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# Reducing Malnutrition in Zambia: Estimates to Support Nutrition Advocacy

ZAMBIA NUTRITION PROFILES 2017

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Zambia Nutrition PROFILES 2017 estimates were developed using a participatory and consultative approach with a multisectoral group of participants, including representatives of Government of the Republic of Zambia Ministries of Health, Agriculture, Local Government and Housing, General Education, Development Planning, Fisheries and Livestock, Water and Sanitation and Information and Broadcasting; cooperating partners; and nutrition implementers/researchers. Specific thanks are due to the National Food and Nutrition Commission (NFNC), Zambia Ministry of Health (MOH), CARE SUN Fund Management Unit, UNICEF, World Food Programme (WFP), Indaba Agricultural Policy Research Institute (IAPRI), Nutrition Association of Zambia, Civil Society Scaling Up Nutrition (CSO-SUN) Initiative, Zambia Institute of Policy Analysis and Research Central Statistics Office (ZIPAR), USAID/Applying Science to Strengthen and Improve Systems (ASSIST) Project, Thrive Project, University of Zambia, and International Baby Food Action Network (IBFAN).

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# Abbreviations and Acronyms

| | |
|---|---|
| BF | breastfeeding |
| CSO | Central Statistical Office |
| dL | decilitre(s) |
| FANTA | Food and Nutrition Technical Assistance III Project |
| g | gramme(s) |
| GRZ | Government of the Republic of Zambia |
| Hb | haemoglobin |
| IYCF | infant and young child feeding |
| kg | kilogramme(s) |
| MOH | Ministry of Health |
| NFNC | National Food and Nutrition Commission |
| RR | relative risk |
| SUN | Scaling Up Nutrition Movement |
| USAID | U.S. Agency for International Development |
| VAD | vitamin A deficiency |
| WHA | World Health Assembly |
| WHO | World Health Organization |
| ZDHS | Zambia Demographic and Health Survey |
| ZMW | Zambian kwacha |

# Executive Summary

Today in Zambia, 40.1 percent of children under 5 years of age are chronically malnourished (stunted) (ZDHS 2013–14). Although Zambia has transitioned to a middle-income country, the prevalence of chronic malnutrition is much higher than in other middle-income countries in the region, such as Kenya. With sustained effort and investment in nutrition, Zambia could be free of malnutrition in the future. What would be the benefits of improved nutrition for Zambia as a nation? And what will be the consequences if nothing is done to improve nutrition? These are the questions national stakeholders and technical experts in Zambia sought to answer through a consultative and consensus-building process using PROFILES, an evidence-based tool developed for nutrition advocacy. The Government of the Republic of Zambia is committed to substantively reducing stunting and other forms of malnutrition; but additional efforts are needed, including continued national and sub-national advocacy. Most importantly, nutrition service delivery needs to be strengthened and expanded across the country.

In February 2017, in partnership with the National Food and Nutrition Commission and Ministry of Health, the Food and Nutrition Technical Assistance III Project (FANTA) facilitated a 4-day participatory workshop with 23 stakeholders to identify and use country-specific data to generate evidence-based estimates for nutrition advocacy using PROFILES. PROFILES consists of a set of computer-based models that calculate consequences if malnutrition does not improve over a defined time period (status quo scenario) and the benefits of improved nutrition over the same time period, including lives saved, disabilities averted, human capital gains, and economic productivity gains (improved scenario). PROFILES then calculates the difference between the status quo scenario and improved scenario in terms of lives saved or deaths averted and economic gains or economic losses averted. PROFILES estimates are generated using these two scenarios over a defined period of time, and based on agreed targets (goals for improvement in the nutrition situation).

To calculate PROFILES estimates, information on a time period, nutrition, and other relevant indictors and targets are needed. Zambia Nutrition PROFILES workshop participants agreed on a 10-year time period: 2017–2026. They also agreed upon the prevalence of select nutrition indicators in the country (for the status quo scenario) and targets for improvement in those nutrition indicators (for the improved scenario). These discussions required country-specific data to quantify the magnitude of the negative consequences of nutrition problems. Sources used in developing the Zambia Nutrition PROFILES 2017 estimates included the Zambia Demographic and Health Survey (ZDHS) 2013–14, 2014 Zambia Food Consumption & Micronutrient Survey, 2015 Zambia Malaria Indicator Survey, Zambia Labour Force Survey 2014, and The Education Act (Zambian law 134).

Zambia Nutrition PROFILES 2017 generated estimates for reductions in the number of deaths related to stunting, wasting, and underweight; reductions in suboptimal breastfeeding practices, vitamin A deficiency (VAD), maternal anaemia, low birth weight, and childhood overweight/obesity; and gains in human capital and economic productivity from improved prevalence of iron deficiency anaemia and reductions in childhood stunting (Figures 1 and 2).

## Figure 1. Estimates of Future Lives Lost, Economic Productivity Lost, Permanent Disabilities and Human Capital Lost Associated with Various Nutrition Problems, 2017–2026

| LIVES LOST | | ECONOMIC PRODUCTIVITY LOST | CHILDHOOD OVERWEIGHT/ OBESITY | HUMAN CAPITAL LOST |
|---|---|---|---|---|
| **156,821** lives of children under 5 years of age lost related to stunting | **48,102** infants' lives lost related to low birth weight | **180.768 billion ZMW** (US$18.315 billion) lost related to stunting | **30,343** children 48–59 months of age likely to become overweight/obese related to suboptimal breastfeeding practices | **40.499 million** equivalent school years of learning lost related to stunting |
| **81,277** lives of children under 5 years of age lost related to wasting | **27,530** infants' lives lost during the perinatal period related to maternal anaemia | **17.937 billion ZMW** (US$1.817 billion) lost related to iron deficiency anaemia among adult women | | |
| **6,521** women's lives lost related to maternal anaemia | **129,781** lives of children under 2 years of age lost related to suboptimal breastfeeding practices | **6.862 billion ZMW** (US$695 million) lost related to iron deficiency anaemia in children | | |
| **46,447** lives of children under 5 years of age lost to vitamin A deficiency | | | | |

## Figure 2. Estimates of Future Lives Saved, Economic Productivity Gained, Permanent Disabilities Averted and Human Capital Gained, 2017–2026

| LIVES SAVED | | ECONOMIC PRODUCTIVITY GAINED | CHILDHOOD OVERWEIGHT/ OBESITY PREVENTED | HUMAN CAPITAL GAINED |
|---|---|---|---|---|
| **43,951** lives of children under 5 years of age saved related to a reduction in stunting | **7,034** infants' lives saved related to increases in birth weight | **67.792 billion ZMW** (US$6.869 billion) gained related to a reduction in stunting | **5,053** children 48–59 months of age prevented from becoming overweight/obese related to improved breastfeeding practices | **9.065 million** equivalent school years of learning gained related to a reduction in stunting |
| **13,550** lives of children under 5 years of age saved related to a reduction in wasting | **15,772** infants' lives saved in the perinatal period related to a reduction in maternal anaemia | **4.772 billion ZMW** (US$483 million) gained related to improvements in iron deficiency anaemia among adult women | | |
| **3,795** women's lives saved related to a reduction in maternal anaemia | **33,784** lives of children under 2 years of age saved related to improved breastfeeding practices | **1.788 billion ZMW** (US$181 million) gained related to improvements in iron deficiency anaemia among children | | |
| **10,727** lives of children under 5 years of age saved related to improvements in vitamin A status | | | | |

# Introduction

Today in Zambia, 40.1 percent of children under 5 years of age are stunted, according to the Zambia 2013–14 Demographic and Health Survey (ZDHS), a decrease of 5 percentage points from 45 percent in the 2007 ZDHS (Central Statistical Office [CSO] et al. 2014; CSO et al. 2009). Yet with sustained effort and investment in nutrition, Zambia could be free of malnutrition. What would be the benefits of improved nutrition for Zambia as a nation? And what will be the consequences if nothing is done to improve nutrition? These are the questions national stakeholders and technical experts in Zambia sought to answer through a recent consultative and consensus-building process using PROFILES, an evidence-based tool developed for the purpose of nutrition advocacy.

The Government of the Republic of Zambia (GRZ) has committed to stepping up efforts to reduce stunting and other forms of malnutrition. There is high-level commitment and momentum for multisectoral action on nutrition, but additional efforts are needed to maximize the effectiveness of the efforts of the government and its partners. There is an identified need for continued national and sub-national advocacy, to create and maintain momentum for sustained change. Most importantly, nutrition service delivery across the country needs to be stregthened and expanded. In partnership with the National Food and Nutrition Commission (NFNC), the Ministry of Health (MOH) and other stakeholders (Appendix B lists the participants), in 2017, the Food and Nutrition Technical Assistance III Project (FANTA), funded by the U.S. Agency for International Development (USAID) and managed by FHI 360, developed estimates of the benefits of improved nutrition using PROFILES.

Developed to support nutrition advocacy, PROFILES consists of a set of computer-based models that calculate the 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 (or, put another way, economic productivity losses averted). To calculate estimates, PROFILES requires current country-specific nutrition data that are identified and agreed on in collaboration with national stakeholders. Sources of information for Zambia Nutrition PROFILES 2017 include the 2013–14 ZDHS, 2014 Zambia Food Consumption & Micronutrient Survey, 2015 Zambia Malaria Indicator Survey, The Education Act (a Zambian law), and the Zambia Labour Force Survey 2014, for the period 2017–2026 (Table 1). This report presents the Nutrition PROFILES 2017 estimates to help move the nutrition advocacy agenda forward in Zambia.

# 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 poor health as well as impaired physical and mental development (World Health Organization (WHO) 2014b).

Malnutrition leads to reduced immunity, impairing an individual's ability to fight and recover from illness. At the same time, repeated infections can lead to malnutrition. The impact of the malnutrition-infection cycle on the immune system is particularly important in countries like Zambia where HIV prevalence is high; 13 percent of adults in Zambia (15 percent of women and 11 percent of men) are HIV positive (CSO Zambia et al. 2014). HIV prevalence is 7 percent among Zambian youth 15–24 years of age and 4 percent among youth 15–17 years, increasing to 12 percent among youth 23–24 years of age (Population Council 2017).

The majority of Zambian women have given birth by 23–24 years of age, when HIV prevalence and transmission risk for women and from mother to child are high. The high prevalence of HIV among women not only compounds the risk of HIV transmission to their children, but also increases their risk of death. Without antiretroviral therapy (ART), 50 percent of HIV-positive children will die by their second birthday (WHO and UNAIDS 2015). Zambia has low coverage of paediatric ART, reaching only 33 percent of at-risk children (UNAIDS 2014). Providing mothers and children with nutrition services is a gateway to HIV prevention, care and treatment because nutrition screening and assessment can identify malnourished people, who are often more vulnerable to being HIV positive, and refer malnourished people whose HIV status is unknown for counseling and testing. Nutrition counseling can also promote early ART and encourage treatment adherence and retention. Therefore, investing in nutrition services and reducing malnutrition in Zambia not only will help to improve the nutrition situation in the country, but can also significantly improve the HIV situation. Together, malnutrition and HIV are major causes of childhood illness and mortality in Zambia (World Bank 2006; Black et al. 2013). Addressing both high levels of malnutrition and preventing/treating HIV will help to significantly reduce child mortality in Zambia and improve the health, well-being, and economic productivity of its citizens.

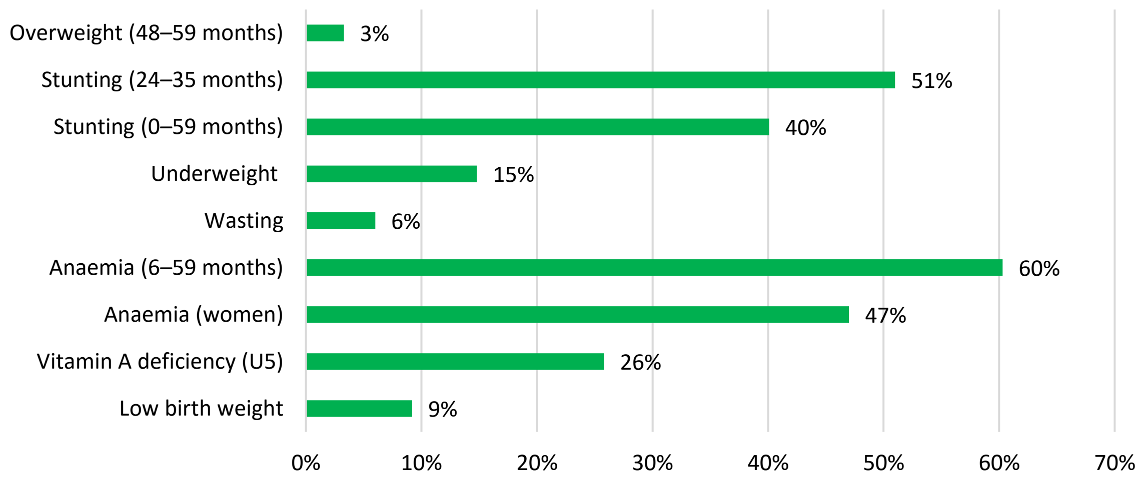
Investing in nutrition saves mothers' and children's lives and improves children's education outcomes, which, in turn, boosts economic productivity (Copenhagen Consensus 2012). For every US$1 spent on nutrition, there is a US$16 return in health and economic benefits (International Food Policy Research Institute 2015). Therefore, investing in nutrition is a "best investment" for Zambia.

