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OFFICE OF THE PRIME MINISTER

Reducing Malnutrition in Uganda: Estimates to Support Nutrition Advocacy Uganda PROFILES 2013

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FOOD AND NUTRITION TECHNICAL ASSISTANCE

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Contents

Acronyms and Abbreviations

COHA	Cost of Hunger in Africa
FANTA	Food and Nutrition Technical Assistance III Project
GDP	gross domestic product
IYCF	infant and young child feeding
MOES	Ministry of Education and Sports
NDP	National Development Plan
SUN	Scaling Up Nutrition
U.N.	United Nations
U.S.	United States
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health Survey
UNAP	Uganda Nutrition Action Plan
USAID	U.S. Agency for International Development
VAD	vitamin A deficiency
WHA	World Health Assembly
WHO	World Health Organization

1. Introduction

Today in Uganda, 33 percent of children under the age of 5 are stunted (too short for their age) and almost half (49 percent) suffer from anaemia, according to the 2011 Uganda Demographic and Health Survey (UDHS 2011). Stunting (or low height for age) decreased by 5 percentage points from 2006 to 2011 but, even with this progress, more than 2 million children in Uganda are stunted. However, with sustained effort and investment in nutrition, Uganda could be free of malnutrition in the near future. What will it take? What would be the benefits? What will be the consequences if nothing is done to improve nutrition? These are the questions that nutrition experts in Uganda and Washington, DC, sought to answer using PROFILES, an evidence-based nutrition advocacy tool.

First developed in the early 1990s, PROFILES consists of a set of computer-based models that calculate estimates of the benefits of improved nutrition on health and development outcomes and the consequences if malnutrition does not improve. To calculate estimates, PROFILES requires current country-specific nutrition data.

The PROFILES process was last completed in Uganda in 2010. Since then, new data have become available through the nationally representative UDHS implemented in 2011. The U.S. Agency for International Development (USAID)-funded Food and Nutrition Technical Assistance III Project (FANTA) was asked to provide updated PROFILES estimates for Uganda incorporating information from the UDHS 2011.

In Uganda, estimates (using the most recent DHS and other relevant sources) were calculated in terms of child and maternal mortality, economic productivity, disabilities, and human capital for the period 2013–2025. This report presents these PROFILES estimates to help move the nutrition advocacy agenda in Uganda forward.

2. Background

Why Invest in Nutrition, and Why Now?

Nutrition is one of the foundations of human health and development. Good nutrition plays an important role in people's health and well-being; conversely, poor nutrition can lead to anaemia, reduced immunity, and impaired physical and mental development (World Health Organization [WHO] 2014). In Uganda, malnutrition is one of the major causes of childhood illness and mortality (World Bank 2006). If malnutrition rates were reduced, Uganda would see significant improvements in the health, well-being, and productivity of its citizens.

Investing in nutrition is economically sound and has been identified as a 'best' investment (Copenhagen Consensus 2012) to save mothers' and children's lives and improve children's education outcomes, which, in turn, boost economic productivity. Every US$1 spent on reducing malnutrition has at least a US$30 return on investment (World Bank 2006; Copenhagen Consensus 2012). For Uganda, nutrition is an essential and cost-effective investment in its future.

Nutrition Challenges to Address

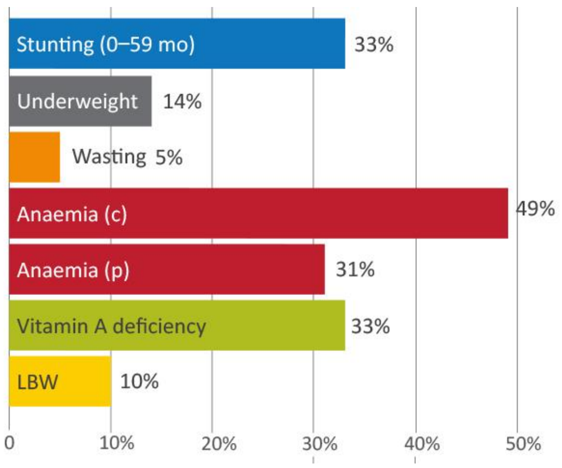
Data from the UDHS 2011 indicate that 33 percent of all children under 5 years of age were chronically malnourished (stunted, or low height-for-age), 5 percent were acutely malnourished (wasted, or low weight-for-height), and 14 percent were underweight (or low weight-for-age) (Figure 1). From 1988/89 to 2011, stunting and underweight decreased by 15 and 6 percentage points, respectively (Figure 2). The current prevalence of stunting is considered to be of 'high' public health significance, while underweight is considered to be of 'medium' public health significance (WHO 1995).

Uganda faces numerous other nutrition issues. Thirty-three percent of children under 5 years of age in Uganda were vitamin A deficient, while 49 percent of children under 5, 31 percent of pregnant women, and 22 percent of non-pregnant women suffered from anaemia (UDHS 2011). Adolescent girls in Uganda were the most malnourished group among women of reproductive age, and 10 percent of all births in Uganda were low birth weight (UDHS 2011).

Suboptimal infant and young child feeding (IYCF) practices are common in Uganda: Although almost all children (98 percent) were breastfed at some point, only half were breastfed within an hour of birth and only 63 percent of children who were 0–5 months at the time of the UDHS were exclusively breastfed. By 4–5 months of age, the percent of exclusively breastfed children dropped to only 41 percent. In addition, among breastfed children 6–23 months, only 44 percent were fed the minimum number of times in the previous 24 hours (minimum meal frequency) and only 6 percent were given foods from four or more groups and fed the minimum times per day (minimum acceptable diet).

The causes of malnutrition in Uganda are manifold: Repeated infections (including acute respiratory infections, diarrhoea, and malaria) and suboptimal breastfeeding and IYCF practices that result in inadequate dietary intake are immediate causes of malnutrition, but underlying causes include lack of safe water, hygiene, and sanitation; food insecurity; high fertility; gender inequality; and poverty. Specifically, the high total fertility rate in Uganda (6.2 births per woman) is a significant risk factor for childhood malnutrition. Fifty-eight percent of adolescent girls have given birth or are pregnant by age 19, and the birth intervals for adolescent girls is also shorter (median 26 months) compared to their older peers. High parity is not only a biological risk for every subsequent birth, but it also results in young mothers having very little time and resources to provide children under the age of 2 with optimum care and feeding, which often results in stunting. As such, malnutrition in Uganda is a complex problem that persists due to multiple causes rooted in various sectors. Therefore, in addition to nutrition-specific interventions, multi-sectoral nutrition-sensitive interventions are also essential to reduce and eradicate malnutrition in Uganda.

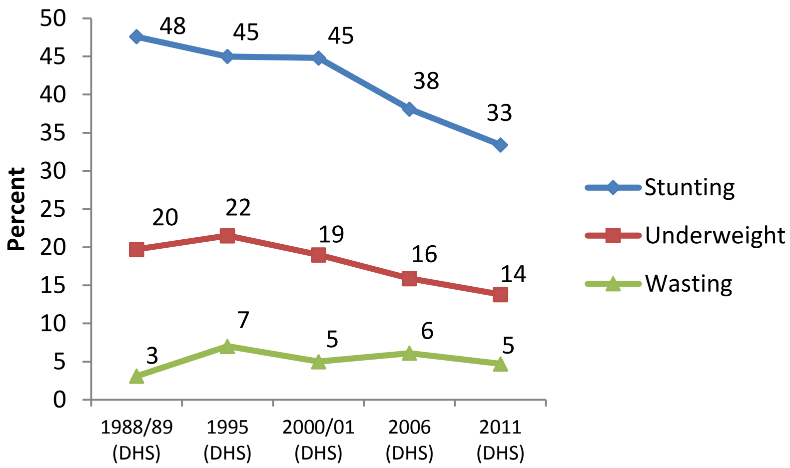
Figure 1. Malnutrition Rates in Uganda



c = under-5 children; p = pregnant women; LBW = low birth weight

Source: UDHS 2011 and UDHS 2011 Vitamin A Addendum

Figure 2. Trends in Malnutrition in Uganda



Note: For comparison purposes, the 1988/89, 1995, and 2000/01 anthropometric indicators were based on the 2006 WHO standards, to match the indicators from the 2006 and 2011 surveys. The values in the graph indicate percentage of children with z-scores < −2.

