Ministère de la Santé Publique et de la Population
Unité de Coordination du Programme National
d'Alimentation et de Nutrition (UCPNANu)

Reducing Malnutrition in Haiti:

Estimates to Support Nutrition Advocacy

Haiti PROFILES 2013

March 2014

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FROM THE AMERICAN PEOPLE

FANTA III
FOOD AND NUTRITION TECHNICAL ASSISTANCE

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Haiti PROFILES 2013 estimates were developed using a participatory and consultative approach working with the Government of Haiti, the U.S. Agency for International Development (USAID), and other stakeholders. A multisectoral group of participants provided input into the development of the estimates and included representatives of the following collaborating institutions: USAID; United Nations agencies (the World Food Programme [WFP], the Food and Agriculture Organization of the United Nations [FAO], the World Health Organization [WHO], and UNICEF); USAID implementing partners (the Food and Nutrition Technical Assistance III Project [FANTA]; and the Strengthening Partnerships, Results, and Innovations in Nutrition Globally [SPRING] project); MEASURE; and government ministries and entities, including:

- Ministère de la Santé Publique et de la Population (MSPP)
- Ministère des Affaires Sociales et du Travail (MAST)
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Additional organizations and projects that contributed to the Haiti PROFILES 2013 estimates include Fonds d'Assistance Economique et Social (FAES), LCH/Droits Humains, Groupe Croissance, Comite National de Sécurité Alimentaire (CNSA), and Université Quisqueya.

Contents

Acronyms and Abbreviations

ACC/SCN	Administrative Committee on Coordination/Subcommittee on Nutrition
CNSA	Comite National de Sécurité Alimentaire
EEEI	Enquête sur l'emploi et l'économie informelle
EMMUS	Enquête Mortalité, Morbidité et Utilisation des Services
FAES	Fonds d'Assistance Economique et Social
FANTA	Food and Nutrition Technical Assistance III Project
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
Hb	hemoglobin
IHSI	Institut Haïtien de Statistiques et d'Informatique
MAST	Ministère des Affaires Sociales et du Travail
MCFDF	Ministère à la Condition Féminine et aux Droits de la Femme
MCI	Ministère du Commerce et de l'Industrie
MEF	Ministère de l'Economie et des Finances
MENFP	Ministère de l'Education Nationale et de la Formation Professionnelle
MHAVE	Ministère des Haïtiens Vivant à l'Etranger
MSPP	Ministère de la Santé Publique et de la Population
MTPTC	Ministère des Travaux Publics, Transport et Communication
SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally
SUN	Scaling Up Nutrition
U.S.	United States
UCPNANu	Unité de Coordination du Programme National d'Alimentation et de Nutrition
UNAG	National Coordination Unit of ABA GRANGOU
USAID	U.S. Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

1. Introduction

Haiti could be free of malnutrition in the near future. But what will it take to achieve this? What would be the benefits? What will be the consequences if nothing is done to improve nutrition? These are the questions national stakeholders and technical experts in Haiti sought to answer through a recent consultative and consensus-building process.

PROFILES, a computer-based tool used to support nutrition advocacy, was instrumental in guiding stakeholder collaboration in pursuit of the goal of ending malnutrition in the country. PROFILES was used to project the benefits of improved nutrition in terms of improvements in development outcomes, specifically, reduced child and maternal mortality and increased economic productivity for the period 2013–2022.

This report describes the PROFILES process and shares PROFILES estimates that were generated through that process that can be used to demonstrate to high-level decision makers and stakeholders in Haiti the benefits of improved nutrition and the risks of not taking any action to improve the nutritional status of the country's citizens.

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 anemia, reduced immunity, and impaired physical and mental development (World Health Organization [WHO] 2013). In Haiti, malnutrition is one of the major causes of childhood illness and mortality (World Bank 2006). If malnutrition rates were reduced significantly, improvements in the health, well-being, and productivity of the Haitian population would be significant.

Investing in nutrition is also economically sound and has been identified as a "best" investment (Copenhagen Consensus 2012). This critical investment saves mothers' and children's lives and improves children's education outcomes, which, in turn, boosts economic productivity. It is estimated that investing in nutrition can increase a country's gross domestic product (GDP) by at least 3 percent annually (World Bank 2006). Furthermore, every US$1 spent on reducing malnutrition has at least a US$30 return on investment (World Bank 2006; Copenhagen Consensus 2012). Thus, investing in nutrition is a fruitful and cost-effective commitment to Haiti's future.

With the enactment of Haiti's National Nutrition Policy in 2012 and increased commitment to and visibility of nutrition with the "Aba Gangrou" Anti-Hunger Initiative, there is an opportunity for Haiti to develop a unified and harmonized approach to nutrition advocacy to support and strengthen coordinated national nutrition service delivery.

Nutrition Challenges to Address

Recently, new data have become available through the Haiti Enquête Mortalité, Morbidité et Utilisation des Services (EMMUS-V), a nationally representative household survey conducted in 2012 with technical assistance from the USAID-funded Demographic and Health Surveys Program.

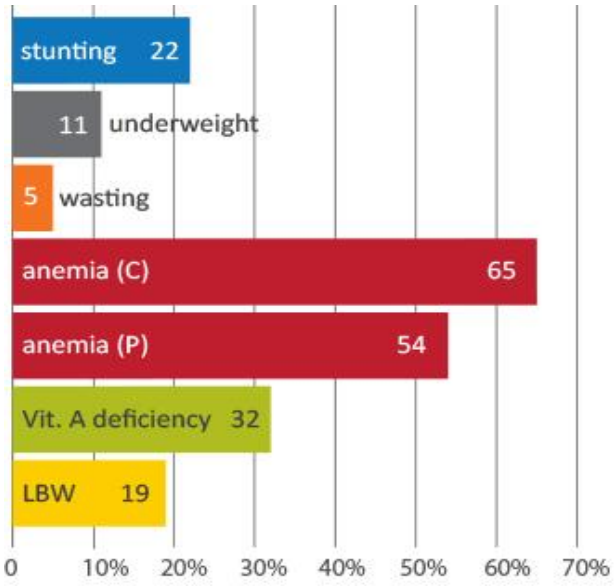
EMMUS-V shows that almost one-quarter of all children under 5 years (22 percent) are chronically malnourished (stunted, or low height-for-age), 5 percent are classified as acutely malnourished (wasted, or low weight-for-height), and 11 percent are underweight (Cayemittes et al. 2013) (see Figure 1). Although trends in malnutrition rates have improved somewhat (from 2000 to 2012, there was a 3 percentage point reduction in underweight and a 7 percentage point reduction in stunting; see Figure 2), the prevalence levels in 2005–2006 were higher or the same than they were in 2000; there is not a sustained trend of improvement. In addition, about two-thirds of all children in Haiti are anemic (65 percent) (Cayemittes et al. 2013) and 32 percent are vitamin A deficient (Ministère de la Santé Publique et de la Population [MSPP]/UNICEF 2005).

These widespread nutrition problems affect both the nation's adolescents and its mothers. According to EMMUS-V, more than half of pregnant women (54 percent) suffer from anemia. As the data indicate, renewed emphasis and investment in nutrition is highly warranted to ensure Haiti's future growth and development.

The causes of malnutrition in Haiti are manifold: Repeated infections, poor health, and inadequate dietary intake are immediate causes of malnutrition, but underlying causes include lack of safe water, hygiene, and

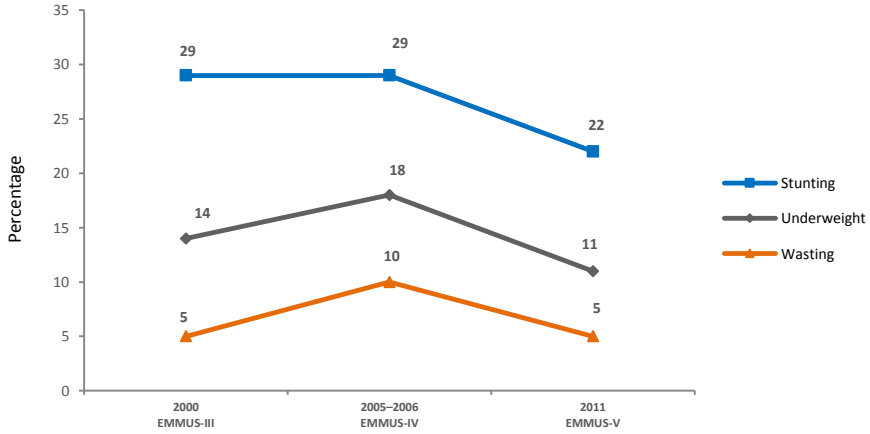
sanitation; food insecurity; gender inequality; and poverty; among others. As such, malnutrition in Haiti is a complex problem that persists due to multiple causes rooted in various sectors. Therefore, in addition to nutrition-specific interventions, nutrition-sensitive interventions that are multisectoral are also essential to reduce and eradicate malnutrition in Haiti.

