Reducing Malnutrition in Guatemala:
Estimates to Support Nutrition Advocacy
Guatemala PROFILES 2017

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Guatemala PROFILES 2017 estimates were developed using a participatory and consultative approach, working with multisectoral stakeholders representing the Government of Guatemala, organizations/projects, and academic institutions including:

- Secretariat for Food Security and Nutrition (Secretaría de Seguridad Alimentaria y Nutricional [SESAN])
- Ministry of Public Health and Social Assistance (Ministerio de Salud Pública y Asistencia Social [MSPAS])
- Food Security and Nutrition Program of the Ministry of Public Health and Social Assistance (Programa de Seguridad Alimentaria y Nutricional del Ministerio de Salud Pública y Asistencia Social [PROSAN/MSPAS])
- Ministry of Social Development (Ministerio de Desarrollo Social [MIDES])
- Ministry of Education (Ministerio de Educación [MINEDUC])
- Institute of Nutrition of Central America and Panama (Instituto de Nutrición de Centroamérica y Panamá [INCAP])
- Central American Institute for Fiscal Studies (Instituto Centroamericano de Estudios Fiscales [ICEFI])
- Galileo University (Universidad Galileo [UG])
- Rafael Landívar University (Universidad Rafael Landívar [URL])
- USAID/Health and Education Policy Plus (HEP+) Project
- USAID/Monitoring and Evaluation Program (Proyecto de Monitoreo & Evaluación [MEP])
- USAID/Maternal and Child Survival Program
- US Agency for International Development [USAID]

Contents

Acronyms

BID	Inter-American Development Bank (Banco Interamericano de Desarrollo)
DHS	Demographic and Health Survey
dL	deciliter(s)
ENEI	National Employment and Income Survey (Encuesta Nacional de Empleo e Ingresos)
ENMICRON	National Micronutrient Survey (Encuesta Nacional de Micronutrientes)
ENPDC	National Strategy for the Prevention of Chronic Malnutrition (Estrategia Nacional para la Prevención de la Desnutrición Crónica)
ENSMI	National Maternal and Child Health Survey (Encuesta Nacional de Salud Materno Infantil)
FANTA	Food and Nutrition Technical Assistance III Project
g	gram(s)
Hb	hemoglobin
HEP+	Health and Education Policy Plus Project
ICEFI	Central American Institute for Fiscal Studies (Instituto Centroamericano de Estudios Fiscales)
INCAP	Institute of Nutrition of Central America and Panama (Instituto de Nutrición de Centroamérica y Panamá)
IYCF	infant and young child feeding
kg	kilogram(s)
MAGA	Ministry of Agriculture, Livestock, and Food (Ministerio de Agricultura, Ganadería y Alimentación)
MEP/USAID	Monitoring and Evaluation Project/USAID (Proyecto de Monitoreo y Evaluación/USAID)
MIDES	Ministry of Social Development (Ministerio de Desarrollo Social)
MINEDUC	Ministry of Education (Ministerio de Educación)
MINFIN	Ministry of Finance (Ministerio de Finanzas)
MSPAS	Ministry of Publich Health and Social Assistance (Ministerio de Salud Pública y Asistencia Social)
PAHO	Pan American Health Organization
PESAN	Strategic Plan for Food Security and Nutrition (Plan Estratégico de Seguridad Alimentaria y Nutricional)
PROSAN/MSPAS	Food Security and Nutrition Program of the Ministry of Public Health and Social Assistance (Programa de Seguridad Alimentaria Nutricional del Ministerio de Salud Pública y Asistencia Social)
RR	relative risk
SESAN	Secretary for Food Security and Nutrition (Secretaría de Seguridad Alimentaria y Nutricional)
SUN	Scaling Up Nutrition Movement

UG	Galileo University (Universidad Galileo)
URL	Rafael Landívar University (Universidad Rafael Landívar)
USAID	US Agency for International Development
VAD	vitamin A deficiency
WFP	World Food Programme
WHA	World Health Assembly

Introduction

Today in Guatemala, 46.5 percent of children under 5 years of age are stunted, according to the country´s 2014–2015 Encuesta Nacional de Salud Materno Infantil, (ENSMI), compared to 48.2 percent in the 2008–2009 ENSMI, representing a decrease of 1.7 percentage points. The annual rate of improvement is 0.28 percentage points per year. As the Government of Guatemala aims to reduce stunting among children under 2 by 10 percentage points from 2016 to 2020, the rate of improvement is too slow to accomplish this and greater investment in nutrition is needed to accelerate progress.

Importantly, the prevalence of stunting varies across Guatemala, ranging from 25 percent in Guatemala City to a high of 70 percent in Totonicapán. The numbers of children under age five affected by stunting in Guatemala is almost 1 million, and Figure 1 shows how the prevalence of stunting and the numbers of children affected varies by department in Guatemala. Yet with sustained effort and investment in nutrition, Guatemala could be free of malnutrition soon. What would be the benefits of improved nutrition for Guatemala as a nation? And what would be the consequences if nothing is done to improve nutrition? These are the questions national stakeholders and technical experts in Guatemala sought to answer through a recent consultative and consensus-building process using PROFILES, an evidence-based tool for nutrition advocacy.

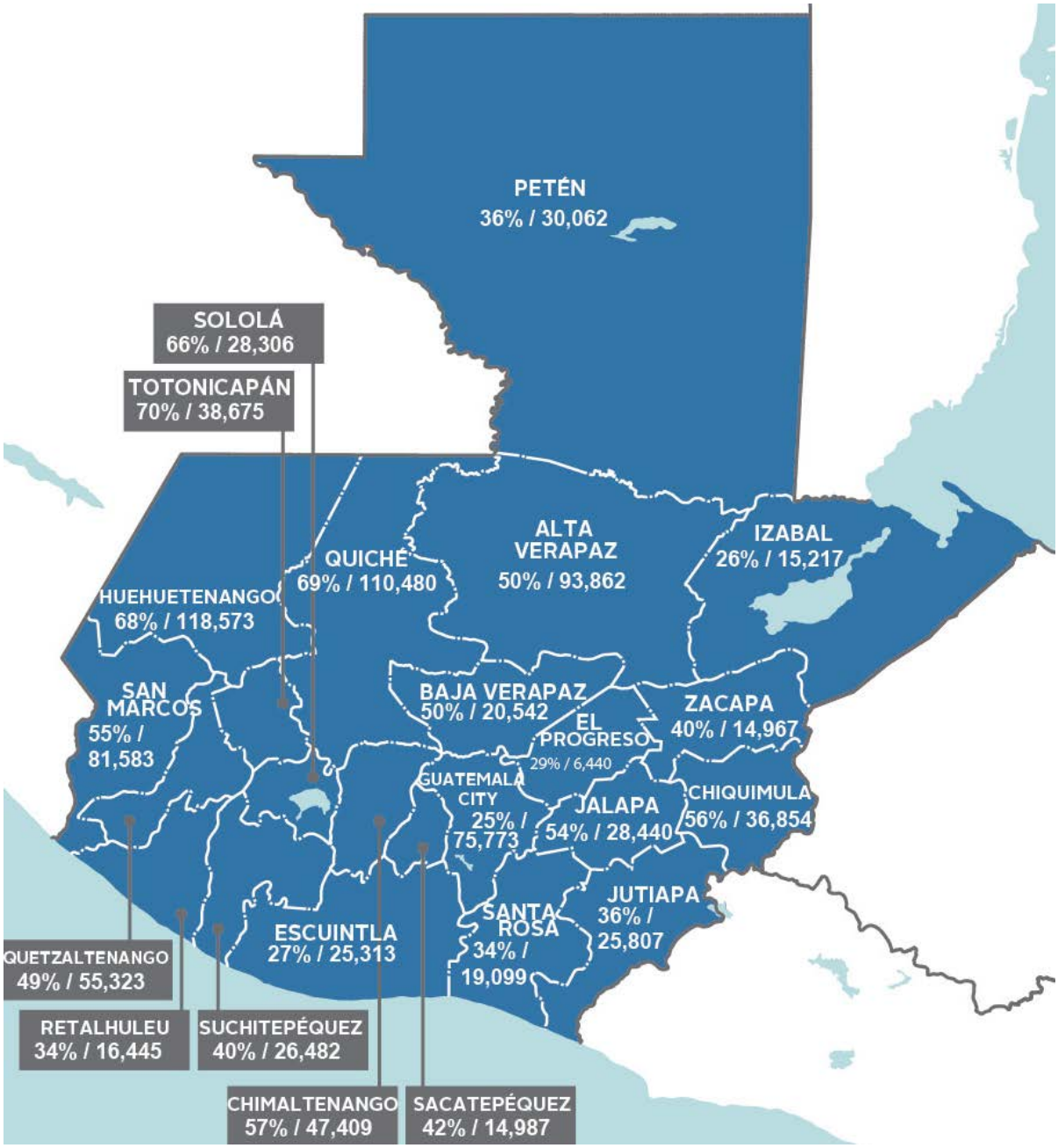
The Government of Guatemala has committed to stepping up efforts to substantively reduce stunting and other forms of malnutrition. There is high-level commitment and momentum for multisectoral action on nutrition in Guatemala, as demonstrated by SESAN, the Government's National Secretariat for Food Security and Nutrition, which is tasked with oversight of the Strategic Plan for Food Security and Nutrition (PESAN) 2016–2020 and is supported by several Ministries, such as: Health (MSPAS), Education (MINEDUC), Social Development (MIDES), Agriculture (MAGA) and Finance (MINFIN). The plan seeks to increase the annual budget related to food security and nutrition by 2.5 percent, as well as strengthen the existing system to fight malnutrition. The government committed to tackle malnutrition by implementing the National Strategy for the Prevention of Chronic Malnutrition (ENPDC) 2016–2020, which proposes four programs and five cross-cutting strategies to reach the goal of reducing stunting among children under 2 years of age by 10 percentage points by 2020. The program areas include primary health care, education for behavior change, water and sanitation, and food availability and access, while the cross-cutting strategies include behavior change, governance, information systems, monitoring and evaluation, and social audits and alliances. In its first phase, this plan will focus on Huehuetenango, Quiché, Alta Verapaz, and Chiquimula and in its second phase will focus on Totonicapán, San Marcos and Sololá.

In 2010, Guatemala joined Scaling Up Nutrition (SUN), a global movement that unites national leaders, civil society, bilateral and multilateral organizations, donors, businesses, and researchers in a collective effort to improve nutrition. The donor conveners are the World Food Programme (WFP) and the Inter-American Development Bank (BID). However, additional efforts are needed to help maximize the effectiveness of the efforts of the government and its partners. There is a need for continued national-level advocacy and further decentralization of the advocacy process from the national to the subnational level to create momentum for sustained change. Most importantly, there is a need to strengthen and expand nutrition service delivery across the country. In partnership with SESAN and other stakeholders, the Food and Nutrition Technical Assistance III Project (FANTA), funded by the U.S. Agency for International

Development (USAID) and managed by FHI 360, used PROFILES to develop estimates of the benefits of improved nutrition to support nutrition advocacy efforts in Guatemala.

PROFILES consists of a set of computer-based models that calculate consequences if malnutrition does not improve over a defined time period and the benefits of improved nutrition over the same time period, including lives saved, disabilities averted, human capital gains, and economic productivity gains. To calculate estimates, PROFILES requires current country-specific nutrition data which are identified and agreed upon in collaboration with stakeholders in the country. In Guatemala, estimates were calculated for 2017–2026 using the most recent ENSMI 2014–2015, the II Encuesta Nacional de Micronutrientes (ENMICRON) 2009–2010, and the Encuesta Nacional de Empleo e Ingresos (ENEI) 2016. This report presents these PROFILES estimates to advance the nutrition advocacy agenda in Guatemala.

Figure 1. Percent and total estimated number of children under 5 years of age who are stunted by department, ENSMI 2014–2015



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 anemia, reduced immunity, and impaired physical and mental development (World Health Organization [WHO] 2014). Malnutrition is one of the major causes of childhood illness and mortality (World Bank 2006; Black et al. 2013). If malnutrition rates were reduced, Guatemala would see significant improvements in the health, well-being, and economic productivity of its citizens.