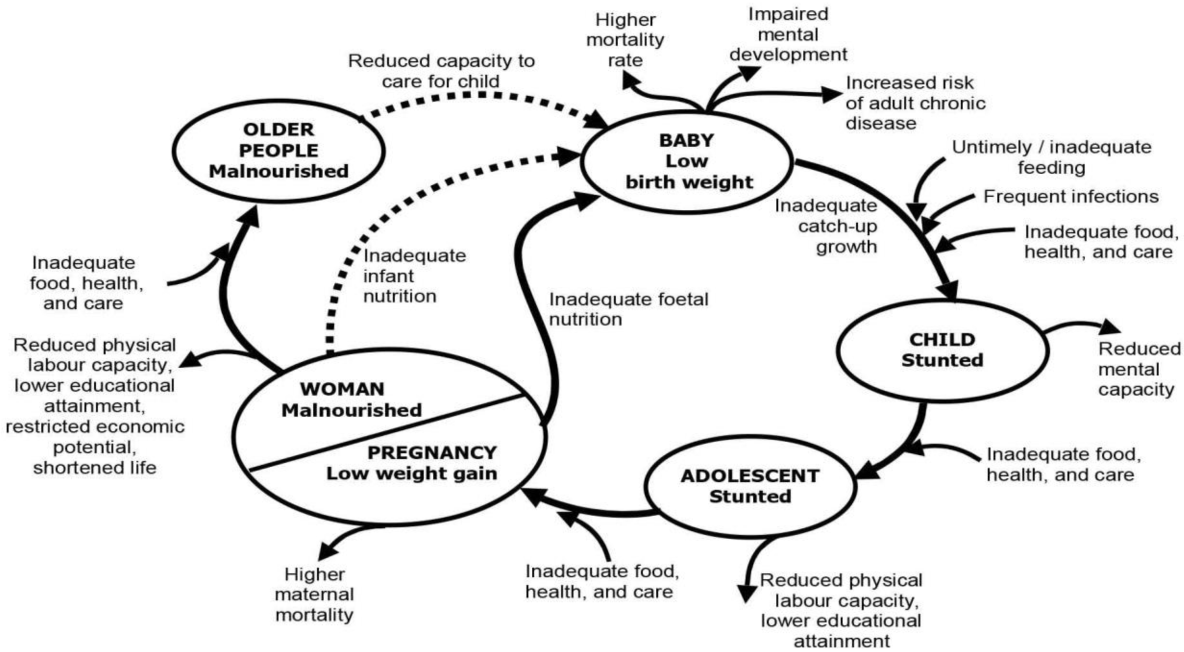
Source: UDHS 1988/89, UDHS 1995, and UDHS 2000/01, with additional analysis from the WHO Global Database on Child Growth and Malnutrition http://www.who.int/nutgrowthdb/database/countries/who_standards/uga_dat.pdf?ua=1; UDHS 2006; UDHS 2011.

What Are the Consequences of Malnutrition?

Malnutrition in Uganda has several adverse consequences. Malnourished children are more frequently ill, have delayed cognitive development, are at increased risk of death, and are likely to complete fewer years of schooling, which subsequently results in lower economic productivity.

It is well established that preventing malnutrition among children under 2 years of age should be the focus of nutrition interventions, and this is a main focus of the Uganda Nutrition Action Plan 2011-2016 (UNAP 2011-2016) which seeks to reduce levels of malnutrition among women of reproductive age, infants, and young children through 2016 and the Scaling Up Nutrition (SUN) movement (Scaling Up Nutrition Road Map Task Team 2010), of which Uganda is a member. Global evidence increasingly suggests that there are four critical points in an individual's life during which malnutrition has the most significant consequences: under 2 years of age; under 5 years of age, when affected by acute malnutrition; adolescence; and during pregnancy and the postpartum period.

Figure 3. Lifecycle of Malnutrition



Source: Administrative Committee on Coordination/Subcommittee on Nutrition (ACC/SCN). 2000.

3. Methods

PROFILES is an evidence-based tool that was developed for the purpose of nutrition advocacy. First developed in the early 1990s, it consists of a set of computer-based models that calculate estimates of the benefits of improved nutrition on health and development outcomes, as well as the economic and health consequences if nutrition does not improve. To calculate estimates, PROFILES requires current country-specific nutrition data.

This section presents the methods that were used to derive the estimates for Uganda in relation to each of the nutrition problems addressed by PROFILES in the country. The basic approach in PROFILES is to provide two scenarios: a 'status quo' scenario and an 'improved' scenario. The status quo scenario assumes there will be no change from the current nutrition situation throughout the chosen time period (the number of years for which estimates are calculated), aside from projected changes in population size. In contrast, in the improved scenario—with results estimated for the same time period—it is assumed that nutrition interventions that are known to be effective are implemented at scale and succeed in reaching the stated targets in terms of reductions in the prevalence of the various nutrition problems.

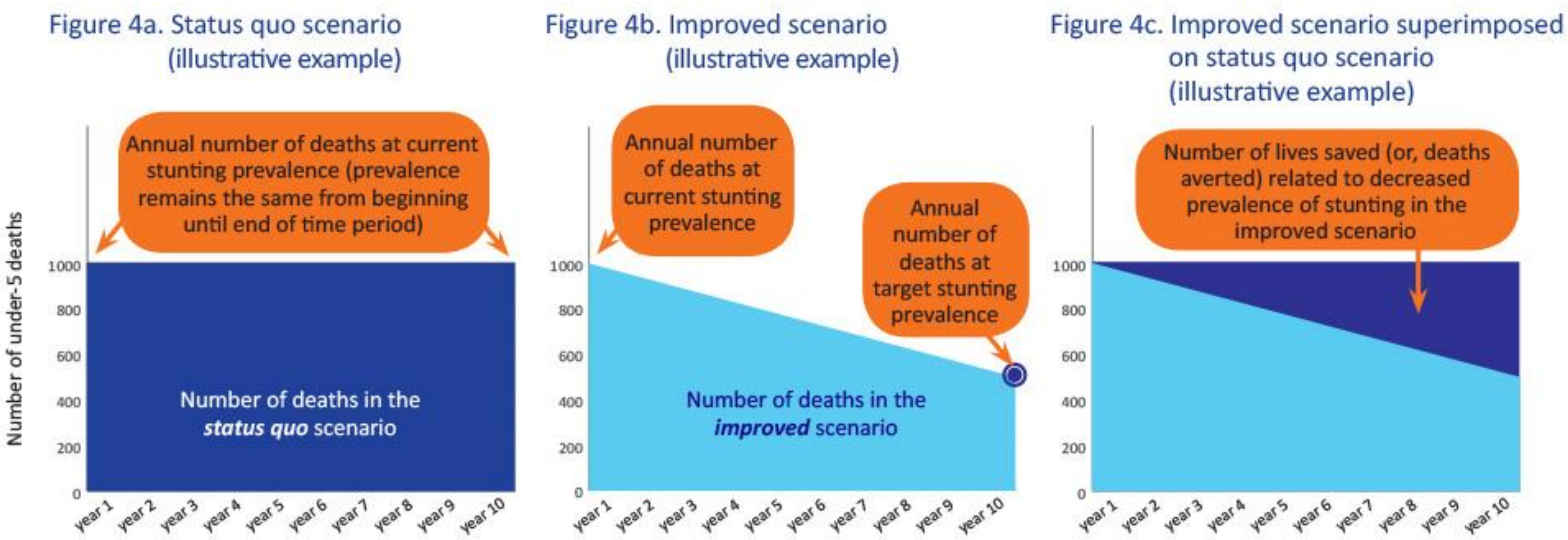
The targets reflect the proportion by which nutrition problems will be reduced over the chosen time period and were determined and agreed upon by Uganda- and U.S.-based nutrition experts in FANTA in November 2013. In the status quo scenario, the negative consequences are expressed, for example, in terms of lives lost, disabilities, human capital lost, and economic productivity lost. When contrasting the results between the status quo and the improved scenarios, the differences reflect the benefits of improved nutrition, expressed as lives saved, disabilities averted, human capital gained, and economic productivity gained (or, put another way, economic productivity losses averted). This is illustrated for child deaths (and lives saved) related to stunting in Figures 4a, 4b, and 4c.

