United Republic of Tanzania

Reducing Malnutrition in Tanzania: Estimates to Support Nutrition Advocacy Tanzania PROFILES 2014

This report is made possible by the generous support of the American people through the support of the U.S. Agency for International Development (USAID) Office of Health, Infectious Diseases, and Nutrition, Bureau for Global Health, and USAID/Tanzania under terms of Cooperative Agreement No. AID-OAA-A-12-00005, through the Food and Nutrition Technical Assistance III Project (FANTA), managed by FHI 360.

The contents are the responsibility of FHI 360 and do not necessarily reflect the views of USAID or the United States Government.

October 2014

Recommended Citation

Ash, Deborah; Sethuraman, Kavita; Sommerfelt, A. Elisabeth; Oot, Lesley; Kovach, Tara; Kaganda, Joyceline; Chiduo, Geoffrey; and Yokobety, Malisa. 2014. *Reducing Malnutrition in Tanzania: Estimates to Support Nutrition Advocacy: Tanzania PROFILES 2014.* Washington, DC, and Dar es Salaam, Tanzania: FHI 360/FANTA, Tanzania Food and Nutrition Centre and Prime Minister's Office, Tanzania.

Contact Information

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

Acknowledgements

Tanzania PROFILES 2014 estimates were developed with the Government of Tanzania with technical and financial support from the Food and Nutrition Technical Assistance III Project (FANTA) using a participatory and consultative approach. A multi-sectoral group of participants including representatives of the following collaborating institutions provided input into the development of the estimates:

- President's Office
- Prime Minister's Office
- Tanzania Food and Nutrition Centre (TFNC)
- Ministry of Agriculture, Livestock and Fisheries
- Ministry of Livestock Development and Fisheries
- National Bureau of Statistics
- Ministry of Health, Community Development, Gender, Elderly and Children
- Ministry of Education, Science, Technology and Vocational Training
- U.S. Agency for International Development (USAID)
- United Nations and other international organisations: World Food Programme (WFP), Food and Agriculture Organisation of the United Nations (FAO), World Health Organisation (WHO), United Nations Renewed Efforts Against Child Hunger and Undernutrition (UN REACH), UNICEF, World Bank, Global Alliance for Improved Nutrition (GAIN)
- Department for International Development (DFID)
- Save the Children
- Helen Keller International (HKI)
- Africare, Mwanzo Bora Nutrition Project
- Partnership for Nutrition in Tanzania (PANITA)
- Local implementing and research partners, including freelance nutrition consultants, Sokoine University of Agriculture (SUA), COUNSENUTH, and Ifakara Health Institute

The Ministry of Labour and Employment (MOLE) also contributed to the Tanzania PROFILES 2014 estimates. Appendix A lists all participants.

Contents

Acknowledgements i

Abbreviations and Acronyms iii

1. Introduction 1

2. Background 2

Why Invest in Nutrition, and Why Now? 2
Nutrition Challenges to Address 2
What Are the Consequences of Malnutrition? 4

3. Methods 5

Nutrition Problems and Consequences Addressed in Tanzania PROFILES 2014 8
Data Sources for PROFILES and Prevalence of Nutrition Problems 9
Assumptions Related to Setting Targets for Reduction of Malnutrition 17
Time Period and Targets 18
Demographic and Employment Information 19

4. Results 20

5. Summary of Discussions on Nutrition Advocacy Needs: Implications for Policy and Practice 26

References 28

Appendix A. Participants in PROFILES Stakeholder Meeting and PROFILES Workshop 30

List of participants in the PROFILES Stakeholders Meeting, 10 March 2014 30
List of participants in the PROFILES Workshop, 11–14 March 2014 31
List of participants in the PROFILES Results Meeting on 19 March 2014 32

Abbreviations and Acronyms

BF	Breastfeeding
COUNSENUTH	Centre for Counselling on Nutrition and Health
DFID	UK Department for International Development
dL	Decilitre(s)
FANTA	Food and Nutrition Technical Assistance III Project
FAO	Food and Agriculture Organisation of the United Nations
g	Gram(s)
GAIN	Global Alliance for Improved Nutrition
HKI	Helen Keller International
IYCF	Infant and young child feeding
kg	Kilogram(s)
MOLE	Ministry of Labour and Employment
NBS	National Bureau of Statistics
PANITA	Partnership for Nutrition in Tanzania
PMO	Prime Minister's Office
REACH	Renewed Efforts Against Child Hunger and Undernutrition
RR	Relative risk
SUA	Sokoine University of Agriculture
SUN	Scaling Up Nutrition Movement
TDHS	Tanzania Demographic and Health Survey
TFNC	Tanzania Food and Nutrition Centre
TZS	Tanzania shilling
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
VAD	Vitamin A deficiency
WFP	World Food Programme
WHA	World Health Assembly
WHO	World Health Organisation

1. Introduction

In Tanzania, 42 percent of children under the age of 5 are stunted, according to the 2010 Tanzania Demographic and Health Survey (TDHS) (National Bureau of Statistics [NBS] and ICF Macro 2011a), a decrease of only 2 percentage points from the 44 percent in the 2004–5 TDHS. Yet with sustained effort and investment in nutrition, Tanzania could be free of malnutrition in the near future. What would be the benefits of improved nutrition for Tanzania 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 Tanzania sought to answer in 2014 through a consultative and consensus-building process using PROFILES, an evidence-based tool developed for the purpose of nutrition advocacy.

With the prevalence of stunting decreasing slowly, the Government of Tanzania has committed to stepping up its efforts to reduce stunting and other forms of malnutrition substantively. There is high-level commitment and momentum for multi-sectoral action on nutrition in Tanzania, as demonstrated by the establishment of a President's Task Force on Nutrition, as well as a High-Level Steering Committee for Nutrition that includes Permanent Secretaries from nine key line ministries, the Planning Commission, development partners, CSOs, the private sector and academia and is chaired by the Permanent Secretary in the Prime Minister's Office (PMO). The National Food and Nutrition Policy has been revised to enable multi-sectoral action on nutrition, and nutrition advocacy activities are underway.

However, additional efforts are needed to maximize the effectiveness of the efforts of the government and its partners. A need has been identified for continued national-level advocacy, but also for further decentralization of the advocacy process from the national level to create momentum for sustained change. Most important, there is a need to strengthen and expand nutrition service delivery across the country. In partnership with the PMO of the Government of Tanzania, the Tanzania Food and Nutrition Centre (TFNC), the United Nations Renewed Efforts Against Child Hunger and Undernutrition (UN REACH) and other stakeholders, the U.S. Agency for International Development (USAID)-funded Food and Nutrition Technical Assistance III Project (FANTA) 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 estimates of the benefits of improved nutrition for health and development outcomes and the consequences if malnutrition does not improve. To calculate estimates, PROFILES requires current country-specific nutrition data that are identified and agreed on in collaboration with stakeholders in-country. In Tanzania, estimates (using the most recent DHS and other relevant sources) were calculated in terms of child and maternal mortality, economic productivity, disabilities and human capital for the period 2014–2025. This report presents the PROFILES estimates to advocate for national scale-up of nutrition-specific interventions and multi-sectoral action to integrate nutrition in non-health sectors, including food security, agriculture, education and social protection, among others.

2. Background

Why Invest in Nutrition, and Why Now?

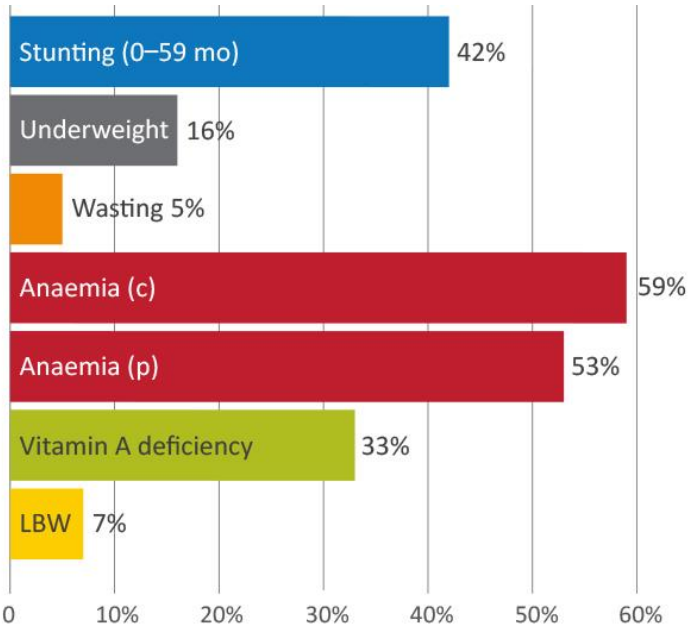
Nutrition is one of the foundations of human health and development. Good nutrition plays an important role in people's health and well-being; conversely, poor nutrition can lead to anaemia, reduced immunity, and impaired physical and mental development (World Health Organisation [WHO] 2014). In Tanzania,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

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

Nutrition Challenges to Address

Findings from the 2010 TDHS indicated that 42 percent of all children under 5 years of age were chronically malnourished (stunted, with low height-for-age), 5 percent were acutely malnourished (wasted, with low weight-for-height) and 16 percent were underweight (with low weight-for-age) (Figure 1). The current prevalence of stunting is considered to be very high, and the prevalence of underweight is considered to be medium in terms of public health significance (WHO 1995).

Figure 1. Malnutrition Rates in Tanzania



Notes: c = under-5 children, p = pregnant women, LBW = low birth weight

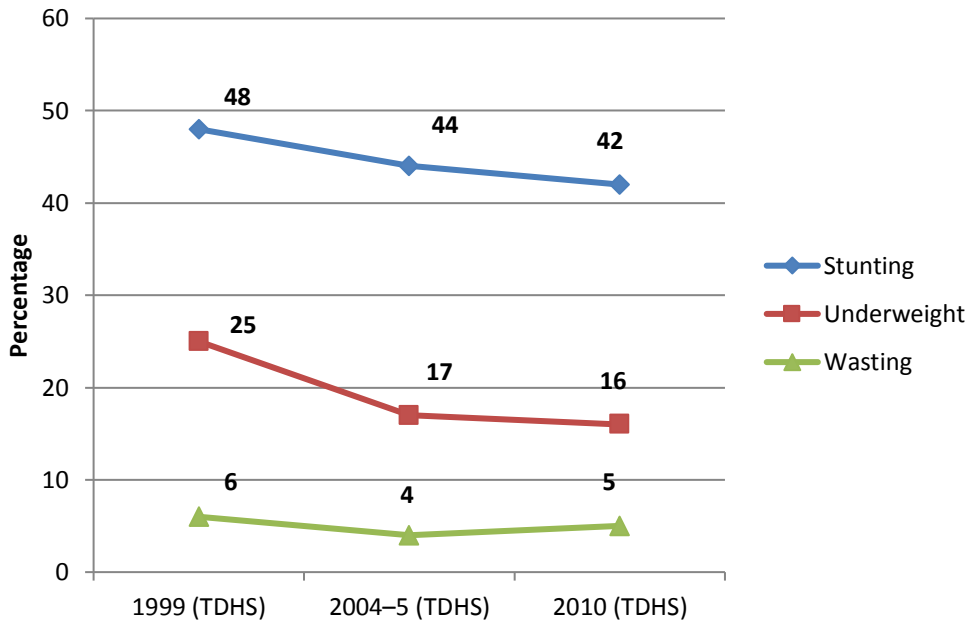
Sources: NBS and ICF Macro 2011a, NBS and ICF Macro 2011b, and TFNC 2004.

