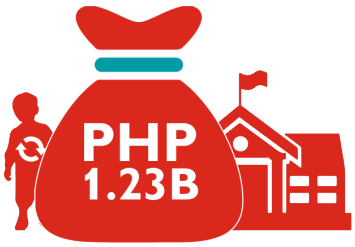
Conclusions and Recommendations

> The combined education and productivity costs associated with child undernutrition in the year 2013 is approximately PhP328 billion.

Conclusions

- A total of 30,935 child deaths (45% of total child mortality) and about 3.7 million incremental (extra) morbidity episodes in the Philippines are linked to child undernutrition.

- The grade-level repetition rate among Filipino primary and secondary students during the 2013-2014 academic year was 33% higher among those who suffered from undernutrition (stunting) before the age of five years old than among those who did not.



In 2013, it is estimated that the Philippines lost approximately **Php 1.23 billion** due to stunting-related grade level repetition.

67% of this total cost was shouldered by the public education system, while the remaining **43%** was shouldered by children's families.

- A total of 48,597 Filipino students repeated a grade level in 2013 because of undernutrition – this is 15% of the repeater population. It costs PhP1.23 billion to cover these repetitions and keep the students in school. Of the total cost, 43% was shouldered by the families, while the rest was covered by the public system.

- An estimated 53% of the working-age population suffered from undernutrition during their childhood, resulting to lower grade level achievement. Undernourished children completed 5.74 years of schooling on average, compared to 7.16 years for their working-age counterparts who did not suffer from undernutrition as children.

- The decrease in educational attainment among workers who were undernourished as children translates to a PhP166.6 billion in lost income. Premature mortality reduced national productivity by an additional PhP160 billion, with an estimated 838,000 deaths occurring before the age of five years old among children who would have been members of the 2013 working-age population.

- Nutrition is an integral focus of the Sustainable Development Goals (SDGs). Out of the 17 SDGs, 12 goals contain indicators relevant to nutrition. Economic investment in nutrition interventions is a key platform for our country's overall progress in health, education, and productivity.

- If the Philippines had reached our Millennium Development Goal (MDG) targets, underweight

If not for the **undernutrition-related child deaths** among its working-age population, the Philippines would have boosted its productivity in 2013 by **Php 160 billion.**

prevalence among children under five would have been reduced from approximately 24% in 2000 to 13.6% by 2015, and stunting prevalence would have been reduced from 36% to 22%. However, in 2015, more than one in five Filipino children (21.5%) were underweight and more than one-third were stunted (33.4%).

- After more than 25 years of steady improvement, childhood undernutrition increased by more than 10% from 2013 to 2015. Under five stunting increased from 30.3% in 2013 to 33.4% in 2015, and underweight increased from 20% to 21.5%. This alarming reversal in progress will undoubtedly have long-term impacts on the health, educational attainment, and economic productivity of the Philippines.

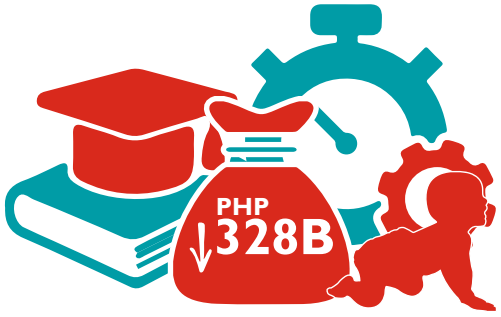
Recommendations

- The Philippines should urgently implement cost-effective nutrition-specific interventions to reverse the increase in undernutrition prevalence among children. This requires equity-based approaches that serve the poorest and most marginalized groups (Prendergast, A.J. and Humphrey, J.H., 2014). **Having an equity-based approach means prioritizing universal access to public services, targeting interventions for disadvantaged groups, and implementing policies to improve social protections, distribution of resources, and human rights.**