The PROFILES spreadsheet models do not include interventions; however, the assumption is that effective interventions would not be implemented at scale from Day 1, but rather would be implemented gradually over the selected time period, and that, hence, improvement in the nutrition indicators and consequently lives saved would be gradual. For this reason, the estimates of lives saved or economic productivity gains is smaller than the total number of lives lost or economic productivity lost over the chosen time period. For example, the graphs in Figure 4 show that, despite the decrease in the prevalence of stunting with the improved scenario, at the end of the 10-year time period, the number of lives lost is still greater than the number lives saved because it is assumed that the decrease in the prevalence of stunting will be gradual and therefore reductions in child mortality attributable to stunting will be gradual, and as such the gains in lives saved will also be gradual. This same basic approach is used in all the modules in PROFILES. Although nutrition interventions were not included in the PROFILES models, the subsequent steps in the nutrition advocacy process can address the need for various nutrition services, interventions, programs, or issues related to the nutrition policy environment.

Figure 4. Status Quo Scenario vs. Improved Scenario: Illustrative Example of Number of Lives Saved (or Deaths Averted) Related to Stunting for Children under 5 Years

Approach used in PROFILES to calculate estimates of lives saved (or deaths averted) and economic productivity gains (or economic productivity losses averted) related to various nutrition indicators

Figures 4a–c provide an illustrative example of the approach used in PROFILES to calculate estimates**. (Information shown in these graphs is not from Uganda PROFILES 2013.)** The example is for stunting. The graphs show how the status quo scenario (Figure 4a) vs. the improved scenario (Figure 4b) is used to provide estimates of lives saved (or deaths averted) related to stunting among children under 5 years during a 10-year period. Figure 4c shows the number of lives saved, calculated by subtracting the number of deaths in the improved scenario from the number of deaths in the status quo scenario. A comparable approach is used in PROFILES to estimate the number of lives saved (or deaths averted) related to other nutrition indicators and to estimate economic productivity gains (or economic productivity losses averted) related to selected nutrition indicators.

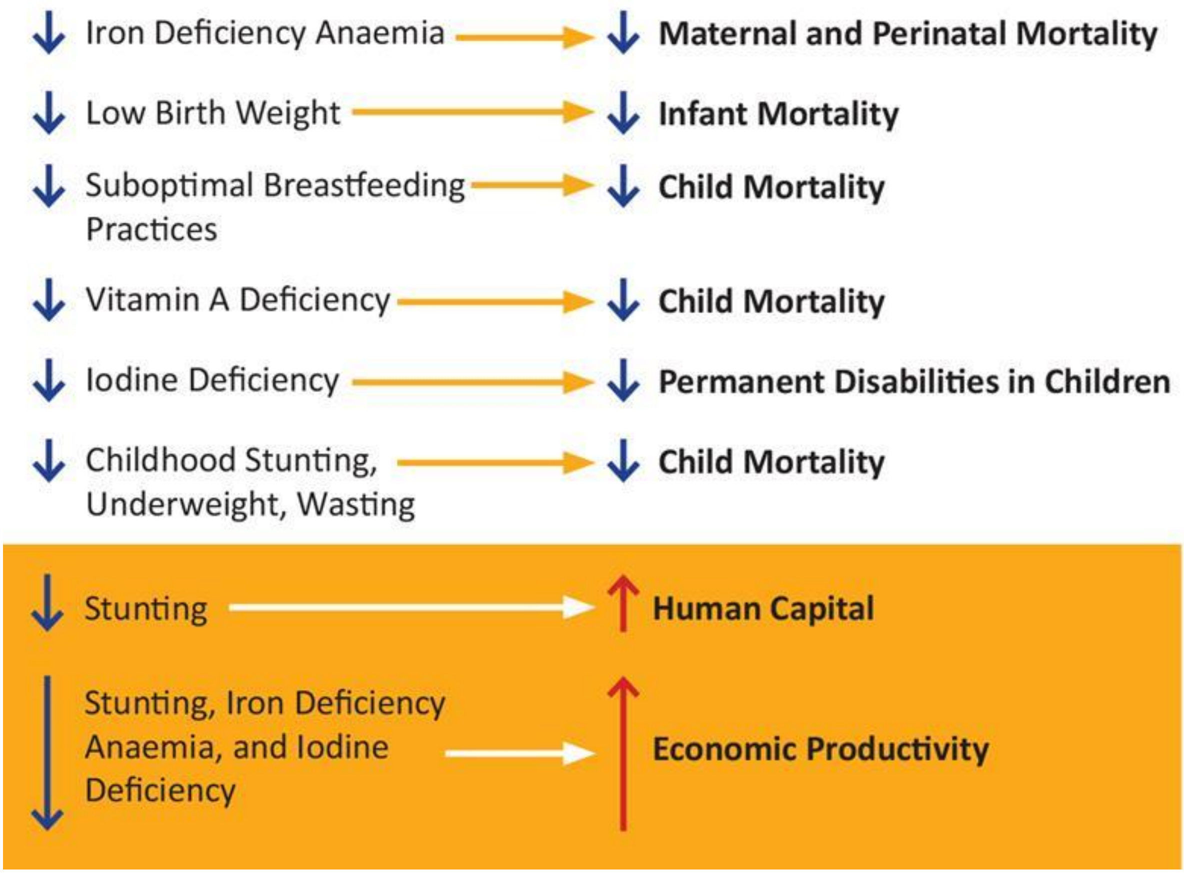


Nutrition Problems and Consequences Addressed in Uganda PROFILES 2013

Uganda PROFILES 2013 calculates estimates of reductions in mortality and permanent disabilities and gains in human capital and economic productivity that can result from reductions in the prevalence of several nutrition indicators, namely, iron deficiency anaemia; low birth weight; suboptimal breastfeeding practices; vitamin A deficiency (VAD); iodine deficiency; and childhood stunting, underweight, and wasting. Uganda PROFILES 2013 estimates of human capital losses attributed to stunting are related to poor cognitive development that results in lost learning over time. Estimates of economic productivity losses attributed to stunting and iodine deficiency are related to poor cognitive development, which affects school performance and, later in life, earning potential. Economic productivity losses related to iron deficiency anaemia among adults is a reflection of decreased capacity to do manual labour. The estimates PROFILES calculates from these nutrition indicators on health, human capital, and economic outcomes are based on impacts demonstrated and established in the scientific literature. For example, stunting, underweight, and wasting are leading causes of child mortality.