Investing in nutrition is economically sound and has been identified as a "best" investment to save mothers' and children's lives and improve children's education outcomes, which, in turn, boosts economic productivity (Copenhagen Consensus 2012). For every US$1 spent on nutrition, there is a US$16 return in health and economic benefits (International Food Policy Research Institute 2015). Investing in nutrition is therefore a best investment for Guatemala.

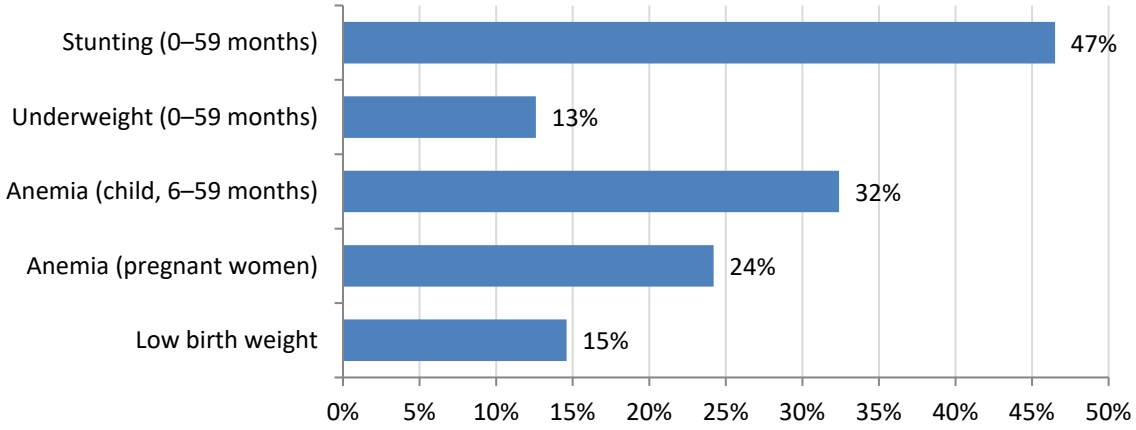
Nutrition Challenges to Address

Findings from the Guatemala 2014–2015 ENSMI indicate that 46.5 percent of all children under 5 years of age are chronically malnourished (stunted, or low height-for-age), 0.7 percent are acutely malnourished (wasted, or low weight-for-height), 12.6 percent are underweight (or low weight-for-age), and 4.7 percent are overweight or obese (high weight-for-height) (MSPAS et al. 2017). The current prevalence of stunting is very high and the prevalence of underweight is medium in terms of public health significance (WHO 2010b).

According to the Guatemala 2014–2015 ENSMI, anemia is prevalent in Guatemala with 32.4 percent of all children under 5 being anemic. In addition, 24.2 percent of pregnant women and 13.6 percent of all women suffer from anemia (MSPAS et al. 2017). Adolescent girls 15–19 years of age in Guatemala are the most malnourished group among women of reproductive age; 7 percent have a body mass index < 18.5, compared to 0.8 percent of women 40–49 years of age. Maternal short stature, which is a determinant of childhood stunting, is also a significant problem; nationally, 25.3 percent of women are shorter than 145 centimeters, and this prevalence rises to 37.3 percent among indigenous women (MSPAS et al. 2017). Maternal short stature increases the risk of stunting in children two-fold. Around 15 percent of infants are born with low birth weight (< 2.5 kg) (MSPAS et al. 2017). Suboptimal infant and young child feeding (IYCF) practices are common in Guatemala; although most children are ever breastfed (97.2 percent), only 63.1 percent are breastfed within an hour of birth and only 53.2 percent of children under 6 months are exclusively breastfed[1]; by 4–5 months of age 43.5 percent are exclusively breastfed (MSPAS et al. 2017). In addition, among breastfed children 6–23 months, 85.5 percent were fed the minimum number of times in the previous 24 hours (minimum meal frequency), 58.9 percent were given foods from four or more food groups, and 55.7 percent were both given foods from four or more groups and fed the minimum number of times per day (minimum acceptable diet). Due to the fortification of sugar in Guatemala with vitamin A (which has been in place since the 1970s), vitamin A deficiency (VAD) has been virtually eliminated and is very low at 0.3 percent[2] (MSPAS 2012).

[1] Exclusive breastfeeding was based on the mother's reported feeding practices in the last 24 hours.
[2] Percent of children 6–59 months of age with serum retinol < 20 µg/dL.

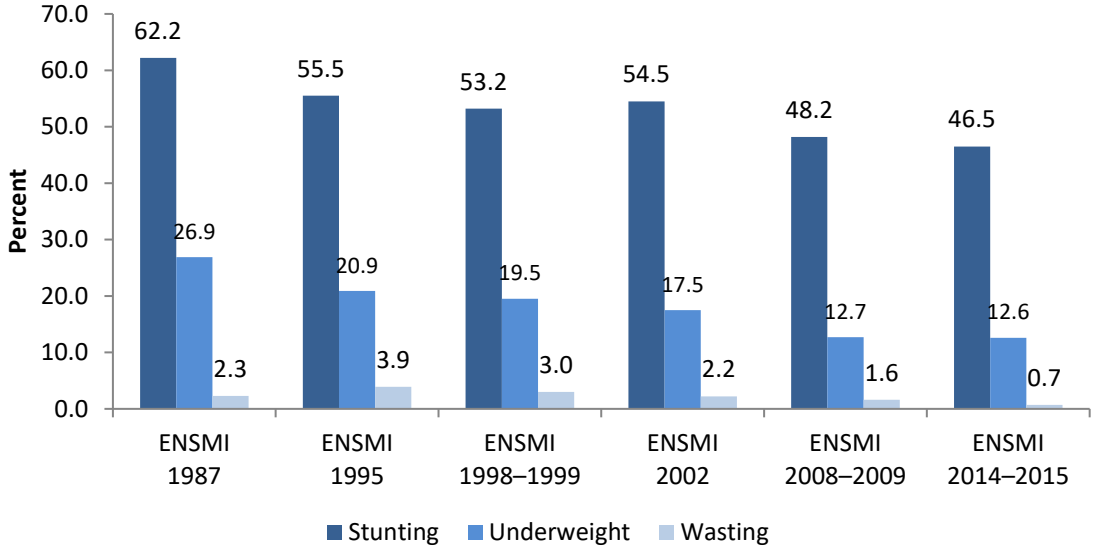
Figure 2. Prevalence of Malnutrition in Guatemala



Source: MSPAS et al. 2017.

From 2002 to 2009 stunting and underweight decreased by 6.3 and 4.8 percentage points, respectively (Figure 3). However, from 2009 to 2015 stunting and underweight decreased by only 1.7 and 0.1 percentage points, respectively.

Figure 3. Trends in Malnutrition Indicators in Guatemala in Successive ENSMI Surveys among Children under 5 Years of Age[a]



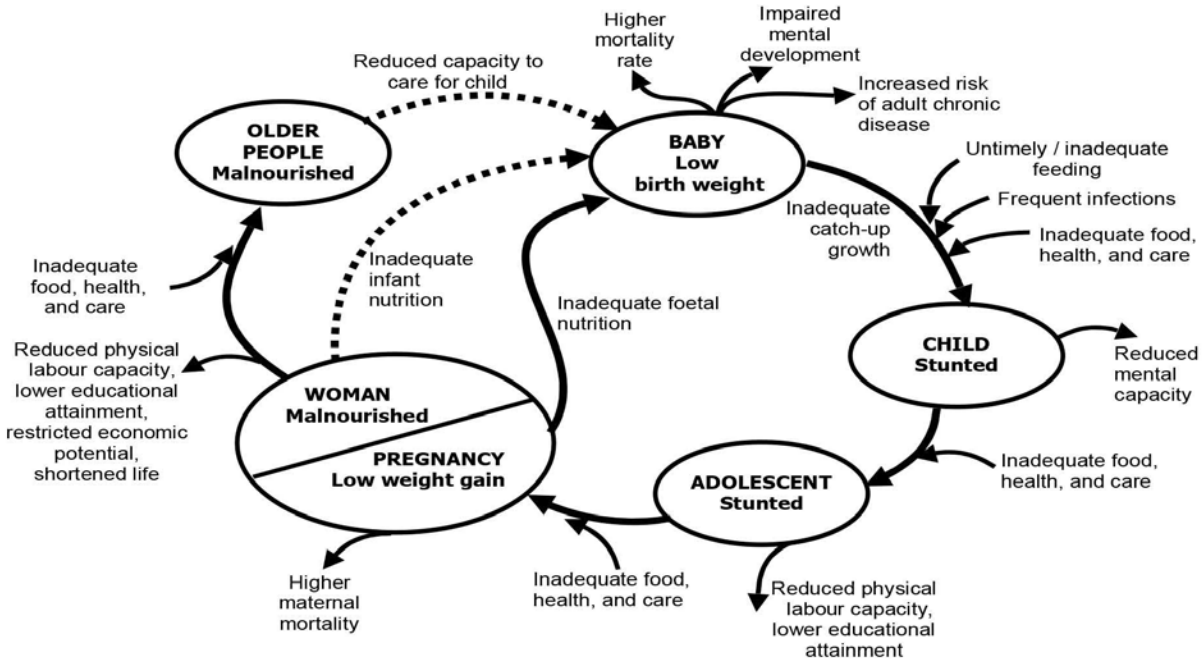
Source: MSPAS et al. 2017; for all the surveys, the values in the graph show the percentage of children with height-for-age, weight-for-age, and weight-for-height z-scores < -2 standard deviation (SD) below the median of the WHO 2006 child growth standard.

[a] ENSMI 1987 was for children 3–36 months of age.

The causes of malnutrition in Guatemala are manifold. Repeated infections (including acute respiratory infections, diarrhea, and malaria) and suboptimal breastfeeding and IYCF practices that result in inadequate dietary intake are immediate causes of malnutrition, but underlying causes include maternal malnutrition and short stature, lack of safe water, hygiene, and sanitation; food insecurity; high fertility; gender inequality; and poverty. In Guatemala, the total fertility rate is 3.1 births per woman (3.7 in rural areas and 2.5 in urban areas) (MSPAS et al. 2017). Malnutrition in Guatemala is intimately linked to the life cycle and is intergenerational in

nature (see Figure 4). In Guatemala, much of childbearing begins in adolescence which contributes to the high prevalence of low birth weight that in turn, contributes to the high prevalence of chronic malnutrition among children under 5. About 40.6 percent of adolescent girls either have given birth or are pregnant with their first child by 19 years of age, and the preceding birth intervals for adolescent girls is also shorter (median 23.6 months) compared to women 20–24 years of age and 25–29 years of age (median 30.2 and 36.7 months, respectively) (MSPAS et al. 2017). Early initiation of childbearing and short birth intervals are not only a biological risk for every subsequent birth, it also results in young mothers having very little time and resources to provide children under 2 years of age with optimum care and feeding, contributing to stunting. As such, malnutrition in Guatemala is a complex problem that persists due to multiple causes rooted in various sectors. Therefore, in addition to nutrition-specific interventions, multisectoral nutrition-sensitive interventions are also essential to reduce and eradicate malnutrition in Guatemala.

Figure 4. Life Cycle of Malnutrition



Source: Adapted from ACC/SCN (2000) Fourth Report on the World Nutrition Situation. Geneva: ACC/SCN in collaboration with the International Food Policy Research Institute (IFPRI).

Consequences of Malnutrition

Malnutrition in Guatemala has several adverse consequences. Malnourished children are more frequently ill and consequently are at increased risk of death. They have delayed cognitive development and consequently are likely to complete fewer years of schooling, which subsequently results in lower economic productivity (Black at al. 2013; Grantham-McGregor et al. 2007).

