

HANDBOOKS

Closing the gap

A model for estimating the cost
of eradicating stunting and
micronutrient deficiencies

Rodrigo Martínez
Amalia Palma



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Summary

One of the serious problems facing Latin America and the Caribbean is the prevalence of stunting, which occurs at a rate of 13.3%, affecting nearly 7.5 million children under the age of five. In addition, 39.5% of children under the age of five suffer from anaemia in the region, though rates vary considerably from country to country. This is a problem because chronic undernutrition and micronutrient deficiencies have an adverse effect on human development in utero, while nursing and during the first years of life, with the potential for both short- and long-term consequences.

At present, there is considerable scientific evidence of the positive impact that various interventions have on reducing the different manifestations of undernutrition. Stronger coordination of actions by public policy sectors, levels of government and social organizations is needed, with a special emphasis on pregnant and nursing women and on children under the age of 24 months. However, despite this awareness, the region must work on developing instruments to improve the decision-making capacity of those who are in charge of implementing policies, in an effective and efficient manner, particularly in relation to assessments of the organizational and investment needs that must be met to close the existing gap.

The Economic Commission for Latin America and the Caribbean (ECLAC) and the World Food Programme (WFP), both agencies of the United Nations System, have agreed to carry out a study to estimate the costs related to adopting more effective actions to fight stunting and micronutrient deficiencies in vulnerable populations. This document proposes a methodology for performing this analysis that can be replicated in various countries in the region.

The first part of the document defines the analytical framework and areas of intervention, for purposes of selecting the most effective set of interventions for eradicating chronic undernutrition. This framework is based on previous work by ECLAC and WFP; interventions were identified based on a series of works published in *The Lancet* in 2008 and 2013.

The second chapter gives a detailed estimate of the coverage deficit and the associated costs to maximize the policy impact. Lastly, final comments are presented, including a discussion of the challenges involved in applying this methodology in the region's countries.

Introduction

Undernutrition is a condition caused by insufficient food intake, in terms of quantity and quality, and the presence of infectious diseases. The most common symptoms are: low weight for age, low height for age, low weight for height and micronutrient deficiencies (Horton and others, 2010).

Chronic undernutrition is one of the most precise anthropometric indicators for estimating childhood undernutrition (Black and others, 2008). Also known as (linear) growth retardation, it refers to a height-for-age that is more than two standard deviations below the median for the reference population and the results of a failure of adequate growth in terms of length/height (PAHO, 2008).

In Latin America and the Caribbean, stunting occurs at a rate of 13.3%, affecting approximately 7.5 million children under the age of five.¹ Regionally, Guatemala has the highest rate of chronic undernutrition among children under five, at 48%, followed by Haiti and Honduras with rates of 22% and the Plurinational State of Bolivia with a rate of 18%.

Other manifestations of undernutrition are micronutrient deficiencies, which have become a public health problem in the countries of Latin America and the Caribbean. Generally, these are associated with poverty and the consumption of food with low nutrient content, specifically low vitamin and mineral content. Micronutrient deficiencies are most commonly seen in pregnant and nursing women and in children under the age of two, inasmuch as these groups have higher vitamin and mineral requirements. The highest deficiency rates seen during these stages of growth and development are for iron, vitamin A, iodine and zinc.

Of all known micronutrient deficiencies, iron deficiency is the most common globally and presents a public health problem in industrialized and non-industrialized countries alike (McLean and others, 2009). The most severe form of iron deficiency is anaemia (WHO, 2001), which affects approximately two billion people worldwide (WHO, 2007).

¹ The data have been compiled by ECLAC, on the basis of the Global Health Observatory data repository and official sources, and correspond to the 2005-2012 period. The average is weighted by the reference population.

The most common causes are iron-deficient diets, infectious diseases like malaria, hookworm infection, deficiencies of other nutrients (such as folate, vitamins B12 and A or any condition that affects red blood cells) and thalassaemia (WHO, 2007).

In the region, the rate of anaemia among children under the age of five is 39.5%, with considerable disparities between countries. Whereas the rate of prevalence is 47.7% in Guatemala, it is around 7.6% in Costa Rica.

Stunting and micronutrient deficiencies impair development in utero, while nursing and during the first years of life, critical stages of growth that affect and are affected by social and economic determinants. These conditions can have both short- and long-term consequences on cognitive and behavioural development, affecting the psychomotor, affective and sensorial development of infants, school performance, labour productivity and income, while also increasing the risk of diabetes, hypertension and cardiovascular diseases (Victoria and others, 2008; ECLAC/UNICEF, 2006). Accordingly, this period—from pregnancy to 24 months of age—has come to be known as the 1,000-day window of opportunity.

There is an abundant body of scientific evidence of the positive impact of various interventions for reducing the different manifestations of undernutrition, particularly the prevalence of chronic undernutrition and micronutrient deficiencies. This body of evidence includes relevant works compiled in *The Lancet* series (2008 and 2013) and the advances of national food and nutritional security policies in the region, both specifically in terms of nutritional interventions and generally in terms of social and economic determinants.

Given the multiple causes of the problem, in order to reduce the likelihood of high rates of undernutrition, better coordination of the actions of various public policy sectors, levels of government and social organizations is needed, with special emphasis on pregnant and nursing women and on infants and children to 24 months of age.

Both globally and regionally, there is consensus as to the priority population, the most important interventions and the need to coordinate across sectors to address the multidimensionality of chronic undernutrition. However, in the region, efforts are needed to develop instruments that will improve the decision-making capacity of those who are in charge of implementing policies, in an effective and efficient manner, particularly in relation to assessments of the organizational and investment needs that must be met to close the existing gap.

In view of the above, the Economic Commission for Latin America and the Caribbean and the World Food Programme (WFP), both agencies of the United Nations System, have agreed to carry out a study to estimate the costs related to adopting more effective actions to fight chronic undernutrition and micronutrient deficiencies in vulnerable populations. Specifically, the plan is to develop a model that can be replicated in various countries and regions to estimate the investment needed to reduce the prevalence of chronic undernutrition to rates below 2.5% in the countries of Latin America and the Caribbean.

To estimate the costs of closing the gap in a country, this document presents a proposal based on an ex ante evaluation methodology, which basically involves the following:

1. Estimating the percentage and size of the undernourished population and the population at high risk of becoming undernourished.
2. Analysing the health and nutritional policy components currently in place in each country and evaluating the expected impact, as well as the optimal set of interventions.
3. Evaluating the unit costs of each intervention, considering differential levels of difficulty according to the type of population and its requirements.
4. Quantifying coverage gaps in order to universalize access to each component in the set of interventions.
5. Estimating the incremental cost of achieving universal coverage.

In order to test the feasibility of implementing the methodological proposal and identify alternate options, two countries were selected as pilot cases: Peru and Guatemala. The document presents part of the results of these cases as an example of some of the benefits, problems and challenges posed by this type of work.

It then outlines the steps required to come up with an estimate of the resources needed to close the gap in coverage with respect to interventions as well as population coverage to eradicate chronic undernutrition and micronutrient deficiencies in the countries of Latin America and the Caribbean. These are divided into two chapters: (i) definition of the analytical framework and areas of intervention; and (ii) analysis of the coverage gap and associated costs for maximizing impact, with the goal of achieving eradication.