Figure 5 shows the nutrition indicators for which PROFILES calculates estimates. For each nutrition indicator listed that is assumed to improve, PROFILES calculates an estimate of a corresponding improvement in a specific health, human capital, or economic outcome in terms of lives saved, human capital gained, or economic productivity gained, respectively.

Figure 5. Nutrition Problems and Consequences Addressed in Uganda PROFILES 2013



Data Sources for PROFILES and Prevalence of Nutrition Problems

To quantify the magnitude of the negative consequences of nutrition problems, PROFILES needs prevalence data for each of the nutrition indicators. For the anthropometry indicators (stunting, wasting, and underweight), the risk of mortality differs by the degree of severity. Discussion among the PROFILES team identified recent data sources to be used in the Uganda PROFILES 2013 (Table 1) and the prevalence of each of the nutrition indicators in the status quo scenario (Tables 2 and 3).

The main data sources used in Uganda PROFILES 2013 are summarized below in Table 1, and further details are provided in Tables 2 and 3 for the nutrition-related indicators (anthropometry, low birth weight, breastfeeding practices, VAD, anaemia, and iodine deficiency).

Table 1. Indicators and Data Sources for Uganda PROFILES 2013

Indicator	Source (Year)
Nutrition Indicators	
Anthropometry (stunting, wasting, underweight) among under-5 children	Uganda DHS (2011)
Low birth weight	Uganda DHS (2011)
Breastfeeding practices	Uganda DHS (2011)
Vitamin A deficiency	Uganda DHS (2011) – Addendum to Chapter 11
Anaemia	Uganda DHS (2011)
Iodine deficiency (goitre)	Bimenya, G.S. et al. 2002.
Mortality and Economic Indicators	
Education information	Republic of Uganda MOES (2008); Uganda National Commission for UNIESCO (2012)
Employment information	2013 Statistical Abstract (UBOS 2013); Labour Market Situation Report (UBOS, 2006)
Maternal mortality ratio	Uganda DHS (2011)
Mortality in the first 5 years of life	Uganda DHS (2011)

Table 2. Estimating Reductions in Mortality and Disability Using Uganda PROFILES 2013

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2025] (%)
Stunting, underweight, and wasting among children 0–59 months associated with under-5 child mortality	PROFILES was updated and expanded in 2008 and calculates mortality estimates for each anthropometric indicator (stunting, underweight, and wasting) by degree of severity. In 2013, the odds ratios were further updated due to new information from Olofin et al. (2013) as cited in Black et al. (2013). These new odds ratios of mortality for each grade of malnutrition related to: stunting (mild 1.5, moderate 2.3, severe 5.5); underweight (mild 1.5, moderate 2.6, severe 9.4); and wasting (mild 1.6, moderate 3.4, severe 11.6). PROFILES uses this information to calculate the population-attributable fraction and the number of deaths (among children 6–59 months) related to each of the three indicators of growth deficit by severity category. Because many children with malnutrition can have more than one form of malnutrition at any given time (e.g., concurrent stunting and wasting or concurrent underweight and wasting), deaths related to each of these indicators cannot be totalled, because some children will be included in more than one indicator of malnutrition/ growth deficit.	Percentages of children in the severe and moderate categories are based on the UDHS 2011. Percentages of children in the mild category are from analysis of the data file from the UDHS 2011.	Stunting: Mild 28.4 Moderate 19.7 Severe 13.7 In summary (moderate + severe): 33.4	Stunting: Mild 0.40 Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Stunting: Mild 17.0 Moderate 11.8 Severe 8.2 In summary (moderate + severe): 20.0
			Underweight: Mild 28.3 Moderate 10.4 Severe 3.4 In summary (moderate + severe): 13.8	Underweight: Mild 0.40 Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Underweight: Mild 17.0 Moderate 6.2 Severe 2.0 In summary (moderate + severe) 8.2
			Wasting: Mild 13.9 Moderate 3.2 Severe 1.5 In summary (moderate + severe): 4.7	Wasting: Mild 0.05 Moderate 0.20 Severe 0.40	Wasting: Mild 13.2 Moderate 2.6 Severe 0.9 In summary (moderate + severe): 3.5
Anaemia during pregnancy related to maternal and perinatal mortality Pregnant women with anaemia (Hb < 11) (%)	Anaemia during pregnancy is an important contributor to maternal mortality, including through an increased risk of death from postpartum haemorrhage. Anaemia during pregnancy also contributes to perinatal mortality, e.g., through increasing the risk of preterm delivery. The PROFILES spreadsheets calculate the contribution of iron-deficiency anaemia to maternal and perinatal deaths based on the work by Stoltzfus et al. (2004), with updated information on the relative risk of maternal death from Black et al. (2013), presuming that 50% of anaemia is due to iron deficiency (an assumption that was also made by Stoltzfus et al.).	UDHS 2011	30.6	0.45	16.8
VAD associated with child mortality Children 6–59 months with VAD (including subclinical) (%)	Vitamin A-deficient children are at risk of blindness resulting from xerophthalmia and corneal ulceration. They also have a higher risk of dying (e.g., from diarrhoea and measles). The PROFILES model that estimates child deaths attributable to VAD uses coefficients from Ross (2008).	UDHS 2011 – Addendum to Chapter 11	32.6	0.60	13.0

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2025] (%)
Low birth weight related to mortality New-born infants with low birth weight (%)	Low birth weight, defined as a weight of < 2,500 g at birth, can be caused by preterm birth and/or intrauterine growth retardation. Using information from literature on increased risk of neonatal or post-Neonatal mortality among infants with a low birth rate (Alderman and Behrman 2004; Ashworth 1998) and country-specific low birth weight rates and mortality rates, PROFILES calculates the population-attributable fraction and excess number of deaths related to low birth weight.	UDHS 2011	10.2	0.30	7.1
Suboptimal breastfeeding (BF) practices related to infant mortality	Suboptimal BF practices (none, partial, or predominant BF when children are 0–5 months, and no BF among children 6–23 months) are an important contributor to infant and young child mortality due to an increased risk of infection. Using information from literature on increased risk of infant mortality due to suboptimal BF by Lamberti et al. (2011) and Black et al. (2008) and country-specific BF information, PROFILES calculates the population-attributable fraction and the excess number of deaths (among children 0–5 months and 6–23 months) related to suboptimal BF. PROFILES uses the following Relative Risks (RRs): • RR all-cause mortality, predominant BF vs exclusive BF (0–5 months): 1.48 • RR all-cause mortality, partial BF vs. exclusive BF (0–5 months): 2.85 • RR all-cause mortality, no BF vs. exclusive BF (0–5 months): 14.4 • RR all-cause mortality, no BF vs. partial BF (6–23 months): 3.68	UDHS 2011	Breastfeeding practices[1]: Exclusive BF 0–5 mo. 63.2 Predominant BF 0–5 mo. 9.4 Partial BF 0–5 mo. 24.9 No BF 0–5 mo. 2.5 Any BF 6–23 mo. 77.7 No BF 6–23 mo. 22.3		Breastfeeding practices**: Exclusive BF 0–5 mo. 90.0 Predominant BF 0–5 mo. 5.0 Partial BF 0–5 mo. 2.5 No BF 0–5 mo. 2.5 Any BF 6–23 mo. 95.0 No BF 6–23 mo. 5.0
Iodine deficiency associated with brain damage and disability as a result of deficiency in utero Population with goitre (%)	Iodine deficiency is the main cause of preventable brain damage worldwide. Iodine deficiency among pregnant women and during the first few months of infancy leads to irreversible brain damage of various degrees of severity in the infant.	Monitoring the severity of iodine deficiency in Uganda. Bimenya, G.S. et al. 2002. (was used in Uganda PROFILES 2010, newer information was not available)	5.0	0.40	3.0

* Proportion reduction applied to current prevalence.