The TDHS also reported that 59 percent of all children under 5 in Tanzania were anaemic and 33 percent were vitamin A deficient; 53 percent of pregnant women, 40 percent of non-pregnant

women and 43 percent of adolescent girls 15–19 years of age suffered from anaemia. (NBS and ICF Macro 2011b). Adolescent girls in Tanzania were the most malnourished group among women of reproductive age (18 percent have a body mass index (BMI) < 18.5, compared to 12 percent of women 40–49 years of age). Seven percent of infants were born with low birth weight (< 2.5 kg) (NBS and ICF Macro 2011a). Suboptimal infant and young child feeding (IYCF) practices are common in Tanzania; although almost all children (97 percent) are ever breastfed, only half are breastfed within an hour of birth and only half of children under 6 months are exclusively breastfed.[1] In addition, among breastfed children 6–23 months, 39 percent were fed the minimum number of times in the previous 24 hours (minimum meal frequency) and only 24 percent were given foods from three or more groups and fed the minimum number of times per day (minimum acceptable diet).

From 1999 to 2010, underweight and stunting decreased by 9 and 6 percentage points, respectively (Figure 2). However, from 2004–5 to 2010, underweight and stunting decreased by only one and 2 percentage points, respectively (NBC and ICF Macro 2011a).

Figure 2. Trends in Malnutrition in Tanzania



Note: For comparison purposes, the 1999 and 2004–05 anthropometric indicators were based on the 2006 WHO standards, to match the 2010 indicators. The values in the graph indicate percentage of children with z-scores < −2.

Source: TDHS 1999 and THDS 2004–5, with additional analysis from the WHO Global Database on Child Growth and Malnutrition, http://microdata.worldbank.org/index.php/catalog/1508/get_microdata; NBS and ICF Macro 2011a.

The causes of malnutrition in Tanzania are manifold. Repeated infections (including acute respiratory infections, diarrhoea and malaria) and suboptimal breastfeeding and IYCF practices that result in inadequate dietary intake are immediate causes of malnutrition, but underlying causes include lack of safe water, hygiene and sanitation; food insecurity; high fertility; gender inequality; and poverty. Specifically, the high total fertility rate in Tanzania, which is 5.4 births per woman, is

[1] TDHS 2010, based on mothers reporting that they exclusively breastfed their children in the past 24 hours

a significant risk factor for childhood malnutrition. About 44 percent of adolescent girls either have given birth or are pregnant with their first child by the age of 19, and the preceding birth intervals for adolescent girls is also shorter (median 26 months) than that of their older peers (more than 31 months). High parity is not only a biological risk for every subsequent birth; it also results in young mothers having very little time and resources to provide children under the age of 2 with optimum care and feeding, resulting in stunting. Malnutrition in Tanzania is thus a complex problem that persists because of multiple causes rooted in various sectors. Therefore, in addition to nutrition-specific interventions, multi-sectoral nutrition-sensitive interventions are essential to reduce and eradicate malnutrition in Tanzania.

What Are the Consequences of Malnutrition?

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

It is well established that preventing malnutrition among children under 2 years of age should be the focus of nutrition interventions, and this is a main focus of the Scaling Up Nutrition (SUN) movement (Scaling Up Nutrition Road Map Task Team 2010), of which Tanzania is a member. Global evidence increasingly suggests that there are four critical points in an individual's life during which malnutrition has the most significant consequences: children under 2 years of age, children under 5 years of age affected by acute malnutrition, adolescence and pregnancy and the postpartum period.

3. Methods

PROFILES consists of a set of computer-based models that calculate estimates of the benefits of improved nutrition for health and development outcomes, as well as the economic and health consequences if nutrition does not improve. To calculate estimates, PROFILES requires current country-specific nutrition data that are identified and agreed by key stakeholders.

The targets reflect the proportion by which nutrition problems will be reduced over the chosen time period and are determined and agreed upon 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 lost. When contrasting the results between the status quo and the improved scenarios, the differences reflect the benefits of improved nutrition, expressed as lives saved, disabilities averted, human capital gained, and economic productivity gained (or, put another way, economic productivity losses averted). This is illustrated for child deaths (and lives saved) related to stunting in Figures 3a, 3b, and 3c.

This section presents the methods used to derive the estimates for each of the nutrition problems addressed by PROFILES in Tanzania. The basic approach in PROFILES is to provide two scenarios: a 'status quo' scenario and an 'improved' scenario. The status quo scenario assumes there will be no change from the current nutrition situation throughout the chosen time period (the number of years for which estimates are calculated), aside from projected changes in population size. In contrast, in the improved scenario—with results estimated for the same time period, it is assumed that nutrition interventions that are known to be effective are implemented at scale and succeed in reaching the stated targets in terms of reduction in the prevalence of the various nutrition problems. The targets reflect the proportion by which nutrition problems will be reduced over the chosen time period and 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 lost. When contrasting the results between the status quo and the improved scenarios, the differences reflect the benefits of improved nutrition, expressed as lives saved, disabilities averted, human capital gained and economic productivity gained (or, put another way, economic productivity losses averted). This is illustrated for child deaths (and lives saved) related to stunting in Figures 3a, 3b, and 3c.

Figure 3. Status quo scenario vs. improved scenario: Illustrative example of number of lives saved (or deaths averted) related to stunting in children under 5 years

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

Figures 3a–c illustrate the approach used in PROFILES to calculate estimates for child deaths and lives saved, in this example, related to stunting (information shown in these graphs is not from Tanzania PROFILES 2014). For the purpose of providing an example of how PROFILES calculates the estimates for the status quo and improved scenarios, the number of children under 5 has been kept constant. However, in the actual PROFILES model, the number of children under 5 each year does not usually increase based on population projections. The graphs show how the status quo scenario (Figure 3a) vs. the improved scenario (Figure 3b) is used to estimate the number of lives saved (or deaths averted) related to stunting among children under 5 during a 10-year period. Figure 3c shows the number of lives saved, calculated by subtracting the number of deaths in the improved scenario from the number of deaths in the status quo scenario. A comparable approach is used in PROFILES to estimate the number of lives saved (or deaths averted) related to other nutrition indicators and to estimate economic productivity gains (or economic productivity losses averted) related to selected nutrition indicators.

Figure 3a. Status quo scenario (illustrative example)

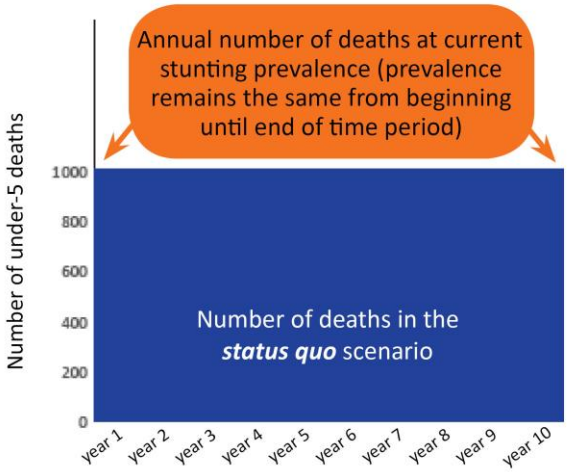


Figure 3b. Improved scenario (illustrative example)

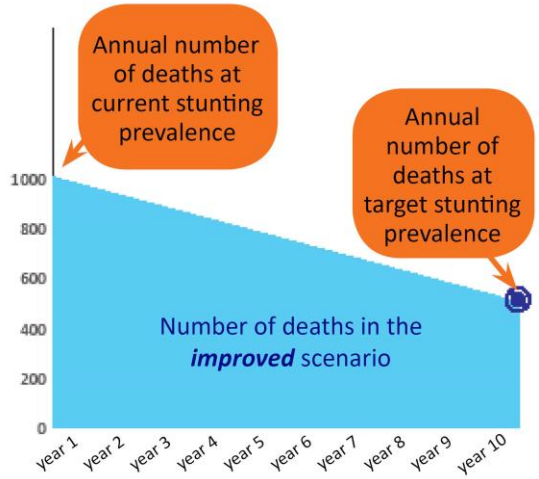
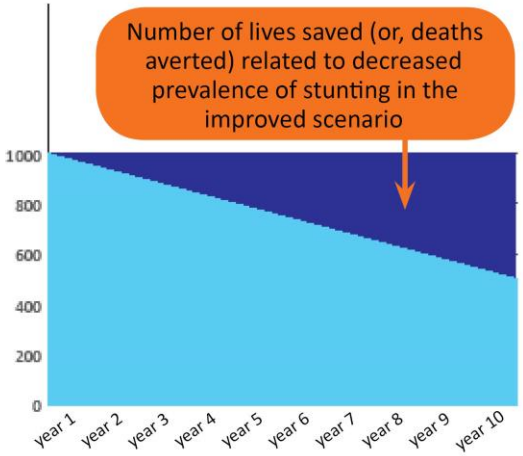