I. Analytical framework and areas of intervention

Estimating the cost of eradicating chronic undernutrition and micronutrient deficiencies requires a decision-making process that is based on an analysis of the effectiveness and efficiency of certain interventions, in order to ensure that the goal can be met as quickly as possible with the fewest resources possible. To begin, an analytical and policy framework is needed in order to prioritize the interventions and guide the process, as well as to analyse policy alternatives for each country.

This involves:

- Establishing an analytical framework for undernutrition that identifies and explains its causes and consequences;
- Identifying and analysing the specific actions and areas of intervention proposed by global and regional initiatives for the eradication of stunting and micronutrient deficiencies;
- Selecting the most appropriate set of interventions for eradicating stunting and micronutrient deficiencies based on an analysis of the initiatives.

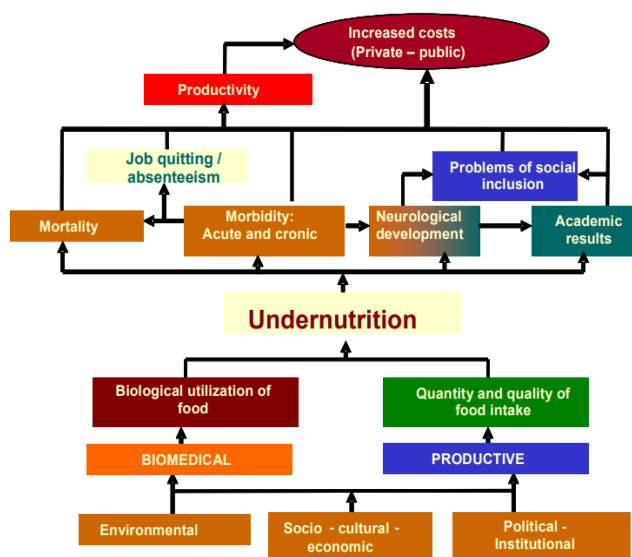
A. Analytical framework for undernutrition

As a first step in analysing the design, implementation and costs of deploying a policy to eradicate undernutrition in a country, an explicit analytical framework must be established, under which a coordinated set of interventions will emerge.

Considering the social and cultural determinants, various analytical frameworks have been developed to explain the main causes and consequences of the phenomenon of undernutrition, particularly stunting and micronutrient deficiencies. Based on experience in the region, the analytical framework proposed to analyse the cost of closing the undernutrition gap is the one that was developed by ECLAC and WFP as part of a study on the cost of hunger (Martínez and Fernández, 2007). As illustrated in chart 1, this framework identifies the basic causes of undernutrition as environmental, social-cultural-economic and political-institutional in nature. Collectively, these affect underlying productive and biomedical causes, which in turn drive immediate causes, such as the quantity and quality of food intake and absorptive capacity.

As for the consequences, undernutrition is associated with increased morbidity and mortality rates, impaired neurological development and educational failure, which have the combined effect of lowering productivity and raising health and education costs. It is important to note that overweight and chronic non-communicable diseases are among the long-term consequences of childhood undernutrition.

Chart 1
Analytical framework of the causes and consequences of undernutrition



Source: R. Martínez and A. Fernández, “El costo del hambre: impacto social y económico de la desnutrición infantil en Centroamérica y República Dominicana”, *Project Documents*, No. 144 (LC/W.144/Rev.1), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), October 2007.

B. Proposed areas of intervention at the global and regional levels

Once the analytical framework has been established, it is important to identify the areas of intervention that will help solve the problem of undernutrition, particularly in relation to low height and micronutrient deficiencies in Latin America. To this end, the region's countries have proposed various strategies, generally under the food and nutritional security approach. Meanwhile, 2008 and 2013 series published in *The Lancet* identify priority areas of intervention based on impact, as determined by empirical evidence around the world, which are summarized in the framework for action developed for the Scaling Up Nutrition (SUN) initiative.

The SUN initiative proposes a framework to enable the participating countries to achieve their nutrition goals through two strategic areas of intervention: “(1) rapid scaling-up of specific nutrition interventions of proven effectiveness; and (2) implementation of sectoral strategies that are nutrition-sensitive (i.e. responsive to the nutritional needs of individuals, households and societies” (SUN, 2012).

Based on scientific evidence from evaluations of specific programmes implemented in regions around the world,² the SUN initiative sets out, for the first area, a set of 13 specific nutrition interventions built around the 1,000-day window of opportunity from pregnancy (9 months) to the second year of life, with resources concentrated on interventions that generate a direct impact on the

² Annex 1 summarizes the impacts and/or effects, products and target populations associated with each of the 13 interventions (Horton and others, 2010).

growth and development of the child while also offering a cost-effective way to reduce maternal and child mortality and contribute to the cognitive, physical and social development of infants (see table 1).

Table 1
Specific interventions proposed by Scaling Up Nutrition
for the prevention and eradication of undernutrition

Promotion of good nutritional practices
Breastfeeding
Complementary feeding for infants after the age of six months
Improved hygiene practices and water use
Provision of micronutrients for young children and pregnant and nursing women
Periodic vitamin A supplements
Periodic zinc supplements for diarrhoea treatment
Micronutrient powders
De-worming drugs for children
Provision of micronutrients through food fortification
Iodized oil capsules where iodized salt is unavailable
Salt iodization
Iron fortification of staple foods
Therapeutic feeding for malnourished children with special foods
Prevention and treatment for moderate undernutrition
Treatment of severe acute malnutrition with ready-to-use therapeutic foods (RUTF) and fortified blended foods (corn-soy blend, CSB)

Source: Scaling Up Nutrition (SUN), *Scaling Up Nutrition: A Framework for Action*, September 2010.

Despite the empirical strength of the SUN initiative and the proposed interventions, as indicated in a recent special issue of *The Lancet* (Bhutta and others, 2013), in order to maximize their impacts, these interventions must be part of broader national policies, or complementary interventions must be deployed for the same objective, in order to properly address the multiple causes of the phenomenon.

The foregoing suggests the need to also work with the food and nutritional security framework, which has primacy in most countries in Latin America and the Caribbean. This framework identifies the interventions that are recommended for the prevention of undernutrition, taking into consideration all social, economic and cultural causes that contribute to the problem. In this context, the interventions proposed under the SUN initiative are part of the policy proposals for the food and nutritional security framework, which are a set of specific interventions for tackling stunting.

The food and nutritional security approach provides a strategic coordination framework for a State policy with interventions designed to strengthen the right to food security and adequate nutrition. Food and nutritional security is defined as “a status in which all people enjoy, in a timely and permanent manner, physical, economic and social access to the food that they need, in the quantity and quality necessary for their adequate consumption and biological utilization, thus guaranteeing the general well-being that contributes to their development” (PAHO, 1991). In short, the food and nutritional security framework establishes the lines of activity that are needed to implement cost-effective interventions in the region of Latin America and the Caribbean, in the scope of national policies for fighting poverty and undernutrition.