- Nutrition starts from the womb, and undernourished and stunted mothers are more likely to give birth to underweight babies. Therefore, it is imperative that nutrition-specific interventions focus on adequate nutrition of pregnant and lactating mothers. Some of the large-scale nutrition interventions in the country, like the feeding programs among pre-school and school-aged children, are not effective in addressing the irreversible impact of undernutrition during a child's first 1000 days (Department of Health, 2008). **Effective interventions should focus on exclusive breastfeeding for six months, extended breastfeeding for two years, and dietary diversity from 6-23 months of age** (dietary diversity means that children should receive food from at least four groups, such as grains, roots, dairy, fruits and vegetables, eggs, meat and legumes and nuts).

- The most significant growth faltering occurs in a child's first 1000 days. Starting in 2016, the National Nutrition Council (NNC) began implementation of the Early Childhood Care and Development Intervention Package for the First 1000 Days, or the ECCD IP/1000 (Department of Health, 2016). This program aims for a holistic approach to the provision of health, nutrition, education and social welfare services focusing on the first 1000 days (National Nutrition Council, 2016) and will be implemented in 10 selected provinces from 2016 to 2018. **The NNC should ensure proper monitoring of ECCD IP/1000 activities and outcomes in order to improve programs and support nationwide implementation.**

- Philippine leaders in the House of Congress and Senate and within the Department of Health should make resources available to expand accessibility, utilization, and multi-sectoral participation in nutrition interventions. **For every US$1.00 spent on nutrition interventions to avert stunting in children below 24 months of age, the Philippines could save US$102.99 in health, education, and lost productivity costs.**



In 2013, the Philippines suffered **Php 328 billion economic losses** or **2.84% of the GDP** due to child undernutrition.

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ANNEX A: Risk Differential Estimation

Option 1: From tetrachoric (2x2) data table

		Undernutrition: YES	Undernutrition: NO
Pathology	YES	*a*	*b*
	NO	*c*	*d*

Where:
Cell a: Number of those suffering from undernutrition who present the pathology (i).
Cell b: Number of those not suffering from undernutrition who present the pathology (i).
Cell c: Number of those suffering from undernutrition who do not present the pathology (i).
Cell d: Number of those not suffering from undernutrition and not presenting the pathology (i).

$$\Delta P = (a\ /(a+c)) - (b/(b+d))$$

Option 2: Using odds ratio (OR)

If data on a, b c and d are not available but marginal percentages are on hand.

		Undernutrition: YES	Undernutrition: NO	
Pathology	YES	*a*	*b*	$P_i = a + b$
	NO	*c*	*d*	c+d
		$P_U = a + c$	b + d	1 = a + b + c + d

To estimate "d" the following formula is used:

$$d = \frac{-B - \sqrt{B^2 - 4AC}}{2A}$$

Where,

$$\begin{aligned} A &= OR - 1 \\ B &= OR(P_U + P_i - 2) - P_i - P_U + 1 \\ C &= OR(1 - P_U - P_i + P_U P_i) \end{aligned}$$

To complete the table and calculate ΔP:

$$\begin{aligned} b &= 1 - P_U - d \\ c &= 1 - P_i - d \\ a &= P_U - c = P_i - b \end{aligned}$$

Option 3: Using prevalence ratio (PR)

When you only have PR ($PR_i = P_i^D / P_i^{NU}$), the components of ΔP are obtained from the following equations:

$$P_i^{NU} = \frac{N * P_i}{PR_i * N^U + N^{NU}}$$

And,

$$P_i^U = \frac{N * P_i * PR_i}{PR_i * N^U + N^{NU}}$$

P_i = Probability that i will occur in the total population
P_i^{NU} = Probability that i will occur in the population not suffering from undernutrition
P_i^U = Probability that i will occur in the population suffering from undernutrition
PR_i = Probability ratio that i will occur
N = Size of total population
N^U = Size of the population suffering from undernutrition
N^{NU} = Size of the population not suffering from undernutrition