** Breastfeeding targets included both setting targets to increase optimal breastfeeding practices (exclusive breastfeeding 0–5 months and some breastfeeding 6–23 months) and reduce suboptimal breastfeeding practices (predominant, partial, or no breastfeeding for 0–5 months and no breastfeeding for 6–23 months);

[1] 'Predominant breastfeeding' refers to infants 0–5 months of age who received breast milk as the predominant source of nourishment during the previous day. Predominant breastfeeding 'allows' oral rehydration salts, vitamin and/or mineral supplements, ritual fluids, water and water-based drinks, and fruit juice. Other liquids, including non-human milks and food-based fluids, are not allowed, and no semi-solid or solid foods are allowed (WHO. 2010; http://www.unicef.org/nutrition/files/IYCF_Indicators_part_III_country_profiles.pdf). 'Partial breastfeeding' refers to a situation where the baby is receiving some breast feeds, but is also being given other food or food-based fluids, such as formula milk or weaning foods.

Table 3. Estimating Losses and Gains in Economic Productivity Using Uganda PROFILES 2013

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025*	Target Prevalence [2025] (%)
Stunting related to future productivity Stunting among children 24–35 months	Growth deficit early in life is related to productivity loss in adulthood. PROFILES estimates the impact of growth deficit in children on future labour productivity based on the facts that stunting developed during the first 2 years of life is generally maintained throughout life and that the productivity of adults is related to their stature. Reduced adult stature due to stunting is a proxy indicator for various nutritional and other insults that can affect physical and mental development (the issue is not short stature per se). Using coefficients based on published scientific literature, PROFILES estimates reduced adult productivity related to both decreased physical capacity and reduced intellectual ability (affecting school achievement). The calculations use the 'economic activity rate' (the population actually working, as well as those eligible to work, including those categorized as unemployed), discounting future wages at 3% per year, and adjusts for normal mortality. The lifetime discount factor is the sum of all the adjusted annual discounted years from 15 through 64 years of age. The lifetime discount factor is used to calculate the present day value of future economic productivity losses related to childhood stunting, based on the proportion of children 24–35 months old that were classified as stunted. The percentage of children classified as having severe, moderate, and mild stunting are considered, after subtracting the proportion of children expected in each of these categories (according to reference population values).	Percentages of children in the severe and moderate categories are based on the UDHS (2011). Percentage of children in the mild category is from analysis of the data file from the UDHS (2011).	Stunting (24–35 months): Mild 30.2 Moderate 24.0 Severe 18.7 In summary (moderate + severe): 42.7	Stunting (24–35 months): Mild 0.40 Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Stunting (24–35 months): Mild 18.1 Moderate 14.4 Severe 11.2 In summary (moderate + severe): 25.6
Anaemia among men and women related to productivity losses Non-pregnant women 15–49 years with anaemia (Hb < 12) (%)	Anaemia among the working-age adult population contributes to reduced productivity for those engaged in physical labour, especially heavy physical labour. The PROFILES model uses the coefficients developed by Ross and Horton (1998) for the effects of iron-deficiency anaemia on reduced capacity to carry out any type of physical labour and heavy physical labour.	UDHS (2011) included anaemia information for two categories of non-pregnant women: lactating and non-lactating. The Uganda PROFILES team calculated a weighted average to arrive at the anaemia prevalence for all non-pregnant women. The UDHS 2011 did not include anaemia information for men.	22.1 Data not available	0.45 NA	12.2 NA
Intrauterine iodine deficiency related to future productivity losses Population with goitre (%)	PROFILES uses information from published literature (including the finding of a community-wide average reduction of 13.5 IQ points in iodine-deficient environments) for the coefficients used to estimate the negative impact of intrauterine iodine deficiency (as reflected in the goitre rate in a population) on future economic productivity. To estimate the future economic productivity losses among children born to iodine-deficient mothers, PROFILES discounts the children's future wages at 3% per year, after adjusting for normal mortality at each year of life (as described for productivity losses related to childhood stunting).	Monitoring the severity of iodine deficiency in Uganda. Bimenya G.S. et al. 2002.	5.0	0.40	3.0

* Proportion reduction applied to current prevalence.

Table 4. Estimating Losses and Gains in Learning Ability Using Uganda PROFILES 2013

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025*	Target Prevalence [2025] (%)
Stunting related to future learning ability Stunting among children 24–35 months	Several studies have established an association between the early insult of stunting in young children that leads to poorer cognitive development and results in poorer school performance (Grantham-McGregor 2007; Glewwe 2001). Studies show that stunted children perform less well in math and reading tests relative to their peers who were well nourished in childhood. Poor performance on standardized educational tests as a result of poor cognitive development reflects a loss of learning potential that over time also affects actual learning. PROFILES uses 0.8 grade equivalents lost per school year per 1 SD reduction in the height-for-age z-score.	Percentages of children in the severe and moderate categories are based on the UDHS (2011)	Stunting (24–35 months): Moderate 24.0 Severe 18.7 In summary (moderate + severe): 42.7	Stunting (24–35 months): Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Stunting (24–35 months): Moderate 14.4 Severe 11.2 In summary (moderate + severe): 25.6
Primary education: Age at school entry Number years of school	The age at school entry in Uganda is 6 years; it was assumed that the average age at school entry is 6.5 years. There are 7 years of primary school.	Rep. of Uganda MOES (2008); Uganda Nat. Commission for UNIESCO (2012)			

* Proportion reduction applied to current prevalence.

The UDHS 2011 provided the input information for anthropometry, low birth weight, breastfeeding practices, and anaemia among women. The anthropometry indicators in Table 2 present information used by the PROFILES spreadsheet models. For each of the three measures of malnutrition - stunting, wasting, and underweight—PROFILES uses the percentage of children with mild (z-scores from −2 to < −1), moderate (z-scores from −3 to < −2), and severe (z-scores < −3) malnutrition. Although there have been some improvements since the 2006 survey, stunting levels are still high (33.4 percent) among children under 5 years of age, and 4.7 percent are wasted. Among new-born babies with a reported birth weight (based on the mother's recall or a written record available at the household level), 10.2 percent weighed less than 2.5 kg and were categorized as having low birth weight. Only 63 percent of children 0–5 months of age at the time of the survey were exclusively breastfed. The PROFILES team used information from the UDHS 2011 to calculate the anaemia prevalence for non-pregnant women. Using the information for lactating women (who were not pregnant) and women who were neither lactating nor pregnant, the team calculated a weighted average to arrive at the anaemia prevalence for both of these groups together (i.e., all non-pregnant women). Anaemia was found among 30.6 percent of pregnant women and 22.1 percent of non-pregnant women. Last, an additional DHS report—an addendum to Chapter 11 of the UDHS 2011—provided information on VAD. VAD (including subclinical deficiency) was found among 32.6 percent of children under 5 years of age.

There was no recent national-level information available for the total goitre rate. The measure of iodine deficiency in the previous Uganda PROFILES in 2010 was again used for the Uganda PROFLES 2013, that is, a goitre prevalence of 5.0 percent (Bimenya 2002).

Assumptions Related to Setting Targets for Reduction of Malnutrition

The estimates that PROFILES calculates are based on several assumptions. In the PROFILES spreadsheets, it is assumed that, in the status quo scenario, the prevalence of various forms of malnutrition do not improve but rather remain unchanged, and consequently there is no improvement in health, human capital, and economic outcomes. This is reflected as lives lost, disabilities, human capital lost, and economic productivity lost. In contrast, in the improved scenario, it is assumed that the prevalences of the different forms of malnutrition are reduced and, for each of these indicators, there is a corresponding improvement in specific health and economic productivity outcomes. To calculate the estimates in the improved scenario, there is a need to set targets for the reduction of the various forms of malnutrition, and the amount by which each form of malnutrition is to be reduced was discussed and agreed upon by the Uganda and Washington, DC, PROFILES team. In setting the targets for the reduction of malnutrition by the end of the time period (2025), participants assumed that evidence-based, effective nutrition interventions would be implemented at scale and would succeed in reaching the targets decided on by the workshop participants by the year 2025.