Table 2
Food and nutritional security policies

Thematic areas of intervention	Policies
1. Food production and access	<p>Facilitate access to productive assets related to land, equipment and financing for the most vulnerable families.</p> <p>Encourage improvement of soils, sound water management and storage, and extension activities that foster the capacity for partnerships/associations and the industrialization of productive processes.</p> <p>Promote and improve food practices based on native and traditional products.</p> <p>Produce supplementary food with high nutritional value for children under the age of two.</p>
2. Infrastructure	<p>Invest in schools and health services.</p> <p>Invest in potable water and sanitation services in marginal areas.</p> <p>Invest in irrigation infrastructure.</p> <p>Establish channels to facilitate the marketing of local products and the distribution of food in emergency situations.</p>
3. Trade	<p>Promote further advances in trade agreements regarding food products.</p> <p>Promote formulas that prevent the exclusion of small producers from modern food production and marketing processes.</p> <p>Develop policies:</p> <ul style="list-style-type: none"> -Short-term policies should focus on ensuring the continuity of the payment chain and on providing dollar liquidity for the financial system. -Medium-term policies should be designed to promote countercyclical macroeconomic policies that include investment in infrastructure and logistics, encourage the diversification of export products and markets, and develop public-private partnerships for innovation and competitiveness, while improving the quality of markets and institutions.
4. Food safety and quality	<p>Strengthen sanitary control systems to protect food safety.</p> <p>Maintain and improve micronutrient fortification programmes.</p> <p>Improve product quality, and invest in new technologies, training and hygiene.</p>
5. Food aid	<p>Provide food supplements and fortification for pregnant women, wet nurses, nursing infants and pre-school children.</p> <p>Provide school food programmes.</p> <p>Distribute money and/or food to populations living in extreme poverty.</p> <p>Create and/or improve systems to ensure a supply of food in emergency situations.</p>
6. Nutrition and health information and knowledge	<p>Expand the coverage of communications campaigns and educational programmes designed to promote healthy eating.</p> <p>Promote breastfeeding.</p> <p>Expand systems for the evaluation and monitoring of nutritional and food security programmes.</p>
7. Health care	<p>Prevent and treat undernutrition and micronutrient deficiencies.</p> <p>Prevent and treat disease.</p> <p>Provide primary health care.</p>

Source: R. Martínez and others, "Food and nutrition insecurity in Latin America and the Caribbean", *Project Documents*, No. 274 (LC/W.274), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), October 2009.

As indicated in table 2, Martínez and others (2009) describe the first six areas of intervention in policies that are applied in countries under the food and nutritional security framework, namely: (1) food production and access; (2) infrastructure; (3) trade; (4) food safety and quality; (5) food aid; and (6) nutrition and health information and knowledge.³ A seventh area —health care— has been added to also incorporate specific interventions in that area.

Another framework to consider is the one for analysing the poverty and vulnerability of the population, as this is directly related to household nutrition. Within this framework, promoting social protection has been a centrepiece of recent debates on government policies. It has meant the development of more comprehensive intervention strategies, with progress in reducing vulnerabilities directly as well as through changes of a more structural nature. Among these policies, conditional transfer programmes have been one of the main interventions used and have demonstrated a positive impact on economic conditions and access to food products among households. Indeed, the works in the 2008 and 2013 series in *The Lancet* (Bhutta and others, 2008; Ruel and Alderman, 2013) concerning maternal and child health interventions, cite complementary interventions in the area of social protection as necessary actions for achieving expected results. Nevertheless, more specific studies are needed to explore the impact of these programmes on nutritional status.

Box 1

Process for identifying policies, programmes and projects in pilot countries

Aside from the scientific knowledge and the consensus that exists on the principal lines of intervention, each country has its own nutritional profile and policies. The two countries serving as pilot cases (Guatemala and Peru) are observed to have clear nutritional policy agendas with specific programmes, projects, products and subproducts, which were analysed in each case to classify the interventions as specific or sensitive.

In both pilot cases, the process of implementing and testing the methodological proposal was done in partnership with national teams. Classification of the type of intervention revealed a different reality in each case, in terms of the priorities that were defined and the strategies used for implementation and organization.

Guatemala

Coordination meetings were held with the working team consisting of the Technical Secretariat for Food and Nutritional Security (SESAN) and the national WFP office. This was the coordinating team, which requested help from the ministries responsible for implementing the Zero Hunger strategy, which is the framework of action for eradicating undernutrition in the country. Effective and sensitive interventions were thus selected based on Zero Hunger. However, the assessment looked specifically at the interventions by the Ministry of Public Health and Social Assistance that are part of a pilot process for implementing the results-based budgeting strategy.

It should be noted that the Zero Hunger compact is a comprehensive policy that incorporates direct and sensitive factors for eradicating undernutrition. Our assessment was limited to the area of health, due to the availability of data and information on unit costs.

Peru

The coordinating team consisted of the national WFP office and the Ministry of Development and Social Inclusion (MIDIS). This team was in charge of identifying the interventions that were being implemented in Peru. In this case, progress was facilitated by a results-based budgeting strategy that includes the Coordinated Nutritional Programme and the Neonatal Maternal Health Programme among its strategic programmes. The products and subproducts of this budget programme were considered in carrying out the exercise to identify coverage gaps

Source: Prepared by the authors.

³ For more information on these areas of intervention, see Martínez and others (2009).

C. Set of interventions to eradicate chronic undernutrition and micronutrient deficiencies in the region

The elements described above have been used to select a set of interventions that are considered to be the most appropriate for eradicating chronic undernutrition and micronutrient deficiencies in the countries of Latin America and the Caribbean. This process has been informed by a detailed analysis of frameworks, policies and findings based on scientific evidence around the world, taking into account the reality in the region. The proposed interventions have been classified into two categories by type: specific interventions and sensitive interventions, which are described below.

1. Specific interventions

Specific interventions are interventions that are designed to have a direct effect on the determinants of nutrition and development in children under the age of five, with an emphasis on the first 24 months of life, related to adequate intake of food and nutrients, parenting practices and care and low infectious disease burden.

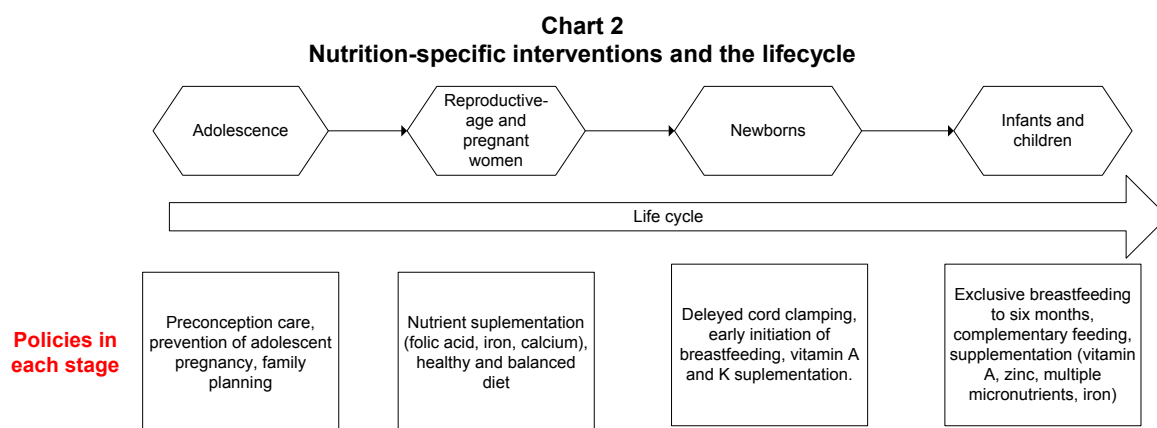
This group includes all those actions that have been identified on the basis of the aforementioned frameworks and the latest proposals set out in *The Lancet*, as follows:

- (i) Supplementation with micronutrients. Considered by the SUN strategy as part of the essential measures in the 1,000-day window of opportunity. The micronutrients for which supplementation is necessary are: iron, folic acid, calcium, iodine, vitamin A and zinc. The beneficiary population for this intervention includes pregnant and nursing women and children under the age of two, which means delivering specific supplements to each population group based on their needs.
- (ii) Breastfeeding and complementary feeding for infants and children from 6 to 23 months of age. This refers to the timely incorporation of safe, nutrient-fortified food into the diet, in conjunction with adequate breastfeeding practices for infants and children from 6 to 23 months. The introduction of nutritional food at 6 months should be accompanied by a strong educational strategy not only for mothers but also for the community. Robust scientific evidence supports the importance of both interventions and points up the essential role of breastfeeding and complementary feeding as important factors in survival, growth and development at the beginning of life. Breastfeeding helps reduce infant mortality, while complementary feeding has a major impact as a strategy for promoting growth. Lastly, the incorporation of both interventions, together with an effective education strategy, has proven effective in reducing chronic undernutrition in this vulnerable group (UNICEF, 2012).
- (iii) Fortification of staple foods to mitigate and/or prevent micronutrient deficiencies. This measure has a long track record in the region. Most countries have laws in place for the fortification of staple foods such as flour, rice and sugar with iron, iodine and fluoride. As stated by the World Health Organization (WHO), this type of action improves the nutritional health of the population without requiring any modification of their diets.
- (iv) Health promotion and education strategies. The latest issue of *The Lancet* includes the promotion of a balanced, adequate, varied and healthy diet as a necessary step in fighting undernutrition. There is scientific evidence that undernutrition increases the prevalence of chronic non-communicable diseases among adults, so priority measures must include the promotion of a healthy diet from the beginning of life. Other priority measures include the promotion of exclusive breastfeeding to six months and complementary feeding from six months to two years of age.
- (v) Improved health services, for the timely delivery of healthcare services of adequate quantity and quality for the population affected by acute undernutrition and at risk of undernutrition. Among the specific measures outlined in the latest issue of *The Lancet* are delayed clamping of the umbilical cord, which enables blood from the placenta to flow back to the infant, increasing

haemoglobin levels in the newborn and the concentration of serum ferritin levels at six months. Interventions targeting reproductive-age women are also needed, as are interventions for the prevention of adolescent pregnancy.

In order to effectively guide the policy components and maximize their impact, in line with existing policy models in the region that are promoted by the WHO, Bhutta and others (2013) distribute nutrition-specific interventions throughout the different stages of the lifecycle. This is a way of organizing actions according to the population to which they are targeted: adolescents, reproductive-age women, pregnant women, newborns, infants and children.

Chart 2 presents the relevant population at each stage of the lifecycle, with the corresponding interventions.



Source: Prepared by the authors, on the basis of Z. Bhutta and others, "Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?", *The Lancet*, vol. 382, No. 9890, Amsterdam, Elsevier, 3 August 2013.

Box 2

Classification of effective interventions for the pilot cases

Guatemala

The following table lists the products that are part of the Zero Hunger Pact and that have been classified based on the proposed categories.

Area of effective intervention	Interventions in Guatemala
Supplementation with micronutrients	Micronutrient supplementation for women of reproductive age Micronutrient supplementation for children under the age of five
Breastfeeding and complementary feeding for infants and children from 6 to 23 months of age	Care-taking practices for children under the age of five Promotion and protection of uninterrupted exclusive breastfeeding until at least two years of age, and complementary feeding
Improved health services	Provision of basic health and nutrition services Prevention of acute malnutrition Prevention and reduction of reproductive risk and infant care
Fortification of complementary foods for children under the age of five	Nutritionally improved and fortified foods Use of complementary fortified foods
Fortification of staple foods	

Box 2 (concluded)

Peru

In the case of Peru, there was access to information on programmes and interventions under the coordinated nutrition programme, the neonatal maternal health programme and other interventions that were identified as important in fighting undernutrition. The interventions that emerged during the joint work and analysis are presented below.

Area of effective intervention	Interventions in Peru
Supplementation with micronutrients	Children receiving iron and vitamin A supplementation Pregnant women receiving iron and folic acid supplementation
Breastfeeding and complementary feeding for infants and children from 6 to 23 months of age	Municipios that promote infant care Communities that promote infant care Healthy families with knowledge about infant care, exclusive breastfeeding and proper feeding and protection of infants and children under the age of 36 months Healthy schools that promote infant care and proper feeding
Improved health services	Refocused prenatal care Normal birth care
Fortification of complementary foods for children under the age of five	Multiple micronutrient supplementation during pregnancy
Fortification of staple foods	

Source: Prepared by the authors, on the basis of data provided by the countries.

2. Sensitive interventions

Sensitive interventions are interventions that address the underlying causes of nutritional and prenatal and child development determinants through an analytical framework of food and nutritional security. Specific interventions constitute the essential set of interventions for reducing stunting and micronutrient deficiencies, but they will not produce results if they are not paired with other measures in each country to achieve effective outcomes. These measures go beyond the scope of health and nutrition to address issues such as access to food, income and public infrastructure improvements.

Among sensitive measures, the latest special issue of *The Lancet* (2013) indicates measures related to improving food security through food production and access (own consumption, access to microcredit and improved processes), as well as the expansion of protection systems and food and income transfer programmes, for populations living in poverty or vulnerability (see table 2)⁴.

In this area, there are preventive measures to reduce the impact on nutrition of associated diseases, such as diarrhoea, acute respiratory infections and parasitic infestation. The SUN strategy identifies deworming as one of the interventions required in the 1,000-day window of opportunity.

Table 3 presents a list with areas of intervention and specific examples of interventions sensitive to undernutrition.

⁴ Interventions in the area of trade were not included from table 2 because they have an indirect impact that has been analysed less in the literature. From the infrastructure area, only investment in sanitation and water and improved roads to facilitate the delivery of products in emergency situations were considered.