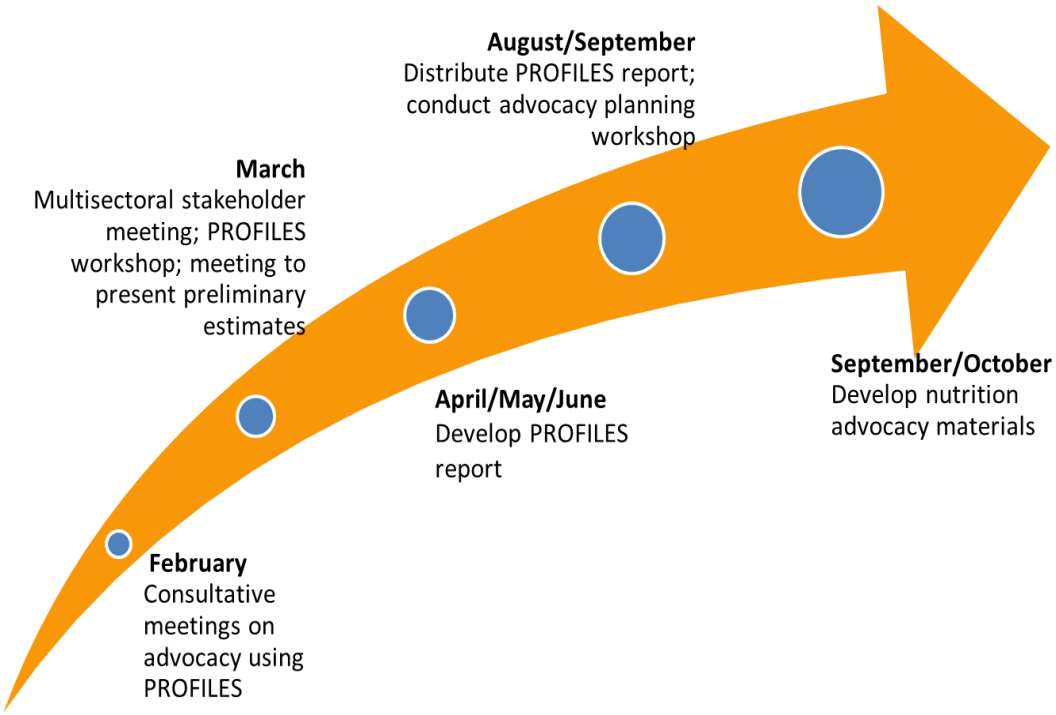
Figure 3c. Improved scenario superimposed on status quo scenario (illustrative example)



The PROFILES spreadsheet models do not include interventions; however, the expectation is that effective interventions would be implemented gradually over the selected time period and that improvement in the nutrition indicators and consequently lives saved would be gradual. For this reason, the estimates of lives saved or economic productivity gains are smaller than the total estimated number of lives lost or economic productivity lost over the chosen time period. For example, the graphs in Figure 3 show that, despite the decrease in the prevalence of stunting with the improved scenario, at the end of the time period, the number of lives lost is still greater than the number of lives saved because it is assumed that the decrease in the prevalence of stunting will be linear and therefore reductions in child mortality attributable to stunting will be gradual, and as such the gains in lives saved will also be gradual. All the PROFILES modules use this same approach. Although nutrition interventions were not included in the PROFILES models, the subsequent steps in the nutrition advocacy process can address the need for various nutrition services, interventions, programs or issues related to the nutrition policy environment.

Figure 4 shows the timeline of the PROFILES process. For Tanzania PROFILES 2014, FANTA, in collaboration with the PMO, TFNC, UN REACH, development partners and representatives of sectors mandated to support nutrition-sensitive actions, held a 1-day key stakeholder meeting on 10 March 2014 in Dar es Salaam to discuss the objectives and rationale of PROFILES, key assumptions of the PROFILES model (such as what information sources should be used) and ways PROFILES will contribute to moving the nutrition advocacy agenda in Tanzania forward. Immediately following the stakeholder meeting, FANTA facilitated a 4-day PROFILES workshop on 11–14 March 2014, where 15 participants from TFNC, UN REACH, the PMO, development partners, and representatives of sectors mandated to support nutrition-sensitive actions collaborated to generate preliminary PROFILES estimates for two scenarios. These preliminary estimates were then shared with more than 35 participants from the PMO, USAID, TFNC, key sectors, UNICEF, the World Health Organization (WHO), and development partners during a meeting on 19 March 2014 to review and discuss the preliminary estimates before finalization.

Figure 4. Timeline for Tanzania PROFILES 2014



During the stakeholder meeting, participants discussed the time period for which to calculate PROFILES estimates in relation to national goals and targets such as the Millennium Development Goals, Tanzania Development Vision 2025 and Tanzania National Nutrition Strategy. During the first day of the workshop, participants built on discussions during the stakeholder meeting on the previous day to select a 12-year time period starting in 2014 and running through 2025 to calculate the Tanzania PROFILES 2014 estimates, consistent with The Tanzania Development Vision 2025 document and World Health Assembly Global Nutrition Targets 2025 and long enough for measurable change to occur. During the workshop, participants entered information into the spreadsheets and developed preliminary PROFILES estimates.

Following the PROFILES workshop, individual meetings were held with some of the workshop participants from TFNC and other experts from the NBS and the Ministry of Labour and Employment (MOLE) to discuss wage and employment information as part of the process to finalize the estimates.

Participants also engaged in initial discussions of nutrition advocacy needs. As next steps in the process (see Figure 4), a national nutrition advocacy planning workshop was planned for September 2014 to develop a harmonised, multi-sectoral strategic nutrition advocacy plan, including a timeline for advocacy activities and development/dissemination of materials and draft nutrition advocacy materials.

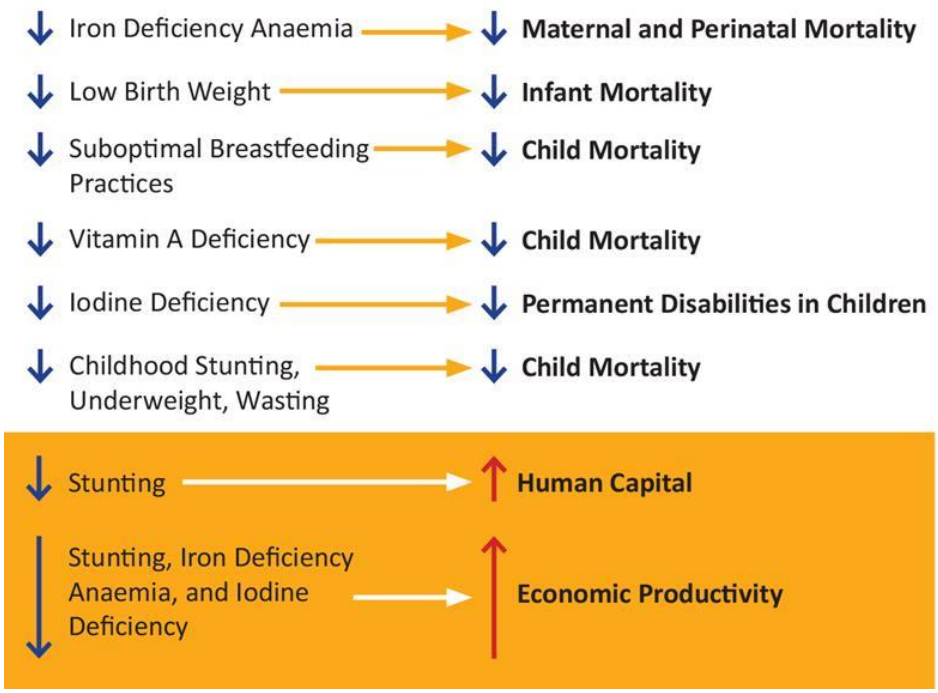
Nutrition Problems and Consequences Addressed in Tanzania PROFILES 2014

Tanzania PROFILES 2014 calculates estimates of reductions in mortality and permanent disabilities and gains in human capital and economic productivity that can result from reductions

in the prevalence of several nutrition indicators, namely, iron deficiency anaemia; low birth weight; suboptimal breastfeeding practices; vitamin A deficiency (VAD); iodine deficiency; and childhood stunting, underweight and wasting. Tanzania PROFILES 2014 estimates of human capital losses attributed to stunting are related to poor cognitive development that results in lost learning over time. Estimates of economic productivity losses attributed to stunting and iodine deficiency are related to poor cognitive development, which affects school performance and, later in life, earning potential. Economic productivity losses related to iron deficiency anaemia among adults is a reflection of decreased capacity for manual labour. The estimates PROFILES calculates from these nutrition indicators on health, human capital and economic outcomes are based on impacts demonstrated and established in the scientific literature. For example, stunting, underweight and wasting are leading causes of child mortality.

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

Figure 5. Nutrition problems and consequences addressed in Tanzania PROFILES 2014



Data Sources for PROFILES and Prevalence of Nutrition Problems

To quantify the negative consequences of nutrition problems, PROFILES needs prevalence data for each of the nutrition indicators. For the anthropometry indicators (stunting, wasting and underweight), the risk of mortality differs by the degree of severity. Participants in the stakeholder meeting and PROFILES workshop collaborated to identify recent data sources (Table 1) and the prevalence of each of the nutrition indicators in the status quo scenario (Tables 2 and 3).

Table 1 also summarizes the main data sources used in Tanzania PROFILES 2014. Tables 2 and 3 include further details on the nutrition-related indicators (anthropometry, low birth weight, breastfeeding practices, VAD, anaemia and iodine deficiency).

Table 1. Indicators and data sources for Tanzania PROFILES 2014

Indicator	Source (Year)
Nutrition Indicators	
Anthropometry (stunting, wasting, underweight) among under 5 children	TDHS (2010)
Low birth weight	TDHS (2010)
Breastfeeding practices	TDHS (2010)
Vitamin A deficiency	TDHS (2010) (Micronutrient Report)
Anaemia	TDHS (2010) (Micronutrient Report)
Iodine deficiency (goitre)	National Survey on Iodine Deficiency in 2004–TFNC
Mortality, Education and Economic Indicators	
Education information	Tanzania Ministry of Education, Science, and Technology, http://www.moe.go.tz/index.php/en/
Employment information	Tanzania Labour Force Survey, 2006 (NBS); 2012 census data from NBS; expert consultations with NBS and MOLE
Maternal mortality ratio	TDHS (2010)
Mortality in the first 5 years of life	TDHS (2010)

Table 2. Estimated reductions in mortality and disability using Tanzania PROFILES 2014

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025 (status quo prevalence will be reduced by this proportion) *	Target prevalence [2025] (%)
Mortality					
Stunting, underweight and wasting among children 0–59 months associated with under 5 child mortality	PROFILES (updated and expanded in 2008) calculates mortality estimates for each anthropometric indicator (stunting, underweight and wasting) by degree of severity. In 2013, the odds ratios were further updated with new information from Olofin et al. 2013 as cited in Black et al. 2013. These new odds ratios of mortality for each grade of malnutrition related to stunting (mild 1.5, moderate 2.3, severe 5.5); underweight (mild 1.5, moderate 2.6, severe 9.4) and wasting (mild 1.6, moderate 3.4, severe 11.6). PROFILES uses this information to calculate the population-attributable fraction and the number of deaths among children 6–59 months related to each of the three indicators of growth deficit by severity category. Because many children with malnutrition can have more than one form of malnutrition at any given time (e.g., concurrent stunting and wasting or concurrent underweight and wasting), deaths related to each of these indicators cannot be totalled, because some children will be included in more than one indicator of malnutrition/ growth deficit.	Percentages of children in the severe and moderate categories are based on the TDHS 2010. Percentages of children in the mild category are from analysis of the data file from the TDHS 2010.	Stunting: Mild 29.2 Moderate 25.5 Severe 16.5 In summary (moderate + severe): 42.0	Stunting: Mild 0.40 Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Stunting: Mild 17.5 Moderate 15.3 Severe 9.9 In summary (moderate + severe): 25.2
			Underweight: Mild 31.4 Moderate 12.0 Severe 3.8 In summary (moderate + severe): 15.8	Underweight: Mild 0.40 Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Underweight: Mild 18.8 Moderate 7.2 Severe 2.3 In summary (moderate + severe) 9.5
			Wasting: Mild 12.5 Moderate 3.6 Severe 1.2 In summary (moderate + severe): 4.8	Wasting: As wasting is currently at an 'acceptable' public health significance level according to WHO, the target was to maintain wasting at < 5%: In summary (moderate + severe): < 5%	In summary (moderate + severe): < 5%:

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025 (status quo prevalence will be reduced by this proportion) *	Target prevalence [2025] (%)
Anaemia during pregnancy related to maternal and perinatal mortality Pregnant women with anaemia (Hb < 11) (%)	Anaemia during pregnancy is an important contributor to maternal mortality, including through an increased risk of death from postpartum haemorrhage. Anaemia during pregnancy also contributes to perinatal mortality, e.g., 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 information from Black et al. (2013), assuming that 50% of anaemia is caused by iron deficiency (an assumption that was also made by Stoltzfus et al.). For Tanzania PROFILES 2014, information on the proportion of anaemia from iron deficiency among pregnant women (38.3%) was obtained from the TDHS 2010 Micronutrient Report. The relative risks (RRs) used in PROFILES are: • RR of maternal mortality associated with a 1 g/dL increase in haemoglobin: 0.71 • RR of perinatal mortality associated with a 1 g/dL increase in maternal haemoglobin: 0.84	TDHS (2010) Micronutrient Report	52.7	0.50	26.4
VAD associated with child mortality Children 6–59 months with VAD (including subclinical) (%)	Vitamin A-deficient children are at risk of blindness resulting from xerophthalmia and corneal ulceration. They also have a higher risk of dying (e.g., from diarrhoea and measles). The PROFILES model that estimates child deaths attributable to vitamin A deficiency uses coefficients from Ross (2008). The RR used in PROFILES is: • RR of mortality due to mild VAD > 6 months: 1.75	TDHS (2010) Micronutrient Report	33.0	1.0 (virtual elimination)	0.0

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025 (status quo prevalence will be reduced by this proportion) *	Target prevalence [2025] (%)
Low birth weight related to mortality New-born infants with low birth weight (%)	Low birth weight, defined as a weight of < 2 500 g at birth, can be caused by preterm birth and/or intrauterine growth retardation. Using information from literature on increased risk of neonatal or post-neonatal mortality among infants with a low birth rate (Alderman and Behrman 2004; Ashworth 1998) and country-specific low birth weight rates and mortality rates, PROFILES calculates the population-attributable fraction and excess number of deaths related to low birth weight. The RRs used in PROFILES are: • RR of neonatal death because of LBW: 4 • RR of post-neonatal infant death because of LBW: 2	TDHS (2010)	7.0	0.30	4.9
Suboptimal breastfeeding practices related to infant mortality	Suboptimal breastfeeding practices (none, partial or predominant breastfeeding of children 0–5 months and no breastfeeding of children 6–23 months) are an important contributor to infant and young child mortality because they increase the risk of infection. Using information from literature on increased risk of infant mortality resulting from suboptimal breastfeeding by Lamberti et al. (2011) and Black et al. (2008) and country-specific breastfeeding information, PROFILES calculates the population-attributable fraction and the excess number of deaths (among children 0–5 months and 6–23 months) related to suboptimal breastfeeding (BF). PROFILES uses the following RRs: RR all-cause mortality, predominant BF vs exclusive BF (0-5 months) 1.48 • RR all-cause mortality, partial BF vs. exclusive BF (0–5 months): 2.85 • RR all-cause mortality, no BF vs. exclusive BF (0–5 months): 14.4 • RR all-cause mortality no BF vs. partial BF (6–23 months): 3.68	TDHS (2010)	Breastfeeding Practices**: Exclusive BF 0–5 mo.: 49.8 Predominant BF 0–5 mo.: 10.4 Partial BF 0–5 mo.: 38.0 No BF 0–5 mo.: 1.8 Any BF 6-23 mo.: 79.7 No BF 6-23 mo.: 20.3		Breastfeeding Practices***: Exclusive BF 0–5 mo.: 70.0 Predominant BF 0-5 mo.: 6.0 Partial BF 0–5 mo.: 23.0 No BF 0–5 mo.: 1.0 Any BF 6–23 mo.: 95.0 No BF 6–23 mo.: 5.0

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025 (status quo prevalence will be reduced by this proportion) *	Target prevalence [2025] (%)
Iodine deficiency associated with brain damage and disability as a result of deficiency in utero Population with goitre (%)	Iodine deficiency is the main cause of preventable brain damage worldwide. Iodine deficiency in pregnant women and during the first few months of infancy leads to irreversible brain damage of various degrees of severity in the infant.	National Survey on Iodine Deficiency in 2004–TFNC	7.0	0.97 (virtual elimination)	0.2

* Proportion reduction applied to current prevalence

** 'Predominant breastfeeding' refers to feeding infants 0–5 months of age 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. No other liquids, including non-human milks and food-based fluids, and no semi-solid or solid foods are allowed (WHO 2010; http://www.unicef.org/nutrition/files/IYCF_Indicators_part_III_country_profiles.pdf). 'Partial breastfeeding' refers to feeding infants some breast milk but also other food or food-based fluids, such as formula milk or weaning foods.

*** Breastfeeding targets included targets both to increase optimal breastfeeding practices (exclusive breastfeeding 0–5 months and some 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 Tanzania PROFILES 2014

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025*	Target prevalence [2025] (%)
Stunting related to future productivity Stunting among children 24–35 months	Growth deficit early in life is related to productivity loss in adulthood. PROFILES estimates the impact of growth deficit in children on future labour productivity based on the fact that stunting developed during the first 2 years of life is generally maintained throughout life and that adults' productivity is related to their stature. Reduced adult stature from stunting is a proxy indicator of various nutritional and other insults that can affect physical and mental development (the issue is not short stature per se). Using coefficients based on published scientific literature, PROFILES estimates reduced adult productivity related to both decreased physical capacity and reduced intellectual ability (affecting school achievement). The calculations use the 'economic activity rate' (the population actually working and eligible to work, including people categorized as unemployed), discounting future wages at 3% per year, and adjusts for normal mortality. The lifetime discount factor is the sum of all the adjusted annual discounted years from 15 through 64 years of age. The lifetime discount factor is used to calculate the present day value of future economic productivity losses related to childhood stunting, based on the proportion of children 24–35 months old who were classified as stunted. The percentage of children classified as having severe and moderate stunting are considered, after subtracting the proportion of children expected in each of these categories (according to reference population values).	Percentages of children in the severe and moderate categories are based on the TDHS (2010)	Stunting (24–35 months): Moderate 31.7 Severe 21.3 In summary (moderate + severe): 53.0	Stunting (24–35 months): Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Stunting (24–35 months): Moderate 19.0 Severe 12.8 In summary (moderate + severe): 31.8
Anaemia among adult women related to productivity losses Non-pregnant women 15–49 years with anaemia (Hb < 12) (%)	Anaemia in working-age adults contributes to reduced productivity for those engaged in physical labour, especially heavy physical labour. The PROFILES model uses the coefficients developed by Ross and Horton (1998) for the effects of iron deficiency anaemia on reduced capacity to carry out any type of physical labour and heavy physical labour.	TDHS (2010) Micronutrient Report included anaemia information for two categories of non-pregnant women: lactating and non-lactating. Members of the Tanzania PROFILES team calculated a weighted average to arrive at the anaemia prevalence for all non-pregnant women. The TDHS 2010 did not include anaemia information for men.	38.8 Data not available	0.50 NA	19.4 NA
Intrauterine iodine deficiency related to future productivity losses Population with goitre (%)	PROFILES uses information from published literature (including the finding of a community-wide average reduction of 13.5 IQ points in iodine-deficient environments) for the coefficients used to estimate the negative impact of intrauterine iodine deficiency (as reflected in the goitre rate in a population) on future economic productivity. To estimate the future economic productivity losses among children born to iodine-deficient mothers, PROFILES discounts the children's future wages at 3% per year, after adjusting for normal mortality at each year of life (as described for productivity losses related to childhood stunting).	National Survey on Iodine Deficiency in 2004, TFNC	7.0	0.97 (virtual elimination)	0.2

* Proportion reduction applied to current prevalence

Table 4. Estimating human capital losses and gains in terms of learning using Tanzania PROFILES 2014

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2025*	Target prevalence [2025] (%)
Stunting related to human capital losses in terms of learning Stunting among children 24–35 months Primary education: Age at school entry Number years of school	Several studies have established an association between the early insult of stunting in young children and poorer cognitive development resulting in poorer school performance (Grantham-McGregor 2007, Glewwe 2001). Studies show that stunted children perform less well in math and reading tests relative to their peers who were well nourished in childhood. Poor performance on standardized educational tests as a result of poor cognitive development reflects a loss of learning potential that over time also affects actual learning. PROFILES uses 0.8 grade equivalents lost per school year per 1 SD reduction in the height-for-age z-score.	Percentages of children in the severe and moderate categories are based on the TDHS (2010)	Stunting (24–35 months): Moderate 31.7 Severe 21.3 In summary (moderate + severe): 53.0 Age 7 years 7 years	Stunting (24–35 months): Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Stunting (24–35 months): Moderate 19.0 Severe 12.8 In summary (moderate + severe): 31.8

* Proportion reduction applied to current prevalence

The 2010 TDHS provided the input information for anthropometry, low birth weight and breastfeeding practices. The anthropometry indicators in Table 2 present information used by the PROFILES spreadsheet models; for each of the three measures of malnutrition—stunting, wasting and underweight—PROFILES uses the percentage of children with mild malnutrition (z-scores from −2 to < −1), moderate malnutrition (z-scores from −3 to < −2) and severe malnutrition (z-scores < −3). Although there has been some improvement since the 2004–5 survey, stunting levels are still very high (42 percent) among children under 5 years, and about 5 percent are wasted. Among newborn infants with reported birth weight (based on mothers' recall or written records available at the household level), 7.0 percent weighed less than 2.5 kg and were categorized as having low birth weight (< 2,500 g).

Information about anaemia was obtained from the TDHS 2010. The 2010 TDHS Micronutrients Report (a separate DHS report titled *Micronutrients: Results of the 2010 Tanzania Demographic and Health Survey*) provided the information on VAD (including subclinical) and the proportion of anaemia related to iron deficiency. The PROFILES team used information from the 2010 TDHS to calculate the prevalence of anaemia in non-pregnant women. Using the information for lactating women (who were not pregnant) and women who were neither lactating nor pregnant, the team calculated a weighted average to arrive at the anaemia prevalence (38.8 percent) for both of these groups together (i.e., all non-pregnant women). Anaemia was found among 52.7 percent of pregnant women and 38.8 percent of women who were not pregnant. Among pregnant women with anaemia, 38.3 percent had anaemia related to iron deficiency. VAD (including subclinical deficiency) was found among 33.0 percent of children under 5 years of age.