Therefore, the question raised by Uganda PROFILES 2013 was: By 2025, by how much do we assume that selected nutrition indicators will improve? The 2025 targets for reduction in the prevalences of various nutrition indicators were discussed and agreed upon by the PROFILES team after consulting the Uganda 2040 Vision Statement, the World Health Assembly (WHA) targets, the Health Sector Development Plan, and the UNAP 2011–2016. The PROFILES team agreed that the targets for improvements in nutrition indicators should be realistic, and that they should not only spur greater investment in nutrition but also foster hope for a Uganda free of malnutrition. Based on this vision, team members assumed that, if the necessary investments are made and evidence-based nutrition interventions are implemented and scaled up over the 13-year time period, the targets set for the reduction in the prevalences of the various nutrition indicators that were agreed to could be achieved.

Time Period and Targets

As noted previously, the PROFILES team decided on a 13-year time period, 2013 through 2025, to be used for PROFILES. This time period was deemed appropriate, as it is about halfway to the Uganda Vision 2040, and was determined to be long enough for measurable change to occur.

In the improved scenario, a linear reduction (or increase in the case of exclusive breastfeeding) in prevalence levels is assumed, that is, the malnutrition prevalence levels in the spreadsheet models gradually improve from the status quo prevalence levels in 2013 to the 2025 targets.

To arrive at the 2025 target for each of the nutrition indicators, the PROFILES team kept various considerations in mind. Information was sought on whether targets had been stated in official government documents that could inform the targets for the time period selected for PROFILES (e.g., Uganda Vision 2040, the Uganda Health Sector Development Plan, and UNAP 2011–2016). Although Uganda Vision 2040 did not have specific nutrition targets, it did express the desire to improve the nutrition status of the population, especially women and children, which helped set the tone for optimistic estimates. Targets from the 2012 WHA and the UNAP 2011–2016 were considered, and the WHO's Nutrition Landscape Information System provided insights on various prevalence cut-off values and the extent to which malnutrition was of public health significance.

Tables 2 and 3 include the target prevalences for the improved scenario, that is, the prevalences at the end of the chosen time period. These tables also show the proportion to be applied to the status quo prevalence. The PROFILES team also considered trend information for the indicators for which it was available, as well as factors related to potential improvement in interventions.

For the anthropometric indicators (stunting, underweight, and wasting), Tables 2 and 3 show the information separately for the mild, moderate, and severe categories. Summary information for the moderate and severe categories combined is also shown.

For stunting (moderate and severe) among children under 5 years of age, a decrease of 0.40 of the status quo percentage was agreed upon (which is in line with WHA targets); the status quo prevalence of 33.4 would be reduced to 20.0 percent by 2025 in the improved scenario. Stunting among children 24–35 months was also reduced by the same proportion (0.40) from a status quo prevalence of 42.7 percent to a target prevalence of 25.6 percent (this is used to calculate increased economic productivity due to reductions in stunting). For underweight (moderate and severe), the status quo prevalence of 13.8 percent is to be reduced by 0.40 to a target prevalence of 8.3 percent. For wasting (moderate and severe) among children under 5 years of age, the status quo prevalence was 4.7 percent and a target was set at 3.5 percent (moderate and severe). A reduction by 0.45 was agreed upon for anaemia during pregnancy, reducing anaemia in pregnant women from 30.6 percent to 16.8 percent. A reduction by 0.60 was agreed upon for the prevalence of VAD among children 6–59 months, from 32.6 percent in the status quo scenario to a target prevalence of 13.0 percent by 2025. Although the UNAP 2011–2016 set that target for 2016, it was clear that Uganda would not reach that goal by then, but the PROFILES team felt that it was a realistic goal given additional time. A 0.40 reduction was agreed upon by the PROFILES team to reduce a 5.0 percent goitre rate in the status quo scenario to 3.0 percent by 2025 in the improved scenario. The team felt that with high levels of salt iodization this was a reasonable goal. For low birth weight, a reduction by 0.30 was agreed on (in line WHA targets); with a status quo prevalence of 10.2 percent, the target prevalence for the improved scenario was 7.1 percent. Last, for breastfeeding practices, the PROFILES team agreed on setting a target of improving exclusive breastfeeding among children 0–5 months of age to 90 percent from the 63.2 percent in the status quo scenario. In addition, the team agreed to an increase of 'any breastfeeding' among children 6–23 months from 77.7 percent in the status quo scenario to 95.0 percent by 2025 in the improved scenario.

Demographic and Employment Information

PROFILES requires demographic information with projections into future years that correspond to the time period used in the projections (for Uganda, 2013–2025). Selected information was obtained from the United Nations Population Prospects 2012 online database (United Nations 2012a; United Nations 2012b) and used in conjunction with the estimated total population for 2013 of 35.4 million (Uganda Bureau of Statistics [UBOS] 2013) and a PROFILES calculator tool to obtain the various demographic estimates required by PROFILES for each year.

Necessary employment information included the economic activity rate (the percentage of the working-age population actually working or available for employment, including those who were unemployed), the percentage of working-age persons who did manual labour, the percentage of working-age males who did manual labour, and the percentage of working-age females who did manual labour. Information from the UBOS 2013 Statistical Abstract and the 2006 Labour Market Situation Report (UBOS 2013; UBOS 2006) was used to obtain employment information.

The UDHS 2011 was the source of information on the perinatal mortality rate (40 per 1,000 births), neonatal mortality rate (27 per 1,000 live births), infant mortality rate (54 per 1,000 live births), and under-5 mortality rate (90 per 1,000 live births). The maternal mortality ratio (438 per 100,000 live births) was also from the UDHS 2011.

4. Results

The results from Uganda PROFILES 2013 are presented in Tables 5–7 and Figures 6–8. Figure 6 shows that if stunting levels remain unchanged from 2013 through 2025, the number of deaths related to stunting in children under 5 (567,621) can be expected to actually increase because of the high fertility rate and a resulting increase in the number of under-5 children. However, Table 5 and Figure 7 show that if high coverage of effective nutrition interventions are implemented and succeed in reducing stunting levels to the proposed targets, 118,652 children's lives could be saved from stunting-related deaths over the time period (2013–2025). Table 5 shows that in the status quo, with no change in the prevalence of wasting, the number of deaths related to wasting would be 272,712. However, if targeted reductions in the prevalence of wasting are reached by 2025, 37,116 children's lives could be saved from wasting-related deaths.

Table 5 and Figure 8 show that in the status quo scenario, with no change in the prevalence of maternal iron-deficiency anaemia, there would be 14,679 maternal deaths related to pregnancy and childbirth and 70,922 perinatal deaths. Table 5 and Figure 9 show that reaching targeted reductions in prevalence of maternal iron-deficiency anaemia by 2025 could save 6,640 women's lives and avert 19,773 perinatal deaths over the 2013–2025 time period. Table 5 and Figure 8 also show that if there was no change in the prevalence of low birth weight, there would be 196,083 deaths related to this problem during 2013–2025. However, Table 5 and Figure 9 show that 25,820 infant deaths could be averted by reductions in low birth weight. Table 5 and Figure 8 also show that if there is no improvement in optimal breastfeeding practices, there would be 363,399 infant deaths related to suboptimal breastfeeding. However, if targeted reductions in suboptimal breastfeeding practices are met by 2025, the lives of 101,107 infant lives could be saved (see Table 5 and Figure 9). In addition, Table 5 and Figure 8 show that if there was no change in the prevalence of VAD, there would be 221,430 under-5 deaths related to vitamin A deficiency during 2013–2025. However, Table 5 and Figure 9 show that 60,923 under-5 deaths could be averted by reductions in VAD.