Figure 1. Malnutrition Rates in Haiti



Notes: C = Under-5 children. P = Pregnant women. LBW = Low birth weight (among mothers who knew the child's birth weight)
Sources: Cayemittes. 2013; MSPP and UNICEF. 2005.

Figure 2. Trends in Malnutrition in Haiti



Note: For comparison purposes, the 2000 and 2005–2006 anthropometric indicators were based on the 2006 WHO standards, to match the 2011 indicators. The values in the graph indicate percentage of children with z-scores < −2.

Source: ICF International. 2013. "EMMUS-V 2012." http://www.measuredhs.com/pubs/pdf/DM31/DM31.pdf.

What Are the Consequences of Malnutrition?

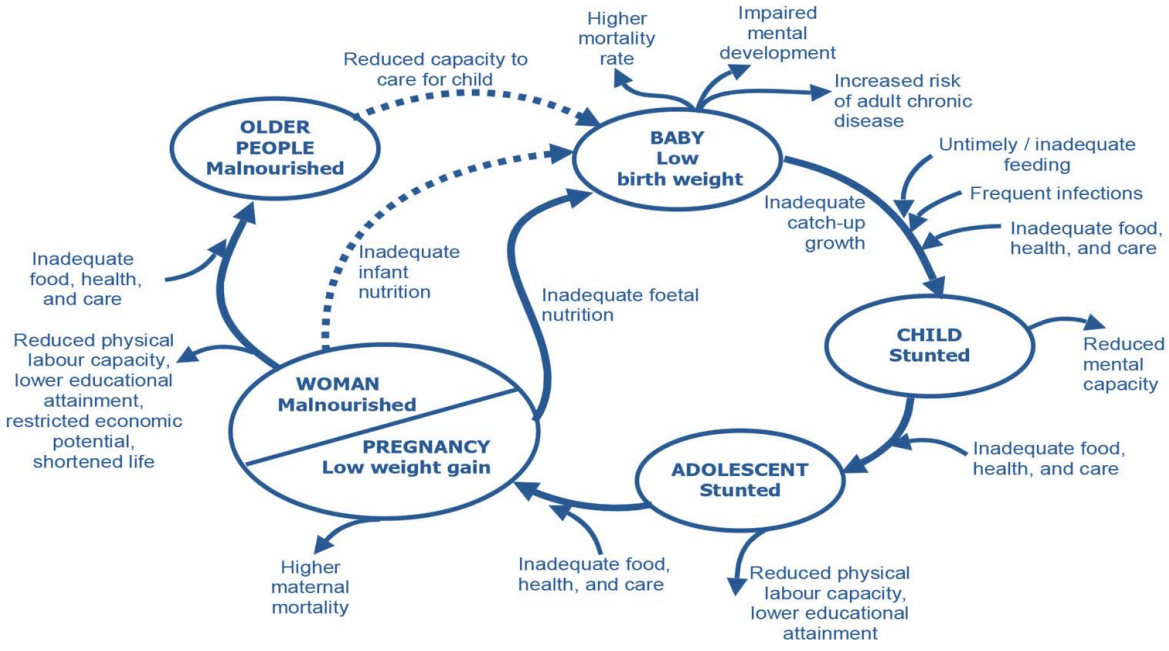
Malnutrition in Haiti, as in many other countries of the world, is in part intergenerational in nature (see Figure 3). Findings from EMMUS-V bring to light several risk factors for delivering a low birth weight infant. Nearly one-third of adolescent girls are pregnant or have given birth to a child by the age of 19. Adolescent girls in Haiti are the most malnourished group among women of reproductive age (23 percent have a body mass index <18.5, compared to 9 percent of women 20 years and older), and this contributes to their increased risk of delivering a low birth weight infant. In contrast, nearly 40 percent of women 30 years and older are overweight or obese (compared to about 15 percent of women 15–29 years), and this also contributes to an increased risk of giving birth to a low birth weight infant. Finally, more than half of all women of reproductive age are anemic, which significantly contributes to the high prevalence of low birth weight in Haiti.

Overall, 19 percent of newborns have low birth weight in Haiti, which has a considerable effect on the prevalence of stunting among children under 5. Even when infants are born with normal birth weight, some still become malnourished early in life as a result of poor infant and young child feeding practices.

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

It is well established that preventing malnutrition among children under 2 years of age should be the focus of nutrition interventions, and this is a main focus of the Scaling Up Nutrition (SUN) movement (Scaling Up Nutrition Road Map Task Team 2010), of which Haiti 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.

Figure 3. Lifecycle of Malnutrition



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

3. Methods

PROFILES is a process centered around a consultative approach with stakeholders using a computer-based model that serves as a tool to support nutrition advocacy. First developed in the early 1990s, PROFILES consists of a set of spreadsheets that reflect current scientific nutrition knowledge. It is designed to estimate the functional consequences of malnutrition on health and development outcomes to support advocacy and communication with policymakers, program implementers, and other stakeholders. To ensure the relevancy of PROFILES results, it is important for stakeholders to agree on the data and targets that are used to populate the model.

This section presents the methods that were used to derive the estimates for Haiti in relation to each of the nutrition problems addressed in Haiti PROFILES 2013. 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 improvement and no change from the current nutrition situation throughout the chosen time period (aside from projected changes in population size). 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 reductions in the prevalence of the various nutrition problems. The targets reflect the proportion by which nutrition problems will be reduced over the chosen time period and 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 and economic productivity losses. When contrasting the results from the status quo and the improved scenarios, the difference between the two scenarios reflects the benefits of improved nutrition, expressed as lives saved and economic productivity gains (or, put another way, economic productivity losses averted).

This is illustrated for child deaths (and lives saved) related to stunting in Figures 4a, 4b, and 4c. For the improved scenario—as can be seen in these illustrative graphs—the number of lives lost is greater than the number lives saved because it is assumed that the decrease in the prevalence of stunting will be gradual and therefore reductions in child mortality attributable to stunting will be gradual, and as such the gains in lives saved will also be gradual. The PROFILES spreadsheet models do not include interventions; however, the presumption is that effective interventions would not be implemented at scale from Day 1, but would be implemented gradually over the selected time period, and that, hence, improvement in the nutrition indicators and consequently lives saved would be gradual. Although nutrition interventions were not included in the PROFILES models, the subsequent steps in the nutrition advocacy process can address the need for various nutrition services, interventions, programs, or issues related to the nutrition policy environment.

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

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

Figures 4a–c provide an illustrative example of the approach used in PROFILES to calculate estimates. (Information shown in these graphs is not from Haiti PROFILES 2013.) The illustrative example presented in Figures 4a–c is for stunting. The graphs show how the status quo scenario (Figure 4a) vs. the improved scenario (Figure 4b) is used to provide estimates of lives saved (or deaths averted) related to stunting among children under 5 years during a 10-year period. Figure 4c indicates that the number of lives saved reflects the number of deaths in the status quo scenario minus the number of deaths in the improved 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.