As no recent national-level information was available for the total goitre rate, the measure of iodine deficiency used by PROFILES, the workshop participants consulted a local expert on iodine deficiency who confirmed that a 2004 national survey on iodine deficiency conducted by TFNC could provide the goitre prevalence; this study found a total goitre prevalence of 7.0% (TFNC 2004). Participants in the PROFILES workshop agreed that this was the best available information to use for the status quo scenario.

Assumptions Related to Setting Targets for Reduction of Malnutrition

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

Therefore, the question raised by Tanzania PROFILES 2014 was: by 2025, by how much do we assume that selected nutrition indicators will improve? Participants in the stakeholder meeting and

the PROFILES workshop, which also included the Director of the Department of Coordination of Government Business of the PMO, discussed the 2025 targets for reduction in the prevalence of various nutrition indicators to arrive at optimistic but realistic targets for the PROFILES estimates. Participants also discussed the optimism of the Tanzania Development Vision 2025 and agreed that greater efforts to reduce malnutrition were needed to reach many of the goals in the document. After deliberating, participants agreed that the estimates of the benefits of improved nutrition could be both optimistic and realistic, and that they should not only spur greater investment in nutrition but also foster hope for a Tanzania free of malnutrition. Based on this vision, they assumed that, if the necessary investments are made and evidence-based nutrition interventions are implemented and scaled up over the 12-year time period, the agreed targets set for the reduction in the prevalence of the various nutrition indicators could be achieved.

Time Period and Targets

As noted, participants decided on a 12-year time period, 2014 through 2025, to be used for PROFILES. The improved scenario assumes a linear reduction (or increase in the case of exclusive breastfeeding) in prevalence levels, that is, the nutrition prevalence levels in the spreadsheet models gradually improve from the status quo prevalence levels in 2014 to the 2025 targets.

To arrive at the 2025 target for each of the nutrition indicators, participants in the PROFILES workshop kept in mind various considerations. Information was sought on whether targets had been stated in official government documents that could inform the targets for the time period selected for PROFILES (such as the Tanzania Development Vision 2025 document and the National Nutrition Strategy). Although the Tanzania Development Vision 2025 did not have specific nutrition targets, it did call for good nutrition and health for every Tanzanian, which helped set the tone for optimistic estimates. In addition, while the National Nutrition Strategy was not used to set targets, it helped guide discussions on target setting. Targets referred to in documents from the 2012 World Health Assembly (WHA) Global Nutrition Targets 2025, to which the Government of Tanzania has committed, and WHO's Nutrition Landscape Information System provided information on various prevalence cut-off values and the public health significance of malnutrition.

Tables 2 and 3 include the target prevalences for the improved scenario, that is, the prevalences at the end of the chosen time period. These tables also show the proportion to be applied to the status quo prevalence. Participants in the March 2014 workshop also considered trend information for the indicators for which this was available, as well as factors related to potential improvement in interventions.

For the anthropometric indicators (stunting, underweight and wasting), Tables 2 and 3 show the information separately for the mild, moderate and severe categories, as well as summary information for the moderate and severe categories combined.

For stunting (moderate and severe) among children under 5 years, participants agreed on a decrease by 0.40 of the status quo percentage (in line with the WHA Global Nutrition Targets 2025); the status quo prevalence of 42.0 would be reduced to 25.2 percent by 2025 in the improved scenario. Stunting among children 24–35 months was also reduced by the same proportion (0.40), from a status quo prevalence of 53.0 percent to a target prevalence of 31.8 percent (this is used to calculate increased economic productivity from reductions in stunting). For underweight (moderate and severe), the status quo prevalence was 15.8 percent, to be reduced by 0.40 to a

target prevalence of 9.5 percent. For wasting (moderate and severe) among children under 5 years, the status quo prevalence was 4.8, deemed 'acceptable' according to the WHO's Nutrition Landscape Information System. Therefore, the group did not set a target for the improved scenario, but noted that their goal for Tanzania (which is in line with the WHA Global Nutrition Targets 2025) is to maintain wasting in children under 5 at < 5 percent. Note, however, that wasting is still high (~11 percent) among children 6–8 months.

Based on a discussion of the WHA global nutrition targets, the group agreed on a reduction by 0.50 for anaemia during pregnancy, a reduction in anaemia in pregnant women from 52.7 percent to 26.4 percent. They agreed on a reduction by 1.0 (that is, 100 percent or virtual elimination) for the prevalence of VAD among children 6–59 months, from 33.0 percent in the status quo scenario to 0.0 percent by 2025. The group thought that because Tanzania has had a longstanding vitamin A program and virtual elimination is feasible, virtual elimination was an optimistic yet realistic target. The group felt that Tanzania could virtually eliminate iodine deficiency and thus agreed on a 0.97 reduction to reduce a 7.0 percent goitre rate in the status quo scenario to 0.2 percent by 2025 in the improved scenario. For low birth weight, the group agreed on a reduction of 0.30 (in line with the WHA Global Nutrition Targets 2025); with a status quo prevalence of 7.0 percent, the consequent target prevalence for the improved scenario was 4.9 percent. For breastfeeding practices, the group agreed on a target of improving exclusive breastfeeding to 70.0 percent, an increase of 20.2 percentage points from the 49.8 percent status quo scenario. In addition, the group agreed with a 15.3 percentage point increase in 'any breastfeeding' among children 6–23 months, from 79.7 percent in the status quo scenario to 95.0 percent by 2025 in the improved scenario.

Demographic and Employment Information

PROFILES requires demographic information with projections into future years that correspond to the time period used in the projections (for Tanzania, 2014–2025). Select information was obtained from the United Nations Population Prospects online database (United Nations 2014a and 2014b) and used in conjunction with both the estimated total population for 2012 (44,928,923) and a PROFILES calculator tool to obtain the various demographic estimates required by PROFILES for each year.

Necessary employment information included the economic activity rate (the percentage of the working-age population actually working or available for employment, including those who were unemployed), the percentage of working-age people who did manual labour, the percentage of working-age males who did manual labour, and the percentage of working-age females who did manual labour. Initially, employment information was obtained from the Tanzania Labour Force Survey in 2006 (NBS and Ministry of Finance and Economic Affairs 2006). Following the PROFILES workshop, additional consultations with experts at the NBS identified employment information from the 2012 census. Consultations with MOLE helped identify the various employment categories that should be considered manual labour. Workshop participants decided to use per capita gross domestic product (GDP) as a proxy for wages; the GDP was found in the report *Tanzania in Figures 2012* (NBS 2013).

The TDHS 2010 was the source of information on the perinatal mortality rate (36 per 1,000 live births), neonatal mortality rate (26 per 1,000 live births), infant mortality rate (51 per 1,000 live births), under 5 mortality rate (81 per 1,000 live births) and maternal mortality ratio (454 per 100,000 live births).

4. Results

The results from Tanzania PROFILES 2014 are presented in Tables 5–8 and Figures 6–9. Table 5 and Figure 6 show that if stunting levels remain unchanged from 2014 through 2025, the number of deaths related to stunting (total of 580,687) in under 5 children can be expected to actually increase because of the high fertility rate and a resulting increase in the number of under 5 children. However, Table 5 and Figure 7 show that if effective nutrition interventions are implemented at high coverage and succeed in reducing stunting levels to the proposed targets, 120,633 children's lives could be saved from stunting-related deaths over the time period (2014–2025).

Table 5 and Figure 8 show that in the status quo scenario, with no change in the prevalence of maternal iron deficiency anaemia, there would be 26,290 maternal deaths related to pregnancy and childbirth and 113,082 perinatal deaths. Table 5 and Figure 9 show that reaching targeted reductions in the prevalence of maternal iron deficiency anaemia by 2025 could save 15,484 women's lives and avert 72,739 perinatal deaths over the 2014–2025 period. They also show that with no change in the prevalence of low birth weight, there would be 148,873 deaths related to this problem during 2014–2025. However, Table 5 and Figure 9 show that 20,460 infant deaths could be averted by reductions in low birth weight. Table 5 and Figure 8 also show that there would be 360,487 under 2 child deaths attributable to suboptimal breastfeeding practices. However, as shown in Table 5 and Figure 9, targeted reductions in suboptimal breastfeeding practices by 2025 could save the lives of 85,519 under 2 children. In addition, Table 5 and Figure 8 show that with no change in the prevalence of VAD, there would be 209,638 under-5 deaths related to VAD during 2014–2025. However, Table 5 and Figure 9 show that 101,859 under-5 deaths could be averted by reductions in VAD. Globally, brain damage from intrauterine iodine deficiency is a leading cause of preventable brain damage. If iodine deficiency remains unchanged, 1.73 million children would be born to iodine-deficient mothers (see Table 6 and Figure 8); these children would have some degree of irreversible brain damage (with a decrease in IQ). However, reaching the target reduction of maternal iodine deficiency by 2025 could result in preventing permanent brain damage in 869,800 children over the 2014–2025 period (see Table 6 and Figure 9).

Table 7 and Figure 8 show the human capital losses in terms of learning related to stunting. If there is no change in the prevalence of stunting, the losses would amount to 87.7 million equivalent school years of learning. Conversely, if stunting is reduced over the 2014–2025 period, the gains would be 24.7 million equivalent school years of learning (see Table 7 and Figure 9).

Economic productivity losses related to stunting among young children, iron deficiency among adult women and iodine deficiency are shown in Table 8 and Figure 8. If stunting levels remain at the current high level during 2014–2025, productivity losses related to stunting would be about 28.8 trillion Tanzania shillings (TZS) (US$18 billion). Productivity losses related to iron deficiency anaemia in adult women would be about 2.3 trillion TZS (US$1.4 billion) if this problem remains unchanged, and if there is no improvement in iodine deficiency, there would be related economic productivity losses of about 1.5 trillion TZS (US$950.7 million).

Table 8 and Figure 9 show the economic productivity gains that could be achieved if the prevalence of stunting, iron deficiency anaemia in adult women and iodine deficiency are significantly reduced over the 2014–2025 period. Overall, economic gains through increased productivity as a result of

improved nutrition exceed 6.2 trillion TZS (US$3.9 billion) for Tanzania by 2025. The economic productivity gains from reducing each of these nutrition problems about 6.2 billion TZS (US$3.9 billion) for stunting, about 767 billion TZS (US$479.1 million) for iodine deficiency and about 611 billion TZS (US$381.7 million) for iron deficiency anaemia among women.