If iodine deficiency remains unchanged, 1.13 million children would be born to iodine-deficient mothers (see Table 6 and Figure 8); these children would have some degree of irreversible brain damage (with a decrease in IQ). However, reaching the target reduction of maternal iodine deficiency by 2025 could result in preventing permanent brain damage in 236,529 children over the 2013–2025 time period (see Table 6 and Figure 9). Globally, brain damage from intrauterine iodine deficiency is a leading cause of preventable brain damage.

Table 7 and Figure 8 show the human capital losses in terms of learning related to stunting. If there is no change in the prevalence of stunting, the losses would amount to 82.1 million equivalent school years of learning. Conversely, if stunting is reduced over the 2013–2025 time period, the gains would be 19.8 million equivalent school years of learning (see Table 7 and Figure 9).

Economic productivity losses related to stunting among young children, anaemia among adult women, and iodine deficiency are shown in Table 8 and Figure 8. If stunting levels remain unchanged during 2013–2025 at the current high level, productivity losses related to stunting would be about 19.3 trillion Ugandan Shillings (US$7.7 billion). Productivity losses related to adult women anaemia would be about 1.1 trillion Ugandan Shillings (US$445.3 million) if this problem remained unchanged, and, if there was no improvement in iodine deficiency, there would be related economic productivity losses of about 910 billion Uganda Shillings (US$363.4 million).

Table 8 and Figure 9 show the economic productivity gains that could be achieved if the prevalence of stunting, anaemia in adult women, and iodine deficiency could be significantly reduced over the 2013–2025 time period. Overall, economic gains through increased productivity as a result of improved nutrition exceed 4.3 trillion Ugandan Shillings (US$1.7 billion) for Uganda by 2025. The economic productivity gains by reducing each of these nutrition problems would be: stunting – about 4.3 trillion Ugandan Shillings (US$1.7 billion); iron-deficiency anaemia among adult women – about 272 billion Ugandan Shillings (US$108.8 million), and iodine deficiency – 190 billion Ugandan Shillings (US$75.9 million).

Table 5. Deaths Attributable to Various Nutrition Problems and Lives Saved Related to Improved Nutrition

Nutrition problem	Number of deaths that would result if the current situation continues *Status quo scenario* 2013–2025	Number of lives that would be saved if nutrition situation improves *Improved scenario* 2013–2025*
Anthropometric indicators		
Deaths/lives saved attributable to **stunting** (severe, moderate, and mild) among children < 5 years of age	567,621	118,652
Deaths/lives saved attributable to **wasting** (severe, moderate, and mild) among children < 5 years of age	272,712	37,116
Low birth weight		
Infant deaths/lives saved	196,083	25,820
Iron-deficiency anaemia		
Maternal deaths/lives saved	14,679	6,640
Perinatal deaths/lives saved	70,922	19,773
Vitamin A deficiency		
Child deaths/lives saved	221,430	60,923
Breastfeeding Practices		
Deaths/lives saved attributable to suboptimal breastfeeding practices among children < 2 years of age	363,399	101,107

* These numbers assume that at-scale implementation of effective nutrition interventions will succeed in reaching the stated targets in terms of reductions (or increase in the case of exclusive breastfeeding) in the prevalence of the various nutrition problems.

Table 6. Iodine Deficiency and Child Disability

Nutrition problem	Number of children who would have mild to severe permanent brain damage if the current situation continues *Status quo scenario* 2013–2025	Number of children for whom disability as a result of maternal iodine deficiency would be prevented if prevalence of iodine deficiency is reduced *Improved scenario* 2013–2025*
Child disability related to maternal iodine deficiency	1,132,428 or 1.13 million	236,529

* These numbers assume that at-scale implementation of effective nutrition interventions will succeed in reaching the stated targets in terms of reductions in the prevalence of the nutrition problem.

Table 7. Human Capital Losses and Gains in Terms of Learning

Nutrition problem	Losses in learning if the current situation continues *Status quo scenario* 2013–2025	Gains in learning if nutrition situation improves *Improved scenario* 2013–2025*
Stunting	82,131,000 or 82.1 million equivalent school years of learning	19,753,000 or 19.8 million equivalent school years of learning

* These numbers assume that at-scale implementation of effective nutrition interventions will succeed in reaching the stated targets in terms of reductions in the prevalence of the nutrition problem.

Table 8. Economic Productivity Losses and Gains

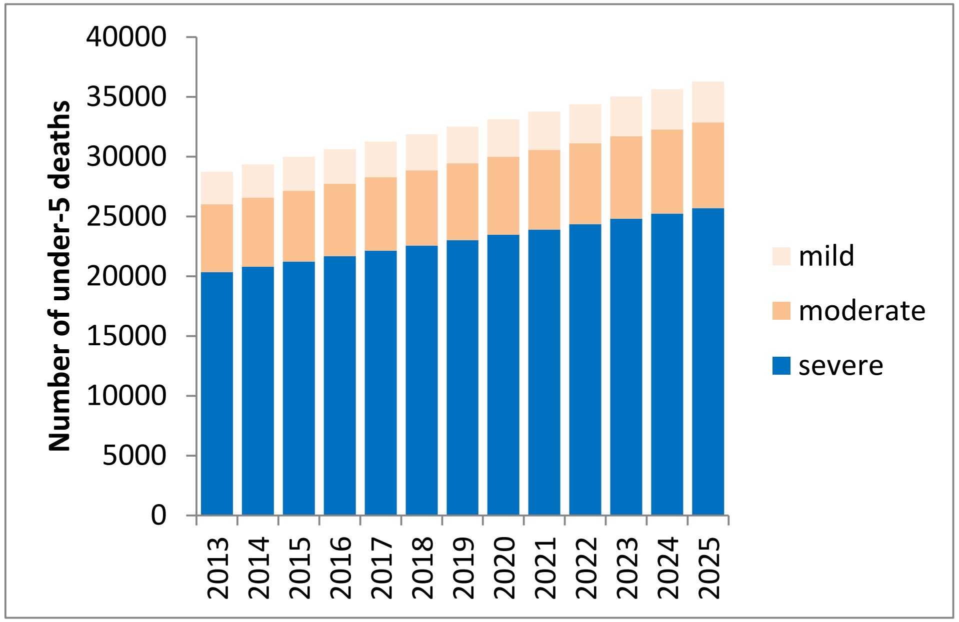
Nutrition problem	Economic productivity losses if the current situation continues *Status quo scenario* 2013–2025	Economic productivity gains if nutrition situation improves *Improved scenario* 2013–2025*
Stunting	19,307,000,000,000 or 19.307 trillion Ugandan Shillings (US$7.709 billion)	4,257,000,000,000 or 4.257 trillion Ugandan Shillings (US$1.699 billion)
Iron-deficiency anaemia	1,115,000,000,000 or 1.115 trillion Ugandan Shillings (US$445.282 million)	272,000,000,000 or 272 billion Ugandan Shillings (US$108.774 million)
Iodine deficiency	910,000,000,000 or 910 billion Ugandan Shillings (US$363.379 million)	190,000,000,000 or 190 billion Uganda Shillings (US$75.898 million)

Note: Productivity gains that could result from reduction in stunting related to improvement in the low birth weight indicator is not shown separately (there would be overlap with the productivity gains shown here associated with improvement in stunting). Productivity losses/gains related to anaemia refers to adult women.