Table 3
Examples of sensitive interventions for each policy area

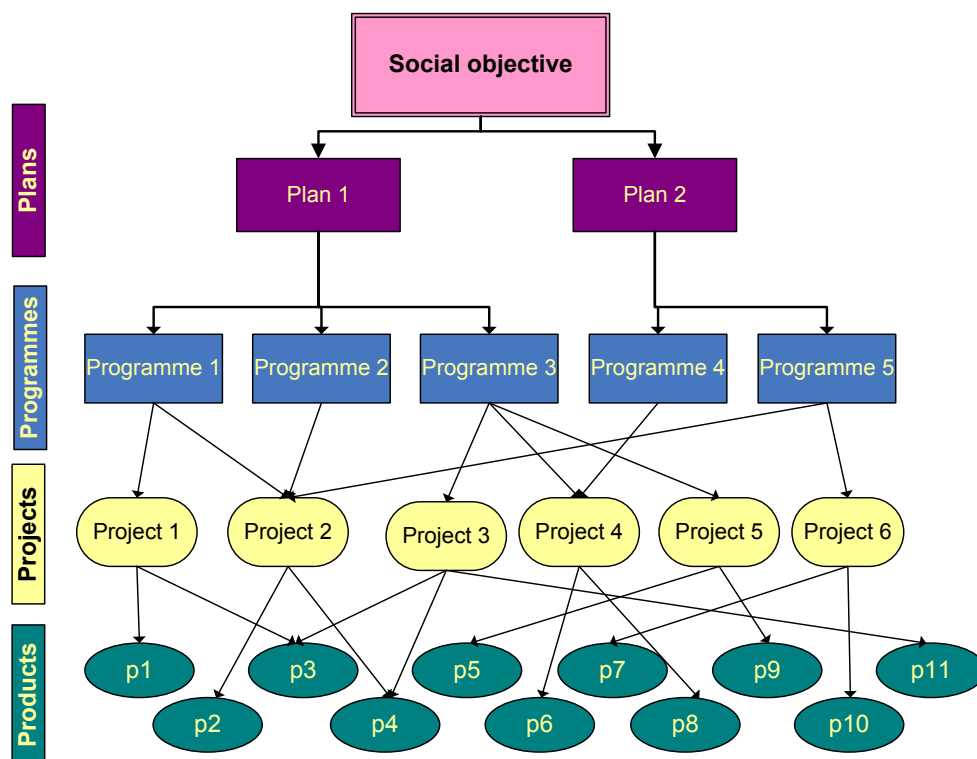
Thematic areas	Programmes	Examples of interventions
Food production and access	Production of complementary foods with high nutritional value for children under the age of two	Subsidies for the production of local foods with high nutritional value Subsidies for research on the nutritional content of traditional foods
	Access to productive assets related to land, equipment and financing for the most vulnerable families	Microcredit programmes Subsidies for microenterprises Access to land titles for small farmers
	Promotion of improvement of soils, sound water management and storage, and extension activities that foster the capacity for partnerships/associations and the industrialization of productive processes	Promotion of better use of resources Advisory services for agricultural production
	Promotion and improvement of food practices based on native and traditional products	Access to biofortification Media campaigns to promote food products Promotion of arrangements for participation and integration of producers of local inputs
Food safety and quality	Strengthening of sanitary control systems to protect food safety	Improved hygiene practices and water use in the home: handwashing, boiling of water for consumption and food preparation and personal hygiene and household cleaning Disinfection and/or treatment of water for human consumption Quality surveillance
	Improvement of product quality and investment in new technologies, training and hygiene	Subsidies for production technologies in the food industry
Infrastructure	Investment in potable water and sanitation services in marginal areas	Construction of potable water and sanitation services Better access to improved water sources in the case of no potable water service
	Creation of channels to facilitate the marketing of local products and the distribution of food in emergency situations	Construction of highways in rural areas
Food aid	School food programmes	School lunchrooms Provision of breakfast or milk School snacks
	Transfers of money and/or food to populations living in extreme poverty	Conditional transfer programmes Vouchers to purchase food Delivery of milk
	Creation and/or improvement of systems to ensure a supply of food in emergency situations	Delivery of emergency food Delivery of emergency grants.
	Expansion of systems for the evaluation and monitoring of nutritional and food security programmes	Programme monitoring and evaluation systems Supply and demand information systems
Nutrition and health information and knowledge	Education for mothers and/or caregivers	Literacy for mothers and/or caregivers Better access to formal education for women
Health care	Prevention and treatment of disease	Deworming of children under the age of 5 with drugs Immunization for the prevention of diarrhoea and acute respiratory infections Regular immunization programme
	Primary health care	Neonatal control Early stimulation programmes

Source: Prepared by the authors, on the basis of R. Martínez and others, "Food and nutrition insecurity in Latin America and the Caribbean", *Project Documents*, No. 274 (LC/W.274), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), October 2009.

To help show how the different interventions (specific and sensitive) translate into a policy for the eradication of undernutrition, along with its selection and description of rules, programmes and projects, the following steps are needed:

- (a) Illustrate how each component fits with the plan or plans that make up the policy. On the issue of food and nutrition, for example, two plans might be identified, one focusing on issues related to food production and distribution (availability and access) and another focusing on nutritional health (biological utilization). Chart 2 shows a representative example.
- (b) Identify the actors (governmental, community, private, etc.) that are participating in the organizational structure for implementation of the policy. Policies are defined at a strategic level and deployed via plans, which are designed and implemented at an intermediate level alongside programmes, which are expressed through a series of specific projects at an operational level (Martínez and others, 2011).

Chart 3
Relationships between the components of the policies implemented to achieve a social objective



Source: R. Martínez and others, "Modelo de análisis del gasto social y primer Objetivo de Desarrollo del Milenio", *Manuales series*, No. 71 (LC/L.3350), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), July 2011.

Box 3
Classification of sensitive areas for the pilot cases

Guatemala: Sensitive interventions under the Zero Hunger Pact^a

Programme area	Sensitive interventions
Strengthening of sanitary control systems to protect food safety	Monitoring of water for human consumption and recreational use
Improvement of product quality and investment in new technologies, training and hygiene	
Investment in potable water and sanitation services in marginal areas	Water and sanitation
Transfers of money and/or food to populations living in extreme poverty	Improved family income and finances
Expansion of systems for the evaluation and monitoring of nutritional and food security programmes	Food and nutritional security information systems Monitoring and evaluation system
Education for mothers and/or caregivers	Communication for the development and creation of mother-to-mother support networks Healthy homes Literacy Communication for food and nutritional security
Primary health care	Growth checkups for children under the age of five
Prevention and treatment of disease	Children under the age of one immunized according to their age and the current immunization schedule Children from the ages of one to five receive boosters Targeted management of cases of acute respiratory infection in children under the age of five Targeted management of cases of acute diarrhoea in children under the age of five

Peru: Sensitive interventions (various programmes)

Programme area	Sensitive interventions
Strengthening of sanitary control systems to protect food safety	Purification and/or treatment of water for human consumption Monitoring of water quality for human consumption
Improvement of product quality and investment in new technologies, training and hygiene	Nutritional quality control of food
Investment in potable water and sanitation services in marginal areas	Access to water and sanitation Construction and improvement of water and sanitation system infrastructure in rural communities
Transfers of money and/or food to populations living in extreme poverty	Beneficiary households of the programme (Juntos) with children under the age of three with access to lifecycle-based health and nutritional services Poorest beneficiary households with children under the age of three receive cash transfers upon fulfilment of co-responsibilities
Expansion of systems for the evaluation and monitoring of nutritional and food security programmes	Programme monitoring, supervision, evaluation and control Nutrition-related monitoring, research and technologies Development of technical guidelines and standards on nutrition
Education for mothers and/or caregivers	Literacy programme Non-school-based public education Educational institutions promote healthy practices in sexual and reproductive health Population with access to family planning methods Adolescents with access to health services for the prevention of pregnancy
Primary health care	Postpartum care Care for healthy newborns Children receive complete schedule of growth and development checkups according to age
Prevention and treatment of disease	Children receive complete schedule of immunizations Care for acute diarrhoeal disease Care for acute respiratory infections Care for acute respiratory infections with complications Care for acute diarrhoeal disease with complications Care for other prevalent diseases Care for children with intestinal parasites

Source: Prepared by the authors.