## Nutrition Challenges in Zambia

The 2013–14 ZDHS reported that 40.1 percent of all children under 5 years of age were chronically malnourished (stunted, or with low height-for-age), 6.0 percent were acutely malnourished (wasted, or with low weight-for-height), 14.8 percent were underweight (with low weight-for-age) and 3.3 percent were overweight or obese (with high weight-for-height) (Figure 1) (CSO et al.2014). The current prevalence of stunting is considered very high and the prevalence of wasting is considered medium in terms of the WHO's public health significance cut-offs (WHO 2010b). See Appendix C for a full list of the WHO classifications.

In addition, 60.3 percent of children 6-59 monthsof age in Zambia are anaemic, 25.8 percent of children under 5 years of age are vitamin A deficient,[1] and 47.0 percent of non-pregnant women suffer from anaemia (MOH 2015; NFNC 2014). Among women of reproductive age in Zambia, adolescent girls are the most likely to be malnourished; 16.4 percent have a low (< 18.5) body mass index (BMI), compared to 8.0 percent of women 30–39 years of age. Around 9 percent of infants are born with low birth weight (< 2.5 kg) (CSO et al. 2014).

**Figure 1. Malnutrition Rates in Zambia (%)**

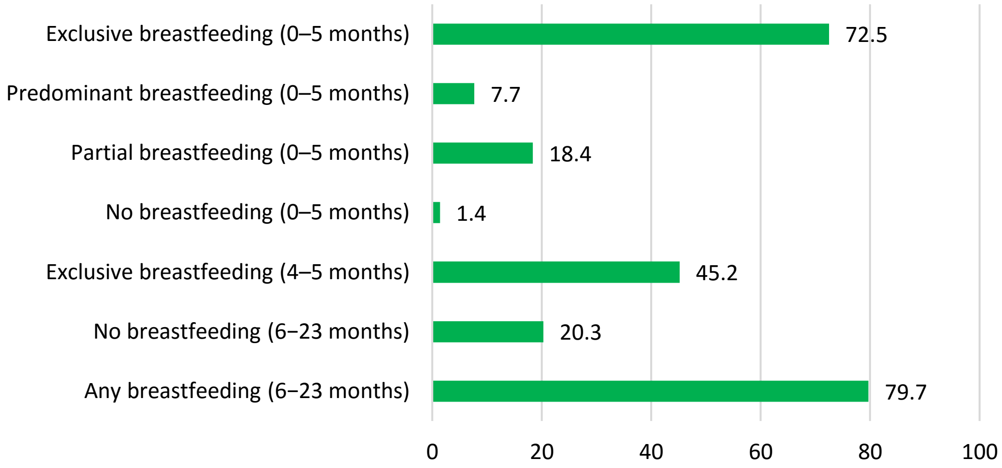



*Sources*: CSO Zambia et al. 2014; Government of the Republic of Zambia, Ministry of Health 2015; Zambia National Food and Nutrition Commission 2014.

Figure 2 shows that suboptimal infant and young child feeding (IYCF) practices are common in Zambia. Although almost all children (97.8 percent) have been breastfed, only 65.8 percent are breastfed within an hour of birth and 72.5 percent of children under 6 months of age are exclusively breastfed, with exclusive breastfeeding prevalence dropping to 45.2 percent by 4–5 months of age. Among breastfed children 6–23 months of age, 46.3 percent were fed the minimum number of times in the previous 24 hours (minimum meal frequency) and only 12.2 percent were given foods from four or more food groups and fed the minimum number of times per day (minimum acceptable diet) (CSO Zambia et al. 2014).

[1] Prevalence is not nationally representative, as data were only available from Luapula and Northern regions.

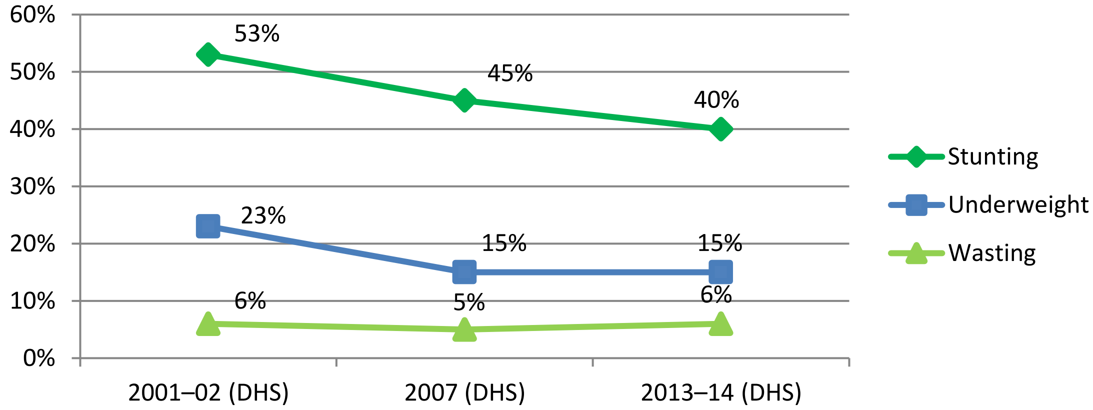
**Figure 2. Breastfeeding Indicators in Zambia (%)**




*Source*: CSO Zambia et al. 2014.

Figure 3 shows that from 2001 to 2014, stunting decreased by 13 percentage points, but underweight remained constant (CSO Zambia et al. 2014; CSO Zambia et al. 2009; CSO Zambia et al. 2003).

**Figure 3. Trends in Malnutrition in Zambia, 2001–2014 (%)**

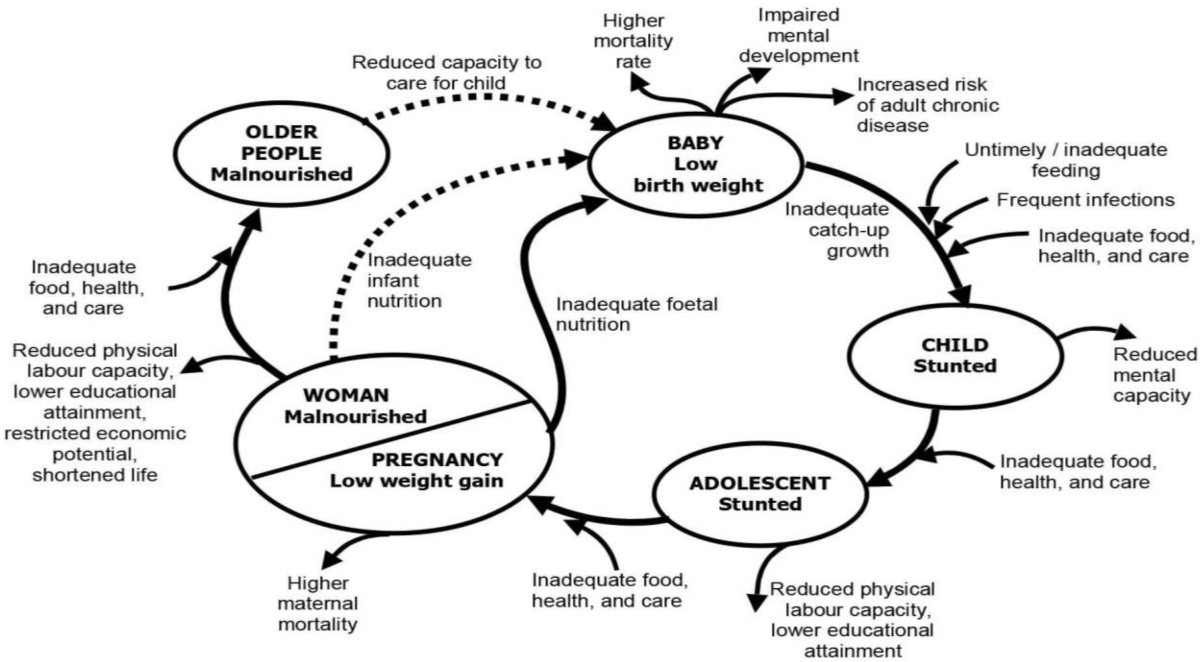



*Sources*: CSO Zambia et al. 2014; CSO Zambia et al. 2009; CSO Zambia et al. 2003.

Note: The values in the graph indicate percentage of children with z-scores < −2 (2013–14 ZDHS). For comparison, the 2001–02 anthropometric indicators were re-analyzed using the 2006 WHO growth standards to match the 2007 and 2013–14 indicators.
*Sources*: CSO, MOH, and ICF International 2014; CSO et al. 2009; CSO, CBOH, and ORC Macro 2003. The source for ZDHS 2001–02 with additional analysis is from the WHO Global Database on Child Growth and Malnutrition (WHO 2014a).

The causes of malnutrition in Zambia are manifold. Repeated infections (including acute respiratory infections, diarrhoea, and malaria) and suboptimal breastfeeding and other IYCF practices that result in inadequate dietary intake are immediate causes, but underlying causes include lack of safe water, hygiene, and sanitation; food insecurity; high fertility; gender inequality; low secondary education levels; and poverty. Specifically, the high total fertility rate in Zambia of 5.3 births per woman (CSO Zambia et al. 2014) is a significant risk factor for childhood malnutrition. Malnutrition is intimately linked to the life cycle and is intergenerational in nature (Figure 4).

**Figure 4. Life Cycle of Malnutrition**

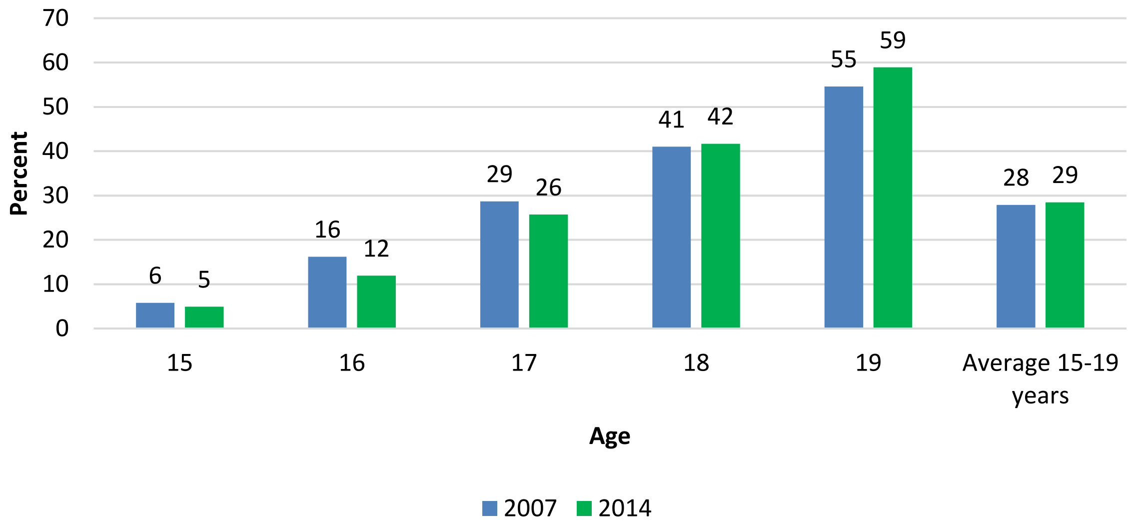



*Source*: Adapted from ACC/SCN. 2000. *Fourth Report on the World Nutrition Situation*. Geneva: ACC/SCN in collaboration with IFPRI.

According to the 2013–14 ZDHS, 28.5 percent of girls 15–19 years of age and 58.9 percent of girls 19 years of age were either pregnant or had given birth to their first child (Figure 5).[2] In comparison, the 2007 ZDHS reported that 27.9 percent of girls 15–19 years of age and 54.6 percent of girls 19 yeas of age had begun childbearing, indicating that the proportion of girls beginning childbearing during adolescence is increasing. The birth interval is also shorter (median 25 months) for adolescent girls than for women 20 years of age and older (median more than 32 months) (CSO Zambia et al. 2014).

[2] The 28.5 percent of adolescent girls who were pregnant or had given birth by age 19 was an average of each individual age (e.g., 15, 16, 17 years of age) and therefore lower than the cumulative total of 58.9 percent.