Table 5. Deaths attributable to various nutrition problems and lives saved related to improved nutrition

Nutrition problem	Number of deaths that would result if the current situation continues *Status quo scenario* 2014–2025	Number of lives that would be saved if nutrition situation improves *Improved scenario* 2014–2025*
Anthropometric indicators		
Deaths/lives saved attributable to **stunting** (severe, moderate and mild) among children under 5	580,687	120,633
Deaths/lives saved attributable to **wasting** (severe, moderate, and mild) among children under 5	No data on wasting as target was to maintain < 5%	No data on wasting as target was to maintain < 5%
Low birth weight		
Infant deaths/lives saved	148,873	20,460
Iron deficiency anaemia		
Maternal deaths/lives saved	26,290	15,484
Perinatal deaths/lives saved	113,082	72,739
Vitamin A deficiency		
Child deaths/lives saved	209,638	101,859
Breastfeeding practices		
Deaths/lives saved attributable to suboptimal breastfeeding practices among children under 2	360,487	85,519

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

Table 6. Iodine deficiency and child disability

Nutrition problem	Number of children who would have mild to severe permanent brain damage if the current situation continues *Status quo scenario* 2014–2025	Number of children for whom disability as a result of maternal iodine deficiency would be prevented if prevalence of iodine deficiency is reduced *Improved scenario* 2014–2025*
Child disability related to maternal iodine deficiency	1,730,000 or 1.73 million	869,800

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

Table 7. Human capital losses and gains in terms of learning

Nutrition problem	Losses in learning if the current situation continues *Status quo scenario* 2014–2025	Gains in learning if nutrition situation improves *Improved scenario* 2014–2025*
Stunting	87,700,000 or 87.7 million equivalent school years of learning	24,700,000 or 24.7 million equivalent school years of learning

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

Table 8. Economic productivity losses and gains

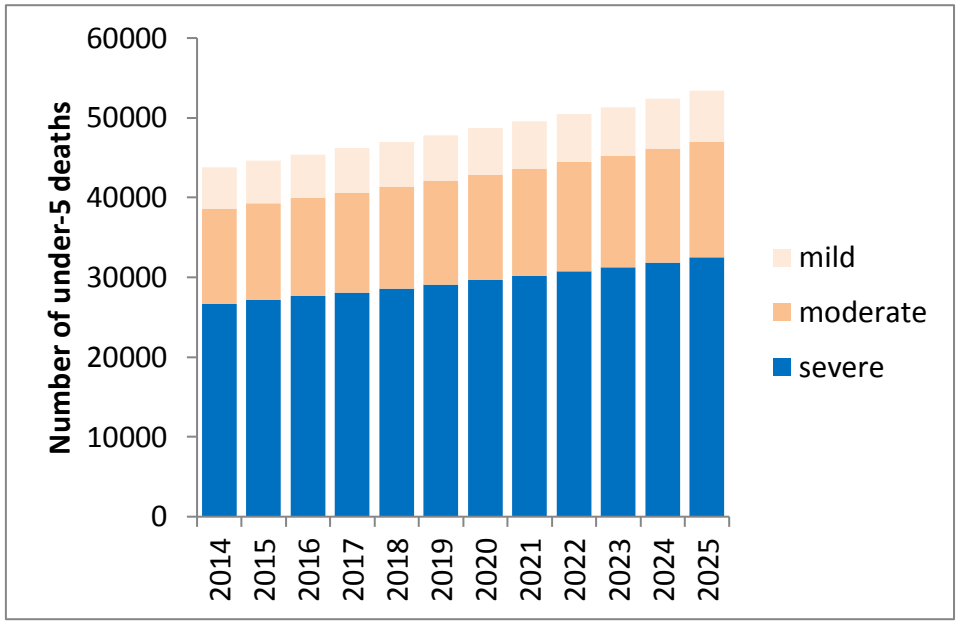
Nutrition problem	Economic productivity losses if the current situation continues *Status quo scenario* 2014–2025	Economic productivity gains if nutrition situation improves *Improved scenario* 2014–2025*
Stunting	28,796,000,000,000 or 28.796 trillion TZS (US$17.997 billion)	6,237,000,000,000 or 6.237 trillion TZS (US$3.898 billion)
Iron-deficiency anaemia	2,285,000,000,000 or 2.285 trillion TZS (US$1.428 billion)	611,000,000,000 or 611 billion TZS (US$381.681 million)
Iodine deficiency	1,521,000,000,000 or 1.521 trillion TZS (US$950.722 million)	767,000,000,000 or 767 billion TZS (US$479.108 million)

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

Note: Numbers in TZS and US$ are rounded. Exchange rate used is 1,600 TZS = US$1.

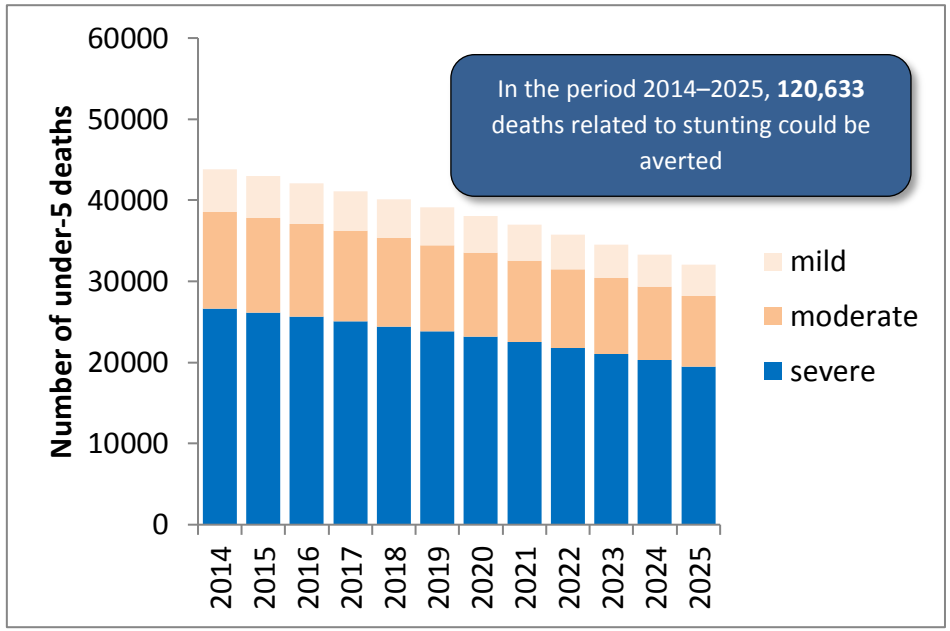
* These numbers assume that at-scale implementation of effective nutrition interventions will succeed in reaching the stated targets in terms of reductions in the prevalence of the various nutrition problems.

Figure 6. Status quo scenario: number of deaths for children under 5 related to stunting* 2014–2025



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

Figure 7. Improved scenario: decreasing number of deaths for children under 5 related to stunting* 2014–2025



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

Figure 8. Estimates of future lives lost, economic productivity lost, permanent disabilities and human capital lost associated with various nutrition problems, 2014–2025

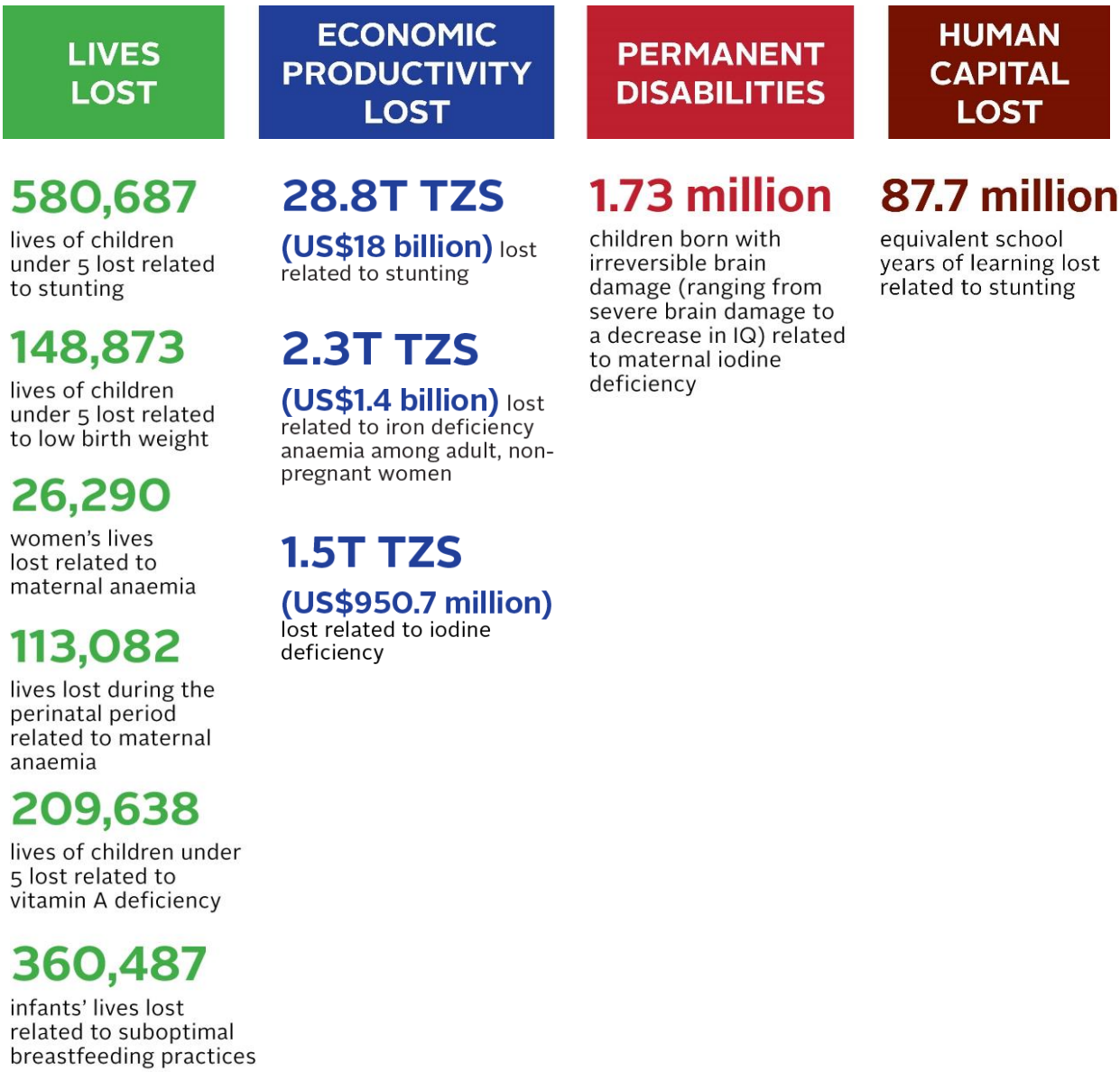
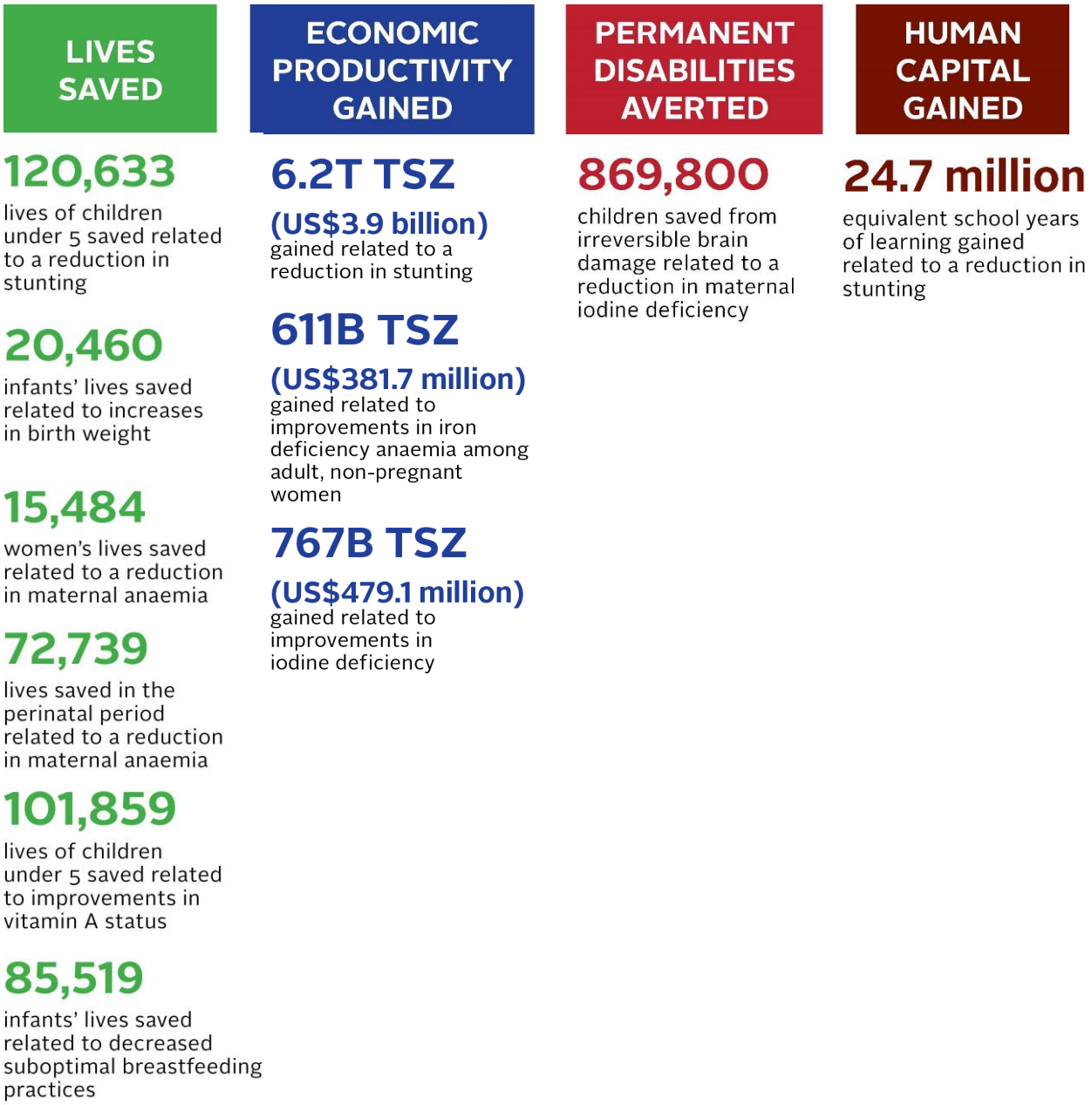