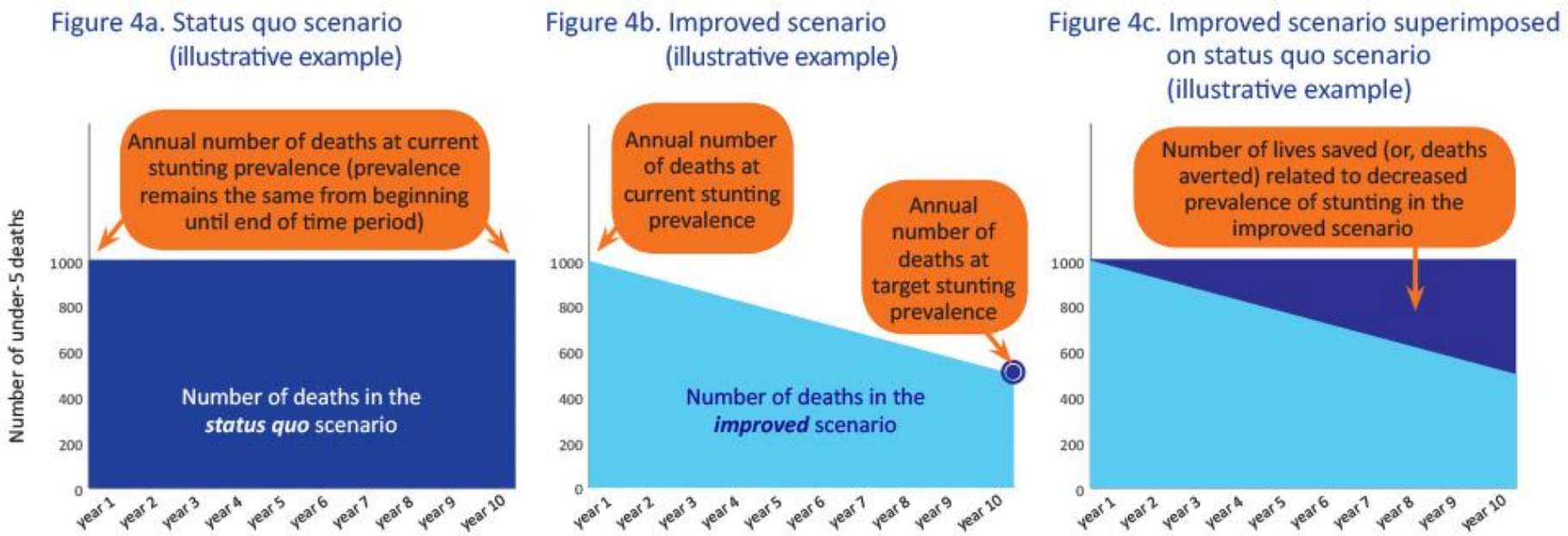


Figure 5 shows the timeline of the PROFILES process. For Haiti PROFILES 2013, a stakeholder meeting and a 4-day workshop were conducted with key stakeholders to develop the estimates from PROFILES. At the stakeholder meeting, which was held on June 3, 2013, in Port-au-Prince, the objectives and rationale for the model were introduced and some key assumptions for the model were discussed. The 4-day PROFILES workshop was held in June 2013, immediately after the stakeholder meeting.

Participants in the stakeholder meeting and the PROFILES workshop consisted of the U.S. Agency for International Development (USAID); U.N. agencies (the World Food Programme [WFP], the Food and Agriculture Organization of the United Nations [FAO], WHO, and UNICEF); USAID implementing partners (Food and Nutrition Technical Assistance III Project [FANTA]; Strengthening Partnerships, Results, and Innovations in Nutrition Globally [SPRING] project); MEASURE; and government ministries and entities, including:

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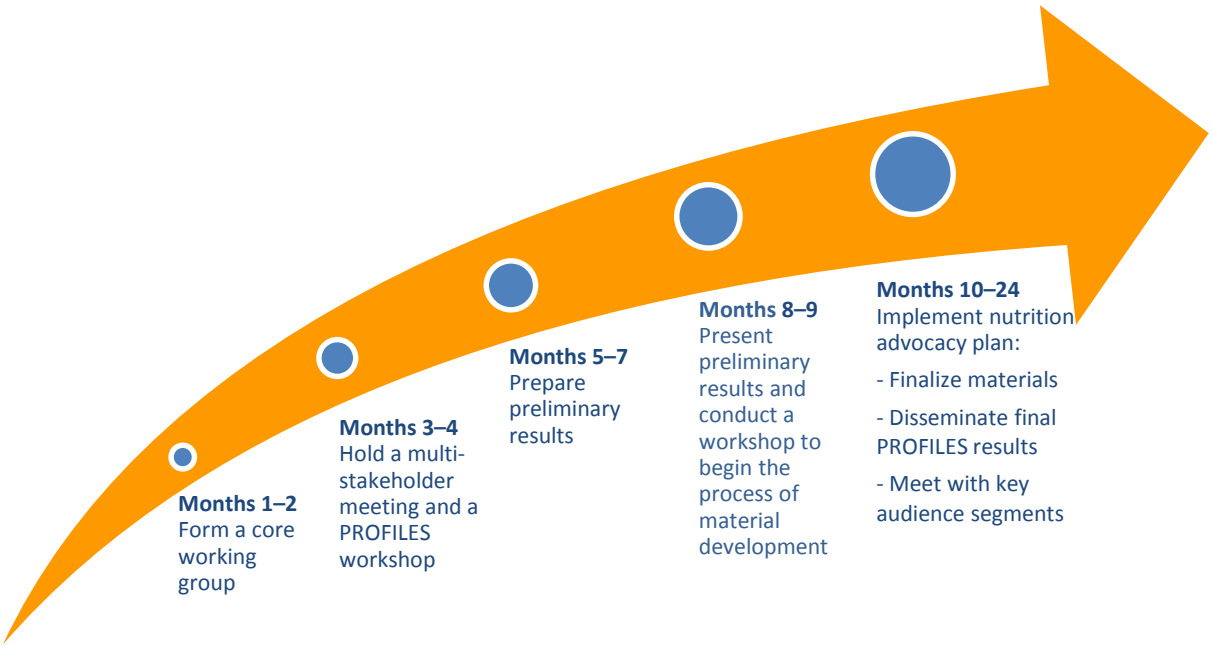
Figure 5. PROFILES Process Timeline



Additional organizations and projects that contributed to the Haiti PROFILES 2013 estimates include Fonds d'Assistance Economique et Social (FAES), LCH/Droits Humains, Groupe Croissance, Comite National de Sécurité Alimentaire (CNSA), and Université Quisqueya. A full list of participants can be found in Appendix A.

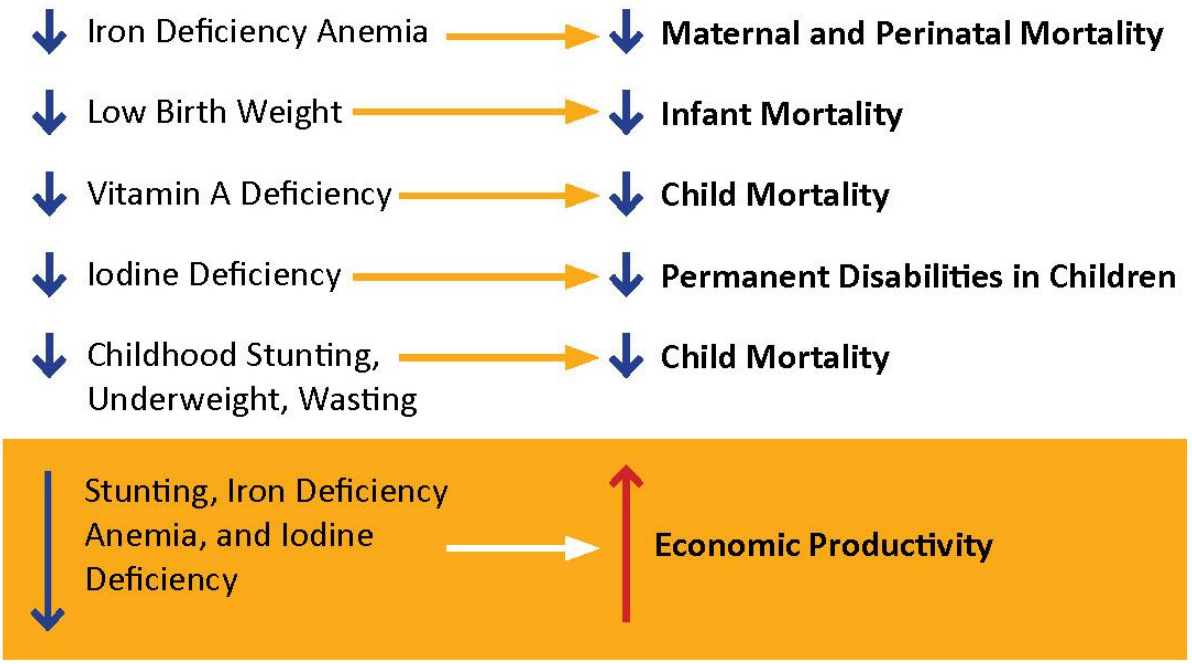
During the first day of the workshop, participants selected 2013–2022 as the 10-year time period for the projections for the Haiti PROFILES 2013 estimates. It was agreed by participants that this time period is long enough for measurable change to occur. During the workshop, participants worked to populate the spreadsheets and develop preliminary PROFILES estimates. Participants also engaged in initial discussions on nutrition advocacy needs.