**Figure 5. Percentage of Adolescent Girls Who Have Begun Childbearing, by Age, 2007 and 2014**




*Source*: CSO et al. 2009; CSO et al. 2014.

Both early childbearing and short birth intervals contribute to a high prevalence of low birth weight, which in turn contributes to a high prevalence of chronic and acute malnutrition among children under 5. In sub-Saharan Africa, the first-born children of adolescent mothers have a 33 percent higher risk of stunting than children of older mothers (Fink et al. 2014). A high number of pregnancies is not only a biological risk for every subsequent birth, but also results in young mothers having very little time and resources to provide children under 2 years of age with optimum care and feeding, resulting in stunting. Low secondary education levels (45 percent of women in Zambia have started or completed secondary school) also impair progress in reducing malnutrition and HIV prevalence. Keeping girls in school is a pathway to improving sexual and reproductive health outcomes by reducing the risk of HIV transmission and improving nutritional status. Being older and more educated also confers greater capabilities to provide optimal care for young children. Studies show that school attendance decreases girls' risk of early marriage and subsequent early childbirth and makes it more likely that they will have healthier pregnancies and babies (UNAIDS 2014). In addition, higher levels of education provide women a bridge to increased employment opportunities, which can also help to reduce stunting levels. Children in Zambia whose mothers have no education are more likely to be stunted (45 percent) than children whose mothers have more than secondary education (18 percent) (CSO et al. 2014).

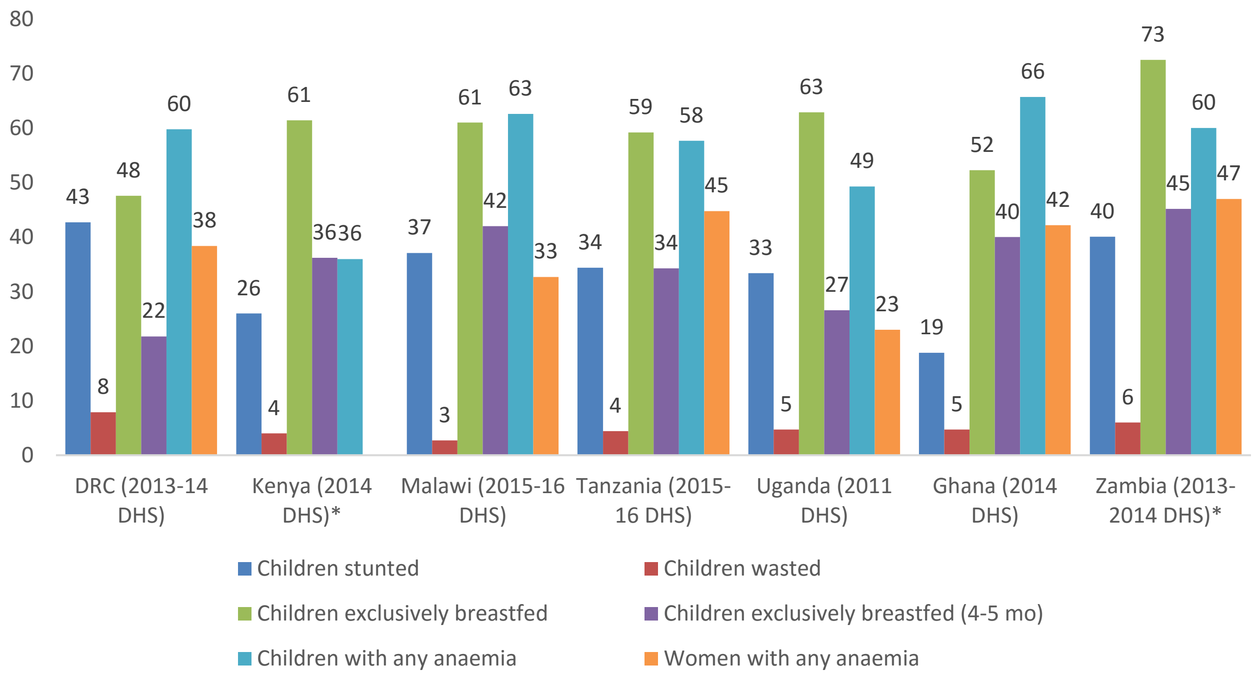
Malnutrition in Zambia is a complex, persistent problem with multiple causes rooted in various sectors. Therefore, in addition to nutrition-specific interventions, multisectoral nutrition-sensitive interventions are essential.

## Consequences of Malnutrition

Malnutrition in Zambia has numerous adverse consequences. Malnourished children are ill more often than children who are not malnourished and consequently at increased risk of death. They have delayed cognitive development and are therefore likely to complete fewer years of schooling, which results in lower economic productivity in adulthood (Black at al. 2013;

Grantham- McGregor et al. 2007). Because of its negative consequences on economic and health goals, countries across Africa are striving to reduce malnutrition. Figure 6 compares Zambia's nutrition situation to that of other countries in the region. While Zambia has the highest prevalence of exclusive breastfeeding, it has a much higher rate of childhood stunting (40 percent) than its middle-income peers, Kenya (26 percent) and Ghana (19 percent).

**Figure 6. Comparison of Malnutrition Prevalence in Zambia and Other African Countries (%)**




*Anaemia data are from the 2015 Malaria Indicator Survey (MIS).

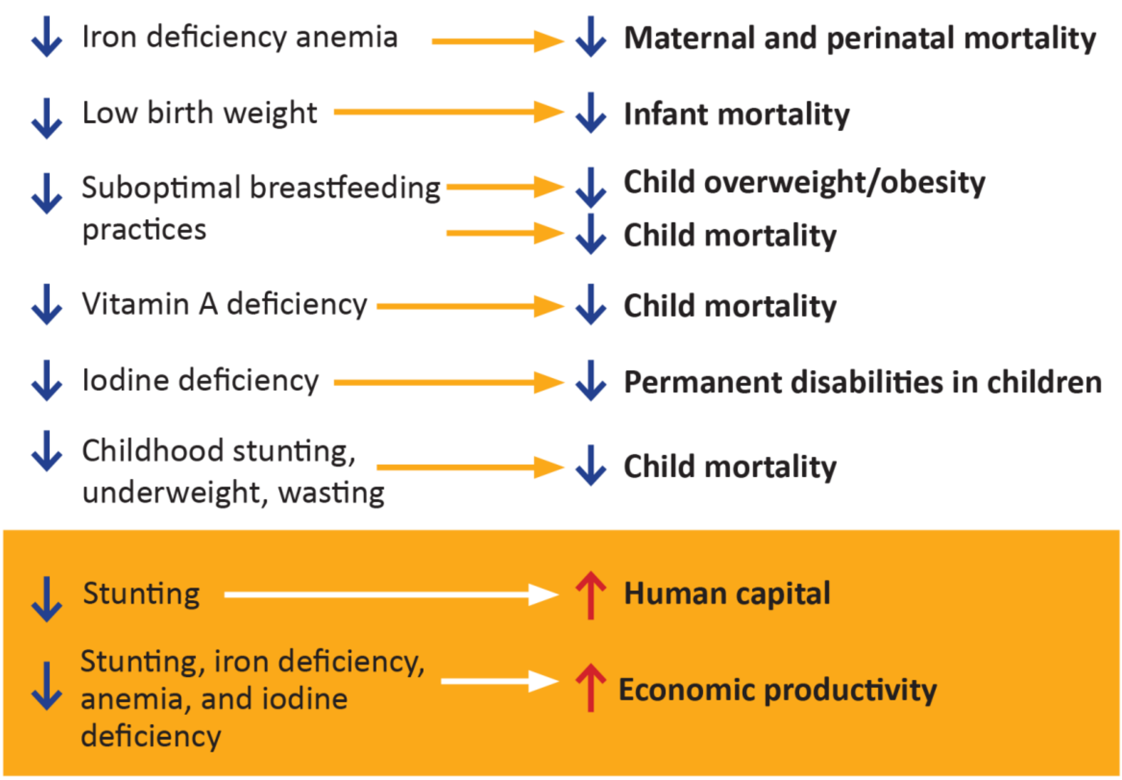
Nutrition interventions should concentrate on preventing malnutrition among children under 2 years of age. This is a focus of the Scaling Up Nutrition (SUN) Movement (Scaling Up Nutrition Road Map Task Team 2010), of which Zambia is a member. Global evidence increasingly suggests four critical periods when malnutrition has the most significant consequences: 0–2 years of age; 0–5 years of age for children with acute malnutrition; adolescence; and pregnancy and the postpartum period.

## Nutrition Problems and Consequences Addressed in PROFILES

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

Figure 7 shows the nutrition indicators for which PROFILES calculates estimates and their consequences. For example, a reduction in suboptimal breastfeeding practices is related to a reduction in child mortality and child overweight/obesity. For each nutrition indicator listed that is assumed to improve, PROFILES calculates an estimate of a corresponding improvement in health (lives saved), human capital, or economic outcome (productivity gained).

**Figure 7. Nutrition Problems and Consequences Addressed in PROFILES**




Note: Zambia Nutrition PROFILES 2017 did not include estimates on iodine deficiency. See p. 14 under the section 'Data Sources for PROFILES and Prevalence of Nutrition Problems' below for more information.

# Method

This section describes how the the estimates were derived for each of the nutrition problems addressed by PROFILES in Zambia. PROFILES consists of a set of computer-based models that calculate the consequences if malnutrition does not improve over a defined time period and the benefits of improved nutrition over the same time period. PROFILES provides 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.

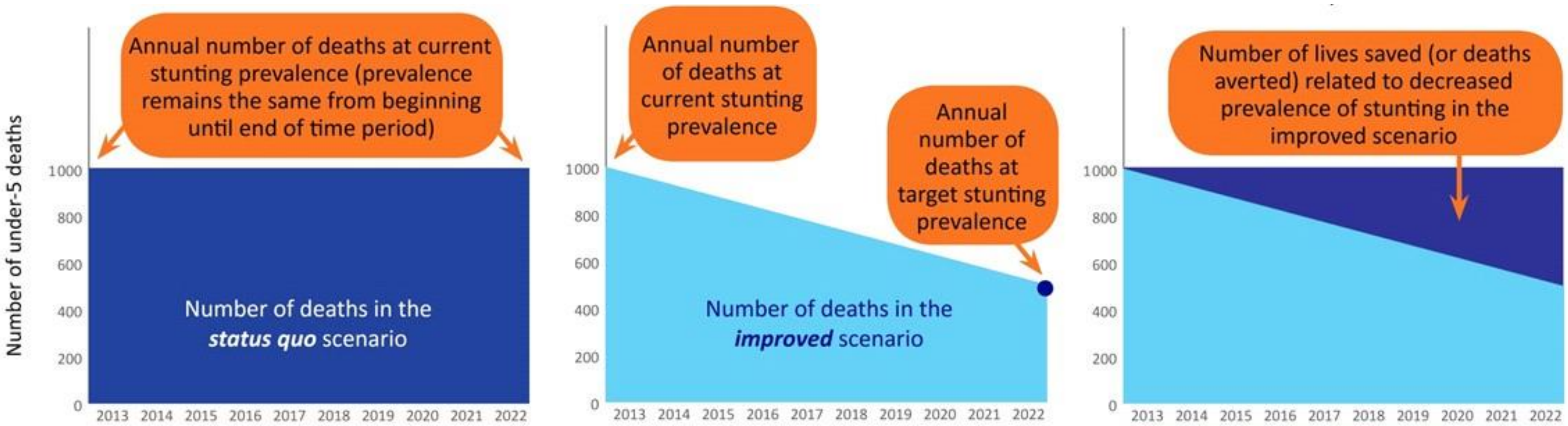
In contrast, the **improved scenario**—with results estimated for the same time period—assumes that nutrition interventions that are known to be effective are implemented at scale and succeed in reaching the stated targets in terms of improvements in the prevalence of various nutrition problems.

The targets reflect the proportion by which nutrition problems will be reduced over the chosen time period and are determined and agreed on through stakeholder meetings and a PROFILES workshop. 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 the results of the status quo and improved scenarios are contrasted, the differences reflect the benefits of improved nutrition, expressed as lives saved, disabilities averted, human capital gains, and economic productivity gains.

Figures 8a–c illustrate the approach used in PROFILES to estimate child deaths (and lives saved) related to stunting (the information shown in the figure is not from Zambia Nutrition PROFILES 2017). To show how PROFILES calculates the estimates for the status quo and the improved scenarios, the number of children under 5 has been kept constant. But in the actual PROFILES model, the number of children under 5 usually increases each year based on population projections. The graphs show how the status quo scenario (Figure 8a) versus the improved scenario (Figure 8b) 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 8c 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. PROFILES uses a comparable approach to estimate the number of lives saved (or deaths averted) related to other nutrition indicators and to estimate economic productivity gains related to select nutrition indicators.