ANNEX B: Assumptions

Data sources

Index / Data	Source
Economic data	
Gross Domestic Product	ADB - Key Indicators for Asia and the Pacific 2015 (2013); International Monetary Fund (IMF)
$US exchange rate	ADB - Key Indicators for Asia and the Pacific 2015 (2013); International Monetary Fund (IMF)
Purchasing power parity	International Monetary Fund (IMF); World Bank (WB) 2013
Social Expenditure	ADB - Key Indicators for Asia and the Pacific 2015 (2013)
Health Expenditure	ADB - Key Indicators for Asia and the Pacific 2015 (2013)
Education Expenditure	ADB - Key Indicators for Asia and the Pacific 2015 (2013)
Average wage per hour	Calculated from GESIS International Social Survey Programme (ISSP) 2011 data https://dbk.gesis.org/dbksearch/sdesc2.asp?no=5800
Average income per year of schooling	Calculated from 2013 DHS
Demographic Data	
Volume of Births / Live Births	UNICEF
Death rate	UNICEF
Distribution of workers by educational status	Calculated from DHS 2013 and UNWPP 2013
Working-age population (WAP) by educational level	Calculated from DHS 2013 and UNWPP 2013
Health Data	
Stunting prevalence for the year of analysis or last available	FNRI-DOST 2013 National Nutrition Survey
Stunting prevalence of children under five years old	FNRI-DOST 2013 National Nutrition Survey; WHO UNICEF Global Database, Countdown 2015 MNCH, WHO NLiS
Stunting mode prevalence	Calculated from FNRI-DOST NNS, WHO UNICEF Global Database, Countdown 2015 MNCH, WHO NLiS
Number of annual disease episodes (anemia, ADS, ARI, Stunting) by age group	Calculated by FNRI-DOST 8th National Nutrition Survey
Percentage of low birth weight children	Provided by FNRI-DOST based on 2013 NNS (children 0-28 days)
Morbidity differential probability for anaemia among healthy versus stunted children by age groups	Calculated by FNRI-DOST based on 2013 NNS
Morbidity differential probability for ADS among healthy versus stunted children by age groups	Calculated by FNRI-DOST based on 2013 NNS

ANNEX B: Assumptions

Index / Data	Source
Morbidity differential probability for ARI among healthy versus stunted children by age groups	Calculated by FNRI-DOST based on 2013 NNS
Probability ratio of death between those who suffered from undernutrition (underweight)	Based on multi country estimates of Black et al 2008
Education Data	
Initial enrolment by years of education	2013 Data provided by the Department of Education
Final enrolment by years of education	2013 Data provided by the Department of Education
Number of passes by years of education	2013 Data provided by the Department of Education
Number of dropouts (rate) by years of education	2013 Data provided by the Department of Education
Number of population repeating grades (rate) by years of education	2013 Data provided by the Department of Education
Private cost (cost to family) per student per year by education level (primary, secondary)	Based on family survey done by de Vera and Tan (2010) on Private Costs and Benefits of adding two years to the Philippine Basic Education System. Education cost in public school was used. The peso value was converted into 2013 cost using CCEMG-EPPI-Center Cost converter http://eppi.ioe.ac.uk/costconversion/
Public cost per student	Data on costing was obtained from DepEd 2014 data and the peso value was converted into 2013 cost using CCEMG-EPPI-Center Cost converter
Relative risk of repeating grades of stunted versus non-stunted	From Cebu Longitudinal Health and Nutrition Survey (CLHNS) as reported by Cost of Hunger in Africa (COHA)
Relative risk of dropping out of stunted versus non-stunted	From Cebu Longitudinal Health and Nutrition Survey (CLHNS) as reported by Cost of Hunger in Africa (COHA)