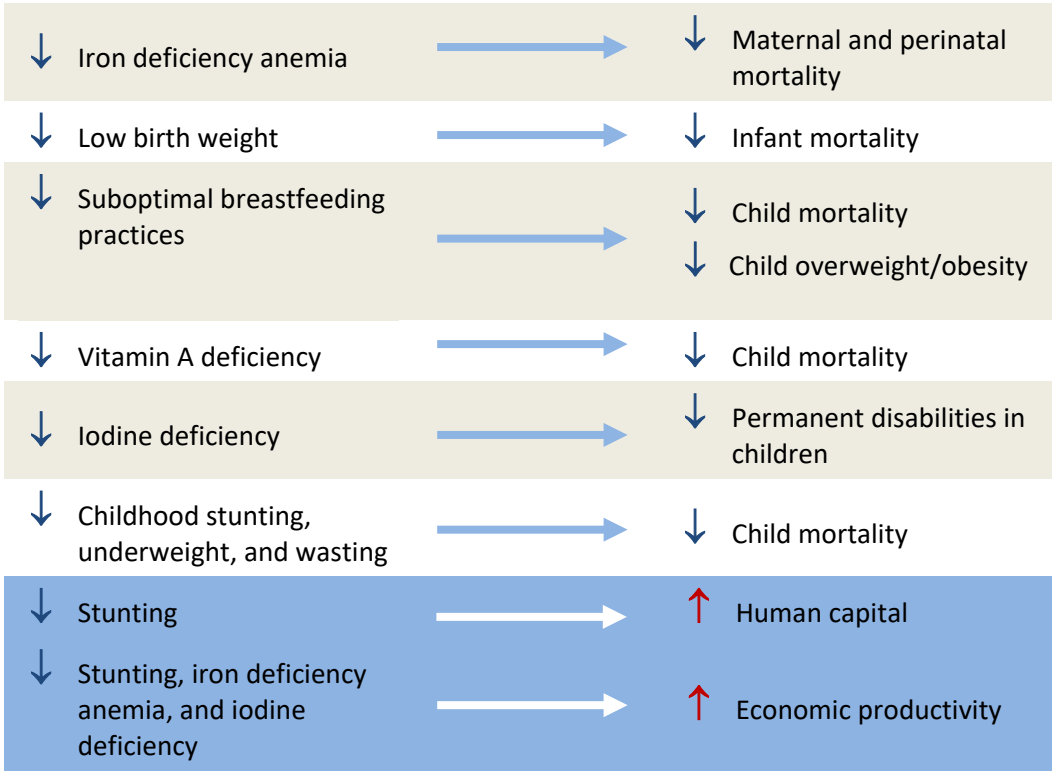
It is well established that preventing malnutrition among children under 2 years of age should be the focus of nutrition interventions, and this is a focus of the Scaling Up Nutrition (SUN) Movement (Scaling Up Nutrition Road Map Task Team 2010), of which Guatemala is a member. Global evidence increasingly suggests that there are four critical periods in an individual's life during which malnutrition has the most significant consequences: from 0–2 years of age, from

0–5 years of age for those affected by acute malnutrition, during adolescence, and during pregnancy and the postpartum period.

Nutrition Problems and Consequences Addressed in PROFILES

PROFILES estimates reductions in the number of deaths and permanent disabilities, and gains in human capital and economic productivity that can result from lower prevalence of several nutrition indicators including iron deficiency anemia; low birth weight; suboptimal breastfeeding practices; vitamin A deficiency (VAD); and childhood stunting, underweight, and wasting (Appendix A is a glossary of terms used in PROFILES). Guatemala PROFILES 2017 estimates of human capital losses attributed to stunting are related to poor cognitive development that result 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 anemia among adults is a reflection of decreased capacity to do manual labor. 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 Benefits of Their Reduction



Note: Guatemala PROFILES 2017 did not include estimates on wasting, childhood overweight/obesity, vitamin A deficiency, or iodine deficiency. See the "Data Sources for PROFILES and Prevalence of Nutrition Problems" section below for more information.

Methods

This section presents the methods that were used to derive the estimates for each of the nutrition problems addressed by PROFILES in Guatemala. PROFILES consists of a set of computer-based models that calculate consequences if malnutrition does not improve over a defined time period and the benefits of improved nutrition over the same time period. 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 situation throughout the chosen time period (the number of years for which estimates are calculated), aside from projected changes in population size and structure. The prevalence of each nutrition problem remains the same every year in the status quo scenario.

In contrast, in the **improved scenario**—with results estimated for the same time period—it is expected that nutrition interventions that are known to be effective are implemented at scale and succeed in reaching the stated targets in terms of improvements in the prevalence of the various nutrition problems.

The targets, which are determined and agreed upon through stakeholder meetings and a PROFILES workshop, reflect the proportion by which it is expected that nutrition problems will be reduced over the chosen time period. In the status quo scenario, the negative consequences are expressed, for example, in terms of lives lost, disabilities, human capital lost, and economic productivity losses. 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 gains, and economic productivity gains.

Figure 6 provides an illustrative example of the approach used in PROFILES to calculate estimates for child deaths (and lives saved) related to stunting (the information shown in the figure is not from Guatemala PROFILES 2017). For the purpose of providing an example of how PROFILES calculates the estimates for the status quo and the improved scenario, the number of children under 5 has been kept constant. But, in the actual PROFILES model, there is usually an increase in the number of children under 5 each year based on population projections. The graphs show how the status quo scenario (Figure 6a) versus the improved scenario (Figure 6b) 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 6c 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 related to selected nutrition indicators.

Figure 6a–c. Status Quo Scenario vs. Improved Scenario: Approach Used in PROFILES to Calculate Estimates of Lives Saved and Economic Productivity Gains Related to Various Nutrition Indicators (Illustrative Example)

Figure 6a. Status Quo Scenario

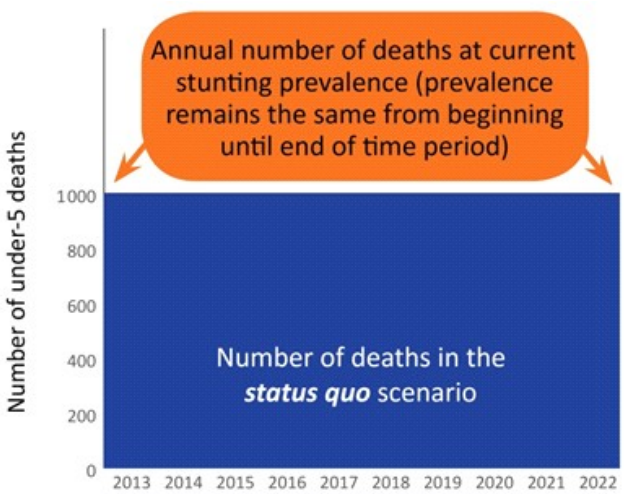


Figure 6b. Improved Scenario

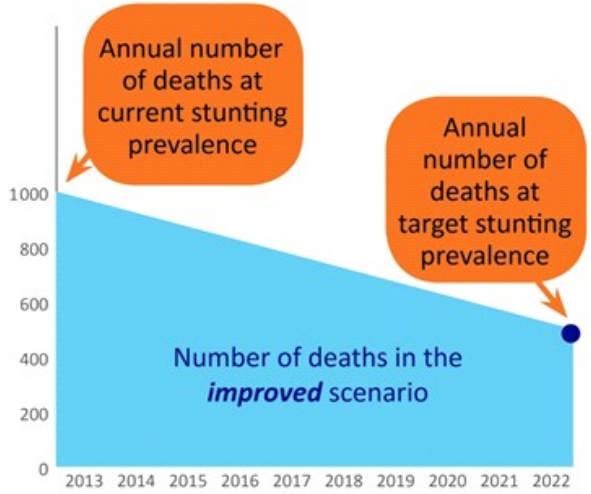
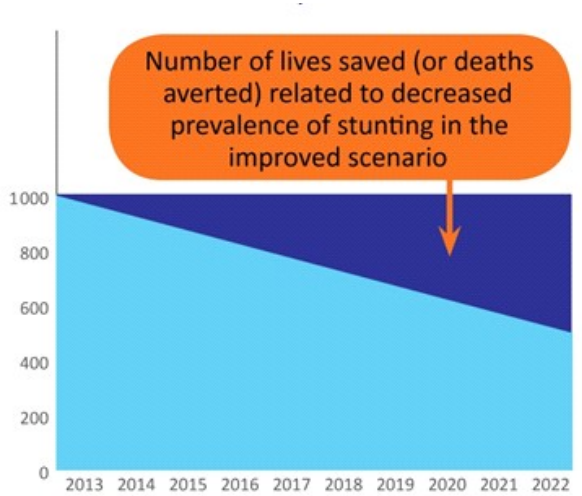


Figure 6c. Improved and Status Quo Scenario



It is expected that if effective interventions are put in place and that they are successful in reaching the targets, the interventions would not be implemented at scale from the start but would be implemented gradually over the time period and that improvement in the nutrition indicators and consequently lives saved would be gradual. For this reason, the estimates of lives saved or economic productivity gains are smaller than the total number of lives lost or economic productivity lost over the chosen time period. For example, the graphs in Figure 6 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 of lives saved. This is because it is assumed that the decrease in the prevalence of stunting will be linear 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 to prioritize various nutrition services, interventions, programs, or issues related to the nutrition policy environment.

Figure 7 shows the timeline of the PROFILES process. For Guatemala PROFILES 2017, FANTA, in collaboration with SESAN, held a 1-day stakeholder meeting on March 6, 2017 in Guatemala City, Guatemala, to discuss the objectives and rationale of PROFILES, key assumptions of the PROFILES models (such as what information sources should be used), and how PROFILES will contribute to moving the nutrition advocacy agenda in Guatemala forward. Immediately following the stakeholder meeting, FANTA facilitated a 4-day PROFILES workshop on March 7–10, 2017, in which 14 participants from SESAN, MSPAS, MIDES, MINEDUC, regional institutes, academia, and USAID partners (see Appendix B for a full list of participants from the two meetings) collaborated to generate preliminary PROFILES estimates for two scenarios. These preliminary estimates were then shared during the nutrition advocacy meeting to provide stakeholders a chance to review and discuss the preliminary estimates before finalization.

Figure 7. Timeline of Nutrition Advocacy Process Using PROFILES in Guatemala

During the first day of the workshop, participants, building upon the discussions held during the stakeholder meeting on the previous day, selected 2017–2026[3] as the 10-year time period for which to calculate the Guatemala PROFILES 2017 estimates. It was agreed by participants that this time period is long enough for substantial change to occur. During the workshop, participants entered information into the spreadsheets and developed preliminary PROFILES estimates. Participants also engaged in initial discussions on nutrition advocacy needs. As next steps in the process (see Figure 7), a national nutrition advocacy planning workshop took place March 20–23, 2017, to develop a harmonized, multisectoral strategic nutrition advocacy plan, including a timeline for advocacy activities.

Data Sources for PROFILES and Prevalence of Nutrition Problems

To quantify the magnitude of the negative consequences of nutrition problems, PROFILES needs country-specific prevalence data for each of the nutrition indicators. The data sources that were used for each of the nutrition indicators is provided in Table 1 and the prevalence of each of the nutrition indicators in the status quo scenario is provided in Tables 2–4.

[3] Time period is inclusive of 2017.

Table 1. Indicators and Data Sources for Guatemala PROFILES 2017[4]

Indicator	Source (Year)
Nutrition Indicators	
Anthropometry (stunting, underweight) among children under 5 years of age	ENSMI (Encuesta Nacional de Salud Materno Infantil) 2014–2015
Low birth weight	ENSMI (Encuesta Nacional de Salud Materno Infantil) 2014–2015
Breastfeeding practices	ENSMI (Encuesta Nacional de Salud Materno Infantil) 2014–2015
Anemia	ENSMI (Encuesta Nacional de Salud Materno Infantil) 2014–2015
Mortality, Education, and Economic Indicators	
Education information	Acuerdo Ministerial 1171–2010, Ministerio de Educación de Guatemala; Informe final de cumplimiento de los Objetivos de Desarrollo del Milenio, Secretaría de Planificación y Programación de la Presidencia, 2015
Employment information	ENEI (Encuesta Nacional de Empleo e Ingresos) 2016
Maternal mortality ratio	ENSMI (Encuesta Nacional de Salud Materno Infantil) 2014–2015
Mortality in the first 5 years of life	ENSMI (Encuesta Nacional de Salud Materno Infantil) 2014–2015

The ENSMI 2014–2015 provided the input information for anthropometry, low birth weight, and breastfeeding practices. 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.