Following the PROFILES workshop, individual meetings were held with some of the workshop participants and other experts as part of the process to finalize the estimates. As a next step in the process, a nutrition advocacy planning workshop was held in November 2013 to develop a harmonized, multi-sectoral strategic nutrition advocacy plan, including a timeline for advocacy activities and development/dissemination of materials. In addition, nutrition advocacy materials were drafted.

Nutrition Problems and Consequences Addressed in Haiti PROFILES 2013

Haiti PROFILES 2013 calculates estimates of reductions in mortality and permanent disabilities and gains in economic productivity that can result from reductions in the prevalence of several nutrition indicators, namely, iron-deficiency anemia; low birth weight; vitamin A deficiency; iodine deficiency; and childhood stunting, underweight, and wasting. Haiti PROFILES 2013 estimates of economic productivity losses attributed to stunting and iodine deficiency are related to poor cognitive development, which affects school performance and, later in life, earning potential. Economic productivity losses related to iron-deficiency anemia among adults is a reflection of decreased capacity to do manual labor. The estimates PROFILES calculates from these nutrition indicators on health 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 6 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 or economic outcome in terms of lives saved or economic productivity gains, respectively.

Figure 6. Nutrition Problems and Consequences Addressed in Haiti PROFILES 2013



Data Sources for PROFILES and Prevalence of Nutrition Problems

To quantify the magnitude of the negative consequences of nutrition problems, PROFILES needs prevalence data for each of the nutrition indicators. For the anthropometry indicators (stunting, wasting, and underweight), the risk of mortality differs by the degree of severity. A collaborative and participatory process involving participants at the stakeholder meeting and in the PROFILES workshop was used to identify recent data sources (Table 1) and the prevalences of each of the nutrition indicators in the status quo scenario (Tables 2 and 3).

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

Table 1. Indicators and Data Sources for Haiti PROFILES 2013

Indicator	Source (Year)
Anthropometry (stunting, wasting, underweight) among under-5 children	Haiti EMMUS-V (2012)
Low birth weight	Haiti EMMUS-V (2012)
Vitamin A deficiency	MSPP/UNICEF (2005)
Anemia	Haiti EMMUS-V (2012)
Iodine deficiency (goiter)	WHO (2006)
Employment information	2007–2008 Enquête sur l'emploi et l'économie informelle (EEEI) (IHSI, 2010)
Maternal mortality ratio	Haiti EMMUS-IV (2005–2006)
Mortality in the first 5 years of life	Haiti EMMUS-V (2012)

Table 2. Estimated Reductions in Mortality and Disability Using Haiti PROFILES 2013

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2022 (status quo prevalence will be reduced by this proportion)	2022 reduced prevalence target (%)
Mortality					
Stunting, underweight, and wasting among children 0–59 months associated with under-5 child mortality	PROFILES was updated and expanded in 2008 and calculates mortality estimates for each anthropometric indicator (stunting, underweight, and wasting) by degree of severity. Black et al. (2008) calculated the odds ratios of mortality for each grade of malnutrition related to: stunting (mild 1.2, moderate 1.6, severe 4.1); underweight (mild 1.8, moderate 2.5, severe 9.7); and wasting (mild 1.5, moderate 3.0, severe 9.4). 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 totaled, 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 Haiti EMMUS-V (2012). Percentages of children in the mild category are from analysis of the data file from the Haiti EMMUS-V (2012).	Stunting: Mild 26.6 Moderate 14.1 Severe 7.8 In summary (moderate + severe): 21.9	Stunting: Mild 0.40 Moderate 0.60 Severe 0.60 In summary (moderate + severe): 0.60	Stunting: Mild 16.0 Moderate 5.6 Severe 3.1 In summary (moderate + severe): 8.8
			Underweight: Mild 23.8 Moderate 8.3 Severe 3.1 In summary (moderate + severe): 11.4	Underweight: Mild 0.30 Moderate 0.60 Severe 0.60 In summary (moderate + severe): 0.60	Underweight: Mild 16.7 Moderate 3.3 Severe 1.2 In summary (moderate + severe) 4.6
			Wasting: Mild 15.3 Moderate 3.9 Severe 1.2 In summary (moderate + severe): 5.1	Wasting: Mild 0.15 Moderate 0.40 Severe 0.40 In summary (moderate + severe): 0.40	Wasting: Mild 13.0 Moderate 2.3 Severe 0.7 In summary (moderate + severe): 3.1
Anemia during pregnancy related to maternal and perinatal mortality Pregnant women with anemia (Hb < 11) (%)	Anemia during pregnancy is an important contributor to maternal mortality, including through an increased risk of death from postpartum hemorrhage. Anemia during pregnancy also contributes to perinatal mortality, e.g., through increasing the risk of preterm delivery. The PROFILES spreadsheets calculate the contribution of iron-deficiency anemia to maternal and perinatal deaths based on the work by Stoltzfus et al. (2004), presuming that 50% of anemia is due to iron deficiency (an assumption that was also made by Stoltzfus et al.).	Haiti EMMUS-V (2012)	53.9	0.45	29.6

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2022 (status quo prevalence will be reduced by this proportion)	2022 reduced prevalence target (%)
Vitamin A deficiency associated with child mortality Children 6–59 months with vitamin A deficiency (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 diarrhea and measles). The PROFILES model that estimates child deaths attributable to vitamin A deficiency uses coefficients from Ross (2008).	2004–2005 national MSPP/UNICEF survey that included vitamin A deficiency (MSPP and UNICEF 2005)	32.0	0.53	15.0
Low birth weight related to mortality Newborn 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.	Haiti EMMUS-V (2012)	19.1	0.47	10.1
Permanent Disability					
Iodine deficiency associated with brain damage and disability as a result of deficiency in utero Population with goiter (%)	Iodine deficiency is the main cause of preventable brain damage worldwide. Iodine deficiency among pregnant women and during the first few months of infancy leads to irreversible brain damage of various degrees of severity in the infant.	Study from Central Plateau referenced by WHO (WHO 2006)	10.0	0.70	3.0

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

Nutrition problem	Rationale/assumptions	Data sources	Current prevalence (used for status quo scenario) (%)	Targeted reduction in prevalence by 2022*	2022 reduced prevalence target (%)
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 labor productivity based on the facts that stunting developed during the first 2 years of life is generally maintained throughout life and that the productivity of adults is related to their stature. Reduced adult stature due to stunting is a proxy indicator for various nutritional and other insults that can affect physical and mental development (the issue is not short stature per se). Using coefficients based on published scientific literature, PROFILES estimates reduced adult productivity related to both decreased physical capacity and reduced intellectual ability (affecting school achievement). The calculations use the "economic activity rate" (the population actually working, as well as those eligible to work, including those categorized as unemployed), discounting future wages at 3% per year, and adjusts for normal mortality. The lifetime discount factor is the sum of all the adjusted annual discounted years from 15 through 64 years of age. The lifetime discount factor is used to calculate the present day value of future economic productivity losses related to childhood stunting, based on the proportion of children 24–35 months old that were classified as stunted. The percentage of children classified as having severe, moderate, and mild stunting are considered, after subtracting the proportion of children expected in each of these categories (according to reference population values).	Percentages of children in the severe and moderate categories are based on the Haiti EMMUS-V (2012). Percentage of children in the mild category is from analysis of the data file from the Haiti EMMUS-V (2012).	Stunting (24–35 months): Mild 29.5 Moderate 18.8 Severe 9.6 In summary (moderate + severe): 28.4	Stunting (24–35 months): Mild 0.40 Moderate 0.57 Severe 0.57 In summary (moderate + severe): 0.57	Stunting (24–35 months): Mild 17.7 Moderate 8.1 Severe 4.1 In summary (moderate + severe): 12.2
Anemia among men and women related to productivity losses Non-pregnant women 15–49 years with anemia (Hb < 12) (%) Men 15–59 years with anemia (Hb < 13) (%)	Anemia among the working-age adult population contributes to reduced productivity for those engaged in physical labor, especially heavy physical labor. The PROFILES model uses the coefficients developed by Ross and Horton (1998) for the effects of iron-deficiency anemia on reduced capacity to carry out any type of physical labor and heavy physical labor.	Haiti EMMUS-V (2012) included anemia information for men and for 2 categories of non-pregnant women (lactating and non-lactating). Members of the Haiti PROFILES team calculated a weighted average to arrive at the anemia prevalence for all non-pregnant women. Information on anemia among men was from EMMUS-V (2012).	49.0 24.5	0.45 0.20	27.0 19.5
Intrauterine iodine deficiency related to future productivity losses Population with goiter (%)	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 goiter 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).	Study from Central Plateau referenced by WHO (WHO 2006)	10.0	0.70	3.0

* As proportion reduction applied to current prevalence.