Note: Numbers in Ugandan Shillings and US$ are rounded. Exchange rate used is 2,504.60 Ugandan Shillings = US$1.

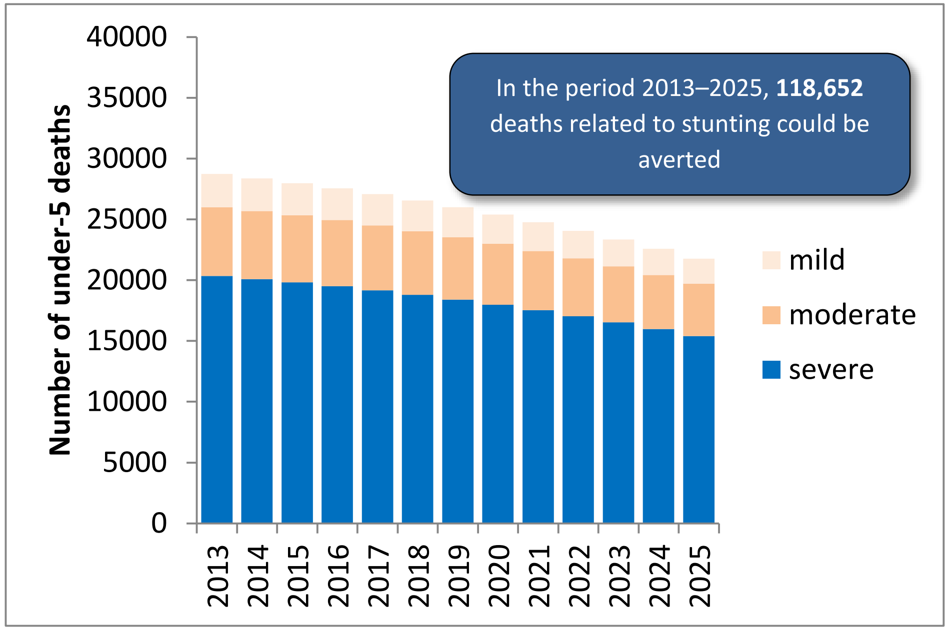
* These numbers assume that at-scale implementation of effective nutrition interventions will succeed in reaching the stated targets in terms of reductions in the prevalence of the various nutrition problems.

Figure 6. Status Quo Scenario: Number of Deaths for Children under 5 Years Related to Stunting,* 2013–2025



* Mild, moderate, and severe stunting (low height-for-age)

Figure 7. Improved Scenario: Decreasing Number of Deaths for Children under 5 Years Related to Stunting,* 2013–2025



* Mild, moderate, and severe stunting (low height-for-age)

Figure 8. Estimates of Future Lives Lost, Economic Productivity Lost, Permanent Disabilities, and Human Capital Lost Associated with Various Nutrition Problems, 2013–2025

LIVES LOST

567,621
lives of children under 5 lost related to stunting

196,083
lives of children under 5 lost related to low birth weight

14,679
women's lives lost related to maternal anaemia

70,922
lives lost during the perinatal period related to maternal anaemia

221,430
lives of children under 5 lost related to vitamin A deficiency

363,399
infants' lives lost related to suboptimal breastfeeding practices

ECONOMIC PRODUCTIVITY LOST

19.307T USh
(US$7.7 billion) lost related to stunting

1.115T USh
(US$445.3 million) lost related to iron deficiency anaemia among adult, non-pregnant women

910B USh
(US$363.4 million) lost related to iodine deficiency

PERMANENT DISABILITIES

1.13 million
children born with irreversible brain damage (ranging from severe brain damage to a decrease in IQ) related to maternal iodine deficiency

HUMAN CAPITAL LOST

82.1 million
equivalent school years of learning lost related to stunting

Figure 9. Estimates of Future Lives Saved, Economic Productivity Gained, Permanent Disabilities Averted, and Human Capital Gained

LIVES SAVED

118,652
lives of children under 5 saved related to a reduction in stunting

25,820
infants' lives saved related to increases in birth weight

6,640
women's lives saved related to a reduction in maternal anaemia

19,773
lives saved in the perinatal period related to a reduction in maternal anaemia

60,923
lives of children under 5 saved related to improvements in vitamin A status

101,107
infants' lives saved related to decreased suboptimal breastfeeding practices

ECONOMIC PRODUCTIVITY GAINED

4.257T USh
(US$1.7 billion)
gained related to a reduction in stunting

272B USh
(US$108.8 million)
gained related to improvements in iron deficiency anaemia among adult, non-pregnant women

190B USh
(US$75.9 million)
gained related to improvements in iodine deficiency

PERMANENT DISABILITIES AVERTED

236,529
children saved from irreversible brain damage related to a reduction in maternal iodine deficiency

HUMAN CAPITAL GAINED

19.8 million
equivalent school years of learning gained related to a reduction in stunting

5. Summary of Nutrition Advocacy Process in Uganda and Way Forward

Since 2002, FANTA has worked with the Government of Uganda, USAID, United Nations (U.N.) agencies, and other stakeholders in Uganda to facilitate a planned and systematic nutrition advocacy process. In 2010, PROFILES estimates were developed to support nutrition advocacy, along with a nutrition advocacy package targeted to key stakeholders in nutrition. FANTA worked with the Ministry of Health to build an advocacy coalition to expand the set of nutrition champions in Uganda and to leverage resources for nutrition. A task force was established to build political and donor interest in improving nutrition and to advocate for an effective legislative framework for the implementation of nutrition activities.

Working collaboratively helped leverage human and financial resources for the nutrition advocacy campaign, while harmonizing key messages early on ensured that nutrition advocates were speaking in one coordinated voice so that efforts were as effective as possible. At the sectoral level, advocacy efforts resulted in the creation of a nutrition position within the local government structure. Advocacy efforts with the media resulted in increased print and broadcast coverage of nutrition issues.

At the national level, discussions with policymakers and politicians resulted in a statement by the Minister of Foreign Affairs committing the Ugandan government to support the SUN movement. Consultative workshops were held to draft a strategic framework for nutrition—the UNAP. In 2011, a statement of political commitment to improve nutrition, signed by the Minister of Health on behalf of the President, was published in a major daily newspaper. For the first time, nutrition was included in Uganda's 5-year National Development Plan (NDP). In the fall, the UNAP 2011–2016 was launched by the President. A formal multi-stakeholder nutrition working group was established along with high-level coordination of nutrition activities by the Office of the Prime Minister. In addition, district nutrition committees were established.

In 2012, to support the operationalization of the UNAP, a collaborative and consensus-building workshop with key stakeholders was held to develop a comprehensive National Nutrition Advocacy Plan targeting the media; civil society; parliamentarians; government ministries, departments, and agencies; local government; development partners; and the private sector. In 2013, PROFILES estimates were developed to support the implementation of this plan. In 2014, FANTA worked with partners to develop a package of prioritized nutrition advocacy materials using results from PROFILES and Cost of Hunger in Africa.

These efforts align with the UNAP and support Uganda's commitment to the SUN movement, in which advocacy to key government and non-government stakeholders is planned to garner greater commitment, accountability, support, and resources for nutrition. The process facilitates a unified and harmonized approach to nutrition advocacy in Uganda that will maximize the effectiveness of the efforts of the Government of Uganda and partners, and is playing an important role in reinforcing the government's commitment to support the scaling up of evidence-based nutrition interventions.

In 2015, FANTA plans to work with the Office of the Prime Minister, USAID, U.N. agencies, and other partners to continue the nutrition advocacy process, specifically to reach the sub-national level.

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