**Figure 8a–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)**

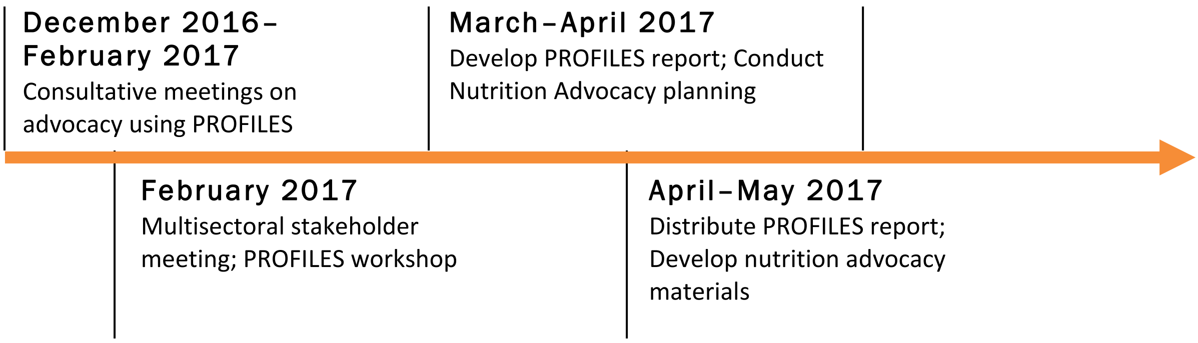
**Figure 8a. Status Quo Scenario** | **Figure 8b. Improved Scenario** | **Figure 8c. Improved and Status Quo Scenarios**



It is expected that effective interventions are put in place to reach the agreed targets. It is also assumed that the interventions would not be implemented at scale immediately, but gradually over the time period; thus, improvement in nutrition indicators and, consequently, lives saved would also be gradual. For this reason, the estimates of lives saved or economic productivity gained are smaller than the total number of lives lost or economic productivity lost over the chosen time period. For example, the graphs in Figure 8 show that, despite a decrease in the prevalence of stunting in 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 the decrease in the prevalence of stunting is asssumed to be linear, and therefore reductions in child mortality attributable to stunting ual and gains in lives saved will also be gradual. This approach is used in all the modules in PROFILES. Although nutrition interventions were not included in the PROFILES models, later steps in the nutrition advocacy process can address the need to prioritize various nutrition services, interventions, programmes, or issues related to the nutrition policy environment.

Figure 9 shows the timeline of the PROFILES process in Zambia. FANTA, in collaboration with the MOH and NFNC, held a 1-day stakeholder meeting in Lusaka on 13 February 2017 saka to discuss the objectives and rationale of PROFILES, key assumptions of the PROFILES models, and how PROFILES will contribute to moving the nutrition advocacy agenda in Zambia forward. Immediately following the stakeholder meeting, FANTA facilitated a 4-day PROFILES workshop on 14–17 February 2017 in Siavonga. The 19 participants from government sectors, including health, agriculture, fisheries and livestock, education, local government, housing, and water and sanitation; UN agencies; USAID implementing partners; academia; and civil society (Appendix B) collaborated to generate preliminary PROFILES estimates for two scenarios. These preliminary estimates were then shared with participants during the first day of the nutrition advocacy meeting.

**Figure 9. Timeline for Zambia Nutrition PROFILES 2017**




During the first day of the workshop, participants built on the discussions during the stakeholder meeting on the previous day to select 2017–2026[3] as the 10-year time period for which to calculate the Zambia Nutrition PROFILES 2017 estimates. Participants agreed 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. They also engaged in initial discussions on nutrition advocacy needs. The next step in the process was a national nutrition advocacy planning workshop on 27 February–2 March 2017 to develop a

[3] The time period is inclusive of 2017.

harmonized, multisectoral strategic nutrition advocacy plan, including a timeline for advocacy activities and development/dissemination of materials and draft nutrition advocacy materials.

## 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. Table 1 lists the data sources used for each of the nutrition indicators.

**Table 1. Indicators and Data Sources for Zambia Nutrition PROFILES 2017**

| Indicator | Source (year) |
|---|---|
| **Nutrition indicators** | |
| Anthropometry (stunting, wasting, underweight, overweight) among children under 5 years of age | 2013–14 ZDHS |
| Low birth weight | 2013–14 ZDHS |
| Breastfeeding practices | 2013–14 ZDHS |
| Vitamin A deficiency | Zambia Food Consumption & Micronutrient Survey 2014 |
| Anaemia | Zambia Malaria Indicator Survey 2015 |
| Iodine deficiency (goiter) | NA[4] |
| **Mortality, Education, and Economic Indicators** | |
| Education information | The Education Act |
| Employment information | Zambia Labour Force Survey 2014 |
| Maternal mortality ratio | 2013–14 ZDHS |
| Mortality in the first 5 years of life | 2013–14 ZDHS |

Tables 2–4 list the prevalences of each of the nutrition indicators in the status quo scenario. The 2013–14 ZDHS provided the information for anthropometry, low birth weight, and breastfeeding practices. 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. Overweight/ obesity was defined weight-for-height z-scores > +2.

Information about anaemia was obtained from the Zambia National Malaria Indicator Survey 2015. Adult data were only available for non-pregnant women but were used to represent the prevalence among both pregnant and non-pregnant women. Anaemia data for children 6-59 months of age were also available in the 2015 Malaria Indicator Survey. The Zambia Food Consumption & Micronutrient Survey 2014 provided the information on VAD (including subclinical).

Estimates for disabilities due to iodine deficiency averted were not calculated because no recent national-level information was available for the total goitre rate, the measure of iodine deficiency used by PROFILES, and participants generally agreed that iodine deficiency was not a problem in Zambia. The 2013–14 ZDHS indicated that 95 percent of households had iodised salt,

[4] Iodine deficiency was not included in the Zambia Nutrition PROFILES 2017. See text below for further explanation.

although the adequacy of the salt was not assessed (CSO Zambia et al. 2014). However, the PROFILES participants felt that advocacy was necessary to support continued adequate iodisation of salt and consumption of iodised salt.

## Time Period and Targets

2017–2026 was selected as the 10-year period for which to calculate the Zambia Nutrition PROFILES 2017 estimates. Participants felt the time period was appropriate, as the 10-year period coincides with the completion of two 5-year development plans and allows for examination of the country's progress towards the 2030 Sustainable Development Goals.

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

Therefore, the Zambia Nutrition PROFILES 2017 workshop posed the question: By 2026, by how much do we assume that selected nutrition indicators will improve? Discussions took into consideration current programmes as well as factors related to potential improvements in interventions, national strategies, and planning documents, which provided insight into priority nutrition areas and national and global goals. In addition, the participants reveiewed the trajectories of several nutrition problems. After deliberating, they 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 Zambia free of malnutrition. Based on this vision, they 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. These tables also include brief notes on assumptions made for each model. For the anthropometric indicators (stunting, underweight, and wasting), Tables 2, 3, and 4 show information separately for the mild, moderate, and severe categories because the risk of dying differs by the degree of severity. The tables also show summary information for the moderate and severe categories combined. A calculator in PROFILES provides a status quo estimate for the percentage in the mild category using information on the mean z-score, 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, the status quo prevalence of 40.1 percent would be reduced to 20.1 percent by 2026 in the improved scenario. The target was selected to be in line with the Zambia–United Nations Sustainable Development Partnership Framework (2016–2021), which proposed a reduction to 30 percent by 2021. The group felt that in another 5 years (2026), a target of 20.1 percent would be achievable. The target was also intended to be in line with the World Health Assembly (WHA) nutrition goals, which includes a 40 percent reduction in the number of children under 5 who are stunted by 2025 (WHO 2014c). Stunting among children 24–35 months of age would be reduced from a status quo prevalence of 51.0 percent to a target prevalence of 17.3 percent (this is used to calculate increased economic productivity related to reductions in stunting). For underweight (moderate and severe), the status quo prevalence was 14.8 percent, to be reduced to a target prevalence of 9.5 percent (consistent with the National Health Strategic Plan 2011–2016 target for underweight). For wasting (moderate and severe), the status quo prevalence was 6.0 percent, to be reduced to a target prevalence of 4.9 percent. The target prevalence was chosen to be consistent with the 2025 WHA nutrition targets, in which wasting is maintained at less than 5 percent (WHO 2014c).

Based on a discussion of the 2025 WHA targets (which calls for a 50 percent reduction in anaemia), participants agreed that anaemia in pregnant women would be reduced from 47.0 percent to 23.5 percent and anaemia in children 6-59 months of age would be reduced from 60.3 percent to 30.2 percent. For VAD among children 6–59 months of age, they agreed that the prevalence would also be reduced by 50 percent, from 25.8 percent in the status quo scenario to a target prevalence of 12.9 percent by 2026. For low birth weight, a one-third reduction in prevalence was agreed upon (in line with the 2025 WHA targets); with a status quo prevalence of 9.2 percent, the target prevalence for the improved scenario would be 6.2 percent. For breastfeeding practices, the group agreed on setting a target of improving exclusive breastfeeding to 90.0 percent, an increase of 17.5 percentage points from the 72.5 percent status quo scenario. In addition, the group agreed on a 10.3 percentage point increase in 'any breastfeeding' among children 6–23 months of age, from 79.7 percent in the status quo scenario to 90.0 percent by 2026 in the improved scenario. Finally, the group agreed on a 20 percentage point increase in exclusive breastfeeding at 4–5 months of age, from 45.2 percent to 65 percent in the improved scenario. The participants felt these targets were optimistic but realistic given the already relatively high prevalence of exclusive and any breastfeeding in the country and the level of resources the country is allocating to improving breastfeeding practices.

## Table 2. Estimated Reductions in Death and Disability Using Zambia Nutrition 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 realted to under-5 child mortality<br><br>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:<br>• Stunting: mild 1.5, moderate 2.3, severe 5.5<br>• Underweight: mild 1.5, moderate 2.6, severe 9.4<br>• Wasting: mild 1.6, moderate 3.4, severe 11.6<br>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.<br><br>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 in the severe and moderate categories are based on the 2013–14 ZDHS.<br><br>Percentages of children in the mild category are calculated by the spreadsheet. | **Stunting:**<br>Mild: 27.6<br>Moderate: 22.9<br>Severe: 17.2<br><br>Mean height-for-age z-score at 48–59 months of age : –1.6<br><br>In summary (moderate + severe): 40.1 | **Stunting:**<br>In summary (moderate + severe): 0.50 | **Stunting:**<br>Mild: 31.0<br>Moderate: 15.6<br>Severe: 4.4<br>In summary (moderate + severe): 20.1 |
| | | | **Underweight:**<br>Mild: 31.2<br>Moderate: 11.7<br>Severe: 3.1<br><br>Mean weight-for-age z-score at 48–59 months of age: –0.9<br>In summary (moderate + severe): 14.8 | **Underweight:**<br>In summary (moderate + severe): 0.36 | **Underweight:**<br>Mild: 28.5<br>Moderate: 8.4<br>Severe: 1.0<br>In summary (moderate + severe): 9.5 |

| 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) (%) |
|---|---|---|---|---|---|
| | | | **Wasting:**<br>Mild: 11.9<br>Moderate: 3.8<br>Severe: 2.2<br><br>Mean weight-for-height z-score at 48–59 months of age : 0.0<br><br>In summary (moderate + severe): 6.0 | **Wasting:**<br>In summary (moderate + severe): 0.19 | **Wasting:**<br>Mild: 19.3[5]<br>Moderate: 4.4<br>Severe: 0.4<br>In summary (moderate + severe): 4.9 |

[5] Mild wasting has actually gone up in the improved scenario because of reductions in the more severe forms of wasting (moderate and severe).

| 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) (%) |
|---|---|---|---|---|---|
| Anaemia during pregnancy related to maternal and perinatal mortality<br><br>Pregnant women with low hemoglobin (Hb < 11 g/dL) (%) | Anaemia during pregnancy is an important contributor to maternal mortality, including an increased risk of death from postpartum haemorrhage. Anaemia during pregnancy also contributes to perinatal mortality, e.g., by increasing the risk of preterm delivery. The PROFILES spreadsheets calculate the contribution of iron deficiency anaemia to maternal and perinatal deaths based on the work by Stoltzfus et al. (2004) with updated relative risk (RR) information from Black et al. (2013), and presuming that 50% of anaemia is due to iron deficiency (an assumption that was also made by Stoltzfus et al.).<br><br>The relative risks (RRs) used in PROFILES are:<br>• RR of maternal mortality related to a 1 g/dL increase in haemoglobin : 0.71<br>• RR of perinatal mortality related to a 1 g/dl increase in maternal haemoglobin: 0.72 (for countries in Africa) or 0.84 (elsewhere) | Zambia Malaria Indicator Survey 2015 | 47.0[6] | 0.50 | 23.5 |