The 2012 Haiti EMMUS-V provided the input information for anthropometry, low birth weight, and anemia among women. The anthropometry indicators in Table 2 present information used by the PROFILES spreadsheet models; for each of the three measures of undernutrition—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) undernutrition. Although there has been some improvements since the 2005–2006 survey, stunting levels are still fairly high (22 percent) among children under 5 years of age, and about 5 percent have wasting. Among newborn babies with a reported birth weight (based on the mother's recall or a written record available at the household level), 19.1 percent weighed less than 2.5 kg and were categorized as having low birth weight. (During the workshop, a different percentage was used because the Haiti EMMUS-V final report had not been published.) Anemia was found among 53.9 percent of pregnant women and 49 percent of women who were not pregnant. The PROFILES team used information from the 2012 Haiti EMMUS-V to calculate the anemia prevalence for non-pregnant women. Using the information for lactating women (who were not pregnant) and women who were neither lactating nor pregnant, the team calculated a weighted average to arrive at the anemia prevalence (49 percent) for both of these groups together (i.e., all non-pregnant women). For men the e prevalence of 24.5 percent was used from the 2012 Haiti EMMUS-V survey (Cayemittes et al. 2013).

A 2004–2005 national MSPP/UNICEF survey carried out by the Institut Haïtien de l'Enfance was the most recent source of information for vitamin A deficiency (MSPP and UNICEF 2005). Vitamin A deficiency (including subclinical deficiency) was found among 32.0 percent of children under 5 years of age. There was no national-level information available for the total goiter rate, the measure of iodine deficiency used by PROFILES; however, workshop participants agreed on using a figure of 10 percent for goiter prevalence. The only information on goiter prevalence was a study from the Central Plateau referenced by WHO (WHO 2006); this study found a prevalence of about 10 percent among adults. Participants in the PROFILES workshop were in agreement that this was the best available information to use for the status quo scenario.

Assumptions Related to Setting Targets for Reduction of Undernutrition

The estimates that PROFILES calculates are based on several assumptions. In the PROFILES spreadsheets, it is assumed that, over time, if different forms of undernutrition are reduced, there would be improvements in health and economic outcomes. As such, in the status quo scenario, it is assumed that the prevalences of various forms of undernutrition do not improve and remain unchanged, and consequently there is no improvement in health and economic outcomes. This is presented as lives lost for the health outcomes and economic productivity losses for the economic outcomes. In contrast, in the improved scenario, it is assumed that the prevalences of the different forms of undernutrition are reduced and, for each of these indicators, there is a corresponding improvement in specific health and economic productivity outcomes. To calculate the estimates in the improved scenario, there is a need to set targets for the reduction of the various forms of undernutrition, and the amount by which each form of undernutrition is to be reduced was discussed and agreed upon in consultation with stakeholders and PROFILES workshop participants. In Haiti PROFILES 2013 then,

the question was, by 2022, by how much do we assume that selected nutrition indicators will improve?

The 2022 targets for reduction in the prevalences of various nutrition indicators were discussed by participants in the stakeholder meeting and the PROFILES workshop. Participants agreed that the effort to generate estimates on the benefits of improved nutrition should be both optimistic and realistic, and that they should not only spur greater investment in nutrition but also foster hope for a Haiti 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 10-year time period, the targets set could be achieved.

Time Period and Targets

During the first day of the PROFILES workshop, participants decided on a 10-year time period, 2013 through 2022, to be used for PROFILES. To develop estimates for the improved scenario, participants also arrived at assumptions about reductions in prevalences by the year 2022 for the various nutrition indicators; the improved prevalence (by the year 2022) is also referred to as the "target prevalence." Stakeholders assumed that evidence-based, effective nutrition interventions would be implemented at scale and succeed in reaching the target by the year 2022. While nutrition interventions were not included in the PROFILES spreadsheet models, the subsequent steps in the nutrition advocacy process can address the need for various nutrition interventions, services, or programs, as well as issues related to the nutrition policy environment.

In the improved scenario, a linear reduction in prevalence levels is assumed, that is, the nutrition prevalence levels in the spreadsheet models gradually improve from the status quo prevalence levels in 2013 to the 2022 targets.

To arrive at the 2022 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. Targets referred to in documents from the 2012 World Health Assembly were also considered. WHO's Nutrition Landscape Information System provided insights on various prevalence cutoff values and the degree of public health significance.

Tables 2 and 3 include the targeted reduction in prevalence (shown as a proportion to be applied to the status quo prevalence) and the consequent target prevalence for the year 2022 (shown as a percentage). Participants in the June 2013 workshop also considered trend information, for the indicators where this was available, as well as factors related to potential improvement in interventions. Based on feedback from MSPP, during the November 2013 Nutrition Advocacy Planning Workshop with key stakeholders, three targets were revised: stunting among children 24–35 months, vitamin A deficiency, and low birth weight. The target for stunting among children 24–35 months was revised to have consistency with the stunting target for children 0–59 months (so both indicators were reduced by approximately 60 percent). During the November 2013 workshop, participants decided a larger reduction in vitamin A deficiency would be more realistic than was envisaged during the June 2013 workshop; this would change the target from a vitamin A deficiency prevalence of 24 percent to 15 percent by 2022. In November, a more ambitious target was also decided on for reducing low birth weight. This was felt to be realistic and would also serve to spur

increased advocacy effort and greater emphasis on interventions to reduce low birth weight, as prevalence has remained high in all EMMUS surveys.

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

For stunting (moderate and severe) among children under 5 years of age, a decrease by 0.60 of the status quo percentage (21.9 percent) was agreed upon, with a consequent target prevalence of 8.8 percent by 2022. Stunting among children 24–35 months was reduced by about the same proportion (0.57) as stunting among children 0–59 months of age from a status quo prevalence of 28.4 percent to a target prevalence of 12.2 percent (this is used to calculate increased economic productivity due to reductions in stunting). For underweight (moderate and severe) among children under 5 years of age, the status quo prevalence was 11.4 percent, to be reduced by 0.60 to a target prevalence of 4.6 percent by 2022. For wasting (moderate and severe), the status quo prevalence was 5.1 percent, to be reduced by 0.40 to a target prevalence of 3.1 percent. A reduction by 0.45 was agreed on for anemia during pregnancy (under the assumption that interventions to address iron-deficiency anemia would be put in place and that the target prevalence would be reached). A reduction by 0.53 was agreed upon for the prevalence of vitamin A deficiency among children 6–59 months, from 32.0 percent in the status quo scenario to reach a target prevalence of 15.0 percent by 2022. For low birth weight, a reduction by 0.47 was agreed on; with a status quo prevalence of 19.1 percent, the consequent target prevalence was 10.1 percent. The goiter rate was assumed to be reduced from 10.0 percent in the status quo scenario to a target prevalence of 3.0 percent by 2022 in the improved scenario, reflecting a reduction by 0.70.

Demographic and Employment Information

PROFILES requires demographic information with projections into future years that correspond to the time period used in the projections (for Haiti, 2013–2022). Selected information was obtained from the United Nations Population Prospects online database (United Nations 2013a and 2013b) and used in conjunction with both the estimated total population for 2012, which, according to IHSI (2012) was 10 413 211, and a PROFILES calculator tool to obtain the various demographic estimates required by PROFILES for each year.

Necessary employment information included the economic activity rate (the percentage of the working-age population actually working or available for employment, including those who were unemployed), the percentage of working-age persons who did manual labor, the percentage of working-age males who did manual labor, and the percentage of working-age females who did manual labor. Information from a 2007–2008 survey on employment and the informal economy, l'Enquête sur l'emploi et l'économie informelle (EEEI) was used to obtain employment information (IHSI 2010). The results of the survey included information on the economic activity rate for males and females combined, along with the economic activity rate among males and among females separately. Among those who were actively working, the percentage doing manual labor was based on the following: those who worked in agriculture, hunting and forestry, fishing and fish farming, aquaculture, extractive activities, manufacturing, and construction. The manual labor information needed by the PROFILES spreadsheets was obtained by applying the manual labor

percentage to the economic activity rate. To obtain the manual labor information required for males and for females, it was assumed that the proportion who worked in manual labor was the same for both (because this information was not available separately for males and females); this proportion was then applied to the economic activity rate for males and for females. Workshop participants decided to use per capita gross domestic product (GDP) as a proxy for wages.