Figure 9. Estimates of future lives saved, economic productivity gained, permanent disabilities averted and human capital gained, 2014–2025



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

This section summarizes the discussions on nutrition advocacy needs in Tanzania that took place during the stakeholder meeting and PROFILES workshop. The information included in this section will form the foundation for a National Nutrition Advocacy Plan for Tanzania, which will be developed during a consultative workshop in September 2014 with multi-sectoral stakeholders.

Nutrition is a critical investment for Tanzania. The PROFILES estimates for Tanzania clearly show that expanding access to maternal and child nutrition services at scale across the country could result in significant health and development benefits, including significant gains in human capital and the health and well-being of citizens, reduced maternal and child mortality and improved economic productivity. These estimates, however, are based on the assumption that over time, proven, effective and evidence-based nutrition interventions will be provided at scale across the country to 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 stated targets in terms of improvement of various nutrition problems.

Creating an enabling environment for improved nutrition will require greater investment and commitment by the Government of Tanzania, and substantial effort to implement and expand access to quality nutrition services at scale is essential if the benefits of improved nutrition, as suggested by the PROFILES estimates for Tanzania, are to be achieved. The recommendations in Box 1 were discussed and agreed on by participants of the stakeholder meeting and PROFILES workshop.

Box 1. Advocacy Recommended to Create an Enabling Environment for Nutrition

1. **Develop and finalize a cross-cutting, strategic multi-sectoral national nutrition policy and advocacy plan.** The National Food and Nutrition Policy will be essential to strengthen the national framework for government and non-government partners to align nutrition services and activities in a coordinated and strategic manner for the greatest impact on reducing malnutrition in Tanzania. Similarly, the national nutrition advocacy plan, to be developed using a consultative approach with key stakeholders in September 2014, should be aligned with the National Food and Nutrition Policy and specify key advocacy audiences, desired changes per audience, barriers inhibiting those changes, advocacy objectives to address barriers per audience, indicators to measure the success of efforts and the means of monitoring. The plan should also include an implementation matrix and timeline advocacy activities and materials to be developed and disseminated. During this process, stakeholders are expected to commit to implementing specific activities laid out in the plan in partnership with the Government of Tanzania and others. A national nutrition advocacy plan would facilitate greater harmonization of efforts and ensure that stakeholders working on nutrition are well coordinated in promoting priority nutrition-specific and nutrition-sensitive actions in Tanzania.
2. **Draft and enact legislation that supports improved nutrition.** Stakeholders discussed priority policies that the Government of Tanzania should commit to, including policies that promote micronutrient supplementation, food fortification and creation of an enabling environment to promote optimal infant and young child nutrition, including exclusive breastfeeding.
3. **Ensure regular financing for nutrition, from both domestic and external funds.** Increasing resource allocation for nutrition in tandem with strengthening integrated implementation of nutrition services at scale will help Tanzania fulfil its national commitments to nutrition targets.
4. **Improve access to nutrition services across Tanzania.** The benefits of reductions in iron deficiency anaemia, low birth weight, VAD, iodine deficiency and childhood stunting and underweight estimated by PROFILES can only be achieved through expanded evidence-based services that enable improved nutrition at the household level. Services should focus on prevention of malnutrition and include strengthening the capacity of health workers to implement nutrition services. Effective supervision, monitoring and evaluation will be important to ensuring quality service delivery and oversight of integrated nutrition services.
5. **Ensure proven, effective and quality nutrition-specific and nutrition-sensitive interventions are implemented at scale throughout the country.**

   Nutrition-specific interventions should focus on:

   - Prevention of chronic malnutrition by:
     - Improving adolescent nutrition
     - Improving maternal nutrition during pregnancy and the postpartum period
     - Improving nutrition of children under 2 by supporting exclusive breastfeeding up to 6 months and continued breastfeeding beyond 6 months, together with appropriate introduction of nutritious complementary foods starting from 6 months and continuing to 2 years
     - Providing micronutrient supplementation
     - Integrating nutrition assessment, counselling and support as a standard of care in clinical and community care.
     - Providing fortified foods

   Nutrition-sensitive interventions should focus on:

   - Improving access to services to ensure that women and children stay healthy
   - Strengthening social and behaviour change to delay early marriage and adolescent pregnancy and expanding access to family planning services, with a focus on adolescent girls and engaging men in family planning
   - Improving access to clean water and sanitation, including safe hand washing and clean places for children to play, to reduce infection and disease
   - Investing in nutrition-sensitive agriculture to make diverse nutritious food accessible to everyone
   - Strengthening and expanding early childhood education programs and increasing secondary school completion for girls and boys
   - Promoting gender equality and women's empowerment by engaging men in supporting mothers and children and empowering women to make decisions in the household and become leaders in their families and communities, leading to a healthier and stronger nation

References

Alderman, H. and Behrman, J.R. 2004. 'Estimated economic benefits of reducing low birth weight in low-income countries'. HNP Discussion Paper. Washington, DC: World Bank.

Ashworth, A. 1998. 'Effects of intrauterine growth retardation on mortality and morbidity in infants and young children'. *European Journal of Nutrition*. Vol. 52. Suppl. 1, pp. 34–42.

Black, R.E. et al. 2008. 'Maternal and child undernutrition: Global and regional exposures and health consequences'. *Lancet*. Vol. 371. No. 9608, pp. 243–260.

Black R.E. et al. 2013. 'Maternal and child undernutrition and overweight in low-income and middle-income countries'. *Lancet* 382, pp. 427–451.

Copenhagen Consensus. 2012. 'Expert Panel Findings.' http://www.copenhagenconsensus .com/sites/default/files/Outcome_Document_Updated_1105.pdf.

Glewwe P.; Jacoby, H.G.; and King, E.M. 'Early childhood nutrition and academic achievement: A longitudinal analysis'. *Journal of Public Economy* 2001; 81: 345–68.

Grantham-McGregor, S. et al. 2007. "Developmental potential in the first 5 years for children in developing countries." *Lancet* 369:60–70.

Lamberti, L.M. et al. 2011. 'Breastfeeding and the risk for diarrhea morbidity and mortality'. *BMC Public Health*. Vol. 11(Suppl 3):S15.

NBS. 2013. *Tanzania in Figures 2012*. Dar es Salaam, Tanzania: NBS.

NBS and ORC Macro. 2005. *Tanzania Demographic and Health Survey 2004-05*. Dar es Salaam, Tanzania: NBS and ORC Macro.

NBS and Macro International Inc. 2000. *Tanzania Reproductive and Child Health Survey 1999*. Calverton, Maryland: NBS and Macro International Inc.

NBS and ICF Macro. 2011a. *Tanzania Demographic and Health Survey 2010*. Dar es Salaam, Tanzania: NBS and ICF Macro.

———. 2011b. *Micronutrients: Results of the 2010 Tanzania Demographic and Health Survey*. Dar es Salaam, Tanzania: NBS and ICF Macro.

NBS and Ministry of Finance and Economics Affairs. 2006. *Tanzania–Integrated Labour Force Survey 2006*.