Estimates for wasting were not calculated in PROFILES because the prevalence of wasting in Guatemala is less than 5 percent (0.7%) and is therefore deemed "acceptable" per WHO public health significance cut-offs (WHO 2010a). Participants felt that wasting could not be improved further by 2026, particularly since the country was not planning to implement additional interventions to address wasting in children under five; however, they noted that their goal for Guatemala is to maintain wasting in children under 5 at < 5 percent, in line with the World Health Assembly (WHA) 2025 targets.

Information from the ENSMI 2014–2015 on the anemia prevalence of 13.6 percent for adult women was used in PROFILES. Anemia prevalence was 24.2 percent among pregnant women.

Information about the total goiter rate, the measure of iodine deficiency used in PROFILES, was not available at the time of the PROFILES workshop (there are no recent goiter surveys in Guatemala.) Experts agreed however, that iodine deficiency was not a public health problem for the entire population, but may be a problem for pregnant women, according to recent surveillance data (INCAP 2015). Various surveys in Guatemala that have included testing of salt samples have shown that adequacy and quality of salt iodization can vary. Although iodized salt is used in bouillon cubes, which may be an important source of iodine, further studies are needed on their availability and use. Based on this discussion participants agreed to not

[4] Estimates for Vitamin A deficiency, iodine deficiency, overweight/obesity and wasting in children were not calculated in PROFILES as the prevalence is low.

generate estimates on iodine deficiency. Nonetheless, participants agreed that addressing the iodine situation in the country was still relevant for nutrition advocacy.

Time Period and Targets

During the PROFILES workshop, the group discussed the potential time period for which to calculate PROFILES estimates in relation to existing national goals and targets, such as Guatemala´s K´atun 2032 vision document, Guatemala´s Sustainable Development Goals (SDGs) 2030, the Plan Estratégico de Seguridad Alimentaria y Nutricional (PESAN) 2016–2020 (Strategic Plan for Food Security and Nutrition), and the Estrategia Nacional para la Prevención de la Desnutrición Crónica 2016–2020 (ENPDC, National Strategy for the Prevention of Chronic Malnutrition). After that discussion, they agreed upon 2017–2026 as the 10-year period for which to calculate the Guatemala PROFILES 2017 estimates. Participants felt the time period was appropriate because this 10-year period aligns with the completion of two 5-year development plans and presents an opportune time to assess the nation's progress towards the 2030 Sustainable Development Goals.

To calculate the estimates in the improved scenario, it is necessary to set targets for the reduction of the various forms of malnutrition. In setting the targets, participants' expectations are that evidence-based, effective nutrition interventions would be gradually implemented at scale and would succeed in reaching the targets decided upon by 2026.

Therefore, the question posed at the Guatemala PROFILES 2017 workshop was: By how much do we assume that selected nutrition indicators will improve by 2026? Official government documents (i.e., Guatemala´s K´atun 2032 vision document, SDGs, PESAN, and ENPDC) helped guide discussions on target setting for the selected time period. In addition, the group reviewed the WHA 2025 nutrition targets (which the Government of Guatemala has committed to), for insights on global nutrition goals, and WHO's Nutrition Landscape Information System, for information on public health levels of concern for certain nutrition indicators (e.g., WHO classifications for population prevalence of stunting: ≥ 40% is "very high;" 30–39% is "high;" 20–29% is "medium;" and < 20% is "low") (WHO 2010b). See Appendix C for a full list of the WHO classifications. Participants in the Guatemala 2017 PROFILES workshop also considered trend information, for the indicators where this was available, as well as factors related to potential improvement in interventions. After deliberating, participants agreed that the targets reflecting the improved nutrition situation could be both optimistic and realistic, and that they should not only spur greater investment in nutrition but also foster hope for a Guatemala free of malnutrition. Based on this vision, it was felt that the targets set for reducing the prevalence of the various nutrition indicators could be achieved. Tables 2, 3, and 4 include the target prevalence at the end of the 10-year time period for the improved scenario and the proportion by which the status quo prevalence would be reduced by the end of the 10-year time period.

For the anthropometric indicators (stunting, underweight, and wasting), Tables 2, 3, and 4 show the information separately for the mild, moderate, and severe categories because the risk of dying differs by the degree of severity. Summary information for the moderate and severe categories combined is also shown. A calculator in PROFILES provides a status quo estimate for the percentage in the mild category using information on the mean z-score, and the percentage of children in the moderate and severe categories. A PROFILES calculator is also used to estimate the percentage in each of the three severity categories in the improved scenario, based on the specified target for the sum of the moderate and severe category. It is possible

that the percentage of children in the mild category could be higher in the improved scenario than in the status quo scenario, reflecting the distribution of z-scores shifting to the right as nutritional status improves.

For stunting (moderate and severe) among children under 5 years of age, the status quo prevalence of 46.5 percent would be reduced by 16 percentage points to 30.5 percent by 2026 in the improved scenario (which is consistent with K'atun 2032 and in line with WHA targets[5]). Among children 24–35 months, stunting would be reduced by 16 percentage points from a status quo prevalence of 51.5 percent to a target prevalence of 35.5 percent (this is used to calculate increased economic productivity due to reductions in stunting).

Based on a discussion of the 2025 WHA targets (which call for a 50 percent reduction in anemia in women of reproductive age), the group agreed on the following anemia reduction targets: 9.2 percentage points in pregnant women (from 24.2 percent to 15.0 percent) and 12.5 percentage points in children 5–14 years of age (from 32.4 percent to 19.9 percent) by 2026. For low birth weight, a 4.4 percentage point reduction was agreed (in line with WHA targets[6]), from the status quo prevalence of 14.6 percent to a target prevalence of 10.2 percent under the improved scenario. For exclusive breastfeeding, the group agreed on a target of 73.1 percent under the improved scenario, an increase of 20 percentage points over the 53.1 percent status quo scenario. In addition, the group agreed on a 10 percentage point increase in "any breastfeeding" among children 6–23 months, from 78.3 percent in the status quo scenario to 88.3 percent in the improved scenario. Lastly, the group agreed on a 20 percentage point increase in exclusive breastfeeding at 4–5 months of age, from 43.5 percent to 63.5 percent in the improved scenario, as participants thought this was realistic and achievable.

World Health Assembly Targets

To improve maternal, infant and young child nutrition WHO's Member States have endorsed global targets for improving maternal, infant and young child nutrition and are committed to monitoring progress. The targets are vital for identifying priority areas for action and catalyzing global change.

Stunting
TARGET: 40% reduction in the number of children under 5 who are stunted

Anemia
TARGET: 50% reduction of anemia in women of reproductive age

Low birth weight
TARGET: 30% reduction in low birth weight

Childhood overweight
TARGET: No increase in childhood overweight

Breastfeeding
TARGET: Increase the rate of exclusive breastfeeding in the first 6 months up to at least 50%

Wasting
TARGET: Reduce and maintain childhood wasting to less than 5%

Demographic, Employment, and Education Information

PROFILES requires demographic information with projections into future years that correspond to the time period used for PROFILES in Guatemala. Population information was obtained from the Guatemalan National Statistics Institute (Instituto Nacional de Estadística de Guatemala [INE]) and used in conjunction with both the estimated total population for 2015 (16,176,133) and a PROFILES calculator tool to obtain the various demographic estimates required by PROFILES for each year. Mortality rates were obtained from the ENSMI 2014–2015: perinatal

[5] A 40% reduction in the number of children under 5 who are stunted by 2025
[6] A 30% reduction in low birth weight by 2025

mortality rate (22 per 1,000 births), neonatal mortality rate (18 per 1,000 live births), infant mortality rate (30 per 1,000 live births), under-5 mortality rate (39 per 1,000 live births); and maternal mortality ratio (140 per 100,000 live births).

PROFILES requires information on the economic activity rate (the percentage of the working-age population actually working or available for employment, including those who were unemployed), the percentages of working-age persons who did manual labor, working-age males who did manual labor, and working-age females who did manual labor. This Information was obtained from the Encuesta Nacional de Empleo e Ingresos 2016 (INE 2016). Wages were about 32,400 GTQ for all sectors and 23,000 GTQ for manual labor.

PROFILES requires information on age at school entry and the duration of universal/primary schooling (years) in the country. This information was taken from the Ministerial Agreement 1171–2010 of the Ministry of Education and the Millennium Development Goals 2015 (Ministerio de Educación, 2010; Segeplán, 2015).

Table 2. Estimated Reductions in Death and Disability Using Guatemala PROFILES 2017

Nutrition problem	Rationale/assumptions	Data sources	Starting prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2026 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2026] (%)
Mortality					
Stunting, underweight, and wasting among children under 5 years of age related to under-5 child mortality Children 0–59 months of age with low height-for-age, weight-for-age, and weight-for-height, by severity level (moderate, severe) (%)	PROFILES calculates mortality related to each anthropometric indicator of undernutrition (stunting, underweight, and wasting) by degree of severity using odds ratios from Olofin et al. (2013) as cited in Black et al. (2013). These odds ratios of mortality related to each grade of malnutrition are: 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 estimates the prevalence of mild stunting, underweight, and wasting from those reported for moderate and severe, assuming that the associated indicators (height-for-age, weight-for-age, and weight-for-height) are normally distributed. 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 totaled.	Percentages of children (0–59 months) in the severe and moderate categories are based on ENSMI 2014-2015. Percentages of children in the mild category are calculated by the spreadsheet.	**Stunting:** Mild: 28.9 Moderate: 29.9 Severe: 16.6 Mean height-for-age z-score at 0–59 months: -1.9 In summary (moderate + severe): 46.5	**Stunting:** In summary (moderate + severe): 0.345	**Stunting:** Mild: 33.4 Moderate: 22.0 Severe: 8.4 In summary (moderate + severe): 30.5
			Underweight: Mild: 33.4 Moderate: 10.5 Severe: 2.1 Mean weight-for-age z-score at 0–59 months: - 0.9 In summary (moderate + severe): 12.6	**Underweight:** In summary (moderate + severe): 0.21	**Underweight:** Mild: 29.1 Moderate: 8.9 Severe: 1.1 In summary (moderate + severe): 10.0

Nutrition problem	Rationale/assumptions	Data sources	Starting prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2026 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2026] (%)
Anemia during pregnancy related to maternal and perinatal mortality Pregnant women with low hemoglobin (Hb < 11 g/dL) (%)	Anemia during pregnancy is an important contributor to maternal mortality, including through an increased risk of death from postpartum hemorrhage. Anemia 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 anemia to maternal and perinatal deaths based on the work by Stoltzfus et al. (2004) with updated relative risk (RR) information from Black et al. (2013), and presuming that 50% of anemia is due to iron deficiency (an assumption that was also made by Stoltzfus et al.); which is the percentage used for Guatemala PROFILES 2017. The relative risks (RRs) used in PROFILES are: • RR of maternal mortality related to a 1 g/dL increase in hemoglobin: 0.71 • RR of perinatal mortality related to a 1 g/dL increase in maternal hemoglobin: 0.84	ENSMI 2014–2015	24.2	0.38	15.0
Low birth weight (LBW) related to infant mortality Newborns with LBW (%)	LBW, 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 weight (Alderman and Behrman 2004) and country-specific LBW information and mortality rates, PROFILES calculates the population-attributable fraction and excess number of deaths related to LBW. The RRs used in PROFILES are: • RR of neonatal death related to LBW: 4 • RR of post-neonatal infant death related to LBW: 2	ENSMI 2014–2015	14.6	0.30	10.2