The 2012 Haiti EMMUS-V was the source of information on the neonatal mortality rate (31 per 1 000 live births), infant mortality rate (59 per 1 000 live births), under-5 mortality rate (88 per 1 000 live births). For the perinatal mortality rate, not available in the Haiti EMMUS-V report, workshop participants decided to use a conservative figure of 21 per 1 000 births. The maternal mortality ratio (630 per 100 000 live births) was based on the 2005–2006 EMMUS-IV because this information was not included in the 2012 survey.

4. Results

The results from Haiti PROFILES 2013 are presented in Tables 4–6 and Figures 7–12.

Table 4 and Figures 7 and 9 show that if stunting and wasting levels remain unchanged from 2013 through 2022, the number of deaths related to stunting (total of 31 960) and wasting (total of 23 623) in children can be expected to remain steady every year. However, Table 4 and Figures 8 and 10 show that if high coverage of effective nutrition interventions are implemented and succeed in reducing stunting and wasting levels to their assumed targets, children's lives could be saved from stunting- and wasting-related deaths. In the 2013–2022 time period, assuming a steady decrease in stunting levels, the lives of 9 073 children under 5 years will be saved. Similarly, assuming a steady reduction in wasting levels over the 2013–2022 time period, the lives of 3 811 children under 5 years will be saved.[1]

Table 4 shows that in the status quo scenario, with no improvement and no change in the prevalence of maternal iron-deficiency anemia, there would be 2 947 maternal deaths related to pregnancy and childbirth and 7 837 perinatal deaths. Table 4 and Figure 11 show that reaching targeted reductions in prevalence of maternal iron-deficiency anemia by 2022 could save 1 352 women's lives and avert 4 039 perinatal deaths over the 2013–2022 time period. In addition, Table 4 shows that if there was no change in the prevalence of low birth weight, there would be 41 408 deaths related to this problem during 2013–2022. However, Figure 11 shows that 7 441 infant deaths could be averted by reductions in low birth weight. During the time period 2013–2022, there would be 22 481 under-5 deaths related to vitamin A deficiency if prevalence levels of this problem remained unchanged. However, 5 142 child deaths could be averted by reductions in vitamin A deficiency. If iodine deficiency remains unchanged, 261 257 children would be born to iodine-deficient mothers (see Table 5); 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 2022 could result in preventing permanent brain damage in 90 703 children over the 2013–2022 time period (see Figure 11). Globally, brain damage from intrauterine iodine deficiency is a leading cause of preventable brain damage.

Economic productivity losses related to stunting among young children, iron deficiency among adults, and iodine deficiency are shown in Table 6. If stunting levels remain unchanged during 2013–2022 at the current high level, productivity losses related to stunting would be around US$959 million. Productivity losses related to adult iron-deficiency anemia would be about US$206 million if this problem remained unchanged, and, if there was no improvement in iodine deficiency, there would be related economic productivity losses of about US$99 million.

Table 6 and Figure 11 show the economic productivity gains that could be achieved if the prevalence of stunting, iron-deficiency anemia in adults, and iodine deficiency could be significantly reduced over the 2013–2022 time period. Overall, economic gains through

[1] There is some overlap in the deaths associated with stunting and with wasting.

increased productivity as a result of improved nutrition exceed US$218 million for Haiti by 2022. The economic productivity gains by reducing each of these nutrition problems would be: stunting – US$218 million; iodine deficiency – US$34 million, and iron-deficiency anemia among adults – US$37 million.

Table 4. Deaths Attributable to Various Nutrition Problems and Lives Saved Related to Improved Nutrition

Nutrition problem	Number of deaths under the status quo scenario 2013–2022	Number of lives saved under the improved scenario 2013–2022*
Anthropometric Indicators		
Deaths/lives saved attributable to **stunting** (severe, moderate, and mild) among children < 5 years of age	31 960	9 073
Deaths/lives saved attributable to **underweight** (severe, moderate, and mild) among children < 5 years of age	42 852	10 683
Deaths/lives saved attributable to **wasting** (severe, moderate, and mild) among children < 5 years of age	23 623	3 811
Low Birth Weight		
Infant deaths/lives saved	41 408	7 441
Iron-Deficiency Anemia		
Maternal deaths/lives saved	2 947	1 352
Perinatal deaths/lives saved	7 837	4 039
Vitamin A Deficiency		
Child deaths/lives saved	22 481	5 142

* Including through at-scale implementation of effective nutrition interventions that succeed in reaching the stated targets in terms of reductions in the prevalence of the various nutrition problems.

Table 5. Iodine Deficiency and Child Disability

Nutrition problem	Number of children that would have mild to severe permanent brain damage under the status quo scenario 2013–2022	Number of children for whom disability as result of maternal iodine deficiency would be prevented under the improved scenario 2013–2022*
Child disability related to maternal iodine deficiency	261 257	90 703

* Including through at-scale implementation of effective interventions that succeed in reaching the stated targets in terms of reductions in the prevalence of the nutrition problem.

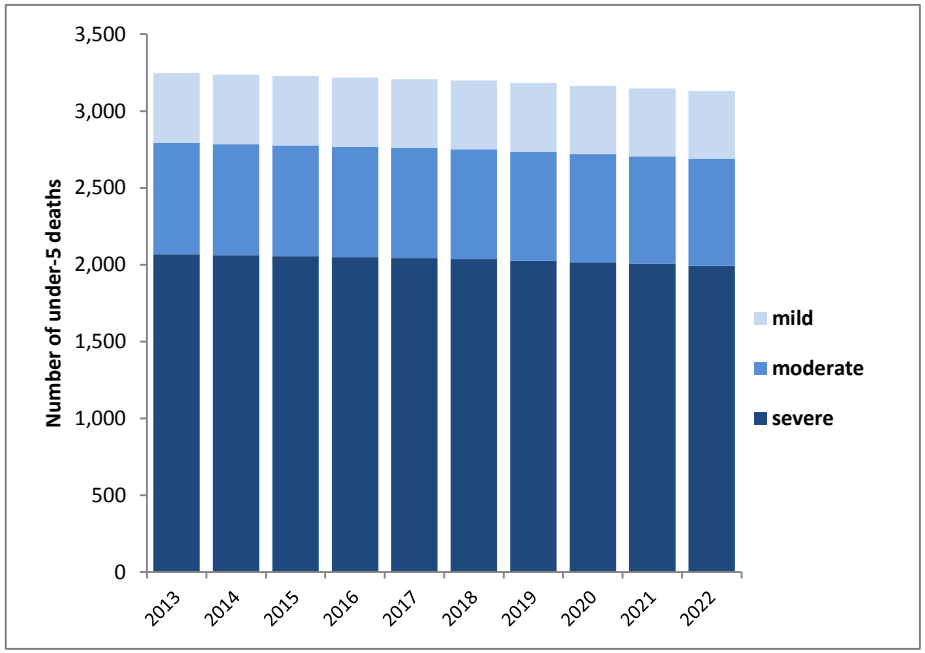
Table 6. Economic Productivity Losses and Gains*

Nutrition problem	Economic productivity losses under the status quo scenario 2013–2022	Economic productivity gains under the improved scenario 2013–2022**
Stunting	US$959 million (42 229 184 741 Haitian Gourdes)	US$218 million (9 589 968 265 Haitian Gourdes)
Iron-deficiency anemia	US$206 million (9 079 395 441 Haitian Gourdes)	US$37 million (1 641 904 522 Haitian Gourdes)
Iodine deficiency	US$99 million (4 391 754 511 Haitian Gourdes)	US$34 million (1 524 732 262 Haitian Gourdes)

*Exchange rate: US$1 = 44 Haiti Gourdes.