[6] Prevalence of anaemia among non-pregnant women was used due to unavailability of data on pregnant women.

| 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) (%) |
|---|---|---|---|---|---|
| VAD related to mortality among children 6-59 months of age<br>Children 6–59 months with low serum retinol (including milld, subclinical VAD) (%) | Children with severe VAD are at risk of blindness resulting from xerophthalmia and corneal ulceration. Mild VAD, which is much more widespread, increased the risk of dying from common childhood diseases(e.g., diarrhoea and measles). The RR used in PROFILES are:<br>• RR of mortality due to mild VAD > 6 months: 1.75[7] | Zambia Food Consumption Survey 2014 | 25.8 | 0.50 | 12.9 |
| Low birth weight (LBW) related to infant mortality<br>Newborns with LBW (%) | LBW , defined as 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 infromation and mortality rates, PROFILES calculates the population-attributable fraction and excess number of deaths related to LBW. The RRs used in PROFILES are:<br>• RR of neonatal death related to LBW: 4<br>• RR of post-neonatal infant related to LBW: 2 | 2013–14 ZDHS | 9.2 | 0.30 | 6.2 |

[7] A meta-analysis of vitamin A supplementation trials concluded that children 6–59 months who received vitamin A supplements were, on average, 23% less likely to die than children not receiving supplements (Beaton et al. 1993). The relative risk of death among children with vitamin A deficiency, compared with non-deficient children, is derived from findings presented in that publication and found to be 1.75 (Jay Ross, personal communication, August, 2016).

| 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<br><br>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 of age vs. exclusive breastfeeding; and no breastfeeding among children 6–23 months of age 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 of age and 6–23 months of age) related to suboptimal breastfeeding . PROFILES uses the following RRs:<br>• RR all-cause mortality, predominant breastfeeding vs. exclusive breastfeeding (0–5 months): 1.48<br>• RR all-cause mortality, partial breastfeeding vs. exclusive breastfeeding (0–5 months): 2.84<br>• RR all-cause mortality, no breastfeeding vs. exclusive breastfeeding (0–5 months): 14.4<br>• RR all-cause mortality no breatfeeding vs. any breatfeeding (6–23 months): 3.69<br><br>For more information on this model see Oot et al. 2015. | 2013-14 ZDHS | **Breastfeeding practices**:**<br>Exclusive breastfeeding 0–5 months of age: 72.5<br>Predominant breastfeeding 0–5 months of age: 7.7<br>Partial breastfeeding 0–5 months of age: 18.4<br>No breastfeeding 0–5 months of age: 1.4<br>Any breastfeeding 6–23 months of age: 79.7<br>No breastfeeding 6–23 months of age: 20.3 | N/A | **Breastfeeding practices***:**<br>Exclusive breastfeeding 0–5 months of age: 90.0<br>Predominant breastfeeding 0–5 months of age: 2.0<br>Partial breastfeeding 0–5 months of age: 8.0<br>No breastfeeding 0–5 months of age: 0.0<br>Any breastfeeding 6–23 months of age: 90.0<br>No breastfeeding 6–23 months of age: 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) (%) |
|---|---|---|---|---|---|
| Suboptimal breastfeeding related to future overweight and obesity at 48–59 months of age<br><br>Exclusive breastfeeding for 6 months (%) | Infants who are not exclusively breastfed have a higher risk of overweight/obesity later in life (Horta et al. 2015). The PROFILES coefficient for this model is based on FANTA analysis of a subset of the 24 studies analyzed by Horta et al. Five studies were selected because they compared infants exclusively breastfed for 6 months with infants not exclusively breastfed for 6 months, and because the overweight/ obesity outcome was observed later in childhood (at around 4 years) rather than in adolescence or adulthood. The pooled analysis of these five studies yields an odds ration of 1.48, which is what is used in this PROFILES model. The RR listed below is the result of the pooled analysis. The prevalence of overweight/obesity (+2 standard deviations (SD) weight-for-height) among children aged 48–59 months of age is 3.3 percent (ZDHS 2014).<br><br>For more information on this model see Oot et al. 2016a. | 2013–14 ZDHS | Exclusive breastfeeding (4–5 months of age): 45.2 | | Exclusive breastfeeding (4–5 months of age)***: 65.0 |

* Proportion reduction applied to current prevalence

** *Predominant breastfeeding* refers to infants 0–5 months of age receiving 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 milk, but is also being given other food or food-based fluids, such as formula milk or complementray foods (complementary foods should only be given to children 6 months and older).

*** 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 Zambia Nutrition PROFILES 2017**

| Nutrition problem | Rationale/assumptions | Data sources | Starting prevalence (used for status quo scenario) (%) | Targeted reduction in prevalence by 2026* | Target prevalence (2026) (%) |
|---|---|---|---|---|---|
| **Mortality** | | | | | |
| Stunting among children 24-25 months of age related to future productivity<br>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 labour 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. | Percentages of children in the severe and moderate categories are based on 2013–14 ZDHS | **Stunting (24–35 months of age):**<br>Moderate: 26.2<br>Severe: 24.8<br><br>Mean height-for-age z-score at 24-35 months of age: -1.6<br><br>In summary (moderate + severe): 51.0 | **Stunting (24–35 months of age):**<br>In summary (moderate + severe): 0.66 | **Stunting (24–35 months of age):**<br>Moderate: 13.8<br>Severe: 3.5<br>In summary (moderate + severe): 17.3 |

| Nutrition problem | Rationale/assumptions | Data sources | Starting prevalence (used for status quo scenario) (%) | Targeted reduction in prevalence by 2026* | Target prevalence (2026) (%) |
|---|---|---|---|---|---|
| Anaemia among adult men and women related to productivity losses<br>Non-pregnant women 15–49 years with low hemoglobin (Hb < 12 g/dL) (%) | Anaemia among the working-age adult population contributes to reduced productivity for those engaged in physical labour, especially heavy physical labour. The PROFILES model uses the coefficients developed by 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 the proportional reduction in productivity in manual labor among anemic adults is 5%, with a further reduction by 12% in heavy manual labor. | The Zambia National Malaria Indicator Survey 2015 included anaemia information for non-pregnant women. Data were also used to represent pregnant women, as data on anaemia prevalence among pregnant women were not available. | 47.0 | 0.50 | 23.5 |
| Men 15-64 years of age with low hemoglobin (Hb < 13 g/dL) (%) | | The Zambia National Malaria Indicator Survey 2015 did not include anaemia information for men. | Data not available | N/A | N/A |
| Children 6-59 months of age with anaemia (%) (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. | Malaria Indicator Survey 2015 | 60.3 | 0.50 | 30.2 |

* Proportion reduction applied to current prevalence

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

| Nutrition problem | Rationale/assumptions | Data sources | Current prevalence (used for status quo scenario) (%) | Targeted reduction in prevalence by 2026* | Target prevalence (2026) (%) |
|---|---|---|---|---|---|
| **Mortality** | | | | | |
| Stunting among children 24-35 months of age related to human capital losses in terms of learning ability<br>Children 24–35 months of age with low height-for-age, (moderate and severe stunting) (%) | Several studies have established an association between the early insult of stunting in young children, which leads to poorer cognitive development, and poorer school performance (Grantham-McGregor et al. 2007; Glewwe et al. 2001). Stunted children perform less well in math and reading tests than 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 SD unit reduction in the mean height-for-age z-score, dervied from the results of Glewwe et al. 2001. | Percentages of children in the severe and moderate categories are based on 2013–14 ZDHS | **Stunting (24–35 months of age):**<br>Moderate: 26.2<br>Severe: 24.8<br>In summary (moderate + severe): 51.0 | **Stunting (24–35 months of age):**<br>In summary (moderate + severe): 0.66 | **Stunting (24–35 months of age):**<br>Moderate: 13.8<br>Severe: 3.5<br>In summary (moderate + severe): 17.3 |
| Primary education: | | The Education Act | | | |
| Age at school entry | The age at school entry in Zambia is 7 years; it was assumed that the average age at school entry is 7 years. | | | | |
| Number years of schooling | There are 7 years of primary school. | | | | |
| | For more information on this model see Oot et al. 2016b. | | | | |

* Proportion reduction applied to current prevalence

## Demographic, Employment, and Education Information

PROFILES requires demographic information with projections into future years that correspond to the time period chosen. For the Zambia nutrition PROGILES, select information was obtained from the United Nations Population Prospects 2015 Revision online database (United Nations 2015) and used in conjunction with both the estimated total population of 16.41 million in 2017 (according to 2010 Census of Population and Housing—Population and Demographic Projections 2011–2035) and a PROFILES calculator tool to obtain the various demographic estimates required by PROFILES for each year.

Employment information was obtained from the Zambia Labour Force Survey 2014 (CSO 2015). Education information included data on primary school starting age and number of years of school specified in the country's education policy. Information from *The Laws of Zambia* (Chapter 134: The Education Act) was used to obtain education information (Ministry of Legal Affairs n.d.). The 2013–14 ZDHS was the source of information on the perinatal mortality rate (31 per 1,000 live births), neonatal mortality rate (24 per 1,000 live births), infant mortality rate (45 per 1,000 live births), under-5 mortality rate (75 per 1,000 live births), and maternal mortality ratio (398 per 100,000 live births) (CSO Zambia et al. 2014). The prevalence of overweight/obesity (weight-for-height z-score +2) in children 48–59 months of age was 3.3 percent, which is needed for the suboptimal breastfeeding and child overweight model (ZDHS 2014).

# Results

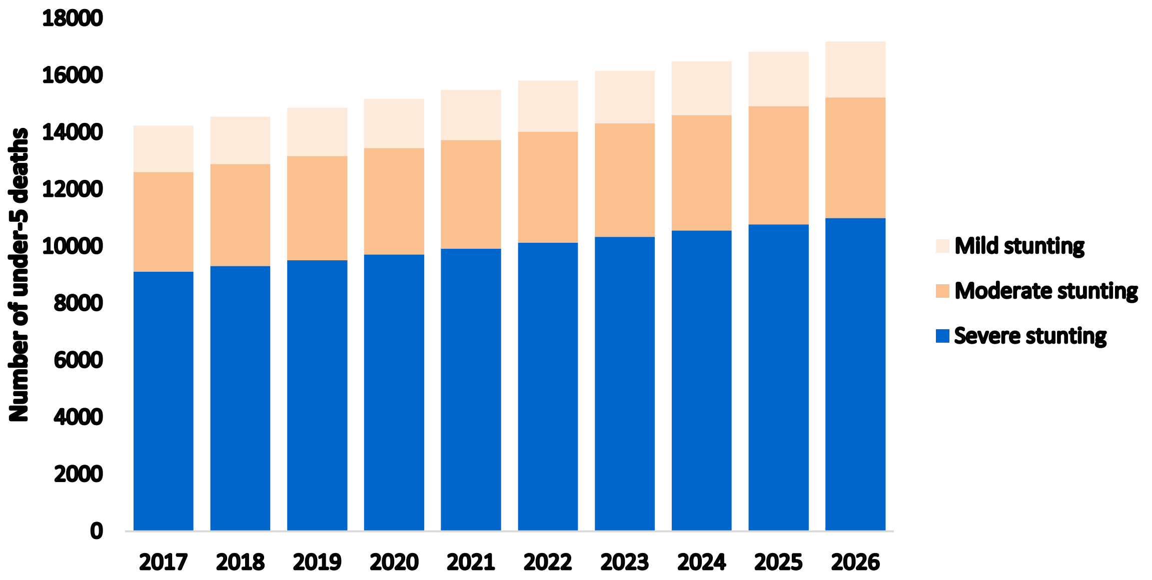
The results of Zambia Nutrition PROFILES 2017 are presented in Tables 5–8 and Figures 10–14. Figures 15 and 16 summarize the results. Table 5 shows that if stunting levels remain unchanged from 2017 to 2026, the number of deaths related to stunting in children under 5 years of age (156,821) can be expected to increase because of Zambia's high fertility rate and a resulting increase in the number of children under 5. However, if the nutrition situation improves and stunting levels are reduced to the proposed targets, 43,951 children's lives could be saved from stunting-related deaths over the time period. Table 5 also shows that in the status quo, with no change in the prevalence of wasting, there would be 81,277 deaths related to wasting. However, if targeted reductions in the prevalence of wasting are reached by 2026, 13,550 children's lives could be saved from wasting-related deaths. Figures 10–13 further illustrate the status quo scenario and improved scenario for stunting and wasting.