ANNEX B: Assumptions

Definition

	Variable	Definition
1	Annual episodes	Total number of disease events associated with undernutrition in a year
2	Birth weight	Refers to the first weight of the fetus or newborn obtained after birth. The unit of measurement is expressed either in grams (g).
3	Childhood Anemia	The condition of having a number of red blood cell or quantity of hemoglobin less than 110 g/l
4	Diarrhea	four (4) loose stools in 24 hours
5	Dropout rate or leave rate	The percentage of pupils/students who leave school during the year for any reason as well as those who complete the previous grade/year level but fail to enroll in the next grade/year level the following school year to the total number of pupils/students enrolled during the previous school year
6	Dropouts	Pupils/students who leave school during the year for any reason as well as those who complete the previous grade/year level but fail to enroll in the next grade/year level the following school year
7	Education cost	Direct cost - direct educational expenditures including: tuition fee, Parents Teacher Association related expenses, school fees (miscellaneous and administration fees), books, school supplies, uniforms, transportation, and other instructional materials. Indirect cost - additional costs related to the additional time spent by parents (e.g. waking up the kids for school, preparing the school uniforms, lunch and school bag, driving and fetching the kids to/ from school, attending parent-related activities like PTA, helping or reviewing kids' homework, washing and pressing uniforms, finding ways to earn extra income for kid's packed meals and other school fees).
8	Initial enrolment by years of education	The actual count of the total number of pupil/students who have registered as of August 31 in a given school year. The data of the laboratory schools, SCUs, CHED and TESDA supervised schools are included
9	Intrauterine growth restriction (IUGR)	Defined as with below the 10th percentile of the recommended gender-specific birth weight for gestational age reference curves
10	Low Birth Weight	Defined as a weight below 2500 grams
11	Repeaters	Pupils/students who failed or left a particular grade/year level during a given school year, or pupils/students who are enrolled in the same grade/year for a second (or more) time.
12	Repetition rate	The percentage of pupils/students enrolled in a given grade/year in a given school year who studies in the same grade/year the following school year.
13	Stunting	The percentage of children aged 0 to 59 months whose height-for-age is below minus two standard deviations (moderate and severe stunting) and minus three standard deviations (severe stunting) from the median of the WHO Child Growth Standards
14	Underweight	The percentage of children aged 0 to 59 months whose weight-for-age is below minus two standard deviations (moderate and severe underweight) and minus three standard deviations (severe underweight) from the median of the WHO Child Growth Standards.
15	Wasting	The percentage of children aged 0 to 59 months whose weight-for-height is below minus two standard deviations (moderate and severe wasting) and minus three standard deviations (severe wasting) from the median of the WHO Child Growth Standards

ANNEX C: Calculation of Health Cost Associated with Undernutrition

The difference in the probability (or differential probability) of having the pathologies (morbidity)—anemia, diarrhea or ADS, ARI and LBW–between those with and without stunting in different age groups (0-28 days old, 1-11 months old, 12-23 months old and 24-59 months old) were estimated using the results generated by FNRI-DOST.

Compute number of disease for each pathology and age group using the following formula

Number of disease events associated with undernutrition	=	Population size of children	x	Prevalence of under-nutrition	x	Annual number of times a pathology presents in those who have it	x	Differential probability of pathology between with and without undernutrition

Get the sum of all age-pathology-specific disease events

The number of deaths associated with underweight is computed as follows:

Number of deaths associated with undernutrition	=	Population size of children 0-59 months old	X	Prevalence of undernutrition among 0-59 months old	X	Difference in probability of death between with and without undernutrition

The mortality risk differential or the difference in probability of death between children who are underweight and not underweight was computed based on the mortality odds ratio (OR) of 2.5 and 9.7 for moderate and severe undernutrition (underweight), respectively (Black et al 2008). All causes of deaths were used in estimating the number of deaths associated with undernutrition due to the challenges associated in identifying the specific causes of deaths related to undernutrition (Fernandez & Martinez, 2007).