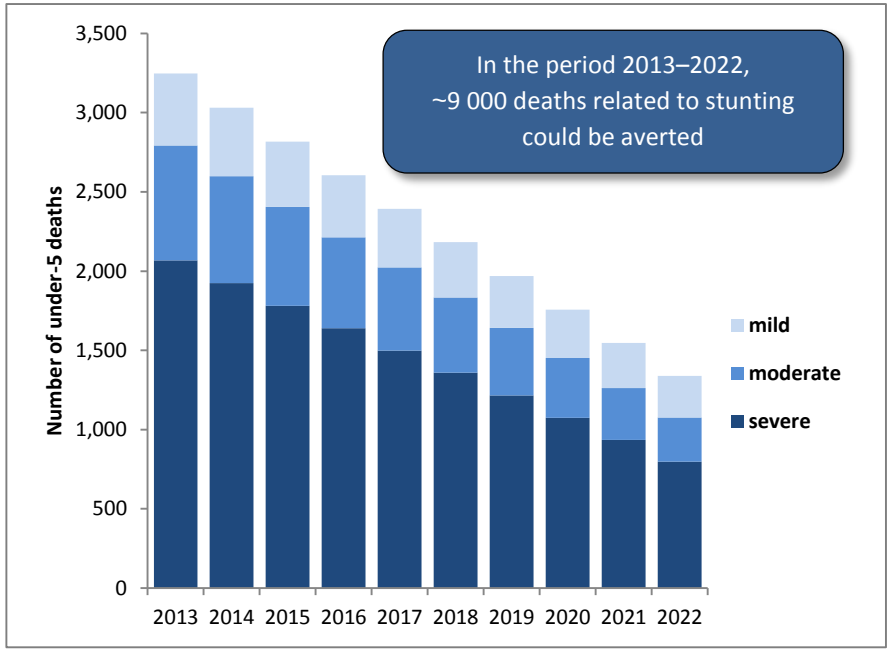
** Including through at-scale implementation of effective nutrition interventions that succeed in reaching the stated targets in terms of reductions in the prevalence of the various nutrition problems.

Figure 7. Status Quo Scenario: Number of Deaths for Children under 5 Years Related to Stunting,* 2013–2022



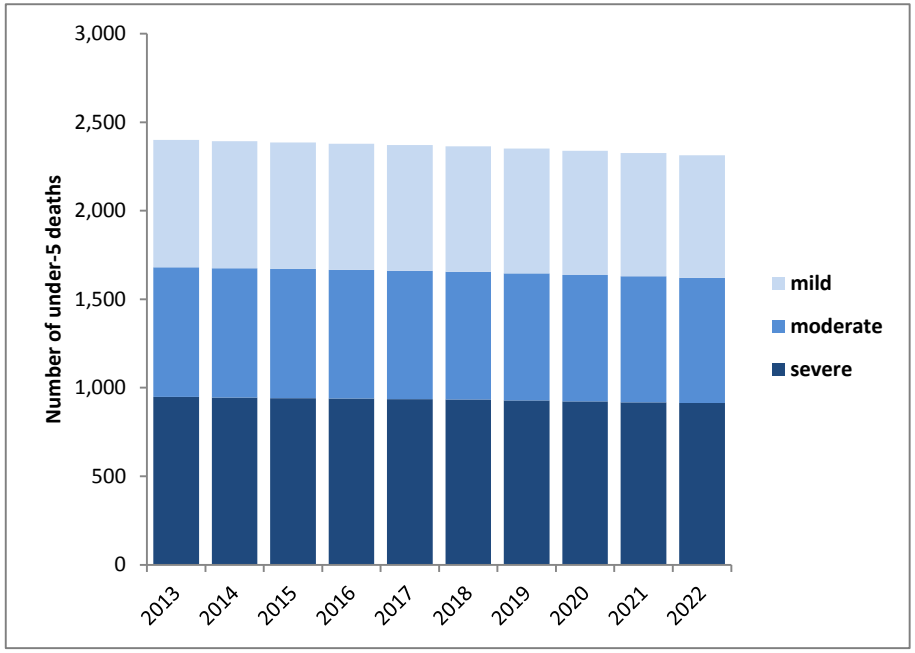
* Mild, moderate, and severe stunting (low height-for-age)

Figure 8. Improved Scenario: Decreasing Number of Deaths for Children under 5 Years Related to Stunting,* 2013–2022



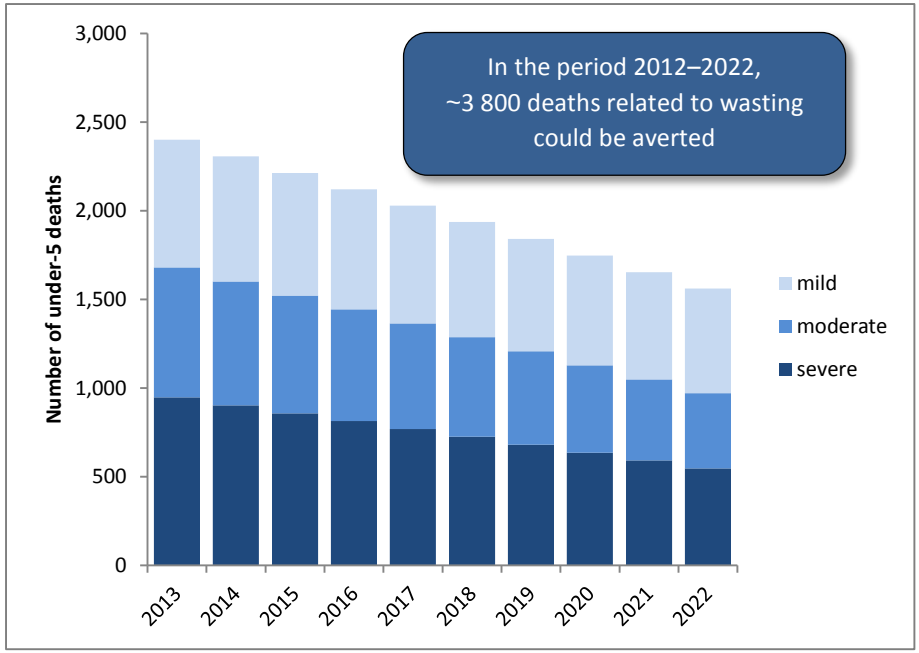
* Mild, moderate, and severe stunting (low height-for-age)

Figure 9. Status Quo: Number of Deaths for Children under 5 Years Related to Wasting,* 2013–2022



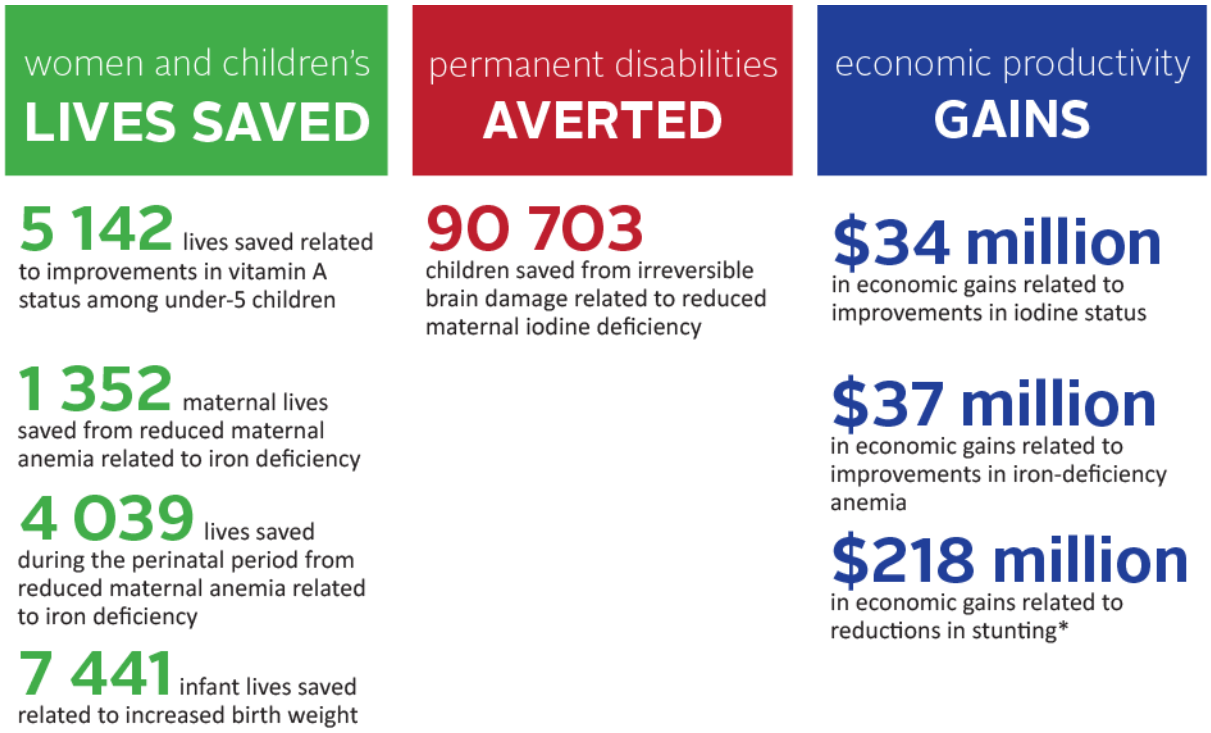
* Mild, moderate, and severe wasting (low weight-for-height)

Figure 10. Improved Scenario: Decreasing Number of Deaths for Children under 5 Years Related to Wasting,* 2013–2022



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

Figure 11. Lives Saved, Permanent Disabilities Averted, and Economic Productivity Gains, 2013–2022



* 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 gains related to reduced anemia prevalence refer to adults (women and men). Note: Numbers in US$ are rounded. Please refer to Table 6 for Haitian Gourdes.