Table 5 also shows that in the status quo scenario, with no change in the prevalence of maternal iron deficiency anaemia, there would be 6,521 maternal deaths related to pregnancy and childbirth and 27,530 perinatal deaths. Reaching targeted reductions in the prevalence of maternal iron deficiency anaemia by 2026 could save 3,795 women's lives and avert 15,772 perinatal deaths over the time period. In addition, with no change in the prevalence of low birth weight, there would be 48,102 deaths related to this problem during 2017–2026. However, 7,034 infant deaths could be averted by reductions in low birth weight. In the status quo scenario, 129,781 deaths in children under 2 years of age would be attributable to suboptimal breastfeeding practices. However, if targeted reductions in suboptimal breastfeeding practices are met by 2026, then the lives of 33,784 children under 2 years of age could be saved. Finally, if there is no change in the prevalence of VAD, there would be 46,447 deaths in children under 5 years of age related to VAD during 2017–2026. However, 10,727 under-5 deaths could be averted by reductions in VAD.

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

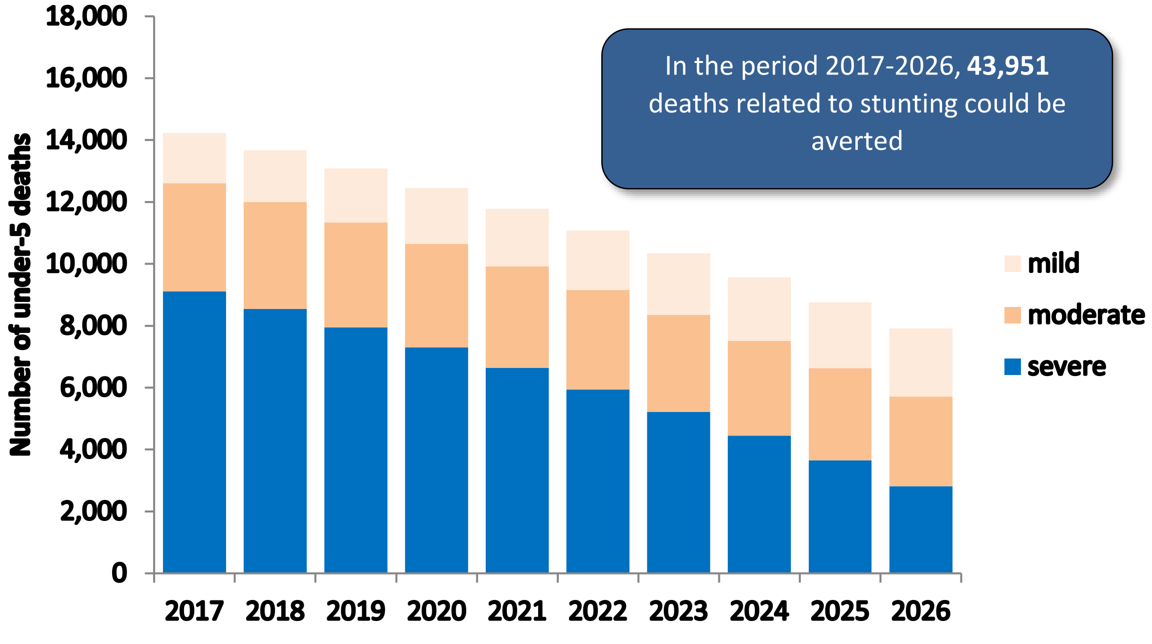
| Nutrition problem | 2017–2026 DEATHS if current situation continues *Status quo scenario* | DEATHS if nutrition situation improves *Improved scenario* | LIVES SAVED if nutrition situation improves *Improved scenario* |
|---|---|---|---|
| **Anthropometric indicators** | | | |
| Deaths/lives saved attributable to **stunting** (severe, moderate, mild) among children < 5 years of age | 156,821 | 112,870 | 43,951 |
| Deaths/lives saved attributable to **wasting** (severe, moderate, and mild) among children < 5 years of age | 81,277 | 67,727 | 13,550 |
| Deaths/lives saved attributable to **underweight** (severe, moderate, and mild) among children < 5 years of age | 107,820 | 85,564 | 22,256 |
| **Low birth weight** | | | |
| Infant deaths/lives saved | 48,102 | 41,068 | 7,034 |
| **Iron deficiency anaemia** | | | |
| Maternal deaths/lives saved | 6,521 | 2,726 | 3,795 |
| Perinatal deaths/lives saved | 27,530 | 11,758 | 15,772 |
| **Vitamin A deficiency** | | | |
| Child deaths/lives saved | 46,447 | 35,720 | 10,727 |
| **Breastfeeding practices** | | | |
| Deaths/lives saved attributable to suboptimal breastfeeding practices among children < 2 years of age | 129,781 | 95,997 | 33,784 |

**Figure 10. Status Quo Scenario: Number of Deaths in Children under 5 Years of Age Related to Stunting,* 2017–2026**



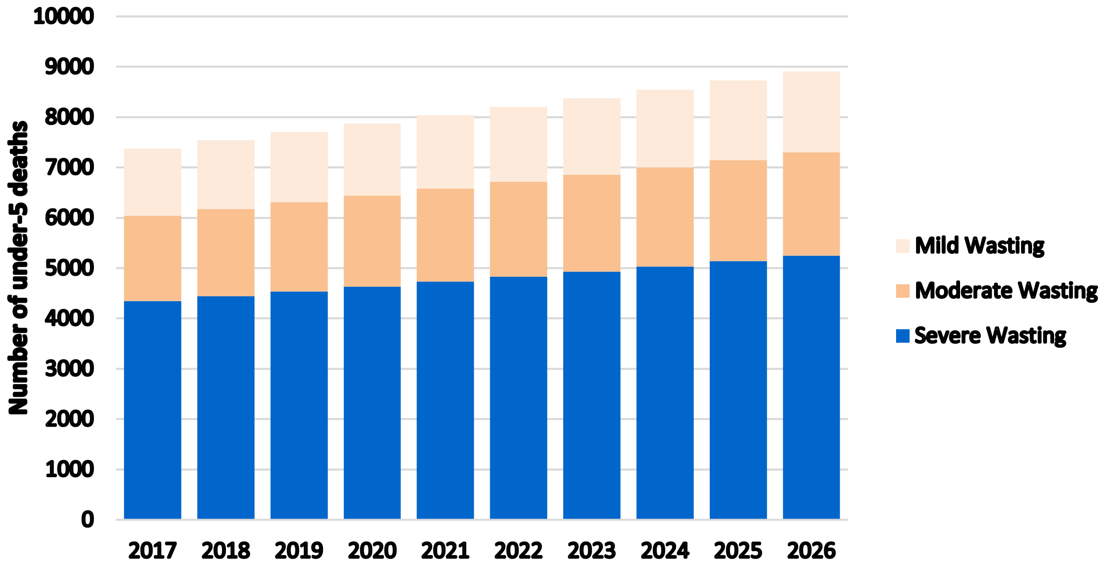

* Mild, moderate and severe stunting (low height-for-age)

**Figure 11. Improved Scenario: Decreasing Number of Deaths in Children under 5 Years of Age Related to Stunting,* 2017–2026**



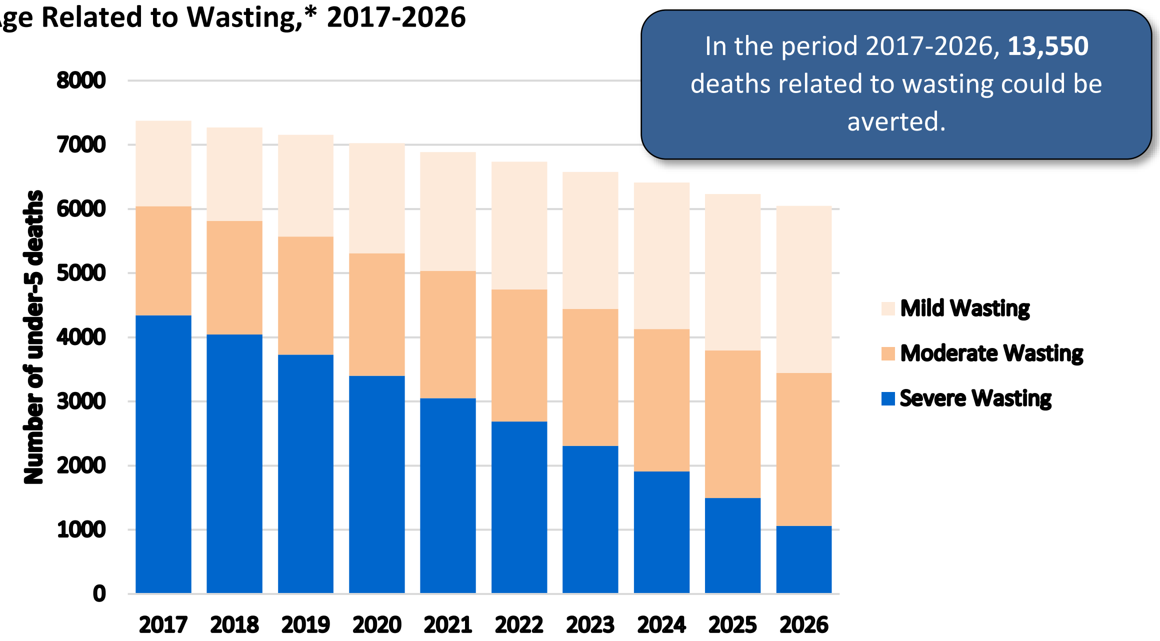

* Mild, moderate and severe stunting (low height-for-age)

**Figure 12. Status Quo Scenario: Number of Deaths in Children under 5 Years of Age Related to Wasting,* 2017–2026**




* Mild, moderate, and severe wasting (low weight-for-height)

**Figure 13. Improved Scenario: Decreasing Number of Deaths in Children under 5 Years of Age Related to Wasting,* 2017-2026**




* Mild, moderate and severe wasting (low weight-for-height)

Table 6 shows the effect of suboptimal breastfeeding practices on preschool overweight/obesity. In the status quo scenario, 30,343 children 48–59 months of age would be at risk of overweight/obesity related to suboptimal breastfeeding practices. However, if the nutrition situation improves, then 5,053 children 48–59 months of age would be prevented from becoming overweight/obese by 2026.

**Table 6. Effect of Suboptimal Breastfeeding Practices on Overweight/Obesity in Preschool Children (48–59 Months of Age)**

| Nutrition problem | Number of children 48–59 months of age likely to become overweight/obese related to suboptimal breastfeeding practices<br>*Status quo scenario* 2017–2026 | Number of children 48–59 months of age prevented from becoming overweight/obese related to improved breastfeeding practices<br>*Improved scenario* 2017–2026 |
|---|---|---|
| Suboptimal breastfeeding related to future overweight and obesity at 48–59 months of age | 30,343 | 5,053 |

Table 7 shows human capital losses in terms of learning related to stunting. If there is no change in the prevalence of stunting, the losses would amount to 40.499 million equivalent school years of learning. Conversely, if stunting is reduced over the time period, the gains would be 9.065 million equivalent school years of learning. By the end of the time period, these gains in learning ability mean that on average, a child who is 2 years of age in 2026 will gain 2.7 equivalent school years of learning if stunting is reduced.

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

| Nutrition problem | Losses in learning if the current situation continues<br>*Status quo scenario* 2017–2016 | Gains in learning if nutrition situation improves<br>*Improved scenario* 2017–2026 |
|---|---|---|
| Stunting | 40.499 million equivalent school years of learning | 9.065 million equivalent school years of learning |

Figure 14 illustrates human capital gains in learning related to a reduction in stunting prevalence.