Nutrition problem	Rationale/assumptions	Data sources	Starting prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2026 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2026] (%)
Suboptimal breastfeeding practices related to mortality among children under 2 years of age Children under 2 years of age suboptimally breastfed, by age group (0–5 months and 6–23 months) and suboptimal breastfeeding practices (%)	Suboptimal breastfeeding practices (none, partial, or predominant breastfeeding when children are 0–5 months vs. exclusive breastfeeding; and no breastfeeding among children 6–23 months vs. any breastfeeding) 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 breastfeeding by Lamberti et al. (2011) and country-specific breastfeeding 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 breastfeeding. PROFILES uses the following RRs: • RR all-cause mortality, predominant breastfeeding vs. exclusive breastfeeding (0–5 months): 1.48 • RR all-cause mortality, partial breastfeeding vs. exclusive breastfeeding (0–5 months): 2.84 • RR all-cause mortality, no breastfeeding vs. exclusive breastfeeding (0–5 months): 14.4 • RR all-cause mortality no breastfeeding vs. any breastfeeding (6–23 months): 3.69 For more information on this model see Oot et al. 2015.	ENSMI 2014–2015	**Breastfeeding Practices**:** Exclusive breastfeeding 0–5 months: 53.1 Predominant breastfeeding 0–5 months: 16.4 Partial breastfeeding 0–5 months: 25.2 No breastfeeding 0–5 months: 5.3 Any breastfeeding 6–23 months: 78.3 No breastfeeding 6–23 months: 21.7	N/A	**Breastfeeding Practices***:** Exclusive breastfeeding 0–5 months: 73.1 Predominant breastfeeding 0–5 months: 9.5 Partial breastfeeding 0–5 months: 14.5 No breastfeeding 0–5 months: 2.9 Any breastfeeding 6–23 months: 88.3 No breastfeeding 6–23 months: 11.7

* Proportion reduction applied to current prevalence

** *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 milk and food-based fluids, are not allowed, and no semi-solid or solid foods are allowed (WHO 2010a). *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 complementary food.

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

Table 3. Estimating Losses and Gains in Economic Productivity Using Guatemala PROFILES 2017

Nutrition problem	Rationale/assumptions	Data sources	Starting prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2026 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2026] (%)
Economic Productivity					
Stunting among children 24–35 months of age related to future productivity Children 24–35 months of age with low height-for-age (stunting), by severity level (moderate, severe) (%)	Growth deficit early in life is related to productivity loss in adulthood. PROFILES estimates the impact of growth deficit in children on future labor productivity based on the fact 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). Alderman et al. (2006) present evidence that a 5.1% reduction in child height results in a 14% reduction in lifetime earnings, suggesting an elasticity of productivity with respect to height of 2.7 (14/5.1), used by PROFILES to estimate the effect of severe and moderate stunting on the present value of future productivity.	ENSMI 2014–2015	**Stunting (24–35 months of age):** Moderate: 31.7 Severe: 19.8 Mean height-for-age z-score at 24–35 months of age: -2.0 In summary (moderate + severe): 51.5	**Stunting (24–35 months of age):** In summary (moderate + severe): 0.31	**Stunting (24–35 months of age):** Moderate: 24.7 Severe: 10.8 In summary (moderate + severe): 35.5
Anemia among adult men and women related to productivity losses Women 15–49 years of age with low hemoglobin [Non-pregnant: (Hb < 12 g/dL) (%) and pregnant: (Hb < 11 g/dL) (%)]	Anemia among the working-age adult population contributes to reduced productivity for those engaged in physical labor, especially heavy physical labor. The PROFILES model uses the coefficients developed by Horton and Ross (2003) for the effects of iron deficiency anemia on reduced capacity to carry out any type of physical labor and heavy physical labor. Specifically, they estimate that among anemic adults, the proportional reduction in productivity in manual labor is 5%, and that the reduction is 17% in heavy manual labor.	ENSMI 2014–2015	13.6	0.44	7.6
Men 15–64 years of age with low hemoglobin (Hb < 13 g/dL) (%)		The ENSMI 2014–2015 did not include anemia information for men.	Data not available	N/A	N/A

Nutrition problem	Rationale/assumptions	Data sources	Starting prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2026 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2026] (%)
Children 6–59 months of age with anemia (Hb < 11 g/dL) (%)	Anemia among children 0–14 years of age reduces future productivity both directly (by causing permanent cognitive deficits) and indirectly (by reducing learning). The PROFILES model is based on coefficients proposed by Horton and Ross (2003) who suggest that childhood anemia reduces future productivity by 2.5% and that this effect accumulates throughout childhood. Thus, each completed year of anemia "locks in" 1/15 of the total future productivity effect, from birth to the 15th birthday.	ENSMI 2014–2015	32.4	0.39	19.9

* Proportion reduction applied to current prevalence

Table 4. Estimating Human Capital Losses and Gains in Terms of Learning Using Guatemala PROFILES 2017

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2026 (status quo prevalence will be reduced by this proportion)*	Target prevalence [2026] (%)
Human Capital					
Stunting among children 24–35 months of age related to human capital losses in terms of learning ability Children 24–35 months of age with low height-for-age (stunting) (moderate and severe) (%)	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 et al. 2007; Glewwe et al. 2001). 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 learning. PROFILES uses 0.8 grade equivalents lost per school year per 1 standard deviation unit reduction in the mean height-for-age z-score, derived from the results of Glewwe et al. 2001.	ENSMI 2014–2015	**Stunting (24–35 months of age):** Moderate: 31.7 Severe: 19.8 In summary (moderate + severe): 51.5	**Stunting (24–35 months of age):** In summary (moderate + severe): 0.31	**Stunting (24–35 months of age):** Moderate: 24.7 Severe: 10.8 In summary (moderate + severe): 35.5
Primary education: Age at school entry Number of years of school:	The age at school entry in Guatemala is 6 years. There are 6 years of primary school. For more information on this model see Oot et al. 2016.	Ministerial Agreement 1171–2010, Ministry of Education; Millennium Development Goals, Segeplán 2015			

* Proportion reduction applied to current prevalence

Results

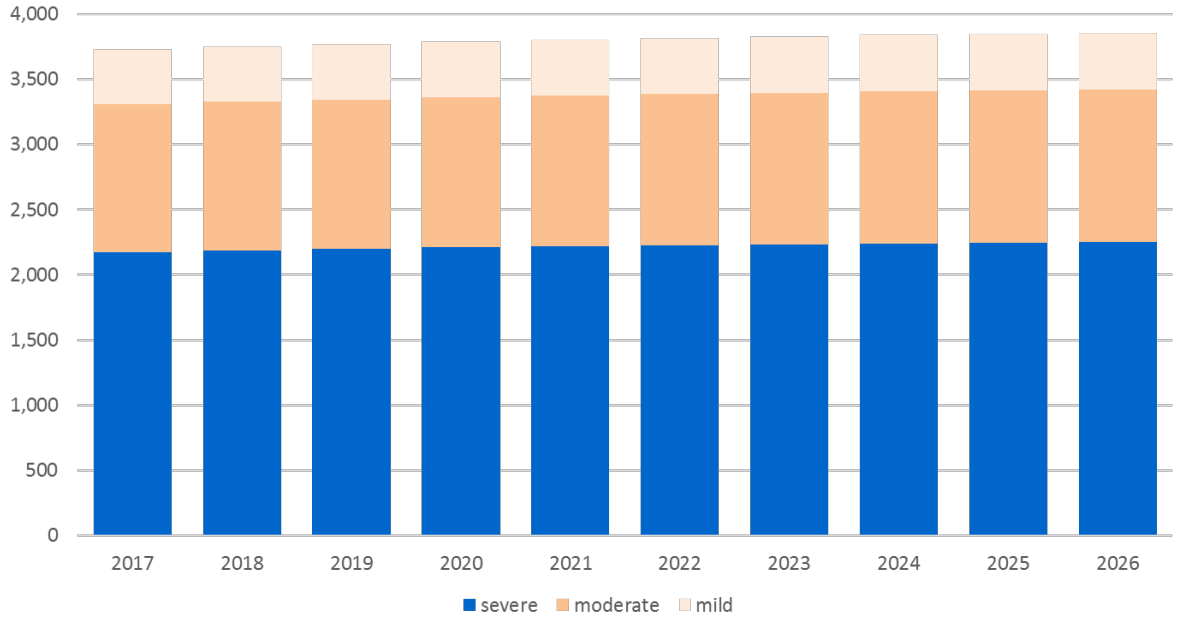
The results from Guatemala PROFILES 2017 are presented in Tables 5–7 and Figures 8–10, and Figures 11 and 12 provide a summary of the results. As shown in Table 5, if stunting levels remain unchanged from 2017–2026, the number of deaths related to stunting in children under 5 years of age could total 38,019. However, if the nutrition situation improves and stunting levels are reduced to the proposed targets, 6,692 children's lives could be saved from stunting-related deaths over the time period (2017–2026). Figures 8–10 provide further details and illustration of the status quo scenario and improved scenario for stunting.

Table 5 also shows that in the status quo scenario, with no change in the prevalence of maternal iron deficiency anemia, there would be 674 maternal deaths related to pregnancy and childbirth and 5,549 perinatal deaths. Reaching targeted reductions in the prevalence of maternal iron deficiency anemia by 2026 could save 248 women's lives and avert 2,010 perinatal deaths over the time period. In addition, if there was no change in the prevalence of low birth weight, there would be 30,542 deaths related to this problem during 2017–2026. However, 3,584 infant deaths could be averted by reductions in low birth weight. In the status quo scenario, there would be 70,935 under-2 child deaths attributable to suboptimal breastfeeding practices. However, if targeted reductions in suboptimal breastfeeding practices are met by 2026, then the lives of 9,147 children under 2 years of age could be saved.

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

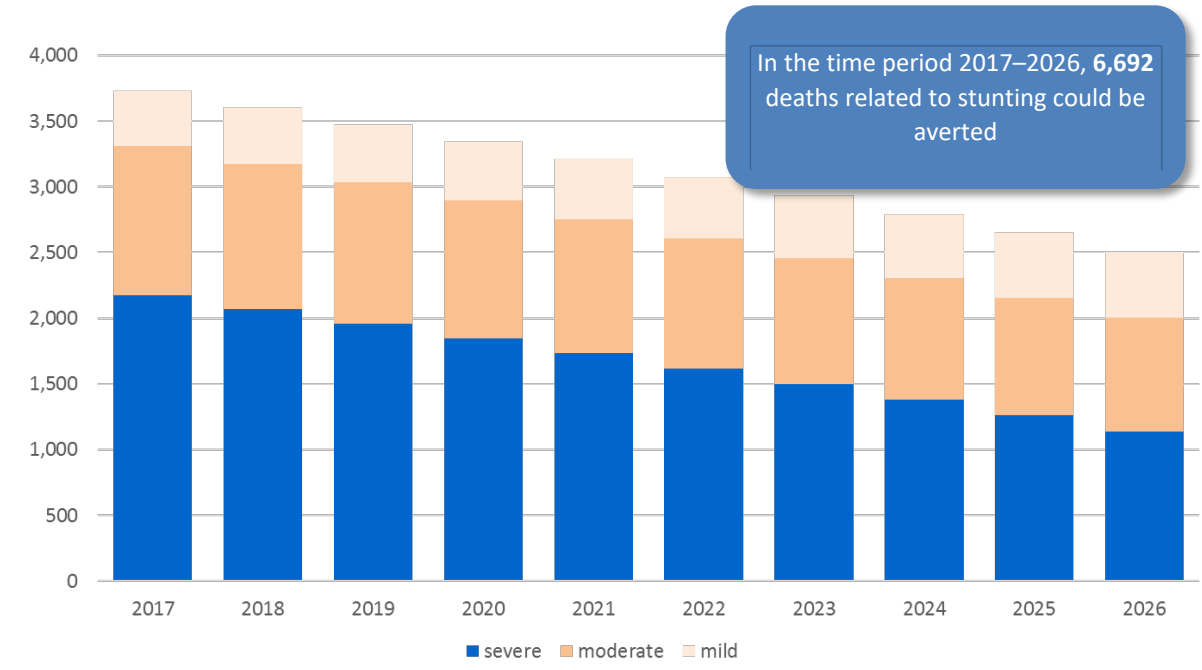
	2017–2026		
Nutrition problem	**DEATHS if current situation continues** ***Status quo scenario***	DEATHS if nutrition situation improves ***Improved scenario***	**LIVES SAVED if nutrition situation improves** ***Improved scenario***
Anthropometric indicators			
Deaths/lives saved attributable to **stunting** (severe, moderate, mild) among children < 5 years of age	38,019	31,327	6,692
Low birth weight			
Infant deaths/lives saved	30,542	26,958	3,584
Iron deficiency anemia			
Maternal deaths/lives saved	674	427	248
Perinatal deaths/lives saved	5,549	3,539	2,010
Breastfeeding practices			
Deaths/lives saved attributable to suboptimal breastfeeding practices among children < 2 years of age	70,935	61,788	9,147

Figure 8. Status Quo Scenario: Number of Deaths for Children under 5 Years of Age Related to Stunting,* 2017–2026



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

Figure 9. Improved Scenario: Decreasing Number of Deaths for Children under 5 Years of Age Related to Stunting,* 2017–2026



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

Table 6 shows human capital losses and gains in terms of learning related to stunting.[7] If there is no change in the prevalence of stunting, the losses would amount to 33 million equivalent school years of learning. Conversely, if stunting is reduced over the time period, the gains would be 3.6 million equivalent school years of learning. By the end of the time period, these gains in learning ability mean that on average, children who are 2 years of age in 2026 will gain 1.7 equivalent school years of learning by the time they reach the age corresponding to the end of the primary school years.