5. Implications for Policy and Practice

The PROFILES estimates for Haiti clearly show that expanding access to maternal and child nutrition services at scale across the country could result in significant health and development benefits for the country, including significant gains in the health and well-being of the country's citizens, reduced maternal and child mortality, and improved economic productivity. As such, nutrition is a crucial investment for Haiti. These estimates, however, inherently assume 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 the prevention and treatment of all forms of malnutrition, and that the interventions will succeed in reaching the stated targets in terms of improvement of various nutrition problems.

Therefore, a greater investment and commitment by the Government of Haiti is required to create an enabling environment for improved nutrition, and a 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 Haiti, are to be achieved.

Specifically, stakeholders discussed the following recommendations in Haiti.

1. **Develop and finalize a cross-cutting strategic and multi-sectoral national nutrition advocacy plan.** This plan, developed using a consultative approach with key stakeholders, should specify key advocacy audiences, desired changes per audience, barriers inhibiting that change, advocacy objectives to address barriers per audience, and indicators to measure the success of efforts and the means of monitoring. In addition, the plan should include an implementation matrix outlining advocacy activities and materials to be developed and disseminated with a timeline. During this process, it is expected that stakeholders will commit to implementing specific activities outlined in the plan in partnership with the Government of Haiti and other partners. The process of developing a nutrition advocacy plan would facilitate greater harmonization of efforts and ensure stakeholders working on nutrition are speaking in one coordinated voice in promoting nutrition in Haiti.
2. **Draft and enact legislation that supports improved nutrition.** Stakeholders discussed priority policies that the Government of Haiti should commit to, including policies that promote micronutrient food fortification, restrict marketing of breast milk substitutes, and provide an enabling environment for women to exclusively breastfeed.
3. **Improve access to nutrition services across Haiti.** While the PROFILES tool has been used to estimate the benefits of reductions of iron-deficiency anemia; low birth weight; vitamin A deficiency; iodine deficiency; and childhood stunting, underweight, and wasting in Haiti, these benefits can only be achieved through expanded evidence-based services that enable improved nutrition at the household level. Services should focus on the continuum of care from prevention to treatment of malnutrition and should include strengthening capacity of health workers to implement nutrition services. Effective supervision, monitoring, evaluation, and research will be important for ensuring quality service delivery and oversight of integrated nutrition services.

4. **Ensure proven, effective, and quality nutrition-specific and nutrition-sensitive interventions are implemented at scale throughout the country.**

   Nutrition-specific interventions should focus on:

   - Support for exclusive breastfeeding up to 6 months of age and continued breastfeeding, together with appropriate and nutritious food, up to 2 years of age
   - Fortification of foods
   - Micronutrient supplementation
   - Treatment of severe malnutrition
   - Prevention of chronic malnutrition
   - Prevention of low birth weight
   - Promoting prevention of adolescent pregnancy
   - Providing nutrition counseling and support to adolescents

   Nutrition-sensitive interventions should focus on:

   - Agriculture: Making nutritious food more accessible to everyone, and supporting small farms as a source of income for women and families
   - Clean water and sanitation: Improving access to clean water to reduce infection and disease
   - Education and employment: Making sure children are well nourished to enable them to learn and earn sufficient income as adults
   - Health care: Improving access to services to ensure that women and children stay healthy
   - Support for resilience: Establishing a stronger, healthier population and sustained prosperity so that they can better endure emergencies and conflicts
   - Women's empowerment: At the core of all efforts, women are empowered to be leaders in their families and communities, leading the way to a healthier and stronger nation

5. **Ensure regular financing for nutrition, from both national and international funds.** Increasing resource allocation for nutrition in tandem with efforts to strengthen integrated implementation of nutrition services at scale will help Haiti achieve the targets set in PROFILES.

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Appendix A. Participants in PROFILES Stakeholder Meeting and PROFILES Workshop

Participant's Surname	Participant's First Name	Organization
Affricot	Jean Franklin	MSPP/DSPE
Alcéus	Jean Antoine	MSPP
Alexis	Mona	CNSA
Anderson	Matthew	USAID
André	Rock	Groupe Croissance
André	Charlemagne	MSPP
Arcens	Bernard	FAO
Arvelo	Nazlie	Option Plus
Beliard	Evens	MSPP
Bien Aimé	Eveline	MCFDF
Bonostro	Murielle	Programme Alimentaire Mondial
Brutus	Jean Robert	UNAG
Brutus	Marie Claire	UNAG
Byron- Louis	P. Andrée	MSPP/DPSPE
Catulle	Beaudouin	DINEPA
Charles	Lynda	MSPP/UCPNANu
Chéry Lainé	Sandra	MSPP
Clerveaux	Christmen R.	MSPP/UCPNANu
Compère	Kerby	MSPP/UCPNANu
Conille	Serge	MSH
Desrosiers	Alix	MEF
Diene	Serigne	FANTA
Dorlien	Renand	IHSI
Dorvélus	Sophia	LCH/Droits Humains
Duperval	Marie Yves P.	Croix Rouge Haïtienne
Eliancy	Kerline	MSPP/UCPNANu
Eloi	Mimose	IHSI
Eustache	Laurent	FUTURIST
Eveillard	Roberte	FANTA
Exumé	Rose Mireille	JSI/SPRING
Fleurantin	Josué	WDA
François	Sanon	RIDEL
Gilles	Gaby Antonelly	FAES
Henry	Marie Mireille	MSPP/UCPNANu
Hilaire	Jean Ulysse	CNSA
Jasmin	Pierre Eric	MTPTC
Jean	Mélissa	Université Quisqueya

Participant's Surname	Participant's First Name	Organization
Jean	Fanélise	MENFP
Jean	Emmanuelle	MSPP/UCPNANu
Jean-Simon	Junier Pleunès	MSPP/UCPNANu
Jérôme	Jean Lyonel	LCH/Droits Humains
Joseph	Fanor	JSI/MEASURE
Labissiere	Yvon	MSPP/UCPNANu
Larosilière	Jean Guy	Ministère du Commerce et de l'Industrie
Lêlio-Joseph	Max	FANTA
Lerebours	Gerald	JSI/SPRING
Mahotière	Jean Rock	DEH
Marhône Pierre	Joseline	MSPP/UCPNANu
Medela	Monique	MSPP/UCPNANu
Mésadieu Coulanges	Erline	UNAG
Montinor	Jean Marie	MSPP/PEPFAR
Moses	Philip	FANTA
Odney	Pierre Ricot	MAST
Philistin	Edrige	NADIEH
Pompilus	Roseline	MSPP/UCPNANu
Quessa	Gudide	MSPP/UCPNANu
Racine	Nicole	JSI/SPRING
Ralph	Bridget	FANTA
Rozefort	D. Donald	MAST
Saint Fleur	Jean Earnest	UNICEF
Saint Hubert	Francis	MHAVE
Sénécal	Maude	Groupe Croissance SA
Sévère	Rachèle G.	MSPP/DSI
Sommerfelt	Elisabeth	FANTA
Sylla Jeanty	Dianette	MSPP/UCPNANu
Telfort	Marc-Aurèle	MSPP/PEPFAR
Thimogène	Raymond	MEF
Tibel	Erchell	JSI/SPRING
Toussaint	Gabriel	LCH/Droits Humains
Traoré	Antoinette	OPS/OMS