General procedures and formulae for the calculation of health costs

Total Health Cost = Total public (family) health cost + Total private (health system) health cost

Total public (family) health cost	=	(1) Cost of primary care for each disease	+	(2) Cost of hospitalization for each disease	+	(3) Cost of hospitalization in the Intensive Care Unit (ICU) for each disease

(1)

Cost of primary care for each disease	=	Number of annual disease events due to undernutrition in a year	x	[Unit cost of primary care visit for each disease	x	Average number of primary care visits for each disease]	+	Cost of medical inputs for primary care treatment for each disease

(2)

Cost of hospitalization for each disease	=	Number of cases requiring hospitalization for each disease	x	[Daily cost of hospital bed	x	Time (in days) of hospital treatment per event for each disease]	+	Cost of medical inputs for inpatient treatment for each disease

ANNEX C: Calculation of Health Cost Associated with Undernutrition

(3)

Cost of hospitalization in the Intensive Care Unit (ICU) for each disease = Number of patients requiring hospitalization in the ICU for each disease x [Daily cost of hospital bed x Time (in days) of hospital treatment in ICU per event for each disease] + Cost of medical inputs for hospitalization in the ICU for each disease

Total private (health system) health cost = (a) Cost to family of primary care for each disease + (b) Cost to family for hospitalization of a member for each disease + (c) Cost to family for hospitalization of a member in the Intensive Care Unit (ICU) for each disease

(a)

Cost to family of primary care for each disease = Number of annual disease events due to undernutrition for each morbidity x Average number of primary care visits for each disease x [Average waiting time (in hrs) spent by an adult to accompany a child patient x Alternative time cost + Costs of transportation for follow-up treatments for each disease] Average travel time (in hrs) of an adult accompanying a child patient

(b)

Cost to family for hospitalization of a member for each disease = Number of patients requiring hospitalization for each disease x Time (in days) of hospital treatment per event for each disease x [Average daily time (in hrs) spent by an adult in accompanying a child patient x Alternative time cost + Costs of transportation for follow-up treatments for each disease]

(c)

Cost to family for hospitalization of a member in the Intensive Care Unit (ICU) for each disease = Number of patients requiring hospitalization in ICU for each disease x Time (in days) of hospital treatment in ICU per event for each disease x [Average daily time (in hrs) spent by an adult in accompanying a child patient x Alternative time cost + Costs of transportation for follow-up treatments for each disease]

ANNEX D: Calculation of Education Cost Associated with Undernutrition

Data on number of enrolment, dropout rate, passing rate, number of repeaters and costs of spending in primary and secondary grade levels were obtained from the Department of Education. The negative effects of undernutrition on the education status of school-age children were estimated using the number of students repeating a grade level who suffered from undernutrition given by the formula below.

Total of result from below all grade level

Number of students repeating a grade level = Initial student enrolment that has suffered from undernutrition before the age of five years old X Differential probability of repeated grades for each year of schooling

The costs associated with the repetition of students because of undernutrition were computed for both the family and educational system using the following formula:

Compute cost in the primary and secondary education

Cost of repeated grades = Population that has suffered undernutrition before the age of five years old and repeats grade schooling x [Operating cost per academic year per student + Average family cost of keeping a student in school for one year at education level]

Add the cost of primary and secondary education to get total cost

The cost of repetition was estimated using the risk differential computed from the relative risk ratio of grade repetition of 1.35 and a relative risk ratio of dropping out of 1.61 from the results of the Cebu Longitudinal Health and Nutrition Survey or CLHNS (Daniels, 2004). Average family cost was obtained from a research study that includes both direct (i.e. tuition fee, books, school supplies, uniforms, transportation, Parents Teacher Association related fees, other school fees, other instructional materials) and indirect cost (i.e. costs measured in terms of additional time spent by the parents) of keeping a child in school (de Vera & Tan, 2010).