Table 6. Human Capital Losses and Gains in Terms of Learning

Nutrition problem	Losses in learning if the current situation continues *Status quo scenario* 2017–2026	Gains in learning if nutrition situation improves *Improved scenario* 2017–2026
Stunting	32,970,000 or 33.0 million equivalent school years of learning	3,561,000 or 3.6 million equivalent school years of learning

Figure 10 provides an illustration of human capital gains in learning related to a reduction in stunting prevalence.

Figure 10. Improved Scenario: Human Capital Gains in Terms of Learning Related to a Reduction in Stunting, 2017–2026

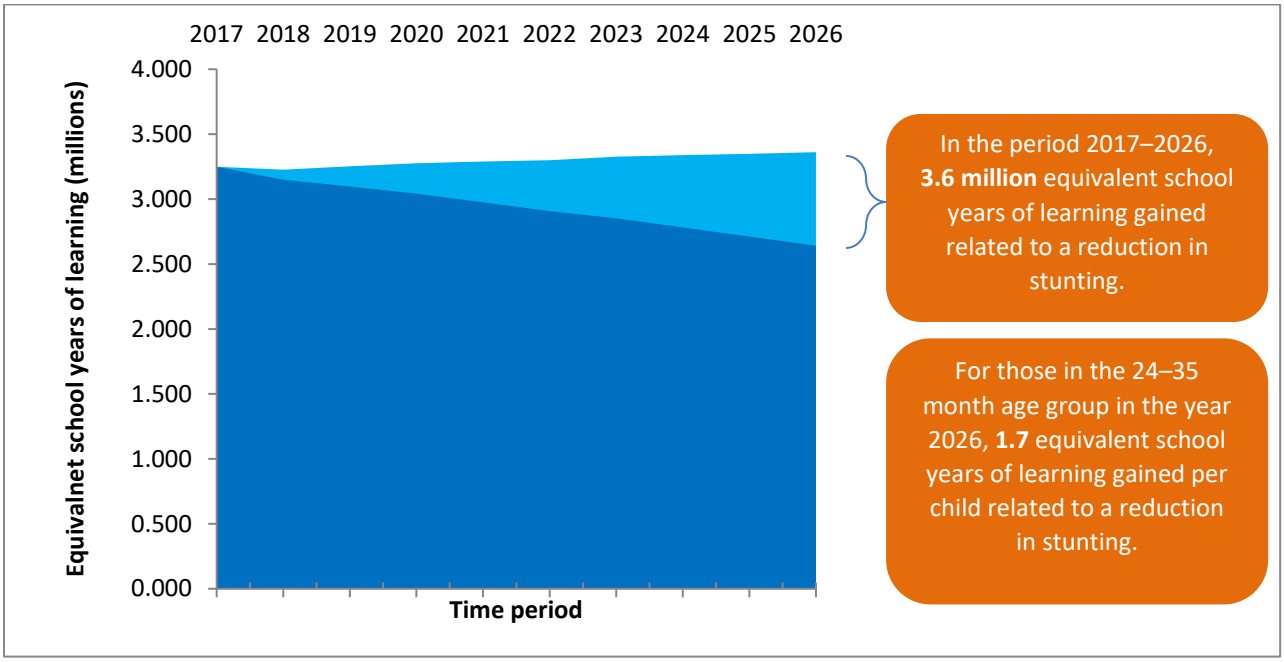


Table 7 shows economic productivity losses related to stunting among young children and iron deficiency anemia among adult women and children 6–59 months of age. If stunting levels remain unchanged during the chosen period at the current high level, future productivity losses related to stunting would be about 146,207 million Guatemalan quetzales (GTQ) (US$ 19,437 million). Productivity losses related to iron deficiency anemia for adults (women) would be

[7] The human capital losses and gains in terms of learning related to stunting that are presented here are considered conservative given that these PROFILES estimates only take into consideration the 6 years of primary school.

about 1,800 million GTQ (US$ 239.30 million) and 3,045 million GTQ (US$ 404.77 million) for children 6–59 months of age if this problem remains unchanged.

Table 7 also shows the economic productivity gains that could be achieved if the prevalence of stunting and iron deficiency anemia in adult women and children could be significantly reduced over the chosen time period. The economic productivity gains from reducing each of these nutrition problems would be 25,229 million GTQ (US$ 3,354 million) for stunting and about 412 million GTQ (US$ 54.81 million) for iron deficiency anemia among adult women and 592 million GTQ (US$ 78.72 million) for children.

Table 7. Economic Productivity Losses and Gains Related to Stunting and Iron Deficiency Anemia

Nutrition problem	Economic productivity losses if the current situation continues *Status quo scenario* 2017–2026	Economic productivity gains if nutrition situation improves *Improved scenario* 2017–2026
Stunting	146 207 000 000 GTQ or 146 207 million GTQ (US$ 19 437 000 000 or US$ 19 437 million)	25 229 000 000 GTQ or 25 229 million GTQ (US$ 3 354 000 000 or US$ 3 354 million)
Iron-deficiency anemia (adult: women)	1 800 000 000 GTQ or 1 800 million GTQ (US$ 239 300 000 or US$ 239.30 million)	412 000 000 GTQ or 412 million GTQ (US$ 54 810 000 or US$ 54.81 million)
Iron-deficiency anemia (child: 6–59 months of age)	3 044 710 000 GTQ or 3 045 million GTQ (US$ 404 770 000 or US$ 404.77 million)	592 130 000 GTQ or 592 million GTQ (US$ 78 720 000 or US$ 78.72 million)

Note: Productivity gains that could result from a 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). Note: Numbers in GTQ and US$ are rounded. Exchange rate used is GTQ7.52 = US$1.

Figure 11. Estimates of Future Lives Lost, Economic Productivity Lost and Human Capital Lost Associated with Various Nutrition Problems, 2017–2026

LIVES LOST		ECONOMIC PRODUCTIVITY LOST	HUMAN CAPITAL LOST
38,019 lives of children under 5 years of age lost related to stunting	**30,542** infants' lives lost related to low birth weight	**146,207 million GTQ (US$ 19,437 million)** lost related to stunting	**33 million** equivalent school years of learning lost related to stunting
674 women's lives lost related to maternal anemia	**5,549** infants' lives lost during the perinatal time period related to maternal anemia	**3,045 million GTQ (US$ 404.77 million)** lost related to iron deficiency anemia among children (6–59 months of age)	
70,935 lives of children under 2 years of age lost related to suboptimal breastfeeding practices		**1,800 million GTQ (US$ 239.30 million)** lost related to iron deficiency anemia among adult women	

Figure 12. Estimates of Future Lives Saved, Economic Productivity Gained and Human Capital Gained, 2017–2026

LIVES SAVED		ECONOMIC PRODUCTIVITY GAINED	HUMAN CAPITAL GAINED
6,692 lives of children under 5 years of age saved related to a reduction in stunting	**3,584** infants' lives saved related to increases in birth weight	**25,229 million GTQ (US$ 3,354 million)** gained related to a reduction in stunting	**3.6 million** equivalent school years of learning gained related to a reduction in stunting
248 women's lives saved related to a reduction in maternal anemia	**2,010** infants' lives saved in the perinatal time period related to a reduction in maternal anemia	**592 million GTQ (US$ 78.72 million)** gained related to improvements in iron deficiency anemia among children	
9,147 lives of children under 2 years of age saved related to improved breastfeeding practices		**about 412 million GTQ (US$ 54.81 million)** gained related to improvements in iron deficiency anemia among adult women	

Summary of Discussions on Nutrition Advocacy Needs: Implications for Policy and Practice

This section summarizes the discussions that took place during the stakeholder meeting and PROFILES workshop on nutrition advocacy needs in Guatemala. The information included in this section formed the foundation for development of a National Nutrition Advocacy Plan for Guatemala with multisectoral stakeholders.

Nutrition is a critical investment for Guatemala. The PROFILES estimates for Guatemala clearly show that improved nutrition could result in significant health and development benefits for the country, including significant gains in human capital and the health and well-being of the country's citizens, reduced maternal and child mortality, and improved economic productivity. Improvements in nutrition, however, are based on the expectations that, over time, proven, effective, and evidence-based nutrition interventions will be implemented at scale across the country to mothers and children, with a focus on a continuum of care that covers both the prevention and treatment of all forms of malnutrition, and that the interventions will succeed in reaching the stated targets in terms of improvement of various nutrition problems.

Participants of the stakeholder meeting and PROFILES workshop discussed and agreed upon the following advocacy needs:

Develop and finalize a cross-cutting strategic and multisectoral national nutrition advocacy plan that aligns with the National Food Security and Nutrition Policy and National Strategy for the Prevention of Chronic Malnutrition 2016–2020.

The national nutrition advocacy plan will facilitate greater harmonization of efforts by government, donors and partners and will ensure that stakeholders working on nutrition are speaking in one coordinated voice in promoting nutrition in Guatemala. The advocacy plan will promote governance and engage central and local government, civil society, media, donors, and the private sector with clear roles for improving nutrition in Guatemala. The advocacy plan will align with Guatemala's National Food Security and Nutrition Policy which provides a framework for coordinating the efforts of the public sector, civil society, and international community to ensure the Guatemalan population receives the food security and nutrition they deserve. It will also align with The National Strategy for the Prevention of Chronic Malnutrition 2016–2020, which aims to prevent chronic undernutrition in children under two years of age, and supports the law that establishes the National Food Security and Nutrition System (Decree 32–2005), which states that Guatemalans have the right to adequate quantity and quality of food to maintain a healthy and active life. Areas to be addressed in a national nutrition advocacy plan include:

1. **Recognize nutrition's impact on health, education and economic productivity and ensure regular financing for nutrition, from both national and international funds.** Historically, investment in nutrition has been limited and lacking long-term sustainable interventions. In Guatemala, the government spends only 2.4% of its gross domestic product (GDP) on health. This is among the lowest of all Central American countries. In 2013, for example, the government invested Q637.2 million in nutrition—only one-third of what was required for national nutrition services. As a result, women and children, especially in rural and remote areas where malnutrition is highest, are not being provided the nutrition services they are entitled to under Guatemalan law.

Creating an enabling environment for improved nutrition will require greater investment and commitment by the Government of Guatemala. Increasing resource allocation for nutrition in tandem with efforts to strengthen integrated implementation of nutrition services at scale will help Guatemala fulfil its national commitments to nutrition targets. Guatemala must escalate investment in nutrition, allocating specific amounts within all relevant line ministries, and guarantee that all budgets will be dispersed and monitored to ensure funds are being used appropriately.