^a Not all components of the Zero Hunger Pact are considered, owing to restricted availability of information.

II. Estimate of the gap and costs

This chapter describes the steps required for preparing an adequate estimation of the cost of the intervention gap for the target population and the cost of covering that gap.⁵

A. Estimating the size of the problem

The first step is to properly estimate the size of the population for which the actions needed to eradicate the problem should be implemented. In other words, it is important to know the size of the reference population and the population targeted by the policy, that is, the number of children under the age of five who are suffering from or are more vulnerable to stunting, which can be presented as follows:

Country	Population 0-59 months	Prevalence (%)	Undernourished population
Guatemala (2009)	2 142 648	48	1 028 471
Peru (2012)	2 853 030	13.5	556 341

Source: Prepared by the authors, on the basis of United Nations, Millennium Development Goals Database [online] <http://mdgs.un.org/unsd/mdg/Data.aspx>; National Institute of Statistics and Informatics (INEI), National Demographic and Health Survey, 2011.

The target population comprises those who have or could have the problem, but the interventions could benefit a larger population (all minors or the entire population, to deliver public information, for example) or a subset of them (for example, minors who are nursing), or they could use other beneficiary populations as a means of reaching the target population (such as mothers, households, homes, etc.).

For purposes of the analysis, the following definitions of population groups are used:

Reference population. Population from 0 to 59 months of age, or the population used for estimating undernutrition in the country.

⁵ This work is based on the methodology used to conduct an ex ante evaluation of any social project. For more information on the content of this methodological analysis, see Cohen and Martínez (2004).

Target population. Population from 0 to 59 months of age that suffers from stunting or is highly vulnerable. This is used to estimate the impact on undernutrition.

Beneficiary population. Population to which the interventions are intended. This may be a subset of the target population (for example, children under two years of age, for whom many priority early childhood interventions are intended), or it may be a group other than the target population but one that is directly related to it and that serves as a channel of distribution or access (for example, mothers who receive training on food preparation or hygiene in the home). This is used to estimate costs, which means that for intervention planning purposes, the beneficiary population to be served in the future must also be estimated.

Covered beneficiaries. Beneficiary population that actually receives the interventions. This group is needed to estimate the operational coverage gap. Covered beneficiaries can be grouped by number of services⁶ and by sectors: public and private.

Covered target population. Target population that is covered by each programme, whether directly or through intermediary beneficiaries. This is used to estimate the coverage gap for the target population.

1. Defining the impact target

In other words, the amount of variation that is needed in terms of the prevalence of undernutrition in order to achieve the expected goal, in this case, undernutrition.

$$I \equiv (U_0 - U_t)$$

$$I \equiv \Delta U$$

Where,

I: is the impact target.

U_0 : is the prevalence of stunting for each country at the moment of analysis.

U_t : is the nutritional status target expected for the population.

Eradicating stunting is equivalent to a prevalence of 2.5%,⁷ so D_1 is 2.5 and the target would thus be defined as:

$$I = U_0 - 2.5$$

Country	Prevalence	Eradiation	Target	Target %
Guatemala (2009)	48	2.5	45.5	95
Peru (2012)	13.5	2.5	11	81

Source: Prepared by the authors.

⁶ This is particularly important when an intervention requires more than one service, e.g., in the case of immunizations that require more than one dose, or pregnancy and newborn checkups.

⁷ The comparison patterns used to analyse nutritional situation, whether from the National Center for Health Statistics (NCHS) or the WHO, are standardized in relation to the distribution of the normal curve of the population, with those who are less than two standard deviations below the median identified as undernourished, which represents 2.5% on the normal curve. Thus, a population with a rate of prevalence equal to or less than 2.5% is believed to be in line with expectations.

2. Defining the impact relationships of the interventions

Once the interventions have been defined in the country based on the proposed analytical framework, work can begin on determining the impact that they have on reducing undernutrition.

Each programme or set of interventions translates into products (goods or services) that are expected to generate a direct or indirect impact on undernutrition in the client population. This depends on the causal chain and the weight that the intermediate variables affected by the product or products delivered have on undernutrition. In general, the sequence of this process is as follows:

Programme → Product → Variable affected → % of impact on stunting

In order to quantify the requirements of the interventions and their costs, a causal chain must be modeled, the beneficiary population must be identified and the impact must be estimated for each one.

For example:

Programme	Product	Beneficiary population	Effect	Estimated impact
Complementary feeding	Multivitamin supplements with iron, vitamins A, C, D, E, B1, B2, B6, B2, folic acid, niacin, iron, zinc, copper and/or iodine (Chispitas)	Children under the age of two	Reduction in micronutrient deficiencies and associated diseases (anaemia)	For micronutrients: Relative reduction of undernutrition at 12 months: 10.3 24 months: 15.9 36 months: 17.4 ^a
Improved handwashing practices	Purified and/or treated water	Homes without safe drinking water in which children under the age of five or pregnant women reside	Improved biological utilization of food due to reduction in diseases such as diarrhoea	Relative reduction in the prevalence of undernutrition due to disease control at: 12 months: 3.7 24 months: 2.9 36 months: 2.7

Source: Prepared by the authors.

^aICEFI/UNICEF (2011), on the basis of Bhutta and others (2008).

The pilot experience with the countries indicates that this point is not yet fully defined in the region. There is not enough empirical evidence with specific results to establish relationships between the variables and their impact. Likewise, the interrelationships (synergies or competencies) between the different variables affected by the interventions and their collective impact on reducing undernutrition are not sufficiently understood.

3. Estimating the beneficiary population to be attended

Once the causal chain has been modeled and the beneficiaries have been identified for each programme, the deficit or gap in coverage must be quantified.

$$\text{Deficit} = AP_{NC} = AP - AD_C$$

Where,

AD_{NC} : is the beneficiary population that is not covered.

AD : is the beneficiary population.

AD_C : is the beneficiary population that is covered.

To summarize this information, a table is needed that includes information on the client population and the target for each intervention, in order to determine the coverage deficit and estimate the cost of meeting the target.

Example:

Programme	Attended population (AD)	Covered beneficiaries (AD _C)	Deficit (AD _{NC} = AD-AD _C)
Promotion of exclusive breastfeeding through health systems (promotional material and counseling)	Total number of pregnant women and mothers of children under the age of six months in a community	Number of pregnant women and mothers of children under the age of six months in a community who receive promotional material and information on exclusive breastfeeding	Difference between the two populations. A difference of zero means that the entire target population is being covered.

Source: Prepared by the authors.

For this aspect, it is important to take into consideration who is covering programme demand. In many cases, civil society organizations provide these types of goods and services to the population, which does not tend to be fully reflected in coverage data. In addition, in some healthcare systems, the private sector participates in delivering the planned interventions. Private-sector participation can be estimated based on Demographic and Health Surveys (DHS),⁸ so that an adjustment can be made to estimate the total gap, in the case that coverage by non-State agents could be changed.

4. Estimating the impact

The impact or effectiveness of policy corresponds to the degree to which the problem (undernutrition) is reduced in aggregate by the various interventions. Thus, each intervention (i) has a partial impact on reducing the level of undernutrition and contributing to the aggregate target.

$$I \equiv (U_0 - U_t)$$

$$I = \Delta U$$

Where:

I: is the impact in terms of the population from 0 to 59 months of age that is no longer undernourished.