ANNEX E: Calculation of Productivity Cost Associated with Undernutrition

Reduction in potential income as a result of lower level of education among those who suffered from undernutrition during childhood

The effect of undernutrition among the working-age population in terms of education achievement was estimated using the formula below. From this result, the average years of schooling was also calculated and compared between those who suffered from undernutrition and those who did not before the age of five years old. This estimate will then be used to compute the reduction in potential income loss.

For each grade level / year of schooling

Percentage of 20 to 64 years old who have achieved each grade level	=	Population that has achieved an education grade level z	X	Historical modal prevalence of stunting	X	Cumulative dropout adjustment factor in each grade level

Working-age population who experienced undernutrition will have lower achievement in education level as a result of suffering from undernutrition before the age of five years old, and in turn will result to having lower income level. Reduction in income is estimated using the formula below.

Reduction in potential income = Sum of age and grade specific income losses below

Age-grade specific annual employment income	x	Age-grade specific historical stunting prevalence	x	Age-grade specific population size	x	Probability differential of having a level of education due to undernutrition

Loss of potential income due to death associated with undernutrition

To estimate the loss in potential income due to death associated with undernutrition, the number of deaths before the age of five years old among the working-age population was first estimated.

Total of deaths in each age group computed as:

Deaths associated with undernutrition before age of 5 years old in working-age population	=	No. of deaths associated with undernutrition before five years of age	x	Survival rate for those who did not suffer from underweight in each age group

ANNEX E: Calculation of Productivity Cost Associated with Undernutrition

Premature death among children equates to loss of income for both the family and the country. This deficit is estimated using the following formula.

Total of income losses for each age group of the working-age population

Loss of potential income due to undernutrition death before age of five years old	=	Average potential annual wage for each age group a person would earn if they did not die as a result of child undernutrition	x	Adjusted deaths due to undernutrition occurring before the age of five years old

The total productivity cost is the sum of the reduction in potential income due to lower education and the loss of potential income due death associated to undernutrition during childhood.

Productivity cost of undernutrition	=	Reduction in potential income as a result of lower level of education achieved by a person who suffered from undernutrition before the age of five	+	Loss of potential income due to death before five years of age

Save the Children

Save the Children is the leading independent organization for children, working in over 120 countries around the world.

We believe that every child deserves a future. In the Philippines and around the world, we give children a healthy start in life, the opportunity to learn and protection from harm. We do whatever it takes for children – every day and in times of crisis – transforming their lives and the future we share.

In 2015, we launched the Lahat Dapat campaign – our biggest campaign yet against child hunger and malnutrition in the Philippines. This campaign aims to raise the public's awareness regarding the alarming status of child hunger and malnutrition in the Philippines, and get more people involved in pushing for sustainable solutions that will help end the vicious cycle of hunger and malnutrition in the country.

LAHAT DAPAT

Visit our website to know more about our Lahat Dapat campaign:
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COST OF HUNGER: PHILIPPINES

Malnutrition should be everyone's business.

The cost of undernutrition is a burden shouldered not only by one third of Filipino children, but by the entire nation. Beyond the health implications for each individual child, malnutrition hinders a child's capability to achieve her full potential as a learner and her future productivity as a worker and a contributor to the Philippines. Thus, malnutrition has an economic cost to all of us. This report has calculated the economic impact of childhood stunting on the educational system, and also on the overall productivity of the Philippine economy.

Undernutrition puts children's cognitive development and educational performance at risk. Studies show that children who are stunted (low height-for-age) at 12-36 months of age have poorer cognitive performance and lower grade level attainment. By the age of 60 months the cognitive impact of stunting is irreversible. Children who are stunted in the first two years of life are more likely to repeat grade levels, drop out of school, and delay school entry. They are also more likely not to finish secondary education. Members of the working age population who experienced childhood stunting have lower income levels. In addition, child deaths result in a loss of income for both the family and the country.