2. **Promote the implementation of proven high-impact nutritional interventions at scale.** Substantial effort to implement and expand access to quality nutrition services at scale is essential if the benefits of improved nutrition, as suggested by the PROFILES estimates for Guatemala, are to be achieved. Prevention of chronic malnutrition interventions should focus on:
    - Improving adolescent nutrition and delaying pregnancy past adolescence
    - Improving maternal nutrition during pregnancy and the postpartum time period
    - Improving nutrition of children under 2 by supporting exclusive breastfeeding up to 6 months of age and continued breastfeeding beyond 6 months of age, together with the appropriate introduction of nutritious complementary foods starting from 6 months of age and continuing to 2 years of age
    - Providing micronutrient supplementation
    - Providing nutrition counseling and support to mothers of children under 2 years of age
    - Providing fortified foods
3. **Ensure that tailored nutrition services are implemented in departments of Guatemala with the greatest numbers of children affected by chronic malnutrition such as the Western Highlands.** In expanding access to quality nutrition services at scale, special consideration should be given to the needs and vulnerabilities of families and children in the Western Highland departments given these areas have significant numbers of stunted children.

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Appendix A. Glossary of Terms in the Context of PROFILES

Term/Phrase	Definition/Usage
Acute malnutrition	(See wasting.)
Anemia	A sign of malnutrition. When the amount of hemoglobin in the blood is inadequate, a person is said to suffer from anemia, which reduces the oxygen-carrying capacity of red blood cells. Anemia can be caused by iron deficiency due to low dietary intake, poor absorption of iron, or blood loss. However, anemia is also caused by infectious diseases such as malaria, hookworm infestation, and schistosomiasis, and genetic diseases. Pregnant women, infants, and young children are particularly vulnerable to anemia. Maternal anemia increases the risk of maternal and perinatal mortality, preterm birth, and low birth weight. In children, anemia impairs cognitive development, and in adults, it reduces work productivity (especially heavy physical labor). Anemia is typically defined as having a blood hemoglobin level less than 11 g/dL in pregnant women and children under 5 years of age, less than 11.5 g/dL in children 5–11 years of age, less than 12 g/dL in non-pregnant women and children 12–14 years of age, and less than 13 g/dL in men. (Some surveys/studies might use an older cut-off of 12 g/dL for children 5–11 years of age).
Anthropometry	The study and technique of human body measurement. It is one tool used to measure and monitor the nutritional status of an individual or group. Examples of anthropometric measures include weight and height, which are used to form indices such as weight-for-height, height-for-age, and weight-for-age. Three indicators of undernutrition (wasting, stunting, and underweight) included in PROFILES are derived from these indices.
Body mass index (BMI)	Defined as an individual's body mass (in kg) divided by height (in meters) squared: BMI = kg/m^2. BMI is used to identify moderate and severe undernutrition among adults but can also be used to identify overweight and/or obesity.
Chronic malnutrition	(See stunting.)
Cretinism	A severe mental and physical disability that occurs in the children of women who have severe iodine deficiency in early pregnancy. (Also see iodine deficiency disorders.)
Discounting	(See economic productivity.)
Economic activity rate (also called labor force participation rate)	The proportion of the working age population actually working or available to work (the numerator includes employed and unemployed). This is distinguished from the more commonly reported "employment rate" in that the denominator is not just the labor force but everyone of working age (15–64 years of age).
Economic productivity	PROFILES estimates the present day value of future productivity taking into account expected mortality from other causes and using a discount rate. Discounting reflects the human tendency to devalue anything in the future; it is independent of inflation and is determined by the "social discount rate," usually taken as 3% per year. The models use current country-specific employment and labor force participation rate, and current divisions between different occupations. In PROFILES, among children, estimates of future economic productivity losses attributed to stunting, iodine deficiency, and iron deficiency anemia are related to poor physical and cognitive development, which affects school performance and, later in life, earning potential. Economic productivity losses are also estimated in relation to iron deficiency anemia among adults, which is a reflection of decreased capacity to do manual labor. In PROFILES, when contrasting the results between the status quo and the improved scenarios, the difference reflects the benefits of improved nutrition expressed as economic productivity gains (or, put another way, economic productivity losses averted).
Equivalent school years of learning	Used in PROFILES to quantify human capital losses in terms of reduced learning ability related to stunting. This unit of measurement sums the deficit in children's reduced learning ability across all the years when a child is supposed to be in school according to a country's education policy.

Term/Phrase	Definition/Usage
Exclusive breastfeeding	The feeding of an infant only with breast milk from his or her mother or a wet nurse, or expressed breast milk, and no other liquids or solids except vitamins, mineral supplements, or medicines in drop or syrup form. Exclusive breastfeeding is recommended until an infant reaches 6 months of age.
Goiter	Abnormal enlargement of the thyroid gland in the neck. Iodine deficiency can cause goiter. Goiter can be assessed by inspection and palpation of the thyroid gland, or by ultrasonography.
Human capital	Intangible collective resources possessed by individuals and groups within a given population. These resources include all the knowledge, talents, skills, abilities, experience, intelligence, training, judgment, and wisdom possessed individually and collectively, the cumulative total of which represents a form of wealth available to nations and organizations to accomplish their goals. Human capital is available to generate material wealth for an economy or a private firm. In a public organization, human capital is available as a resource to provide for the public welfare. How human capital is developed and managed may be one of the most important determinants of economic and organizational performance.
Improved scenario	(See PROFILES.)
Iodine deficiency disorders	A range of abnormalities that result from iodine deficiency, including goiter, cretinism, and reduced IQ. Iodine deficiency during fetal life 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.
Lives saved	In the context of PROFILES, lives saved reflects the number of lives saved due to a reduction in the prevalence of various nutrition problems (such as stunting, wasting, underweight, vitamin A deficiency, anemia, suboptimal breastfeeding practices, and low birth weight) in the improved scenario of PROFILES. (Also see PROFILES.)
Low birth weight	Refers to when an infant weighs less than 2,500 g (5.5 lbs) at birth. It is usually an outcome of intrauterine growth retardation and/or preterm birth. Low birth weight is not only closely associated with increased risk of fetal and neonatal mortality and morbidity, but also with increased risk of inhibited growth, poor cognitive development, and chronic diseases later in life.
Malnutrition	Malnutrition is an abnormal physiological condition caused by inadequate, excessive, or imbalanced intake of nutrients. It includes undernutrition, overweight/obesity, and micronutrient deficiencies. Undernutrition is a consequence of a deficiency in nutrient intake and/or absorption in the body. Different forms of undernutrition, which can appear isolated or in combination, include wasting and/or bilateral pitting edema (acute malnutrition), stunting (chronic undernutrition), underweight (combined form of wasting and stunting), and micronutrient deficiencies. Undernutrition in women is associated with increased risk of maternal mortality and delivering babies with low birth weight. In children, undernutrition is associated with increased risk of illness and death, as well as compromised physical and cognitive development. Overweight and obesity (severe overweight) occur when an individual has too much body fat and weighs more than would be expected for healthy person of the same height, putting their health at risk. Overweight and obesity are complex conditions with multiple causes, including an imbalance between calories consumed and calories expended, low levels of physical activity, medical conditions, and genetics, among others. Childhood overweight/obesity is associated with health risks in childhood and adulthood. Children who are overweight/obese are at increased risk for type 2 diabetes, asthma, and high blood pressure, among other diseases, and because overweight/obese children are more likely to become overweight adults, they are also at increased risk of the poor health outcomes associated with adult obesity or overweight, including diabetes, heart disease, cancer, and stroke.
Micronutrients	Essential vitamins and minerals required in small amounts by the body throughout the life cycle.
Micronutrient deficiencies	A consequence of inadequate micronutrient intake and/or absorption in the body. The most common forms of micronutrient deficiencies are related to iron, vitamin A, and iodine deficiency.

Term/Phrase	Definition/Usage
Mortality	(See subcategories below.)
Infant mortality	The probability of dying before the first birthday, expressed as number of deaths per 1,000 live births.
Maternal mortality	The maternal mortality ratio is defined as the ratio of the number of maternal deaths per 100,000 live births. In population surveys, maternal deaths are generally defined as deaths during the reproductive process—that is, during pregnancy, childbirth, or within 2 months after the birth of a child or termination of a pregnancy.
Neonatal mortality	The probability of dying during the neonatal period, expressed as number of deaths per 1,000 live births. The neonatal period is generally defined as the first 28 days of life. In population surveys, deaths in the first month of life are often used in neonatal mortality estimates.
Perinatal mortality	The probability of dying during the perinatal period, generally defined as the number of stillbirths plus deaths in the first week of life per 1,000 total births.
Under-5 mortality	The probability of dying before the fifth birthday, expressed as number of deaths per 1,000 live births.
Nutrition advocacy	A platform to create movement toward greater political and social commitment for nutrition in a country. It is defined and shaped by the specific country context. Nutrition advocacy can support a given country at any stage along the way to providing nutrition services and reducing malnutrition. A central focus of nutrition advocacy is to promote accountability for nutrition and strengthen nutrition governance. For example, nutrition advocacy can serve to support the development of a nutrition policy, investment of resources to strengthen and expand implementation of nutrition services, greater coordination between government and nongovernmental organizations that play an important role in providing nutrition services across the country, or a variation of these.
Nutrition costing	Estimates the costs of implementing a comprehensive set of nutrition programs in a country or prioritized geographic area over a specific time period. Nutrition costing is developed in the country, considering the country-specific context, and is the result of a collaborative and participatory process during which multisectoral stakeholders engage in defining the assumptions on which nutrition costing is based—for instance, selecting necessary interventions and activities, and defining a management structure for service provision—which in turn allows identification of the required inputs for each activity and estimation of the program cost for a specified time period.
Odds ratio	A measure of association between a risk factor and a disease (or health outcome). Specifically, in a case control study, the odds ratio is the odds that a case (one with the disease) was exposed to the risk factor divided by the odds that a control (one without the disease) was exposed to the same risk factor.
Overweight	(See malnutrition.)
Permanent disability	Within the context of PROFILES, permanent disability refers to the lifelong impairment or loss of a person's physical or mental abilities due to a nutritional condition early in life.
Population attributable fraction (PAF)	Proportion (fraction) of a disease (or health outcome) in a population that is attributable to a specific risk factor or that could be avoided by eliminating the risk factor. PAF is calculated as a function of the prevalence of exposure to the risk factor and the relative risk. An example from PROFILES is the proportion of child deaths attributable to underweight.
Prevalence	Refers to the number of cases of a disease that are present in a particular population at a given time, often expressed as percentage or proportion. PROFILES uses point prevalence—which is the prevalence at a point in time, often referred to as a snapshot of a population.