Olofin, I. et al. 2013. 'Associations of suboptimal growth with all-cause and cause-specific mortality in children under five years: A pooled analysis of ten prospective studies'. *PLoS ONE* 8(5): e64636. doi:10.1371/journal.pone.0064636.

Ross, J. 2008. *PROFILES Guidelines: Calculating the effects of malnutrition on economic productivity, health and survival*. Washington, DC: Academy for Educational Development.

Ross, J. and Horton, S. 1998. *Economic consequences of iron deficiency*. Ottawa: Micronutrient Initiative.

The Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ). 'Education Fact Sheet.' 2014. Available at: http://www.sacmeq.org/sacmeq-members/ tanzania-mainland/education-fact-sheet.

Scaling Up Nutrition Road Map Task Team. 2010. 'A Road Map for Scaling Up Nutrition (SUN)'. Available at: http://un-foodsecurity.org/sites/default/files/SUNRoadMap_English.pdf.

Stoltzfus, R.; Mullany, L.; and Black, R.E. 2004. 'Iron deficiency anaemia'. In *Comparative Quantification of Health Risks: Global and regional burden of disease attributable to selected major risk factors.* Ezzati, M.; Lopez, A.D.; Rodgers, A.; and Murray, C.J.L. (eds.). Vol. 1, pp. 163–209. Geneva: WHO.

TFNC. 2004. 'National Survey on Iodine Deficiency in 2004'. Available at: http://tfnc.or.tz/eng/focus/ idd.htm.

United Nations, Department of Economic and Social Affairs, Population Division, Population Estimates and Projections Section. 2012a. 'World Population Prospects: The 2012 Revision'. Available at: http://esa.un.org/wpp/unpp/panel_population.htm.

———.2012b. 'World Population Prospects: The 2012 Revision'. Available at: http://esa.un.org/wpp/unpp/panel_indicators.htm.

WHO. 2014. 'Global Targets 2025'. Available at: http://www.who.int/nutrition/topics/ nutrition_ globaltargets2025/en/.

———. 2014. 'Global Database on Child Growth and Malnutrition'. Available at: http://www.who.int/nutgrowthdb/database/countries/tza/en/.

———. 2010. *Nutrition Landscape Information System (NLIS) Country Profile Indicators: Interpretation Guide.* Geneva: WHO.

———. 1995. 'Physical Status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee. Technical Report Series No. 854'. Available at: http://whqlibdoc.who.int/ trs/WHO_TRS_854.pdf.

———. 2014. 'Nutrition'. Available at: http://www.who.int/topics/nutrition/en/.

World Bank. 2006. *Repositioning Nutrition as Central to Development: A Strategy for Large-Scale Action.* Washington, DC: World Bank.

Appendix A. Participants in PROFILES Stakeholder Meeting and PROFILES Workshop

Participants in the PROFILES Stakeholders Meeting, 10 March 2014

S/N	Name of Participant	Sex	Organisation/Company	Job Position/Title
1	Yokobety N. Malisa	F	PMO	ASSISTANT DIRECTOR
2	Deogratius Malamsha	M	NBS	STATISTICIAN
3	Masuma Mamdani	F	IFAKARA HEALTH INSTITUTE	SR RESEARCH POLICY ANALYST
4	Samson Ndimanga	M	TFNC	RESEARCHER ECONOMIST
5	Margaret Natai	M	MAFC	PRINCIPAL AGR. OFFICER
6	Kissa Kulwa	F	Sokoine University of Agriculture	SR. LECTURER
7	Philip Mann	M	UN REACH	FACILITATOR
8	Deborah Ash	F	FHI 360/FANTA	FANTA PROJECT MANAGER
9	Vedasto Rutachokozibwa	M	MWANZO BORA NUTRITION PROJECT	DEPUTY CHIEF OF PARTY
10	David Katusabe	M	FHI 360/FANTA	CONSULTANT
11	Nanzia Mbaga	F	GAIN	PROJECT OFFICER
12	Lunna Kyungu	F	COUNSENUTH	PROGRAM MANAGER
13	Aneth Vedastus	F	TFNC	STATISTICIAN
14	Caroline Mshanga	F	FHI 360/FANTA	PROGRAM OFFICER
15	Lesley Oot	F	FHI 360/FANTA	TECHNICAL OFFICER
16	Esther Mbully	F	FHI 360	PROJECT ASSISTANT
17	A. Elisabeth Sommerfelt	F	FHI 360/FANTA	SCIENTIST, PROFILES AND MCH NUTRITION ADVOCACY
18	Elizabeth Macha	F	UNICEF	NUTRITION SPECIALIST
19	Biran Ndiaye	M	UNICEF	NUTRITION MANAGER
20	Yahaya Ipunge	M	WORLD BANK	SR HEALTH SPECIALIST
21	Wilbald Lorri	M	President's Office	SPECIAL ADVISOR
22	Vincent Assey	M	MOHSW	ASSISTANT DIRECTOR NUTRITION SECTION
23	Yikyoung Lee	F	WORLD BANK	SR HEALTH SPECIALIST
24	Musa Mgate	M	SAVE THE CHILDREN	SR INTERN ED
25	Francis Modaha	M	MOHSW-TFNC	SR RESEARCH OFFICER
26	Benedict Jeje	M	MOHSW-TFNC	AG MANAGING DIRECTOR
27	David Charles	M	USAID	AG NUTRITION LEAD
28	Mgune Masatu	M	PMO	SR ECONOMIST
29	Isaack Kituru	M	HKI	SBCC TECHNICAL ADVISOR
30	Rosemary Mwaisaka	F	WFP	PO NUTRITION
31	Helen Semu	F	MOHSW	AG. ASSISTANT DIRECTOR
32	Fortunatus Kagoro	M	MOEVT	PRINCIPAL EDUCATION OFFICER
33	Tara Kovach	F	FHI 360/FANTA	TECHNICAL ADVISOR
34	Jane Msagati	F	PANITA	PROGRAM COORDINATOR

List of participants in the PROFILES Workshop, 11–14 March 2014

S/N	Name of Participant	Sex	Organisation/Company	Job Position/Title
1	Yokobety N. Malisa	F	PMO	ASSISTANT DIRECTOR
2	Philip Mann	M	UN REACH	FACILITATOR
3	Angelina Ballart	F	Freelance Consultant	NUTRITIONIST
4	Margaret Natai	F	MAFC	PRINCIPAL AGR. OFFICER NUTRITION
5	Julitha Masanja	F	MCDGC	PRINCIPAL COMMUNITY DEVELOPMENT OFFICER
6	Aulelus Nyamba	M	TFNC	ECONOMIST
7	Samson Ndimanga	M	TFNC	ECONOMIST
8	Aneth Vedastus	F	TFNC	STATISTICIAN
9	Caroline Mshanga	F	FHI 360/FANTA	PROGRAM OFFICER
10	Lesley Oot	F	FHI 360/FANTA	TECHNICAL OFFICER
11	Esther Mbully	F	FHI 360	ASSISTANT
12	A. Elisabeth Sommerfelt	F	FHI 360/FANTA	SCIENTIST, PROFILES AND MCH NUTRITION ADVOCACY
13	Priscus Tairo	M	PRESIDENT'S OFFICE PLANNING COMMISSION	ECONOMIST
14	Mbaraka Stambuli	M	MLDF	AGRICULTURE ECONOMIST
15	Deborah Ash	F	FHI 360/FANTA	FANTA PROJECT MANAGER
16	Geoffrey Chiduo	M	TFNC	ECONOMIST
17	Obey Assery	M	PMO	DIRECTOR
18	Tara Kovach	F	FHI 360/FANTA	TECHNICAL ADVISOR
19	Mary Victor Kibona	F	TFNC	RESEARCH OFFICER

Participants in the PROFILES Results Meeting on 19 March 2014

S/N	Name of participant	Sex	Organisation/Company	Job Position/Title
1	Yokobety N. Malisa	F	PMO	ASSISTANT DIRECTOR
2	Aulelus Myamba	M	TFNC	RESEARCHER ECONOMIST
3	Masuma Mamdani	F	IFAKARA HEALTH INSTITUTE	SR RESEARCH POLICY
4	Samson Ndimanga	M	TFNC	RESEARCHER ECONOMIST
5	Margaret Natai	M	MAFC	PRINCIPAL AGR.OFFICER
6	Kissa Kulwa	F	SUA	SR LECTURER
7	Philip Mann	M	UN REACH	FACILITATOR
8	Deborah Ash	F	FHI 360/FANTA	FANTA PROJECT MANAGER
9	Vedasto Rutachokozibwa	M	MWANZO BORA NUTRITION PROJECT	DEPUTY CHIEF OF PARTY
10	David Katusabe	M	FHI 360/FANTA	CONSULTANT
11	Joyceline Kaganda	F	TFNC	DIR NET/TFNC
12	Lunna Kyungu	F	COUNSENUTH	PROGRAM MANAGER
13	Aneth Vedastus	F	TFNC	STATISTICIAN
14	Brenda K Muwaga	F	GRACA MACHEL TRUST	CONSULTANT
15	Lesley Oot	F	FHI 360/FANTA	TECHICAL OFFICER
16	Esther Mbully	F	FHI 360	PROJECT ASSISTANT
17	A. Elisabeth Sommerfelt	F	FHI 360/FANTA	SCIENTIST, PROFILES AND MCH NUTRITION ADVOCACY
18	Alo I. Stevens	M	WHO	NUTRITION OFFICER
19	Brian Ndiaye	M	UNICEF	NUTRITION MANAGER
20	Geoffrey Chiduo	M	TFNC	RESEARCH OFFICER
21	Joyce Kinabo	F	SUA	PROFESSOR
22	Mary V. Kibona	F	TFNC	RESEARCHER NUTRITION
23	Mbaraka Stambuli	F	MLDF	AGRICULTURE ECONOMIST
24	Benoit Gambier	M	FAO	COORDINATOR M&E
25	Lisha Lala	F	DFID	HEALTH ADVISER
26	Rosemary Mwaisaka	F	WFP	PO NUTRITION
27	Helen Semu	F	MOHSW	AG. ASSISTANT DIRECTOR
28	Melchiade Ruberintwari	M	FHI 360	COUNTRY REPRESENTATIVE
29	Deogratius Malamsha	M	NBS	STATISTICIAN
30	Angelina Ballart	F	Freelance Consultant	NUTRITIONIST
31	Rogers Wanyama	M	WFP	NUTRITIONIST
32	Janeth Said	F	USAID	NUTRITION ADVISOR
33	Biram Ndiaye	M	UNICEF	NUTRITION MANAGER
34	Vincent Assey	M	MOHSW NUTRITION SECTION	ASSISTANT DIRECTOR
35	Jane Msagati	F	PANITA	PROGRAM COORDINATOR
36	Joyce Ngegba	F	Save the Children	PROGRAM MANAGER