**Figure 14. Improved Scenario: Human Capital Gains in Terms of Learning Related to a Reduction in Stunting, 2017–2026**

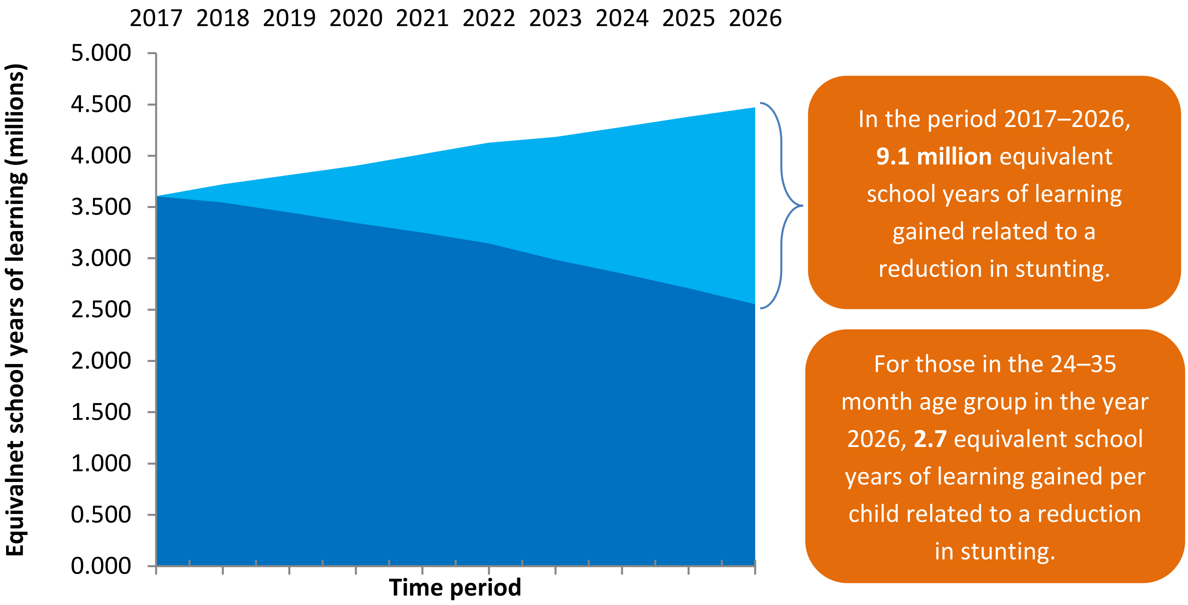



Table 8 shows economic productivity losses related to stunting in young children and iron deficiency in adult women and men. If stunting levels remain unchanged during the chosen period, future productivity losses related to stunting would be about 180.768 billion ZMW (US$18.315 billion). Productivity losses related to iron deficiency anaemia would be about 17.937 billion ZMW (US$1.817 billion) in adults (women) and 6.862 billion ZMW (US$695 million) in children if this problem remains unchanged.

Table 8 also shows the economic productivity gains that could be achieved if the prevalence of stunting and iron deficiency anaemia 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 67.792 billion ZMW (US$6.869 billion) for stunting and about 4.772 billion ZMW (US$483 million) for iron deficiency anaemia among adult women and 1.788 billion ZMW (US$181 million) for children.

Productivity gains are based on the average annual wage (in manual labour jobs) in the country. For Zambia, it was agreed during the PROFILES workshop to use the information from the Zambia Labour Force Survey 2014, which was 20,934 ZMW. As a middle-income country, Zambia's annual wage is higher than the average wage in other lower income countries, such as Uganda and Malawi, and therefore the economic productivity losses are higher. Although there is significant income inequality across Zambia, and the national average masks that disparity, the PROFILES workshop participants felt that the figure calculated from 2014 Labour Force Survey was the best resource to use given the data available. Importantly, the higher economic productivity losses in Zambia, given the middle-income status, also suggest that Zambia has more to lose when the prevalence of malnutrition remains high because of the adverse impact of malnutrition on human capital and income earning capabilities.

**Table 8. Economic Productivity Losses and Gains Related to Stunting and Iron Deficiency Anaemia**

| Nutrition problem | Economic productivity losses if the current situation continues<br>*Status quo scenario* 2017–2026 | Economic productivity gains if nutrition situation improves<br>*Improved scenario* 2017–2026 |
|---|---|---|
| Stunting | 180,768,000,000 ZMW<br>or<br>180.768 billion ZMW<br>(US$18.315 billion) | 67,792,000,000 ZMW<br>or<br>67.792 billion ZMW<br>(US$6.869 billion) |
| Iron-deficiency anaemia (adult) | 17,937,000,000 ZMW<br>Or<br>17.937 billion ZMW<br>(US$1.817 billion) | 4,772,000,000 ZMW<br>Or<br>4.772 billion ZMW<br>(US$483 million) |
| Iron-deficiency anaemia (child) | 6,862,000,000 ZMW<br>Or<br>6.862 billion ZMW<br>(US$695 million) | 1,788,000,000 ZMW<br>Or<br>1.788 billion ZMW<br>(US$181 million) |

*Note*: Productivity gains that could result from a reduction in stunting related to improvement in the low birth weight indicator are not shown separately (they would overlap with the productivity gains shown here associated with improvement in stunting). Productivity losses/gains related to iron deficiency anaemia (adult) refers to adult women. Numbers in ZMW and US$ are rounded. The exchange rate used is 9.87 ZMW = US$1

**Figure 15. Estimates of Future Lives Lost, Economic Productivity Lost, Permanent Disabilities and Human Capital Lost Associated with Various Nutrition Problems, 2017–2026**

| LIVES LOST | | ECONOMIC PRODUCTIVITY LOST | CHILDHOOD OVERWEIGHT/ OBESITY | HUMAN CAPITAL LOST |
|---|---|---|---|---|
| **156,821** lives of children under 5 years of age lost related to stunting | **48,102** infants' lives lost related to low birth weight | **180.768 billion ZMW** (US$18.315 billion) lost related to stunting | **30,343** children 48–59 months of age likely to become overweight/obese related to suboptimal breastfeeding practices | **40.499 million** equivalent school years of learning lost related to stunting |
| **81,277** lives of children under 5 years of age lost related to wasting | **27,530** infants' lives lost during the perinatal period related to maternal anaemia | **17.937 billion ZMW** (US$1.817 billion) lost related to iron deficiency anaemia among adult women | | |
| **6,521** women's lives lost related to maternal anaemia | **129,781** lives of children under 2 years of age lost related to suboptimal breastfeeding practices | **6.862 billion ZMW** (US$695 million) lost related to iron deficiency anaemia in children | | |
| **46,447** lives of children under 5 years of age lost to vitamin A deficiency | | | | |

**Figure 16. Estimates of Future Lives Saved, Economic Productivity Gained, Permanent Disabilities Averted and Human Capital Gained, 2017–2026**

| LIVES SAVED | | ECONOMIC PRODUCTIVITY GAINED | CHILDHOOD OVERWEIGHT/ OBESITY PREVENTED | HUMAN CAPITAL GAINED |
|---|---|---|---|---|
| **43,951** lives of children under 5 years of age saved related to a reduction in stunting | **7,034** infants' lives saved related to increases in birth weight | **67.792 billion ZMW** (US$6.869 billion) gained related to a reduction in stunting | **5,053** children 48–59 months of age prevented from becoming overweight/obese related to improved breastfeeding practices | **9.065 million** equivalent school years of learning gained related to a reduction in stunting |
| **13,550** lives of children under 5 years of age saved related to a reduction in wasting | **15,772** infants' lives saved in the perinatal period related to a reduction in maternal anaemia | **4.772 billion ZMW** (US$483 million) gained related to improvements in iron deficiency anaemia among adult women | | |
| **3,795** women's lives saved related to a reduction in maternal anaemia | **33,784** lives of children under 2 years of age saved related to improved breastfeeding practices | **1.788 billion ZMW** (US$181 million) gained related to improvements in iron deficiency anaemia among children | | |
| **10,727** lives of children under 5 years of age saved related to improvements in vitamin A status | | | | |

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

This section summarizes the discussions of nutrition advocacy needs in Zambia during the stakeholder meeting and PROFILES workshop. The information in this section was the foundation of discussions among multisectoral stakeholders during the February 2017 Nutrition Advocacy Planning Workshop, which was tasked with developing a National Nutrition Advocacy Plan for Zambia.

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

Creating an enabling environment for improved nutrition will require greater investment and commitment by the GRZ and cooperating partners. Substantial effort to implement and expand access to quality nutrition services at scale is essential to achieve the benefits of improved nutrition suggested by the PROFILES estimates for Zambia. Participants in the stakeholder meeting and PROFILES workshop discussed and agreed on the following advocacy needs:

1. **Broaden the health management information system (HMIS) to integrate an expanded set of nutrition indicators.** The current government HMIS includes limited nutrition indicators, making it challenging to track progress on improvements in nutrition and nutrition service delivery. Stunting, wasting, and overweight/obesity should be added to the nutrition indicators in the HMIS.
2. **Improve monitoring and evaluation systems to track changes and progress in nutrition.** An effective system for monitoring and evaluating nutrition indicators requires standard, clear, and easy to use tools to collect and report on nutrition data. Clear roles and responsibilities for data collecting, tracking, and reporting are also required.
3. **Strengthen training of nutrition professionals and improve staff retention.** Currently, the GRZ health system has limited capacity for nutrition service delivery. There is a need for more human resources and capacity building in nutrition to expand and improve the quality and scale of nutrition service delivery in the country. In addition, there is a need to invest in building the capacity of key staff in other sectors to promote multisectoral knowledge, commitment, and action to reduce malnutrition.
4. **Target adolescents and their children with integrated nutrition, HIV, and reproductive health services and interventions.** Adolescent pregnancy remains a significant problem in Zambia, with 28.5 percent of girls 15–19 years of age and 58.9 percent of girls 19 years of age beginning childbearing. The proportion of adolescent girls who have begun childbearing is increasing. The first-born children of adolescent girls are 33 percent more likely to be stunted than children born to older mothers (Fink et al. 2014). Because of the high prevalence of HIV among young women in Zambia, adolescent pregnancy is a key driver of

mother-to-child transmission of HIV, which in turn increases the risk of stunting because of HIV-related adverse health consequences (e.g., HIV increases energy needs and can decrease appetite). Childbearing begins early, and this increases lifetime fertility. Adolescent mothers struggle to provide for their children because they lack access to and control over resources and are too young to provide optimal child care.

5. **Ensure regular financing for nutrition from both national and international funds.** Increasing resource allocation for nutrition in tandem with strengthening integrated implementation of nutrition services at scale will help Zambia fulfill its national commitments to nutrition targets.
6. **Increase coordination, collaboration, and integration of nutrition-related activities among development partners.** Although numerous donors are working in Zambia to improve nutrition, their efforts are often disjointed and uncoordinated. There is a need for improved coordination and collaboration among development partners—and among development partners, their implementing partners, and the government—to ensure adequate coverage and funding for nutrition activities so that effective, proven and quality nutrition-specific and nutrition-sensitive interventions are implemented at scale throughout the country.
7. **Increase coordination, collaboration, and integration of nutrition-related activities among government sectors.** To ensure adequate coverage and funding of nutrition activities, advocacy efforts are necessary to reach ministries throughout the government. Addressing malnutrition in Zambia is a multifaceted issue that will require multisectoral actions, funding, and support. Advocacy efforts can help identify and clarify the role of each ministry in reducing malnutrition.

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# Appendix A. Glossary of Terms in the Context of PROFILES

| Term/Phrase | Definition/Usage |
|---|---|
| Acute malnutrition | (See wasting.) |
| Anaemia | A sign of malnutrition when the amount of haemoglobin in the blood is inadequate, which reduces the oxygen-carrying capacity of red blood cells. Anaemia can be caused by iron deficiency due to low dietary intake, poor absorption of iron, or blood loss. Anaemia 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 anaemia. Maternal anaemia increases the risk of maternal and perinatal mortality, preterm birth and low birth weight. In children, anaemia impairs cognitive development, and in adults, it reduces work productivity (especially heavy physical labour). Anaemia is typically defined as a blood haemoglobin 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 cutoff of 12 g/dl for children 5–11 years of age). |
| Anthropometry | The study and technique of human body measurement. Anthropometry 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) | 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 (See also iodine deficiency disorders.) |
| Discounting | (See economic productivity.) |
| Economic activity rate (also called labour 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 labour force but everyone of working age (15–64 years). |
| 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 percent per year. The models use current country-specific employment and labour force participation rates, and current divisions between different occupations. In PROFILES, among children, estimates of future economic productivity losses attributed to stunting, iodine deficiency and iron deficiency anaemia 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 aanaemia among adults, which is a reflection of decreased capacity to do manual labour. In PROFILES, the difference between the status quo and improved scenarios reflects the benefits of improved nutrition expressed as economic productivity gains (or, put another way, economic productivity losses averted). |
| Equivalent school years of learning | The sum of 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, used in PROFILES to quantify human capital losses in terms of reduced learning ability related to stunting |

| Term/Phrase | Definition/Usage |
|---|---|
| Exclusive breastfeeding | Giving a baby only breast milk and no other liquids or solids, not even water unless medically indicated. Exclusive breastfeeding is recommended until an infant has completed 6 months of age. Replacement feeding should only be considered if acceptable, feasible, affordable, sustainable and safe. |
| Goitre | Abnormal enlargement of the thyroid gland in the neck that can be caused by iodine deficiency . Goitre can be assessed by inspection and palpation of the thyroid gland, or by ultrasonography. |
| Human capital | Intangible collective resources possessed by individuals and groups in a given population (individual and collective knowledge, talents, skills, abilities, experience, intelligence, training, judgement and wisdom), the cumulative total of which represents a form of wealth available to nations and organisations to accomplish their goals. Human capital is available to generate material wealth for an economy or a private firm. In a public organisation, 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 goitre, cretinism and reduced IQ. Iodine deficiency during foetal 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 infants. |
| Lives saved | In the context of PROFILES, the number of lives saved due to a reduction in the prevalence of various nutrition problems (such as stunting, wasting, underweight, vitamin A deficiency, anaemia, suboptimal breastfeeding practices and low birth weight) in the improved scenario (Also see PROFILES.) |
| Low birth weight | Weight of less than 2,500 g (5.5 lbs) at birth, usually an outcome of intrauterine growth retardation and/or preterm birth. Low birth weight is not only closely associated with increased risk of foetal and neonatal mortality and morbidity, but also with increased risk of inhibited growth, poor cognitive development and chronic diseases later in life. |
| Malnutrition | 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 oedema (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 expected for healthy person of the same height, putting 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. 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 |