Term/Phrase	Definition/Usage
PROFILES	Developed to support nutrition advocacy, PROFILES consists of a set of computer-based models that calculate consequences if malnutrition does not improve over a defined time period and the potential benefits of improved nutrition over the same time period, including lives saved, disabilities averted, human capital gains, and economic productivity gains. To calculate estimates, PROFILES requires current country-specific nutrition data that are identified and agreed upon in collaboration with stakeholders 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 situation throughout the chosen time period (the number of years for which estimates are calculated), aside from projected changes in population size and structure. The prevalence of each nutrition problem remains the same every year in the status quo scenario. In contrast, in the improved scenario—with results estimated for the same time period—it is expected that nutrition interventions that are known to be effective are implemented at scale and succeed in reaching the stated targets in terms of improvements in the prevalence of the various nutrition problems. Although nutrition interventions are 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. The improved scenario prevalence targets for the various nutrition problems are determined and agreed upon through stakeholder meetings and a PROFILES workshop.
Relative risk	Measures the association between a risk factor and a disease or health outcome. It describes the likelihood of developing disease in a group exposed to the risk factor compared to a non-exposed group. The relative risk is a ratio calculated as the risk of disease among those exposed to the risk factor divided by the risk among the non-exposed.
Starting prevalence in PROFILES	The prevalence at the start of the time period for which the *PROFILES Spreadsheet Workbook* will calculate estimates. This may or not be the current prevalence of a nutrition condition because national surveys are done a few years apart and existing data may be not be current. Therefore, it is recommended that PROFILES use the most recent or the most credible prevalence data available as identified by stakeholders.
Status quo scenario	(See PROFILES.)
Stunting/stunted	Stunting, or chronic malnutrition, describes nutritional status as measured by height-for-age. A child who is below -2 standard deviations (SD) from the World Health Organization 2006 Child Growth Standards reference median for height-for-age is considered to be too short for his/her age, or stunted, which is a condition reflecting chronic nutritional deficiency. Stunting is a result of prolonged or repeated episodes of undernutrition often starting before birth. This type of undernutrition is best addressed through preventive maternal health programs aimed at pregnant women, infants, and children under 2 years of age. Program responses to stunting require longer-term planning and policy development.
Suboptimal breastfeeding practices	The breastfeeding model in PROFILES looks at suboptimal breastfeeding practices as no, partial, or predominant breastfeeding when children are 0–5 months of age versus exclusive breastfeeding and as no breastfeeding among children 6–23 months of age versus any breastfeeding. Suboptimal breastfeeding practices are an important contributor to infant and young child mortality due to an increased risk of infection. In PROFILES, predominant breastfeeding among infants 0–5 months of age refers to those 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 milk and food-based fluids, are not allowed, and no semi-solid or solid foods are allowed. Partial breastfeeding among infants 0–5 months of age refers to those who received breast milk as well as non-human milk, food-based fluids, and/or semi-solid/solid foods.

Term/Phrase	Definition/Usage
Target prevalence in PROFILES	This refers to the prevalence at the final year of the chosen time period. For example, if the starting prevalence is 35%, stakeholders may decide that the target prevalence by the end of the time period is 15%. That is what the prevalence should be by the final year of the time period.
Targeted reduction in prevalence in PROFILES	Refers to the proportion reduction in prevalence to reach the target prevalence.
Time period in PROFILES	Refers to the period (number of years) for which the PROFILES estimates will be calculated.
Undernutrition	(See malnutrition.)
Underweight	Describes nutritional status as measured by weight-for-age among children under 5. Underweight is a composite form of undernutrition that includes elements of stunting and/or wasting and is defined by a weight-for-age z-score below -2 SD from the reference median (World Health Organization 2006 Child Growth Standards).
Vitamin A deficiency	Vitamin A is an important nutrient required for maintaining immune function, eye health, vision, growth, and survival in human beings. Vitamin A-deficient children are at risk of severe visual impairment and blindness (xerophthalmia—including Bitot's spots and corneal ulceration—is among the ophthalmic manifestations of vitamin A deficiency). They also have a higher risk of death (e.g., from diarrhea and measles). A common indicator of vitamin A deficiency is the level of retinol (a form of vitamin A) in blood. The recommended cut-off for mild (or subclinical) vitamin A deficiency among children is < 0.70 μmol/l.
Wasting/wasted	Wasting, or acute malnutrition, describes nutritional status as measured by weight-for-height. A child who is below -2 SD from the World Health Organization 2006 Child Growth Standards reference median for weight-for-height is considered to be too thin, or wasted, which is a condition reflecting acute or recent nutritional deficit. It is a result of a sudden lack of an adequate amount or variety of food or severe and/or repeated infections. Severe wasting is a form of undernutrition that can be fatal. There are different levels of severity of acute malnutrition: moderate acute malnutrition and severe acute malnutrition.
Weight-for-age	(See underweight.)
Weight-for-height	(See wasting.)
Z-score	The World Health Organization (WHO) Global Database on Child Growth and Malnutrition uses a z-score system to express the anthropometric value as number of standard deviation units (or z-scores) below or above the reference mean or median value. WHO uses a cut-off point of < -2 SD to classify low weight-for-age, low height-for-age, and low weight-for-height as moderate and severe underweight, stunting, and wasting. WHO uses a cut-off point of < -3 SD to define severe underweight, stunting, and wasting.

Appendix B. Participants in the Stakeholder Meeting and PROFILES Workshop

List of participants from the Stakeholder Meeting, March 6, 2017

Name of Participant	Organization/Company	Title
Rafael Salinas	Secretariat for Food Security and Nutrition (SESAN)	Technical Deputy Secretary
Analuisa Guillén	SESAN	Institutional Strengthening
Edgar Hidalgo	SESAN	Technical Advisor
Sebastián Croissiert	SESAN	Technical Advisor
Karin Medrano	SESAN	Food Utilization Coordinator
Francisco Chew	Ministry of Public Health and Social Assistance (MSPAS)	Coordinator
Ruth Estrada	MSPAS	Technical Advisor – Norms, Food Security and Nutrition Program (Programa de Seguridad Alimentaria y Nutricional [PROSAN])
Adelis Velasquez	MSPAS	Nutritionist
Julieta Torres	MSPAS	Trainer
Maria José Guerro	MSPAS	Technical Assistance - Nutrition
Daniela Tevalán	Ministry of Social Development (MIDES)	Professional Advisor
Vivian Lemus	Ministry of Finance (MINFIN)	Director
José Rodas	MINFIN	Municipal Training, DAAFIM
Alvaro Samayoa	MINFIN	Director, DAAFIM
Clara Aurora García	National Maternal and Child Health and Nutrition (MCHN) Survey	Technical Deputy Director
Vikki Stein	USAID/Guatemala	Director, Health and Education Office (HEO)
Claudia Rosa	Health and Education Policy Plus (HEP+) Project	Deputy Director
Marisela de la Cruz	HEP+ Project	Health Advisor, Policy and Transparency
Justin Kavle	Maternal and Child Survival Program (MCSP)/PATH	Nutrition Advisor
Carlos Grossman	Central American Institute for Fiscal Studies (Instituto Centroamericano de Estudios Fiscales [ICEFI])	Research Assistant
Jorge Lavarreda	National Center for Economic Research (Centro de Investigaciones Económicas Nacionales [CIEN])	Researcher
Norma Alfaro	INCAP	Nutritionist
Mireya Palmieri	INCAP	Consultant
Sandra Sandoval	Plan International	Advisor, Food Security and Nutrition

Maria Claudia Santizo	UNICEF	Nutrition Officer
Maira Ruano	PAHO/WHO	Consultant
Irma Chavarria	World Food Programme (WFP) – United Nations	Coordinator EEC
Homa Zahra Fotouhi	World Bank	Representative
Fernando Paredo	World Bank	Operations Officer
Vilma Chavez de Pop	Galileo University	Doyenne
Ana Isabel Rosal	Valley University Guatemala (Universidad del Valle Guatemala)	Director, Nutrition Department
Pablo Toledo	Monitoring and Evaluation Program (MEP)/USAID	M&E Specialist
Patricia Dominguez	FANTA	Technical Advisor, Food Security and Maternal and Child Health and Nutrition
Monica Woldt	FANTA	Technical Advisor, Maternal and Child Health and Nutrition
Karen Steele	FANTA	Consultant
A. Elisabeth Sommerfelt	FANTA	Pediatrician

List of participants from the PROFILES Workshop, March 7–10, 2017

Name of Participant	Organization/Company	Title
Ana Luisa Guillén	SESAN	Institutional Strengthening
Sebastián Croissiert	SESAN	Technical Advisor
Karin Medrano	SESAN	Food Utilization Coordinator
Ruth Estrada	MSPAS	Technical Advisor – Norms, Food Security and Nutrition Program (Programa de Seguridad Alimentaria y Nutricional [PROSAN])
Daniela Tevalán	Ministry of Social Development (MIDES)	Professional Advisor
Luisa Reyna Sosa	Ministry of Education (MINEDUC)	Nutrition Advisor, Directorate General for Community Participation and Assistance Services (Dirección General de Participación Comunitaria y Servicios de Apoyo [DIGEPSA])
Pablo Toledo	Monitoring and Evaluation Program (MEP)/USAID	M&E Specialist
Marisela de la Cruz	Health and Education Policy Plus (HEP+) Project	Health Advisor, Policy and Transparency
Carlos Grossman	Central American Institute for Fiscal Studies (Instituto Centroamericano de Estudios Fiscales [ICEFI])	Research Assistant
Norma Alfaro	INCAP	Nutritionist
Mireya Palmieri	INCAP	Consultant
Roberto Molina	National MCHN Survey	Statistician
Vilma Chavez de Pop	Galileo University	Doyenne

Sonia Barrios	University Rafael Landívar (URL)/Ministry of Health	Area Coordinator/URN Chief
Patricia Dominguez	FANTA	Technical Advisor, Food Security and Maternal and Child Health and Nutrition
Monica Woldt	FANTA	Technical Advisor, Maternal and Child Health and Nutrition
Karen Steele	FANTA	Consultant
A. Elisabeth Sommerfelt	FANTA	Pediatrician

Appendix C. Public Health Significance Cut-offs

Public health significance cut-offs have been established by the World Health Organization for various nutrition indicators, which are provided below.

Stunting, Wasting, and Underweight: Cut-Off Values for Public Health Significance

Indicator	Prevalence cut-off values for public health significance
Underweight	< 10%: Low prevalence 10–19%: Medium prevalence 20–29%: High prevalence ≥ 30%: Very high prevalence
Stunting	< 20%: Low prevalence 20–29%: Medium prevalence 30–39%: High prevalence ≥ 40%: Very high prevalence
Wasting	< 5%: Acceptable 5–9%: Poor 10–14%: Serious ≥ 15%: Critical

Source: WHO 2010b

Vitamin A Deficiency: Cut-Off Values for Public Health Significance

Indicator	Prevalence cut-off values for public health significance
Serum or plasma retinol < 0.70 µmol/l in preschool-age children	≤ 1.9%: No public health problem ≥ 2% to < 10%: Mild ≥ 10% to < 20%: Moderate ≥ 20%: Severe
Night blindness (XN) in pregnant women	≥ 5%: Moderate

Source: WHO 2010b; WHO 2009

Iodine Deficiency: Cut-Off Values for Public Health Significance

Indicator	Prevalence cut-off values for public health significance
Iodine deficiency measured by median urinary iodine concentration (µg/l)	**Median urinary iodine concentration (school-age children):** < 20 µg/l: Severe deficiency 20–49 µg/l: Moderate 50–99 µg/l: Mild deficiency 100–199 µg/l: Optimal 200–299 µg/l: Risk of iodine-induced hyper-thyroidism ≥ 300 µg/l: Risk of adverse health consequences **Median urinary iodine concentration (pregnant women)** < 150 µg/l: Insufficient 150–249 µg/l: Adequate 250–499 µg/l: More than adequate ≥ 500 µg/l: Excessive
Total goiter rate	0.0–4.9%: None 5.0–19.9%: Mild 20.0–29.9%: Moderate ≥ 30%: Severe

Source: WHO 2010b; WHO 2007

Note: Epidemiological criteria for assessing the severity of iodine deficiency disorder is based on the prevalence of goiter in school-age children.

Maternal Underweight: Cut-Off Values for Public Health Significance

Indicator	Prevalence cut-off values for public health significance
Adult BMI < 18.5 (underweight)	5–9%: Low prevalence (warning sign, monitoring required) 10–19%: Medium prevalence (poor situation) 20–39%: High prevalence (serious situation) ≥ 40%: Very high prevalence (critical situation)

Source: WHO 2010b

Anemia: Cut-Off Values for Public Health Significance

Indicator	Prevalence cut-off values for public health significance
Anemia	≤ 4.9: No public health problem 5.0–19.9: Mild public health problem 20.0–39.9: Moderate public health problem ≥ 40.0: Severe public health problem

Source: WHO 2010b

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Contact Information

Food and Nutrition Technical Assistance III Project (FANTA)
FHI 360
1825 Connecticut Avenue, NW
Washington, DC 20009-5721
Tel: 202-884-8000
Fax: 202-884-8432
fantamail@fhi360.org
www.fantaproject.org