ΔU: corresponds to the difference in the nutritional prevalence, the target to meet.

In terms of the interventions, if each I_i is defined as the impact that each intervention i has on undernutrition, the total impact could be understood as:

$$I = \sum I_i \pm \sum I_{ij}$$

In other words, it is the sum of all the partial impacts, of each intervention, plus the positive or negative outcome resulting from the different interactions between all the interventions that are being carried out for the same population.

Given that each intervention can have an impact on different subgroups of the target population, the foregoing can be disaggregated as:

$$I = \frac{\sum \Delta U_i * OP_i \pm \sum \Delta D_{ij} * OP_{ij}}{RP}$$

Where:

⁸ The Demographic and Health Surveys (DHS), in their standard version 6 format, include questions on the location where the intervention was performed in the case of treatment of diarrhoea and fever/cough in children and prenatal and birth care in the case of pregnant women, where the newborn received the first checkup, and where children received their immunizations.

- ΔU_i : corresponds to the marginal variation in the level of undernutrition due to intervention i .
- OP_i : is the proportion of the target population that receives the benefits of intervention i , whether directly or indirectly.
- ΔU_{ij} : reflects the impact resulting from the interactions between the various interventions.
- OP_{ij} : is the proportion of the target population that receives the joint effects of interventions i and j , whether directly or indirectly.
- RP: is the reference population for the period, which generally corresponds to infants and children from 0 to 59 months of age.

In other words,

$$I = \frac{(\Delta U_1 * OP_1) + \dots (\Delta U_i * OP_i) + \dots (\Delta U_{14} * OP_{14}) \pm (\Delta U_{ij} * OP_{ij})}{RP}$$

The time required for each intervention is important to consider. For example, in the case of sanitation, which is a long-term investment, a lengthy period of time must elapse before an attempt is made to verify impacts on the population. In contrast, micronutrient supplementation can be expected to produce results over shorter periods of time. Accordingly, interventions must be identified based on the time required for the investment and implementation phases plus the time required to generate an impact on the target population (not all impacts are produced at the time of delivery of the good or service). Thus, in order to properly run this analysis, a flow of impacts must be developed.

Box 4 **Challenges in measuring impacts**

Improving the availability of information for estimating impact is a challenge in the countries. At present, the impact estimates that have been used to identify policies correspond to works published in the 2008 and 2013 series of *The Lancet*.

The findings regarding many of the evaluations that have been done are not conclusive regarding the impact on stunting, even when they are conclusive regarding underlying factors. This does not mean that the policies are not instrumental in reducing undernutrition, but rather that there is no reliable and accurate empirical evidence as to how and to what extent these underlying variables affect undernutrition.

For example, Bhutta and others (2008 and 2013) maintain that there is no conclusive empirical evidence on the impact of the promotion of breastfeeding on chronic undernutrition but that there is such evidence on the survival of children. The authors therefore point out the need for better efficiency and cost-effectiveness evaluations in the countries, in relation to nutritional measures. In addition, a deeper understanding is needed of the impact of interventions, such as micronutrient supplementation for children and pregnant women, on stunting and the benefit or absence thereof on weight.

Given that there was not enough data to estimate impact in the pilot studies in Peru and Guatemala, the studies were limited in scope to coverage gaps and costs.

Source: Prepared by the authors.

In the event that there is insufficient information or the necessary background data to conduct individual analyses of the impact of the interventions, an estimate of the aggregate impact can be run based on expert opinion. An alternate method that synthesizes these opinions is the Delphi method, which is used, for example, in estimates of healthy years of life lost or disability-adjusted life years, and makes it possible to estimate impact based on the opinions of experts in the substantive area of analysis, which in this case are nutrition experts (see Cohen and Martínez, 2004).

5. Establishing protocols

Based on the specific and sensitive interventions that are identified, protocols must be developed to effectively determine the quantities of inputs and resources needed for the various processes and activities, and process maps with flow charts of activities must be prepared for each intervention. Developing these in detail is essential for estimating, first, the cost associated with each activity, and second, the total cost of scaling up coverage of each programme.

Protocols include both the identification of quantity and quality standards for service delivered to the population and the mapping of processes, which describes the operational sequencing of the activities needed for production and distribution of the service, including the volumes of resources and inputs that these activities require.

The following is a brief description of the steps required to develop the protocols for a product:

- Define the quantity and quality standards required for the service that will be delivered, with defined targets and indicators.
- Describe the process map,⁹ that is, the sequence of processes and activities required to carry out each intervention up to the point at which the service or good is delivered to the target population. It is important to categorize these by their relevance to achieving the product, with core or essential processes (in the design, production and distribution stages) separated from support processes (such as monitoring and evaluation).
- Describe the objectives of the process and targets, with a description of the activities, inputs and resources required for each one. This is key for estimating costs.
- Quantify the time needed for each part of the process, which makes it easier to ascertain how long it will take the intervention to reach the target population.
- Identify the individuals or entities responsible for each process.
- Construct a matrix of resources and inputs for each process, in which all the previous elements are described. This includes a description of the human resources needed for each activity, whose participation may be defined on the basis of the time allocated for this work, which also allows for monitoring when the individual is in charge of more than one programme, which is often the case with health services, particularly in remote areas.

Examples of resource matrix:

- i) Delivery of food supplement with formula¹⁰

⁹ For more information, see Cohen and Martínez (2004).

¹⁰ These formulas are presented by way of example and were excerpted from the document by the Ministry of Public Health and Social Assistance of Guatemala (2009). Based on this document, F-75 and F-100 are therapeutic formulas specifically designed for the treatment of severe acute malnutrition (p. 19).

Table 4
Intervention: adequate nutritional treatment

Process	Activities	Inputs/resources	Time	Quality
Delivery of therapeutic supplements	Selection of best formula for age group	Nutritionist	1 month	Professional with experience. Bibliographic support for recent studies.
	Identification of providers	Quotes	2 weeks	At least 3 quotes.
	Purchase of supplement		1 week	Minimum requirements ^a F-75 Nonfat powdered milk, vegetable oil, sugar, maltodextrin, vitamins and minerals F-100 Nonfat powdered milk, vegetable oil, whey, maltodextrin, sugar, vitamins and minerals
	Shipping to health posts and clinics	Shipping, labels	1 week	Delivery on the estimated date
	Storage	Warehouse	1 week	Storage in a cool environment
	Delivery to mothers, fathers or caregivers for the child	Nurses/nutritionist at health clinic. Informational pamphlet.	Periodic	Delivery at the checkup or health consultation

Source: Prepared by the authors, on the basis of Ministry of Public Health and Social Assistance of Guatemala, "Protocolo para el tratamiento en centros de recuperación nutricional de la desnutrición aguda severa y moderada sin complicaciones en el paciente pediátrico", Guatemala City, November 2009.

^aFor more information, see Ministry of Public Health and Social Assistance of Guatemala (2009, p. 20).

- (i) Counseling for the mother, father or caregiver for the infant with outpatient treatment of stunting. One of the processes needed to provide counseling is the production of informational pamphlets for mothers and fathers and a place for various activities for providing counseling to the population.