| Term/Phrase | Definition/Usage |
|---|---|
| Micronutrient deficiencies | A consequence of reduced micronutrient intake and/or absorption in the body. The most common forms of micronutrient deficiencies are related to iron, vitamin A and iodine deficiency. |
| 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 and takes into account the country-specific context. It 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, 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 that a case (someone with the disease) was exposed to the risk factor divided by the odds that a control (someone without the disease) was exposed to the same risk factor. |
| Overweight | (see malnutrition.) |
| Permanent disability | In the context of PROFILES, 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) | The 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 | The number of cases of a disease that are present in a particular population at a given time, often expressed as a 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 the 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—nutrition interventions that are known to be effective are expected to be implemented at scale and to 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, programmes, 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 | A measure of the association between a risk factor and a disease or health outcome. It describes the likelihood of a group exposed to a risk factor developing a disease compared to a non-exposed group. 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 SDs from the WHO 2006 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 malnutrition. 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 programmes aimed at pregnant women, infants, and children under 2 years of age. Programme responses to stunting require longer-term planning and policy development. |
| Suboptimal breastfeeding practices | Considered to be no, partial, or predominant breastfeeding when children are 0–5 months of age and no breastfeeding among children 6–23 months of age. 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 feeding 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 | The prevalence by the final year of the chosen time period. For example, if the starting prevalence is 35 percent, stakeholders may decide that the target prevalence by the end of the time period should be 15 percent. |
| Targeted reduction in prevalence in PROFILES | The proportion reduction in prevalence to reach the target prevalence |
| Time period in PROFILES | The number of years for which the PROFILES estimates will be calculated |
| Undernutrition | (See malnutrition.) |
| Underweight | A composite form of undernutrition in children under 5 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 (WHO 2006 Child Growth Standards). |
| Vitamin A deficiency | Vitamin A is an important nutrient required for maintaining immune function, eye health, vision, growth, and survival. 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). Vitamin A-deficient children also have a higher risk of death (e.g., from diarrhoea and measles). A common indicator of vitamin A deficiency is the level of retinol (a form of vitamin A) in blood. The recommended cutoff 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 standard deviations from the World Health Organization 2006 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 the number of SD units (or z-scores) below or above the reference mean or median value. WHO uses a cutoff 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 cutoff point of < –3 SD to define severe underweight, stunting, and wasting. |

# Appendix B. Participants in the PROFILES Stakeholder Meeting, PROFILES Workshop, and Nutrition Advocacy Meeting

### List of Participants in the PROFILES Stakeholders Meeting, 13 February 2017

| Name | Title | Organization |
|---|---|---|
| Kwezi Jere | Technical Advisor-WASH | Ministry of Local Government and Housing/UNICEF |
| Marjorie Mwale Lusaka | Water Engineer | Ministry of Water and Sanitation |
| Wendy-Ann Rowe | Head of Programs | Catholic Relief Services (CRS)/Zambia |
| Vicky Veevers | Nutrition Consultant | CRS and University of Zambia (UNZA) |
| Wilbroad Zimba | Publicity Secretary | Nutrition Association of Zambia |
| Mwandwe Chileshe | Acting Country Coordinator | Civil Society–Scaling Up Nutrition (CSO-SUN) Alliance |
| Felix Mwenge | Research Fellow | Zambia Institute of Policy Analysis and Research (ZIPAR) |
| Lubinda Mukata | Senior Statistician/Head-Field Coordination | Central Statistics Office (CSO) |
| Carolyn B. Chuunga | Senior Chiefs' Affairs Officer | Ministry of Chiefs and Traditional Affairs |
| Rose Musumali Lungu | Nutrition Specialist | USAID Systems for Better Health (SBH) |
| Malili A Nakanyika | Fisheries Sociologist | Department of Fisheries |
| Rabecca B. Mwewa | Provincial Nutritionist | Lusaka Provincial Health Office |
| Grace Mushibwe | National Coordinator | International Baby Food Action Network (IBFAN) |
| Josephine Nyambe | Technical Advisor | CARE-SUN Fund Management Unit |
| Mweshi Katongo | Senior Planner | Ministry of Gender |
| Banda Sosten | Economist | National Food and Nutrition Commission (NFNC) |
| Dorothy Nthani | Lecturer | University of Zambia |
| Rhoda Mofya Mukuka | Research Fellow | Indaba Agricultural Policy Research Institute |
| Rose S. Silyato | Principal Food and Nutrition Officer | Ministry of Agriculture |
| Ebedy Sadoki | Chief of Party | USAID/Applying Science to Strengthen and Improve Systems (ASSIST) Project |
| Helen K. Chirwa | Nutrition Advisor | USAID/Zambia |
| Happy Banda | Senior Planner | Ministry of National Development Planning |
| Clevinah I Mizanda | Chief Environmental Health Officer | Ministry of Health (MOH) |
| Chileshe Chilangwa | Deputy Chief of Party | FHI 360/Zambia |
| Eustina Mulenga Besa | Head-Nutrition Education and Communication Unit | NFNC |
| Beatrice Kawana | Senior Technical Advisor | PATH/Thrive Project |
| Yvonne N. Mwale | Planner | Planning Department, MOH |
| Mubu Lizazi | Policy Analyst | MOH |
| Tresphor Chanda | Nutrition Focal Point Person | Ministry of General Education |

| Name | Title | Organization |
|---|---|---|
| Dorothy Sikazwe | Chief Nutrition Officer | Ministry of Health |
| Jane Chitanda | National Nutrition Technical Officer | MOH/Millennium Development Goal Initiative (MDGI) |
| Musonda Mofu | Deputy Executive Director | NFNC |
| Mathews Mhuru | Programme Manager | World Food Program |
| Ruth Siyandi | Nutrition Specialist | UNICEF |
| Wendy Hammond | Project Manager | FANTA HQ |
| Elisabeth Sommerfelt | Scientist, Maternal and Child Health and Nutrition | FANTA HQ |
| Kavita Sethuraman | Technical Advisor, Maternal and Child Health and Nutrition | FANTA HQ |
| Earnest Muyunda | Project Manager | FANTA/Zambia |

## List of Participants in the PROFILES Workshop, 14–17 February 2017

| Name | Title | Organization |
|---|---|---|
| Kwezi Jere | Technical Advisor-WASH | Ministry of Local Government and Housing/UNICEF |
| Wilbroad Zimba | Publicity Secretary | Nutrition Association of Zambia |
| Mwandwe Chileshe | Acting Country Coordinator | Civil Society-Scaling Up Nutrition (CSO-SUN) Alliance |
| Felix Mwenge | Research Fellow | Zambia Institute of Policy Analysis and Research (ZIPAR) |
| Lubinda Mukata | Senior Statistician/Head-Field Coordination | Central Statistics Office |
| Malili A Nakanyika | Fisheries Sociologist | Department of Fisheries |
| Josephine Nyambe | Technical Advisor | CARE-SUN Fund Management Unit |
| Banda Sosten | Economist | National Food and Nutrition Commission (NFNC) |
| Dorothy Nthani | Lecturer | University of Zambia |
| Rose S. Silyato | Principal Food and Nutrition Officer | Ministry of Agriculture |
| Ebedy Sadoki | Chief of Party | USAID/Applying Sicence to Strengthen and Improve Systems (ASSIST) Project |
| Eustina Mulenga Besa | Head-Nutrition Education and Communication Unit | NFNC |
| Beatrice Kawana | Senior Technical Advisor | PATH/Thrive Project |
| Musonda Mofu | Deputy Executive Director | NFNC |
| Mathews Mhuru | Programme Manager | World Food Programme |
| Ruth Siyandi | Nutrition Specialist | UNICEF |
| Wendy Hammond | Project Manager | FANTA HQ |
| Elisabeth Sommerfelt | Scientist, Maternal and Child Health and Nutrition | FANTA HQ |
| Kavita Sethuraman | Technical Advisor, Maternal and Child Health and Nutrition | FANTA HQ |
| Agnes Aongola | Chief Nutrition Liaison Officer | Ministry of Health |

| Name | Title | Organization |
|---|---|---|
| Earnest Muyunda | Project Manager | FANTA/Zambia |

### List of Participants from the Nutrition Advocacy Meeting, 27 February–2 March 2017

| Name | Title | Organization |
|---|---|---|
| Kwezi Jere | Technical Advisor-WASH | Ministry of Local Government and Housing/UNICEF |
| Wilbroad Zimba | Publicity Secretary | Nutrition Association of Zambia |
| Mwandwe Chileshe | Acting Country Coordinator | Civil Society-Scaling Up Nutrition (CSO-SUN) Alliance |
| Felix Mwenge | Research Fellow | Zambia Institute of Policy Analysis and Research (ZIPAR) |
| Lubinda Mukata | Senior Statistician/Head-Field Coordination | Central Statistics Office |
| Malili A Nakanyika | Fisheries Sociologist | Department of Fisheries |
| Josephine Nyambe | Technical Advisor | CARE-SUN Fund Management Unit |
| Banda Sosten | Economist | National Food and Nutrition Commission (NFNC) |
| Dorothy Nthani | Lecturer | University of Zambia |
| Rose S. Silyato | Principal Food and Nutrition Officer | Ministry of Agriculture |
| Ebedy Sadoki | Chief of Party | USAID/Applying Science to Strengthen and Improve Systems (ASSIST) Project |
| Eustina Mulenga Besa | Head-Nutrition Education and Communication Unit | NFNC |
| Beatrice Kawana | Senior Technical Advisor | PATH/Thrive Project |
| Tresphor Chanda | Nutrition Focal Point Person | Ministry of General Education |
| Musonda Mofu | Deputy Executive Director | NFNC |
| Mathews Mhuru | Programme Manager | World Food Program |
| Brian Siwisha | Publishing Editor | Zambia National Information Services (ZANIS) |
| Lilian Mumba | Senior Information Officer | National Agricultural Information Services (NAIS) |
| Patricia Milandu | Quality Improvement Advisor | USAID/ASSIST Project |
| Winfridah Mulenga | Chief Health Promotion Officer | Ministry of Health (MOH) |
| Ruth Siyandi | Nutrition Specialist | UNICEF |
| Mulako Kabisa | Researcher | Indaba Agricultural Policy Research Institute (IAPRI) |
| Belinda Tembo | Nutritionist | NFNC |
| Norah Langat | Program Officer | FANTA HQ |
| Wendy Hammond | Project Manager | FANTA HQ |
| Tara Kovach | Technical Advisor | FANTA HQ |
| Agnes Aongola | Chief Nutrition Liaison Officer | MOH |
| Earnest Muyunda | Project Manager | FANTA/Zambia |

# 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<br>10–19%: Medium prevalence<br>20–29%: High prevalence<br>≥ 30%: Very high prevalence |
| Stunting | < 20%: Low prevalence<br>20–29%: Medium prevalence<br>30–39%: High prevalence<br>≥ 40%: Very high prevalence |
| Wasting | < 5%: Acceptable<br>5–9%: Poor<br>10–14%: Serious<br>≥ 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<br>≥ 2% to < 10%: Mild<br>≥ 10% to < 20%: Moderate<br>≥ 20%: Severe |
| Night blindness (XN) in pregnant women | ≥ 5: Moderate |

Source: WHO 2010b

### 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):**<br>< 20 μg/l: Severe deficiency<br>20–49 μg/l: Moderate<br>50–99 μg/l: Mild deficiency<br>100–199 μg/l: Optimal<br>200–299 μg/l: Risk of iodine-induced hyper-thyroidism<br>≥ 300 μg/l: Risk of adverse health consequences<br>**Median urinary iodine concentration (pregnant women)**<br>< 150 μg/l: Insufficient<br>150–249 μg/l: Adequate<br>250–499 μg/l: More than adequate<br>≥ 500 μg/l: Excessive |
| Total goiter rate | 0.0–4.9%: None<br>5.0–19.9%: Mild<br>20.0–29.9%: Moderate<br>≥ 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)<br>10–19%: Medium prevalence (poor situation)<br>20–39%: High prevalence (serious situation)<br>≥ 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<br>5.0–19.9: Mild public health problem<br>20.0–39.9: Moderate public health problem<br>≥ 40.0: Severe public health problem |

Source: WHO 2010b