Table 5
Intervention: counseling for mother, father, or caregiver of child

Process	Activities	Inputs/resources	Time	Quality
Informational pamphlets for mothers and fathers	Definition of information to include on the pamphlets	Meeting room, nutrition professionals	2 weeks	Content validated by specialists from the ministry and academia
	Design of pamphlets	Two nutrition professionals from the ministry	3 weeks	Endorsed by specialists
	Design professional	Designer	1 month	Published terms of reference and competitive process
	Printing	Printing, paper	1 week	
	Distribution to health clinics	Shipping, labels	2 weeks	Delivery on scheduled date and budget
	Training for healthcare personnel	Trainers, transfers, coffee, nurses or primary care professionals	1 week	Approval of results by specialists and positive review by participants

Box 5 Protocols and their use in the pilot experiences

The pilot experience in Peru and Guatemala revealed that there is not always clarity on these protocols and adequate information is not available. In general, the estimates are prepared on the basis of the needs of the clinics and directly with the ministries in charge of the interventions and budget personnel (Ministry of Finance or the Economy).

Both countries are implementing results-based budgeting, with stunting identified as a public policy objective, which means that there is more information available on costs and programming of related interventions.

In the case of Peru, the exercise worked with the operational definitions for the two strategic programmes for which information on the interventions was obtained, which provided information on the targets and target population. Given the budgetary priority, data was available on the inputs and costs of interventions under both programmes. However, this information does not constitute a standardized service protocol, so differences were found in the inputs required for the same intervention carried out in two types of clinics.

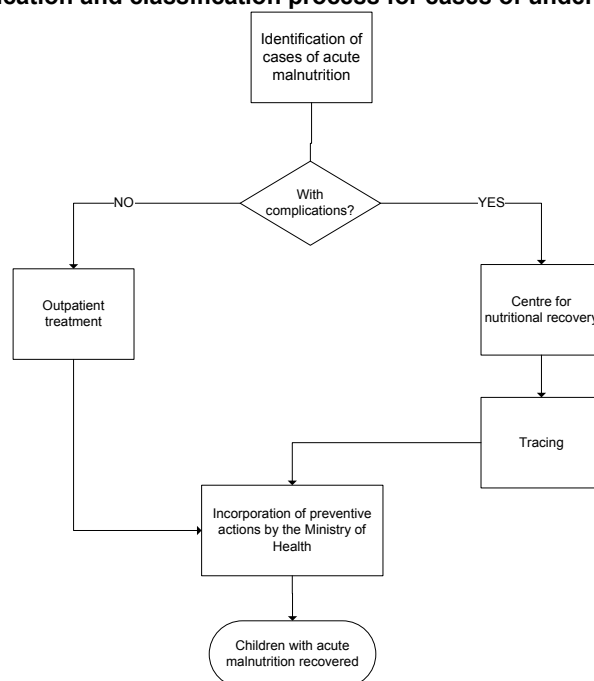
In the case of Guatemala, information was available on interventions carried out by the Ministry of Public Health and Social Assistance that are part of the pilot programme for implementing the results-based budgeting process. There was not enough information to estimate the unit cost or service protocols.

The recommendation in both countries has been to work on defining the protocols for each intervention, which would allow for a detailed and precise analysis of the use of inputs in relation to the type of service required, with specificity according to the particular needs. This seems even more important in these countries, which have large rural populations and thus require specifications for each service according to the zone of residence.

Source: Prepared by the authors.

- Prepare a flow chart of processes. For example, the following chart describes one of the processes needed for the treatment of severe and moderate acute malnutrition. Identification is the first step needed to transfer the child to the outpatient clinic or hospital. The service protocol defines all these steps, with their associated activities

Chart 4
Identification and classification process for cases of undernutrition



Source: Adapted from Ministry of Public Health and Social Assistance of Guatemala, "Protocolo para el tratamiento en centros de recuperación nutricional de la desnutrición aguda severa y moderada sin complicaciones en el paciente pediátrico", Guatemala City, November 2009.

6. Estimating costs

In relation to costs, it is important to be clear on what to count. The direct cost refers to the price of the service delivered, whereas the total cost also includes part of implementation of the policy, its administration (including monitoring and evaluation), and complementary costs assumed by the target population (or other agents) in the service production and distribution process.

The foregoing takes on even more importance when looking at the data and disparities within countries, where the dispersion of the population in rural areas, which tend to be more affected by undernutrition, presents an operational challenge and higher costs for the same intervention. The mapping of processes, with their corresponding activities, inputs, resources and times identified in the previous point, is key for differentiating costs by zone. Water and sanitation policy provides a clear example, with its higher investment costs in rural areas, which can also prompt changes in the type of delivery, depending on the available resources.

Nevertheless, owing to operational inefficiencies, there can also be cases in which there is idle capacity that could cover part of the deficit at lower-than-average costs. Consequently, the average cost observed at the time of analysis may be an initial proxy, but a more in-depth study is needed to properly estimate the marginal cost, which will have to be met in the future to resolve the coverage deficit.

Thus, costs C can be estimated as follows:

- (a) The first step is to evaluate what proportion of the beneficiary population that is not covered could be covered by using idle capacity from the existing operations and infrastructure by optimizing management.

To this end, the existing supply must be evaluated and contrasted with the potential capacity of each type of intervention, without incurring new investments (optimization), asking, for example, if the size of the population that is covered could be increased by expanding the facilities and equipment infrastructure, or by expanding the professional and technical teams.

Idle capacity = optimized coverage - actual coverage

$$IC_i = AP_{pi} - AP_{Ci}$$

Where,

- IC_i : corresponds to the idle capacity of intervention i .
- AP_p : is the potential beneficiary population or optimized coverage of intervention i .
- AP_{Ci} : is the beneficiary population covered by intervention i .

This evaluation of potential capacity should be contrasted with the minimum service quality standards for the interventions. For this part, the quality of the service provided must be contrasted with the standards defined in the protocols, as there could be a case in which the optimized coverage (meeting the standards) is less than the actual coverage, in which case idle capacity would be negative and the operational challenge and associated costs would increase.

- (b) Quantify the optimized covered beneficiary population by adding idle capacity to actual capacity.

$$AP_{Ci}^* = AP_{Ci} + IC_i$$

Where,

AP_{Ci}^* : corresponds to the optimized covered beneficiary population of intervention i. If there is no idle capacity or it cannot be reliably estimated, the optimized coverage would be equivalent to actual coverage.

$$\text{If } KO_i = 0; AP_{Ci}^* = AP_{Ci}$$

- (c) Estimate the average costs of the optimized covered population, as an initial proxy of the unit cost of the population that is not covered.

These costs correspond to the total cost of the implemented intervention divided by the beneficiary population that is covered by it.

$$AC_i = \frac{TC_i}{AP_{Ci}^*}$$

Where,

- AC_i : is the average unit cost of each intervention i.
 CT_i : corresponds to the total cost of the intervention, which includes the direct and operating costs of current operation.
 AP_{Ci}^* : is the size of the beneficiary population covered by optimized intervention i.

Box 6 Estimating unit cost

One way of estimating the unit cost (average) of each intervention is by using the information generated by the individual institutions that are in charge of the interventions. However, in reality, this information can be hard to obtain, because in many cases the institutions operate in function of the daily requests from operational units and do not keep a clear record of the cost per unit of service.

In the pilot experience in the countries, the unit cost was gathered from information from the results-based budgeting system. This tool, which sets a specific objective based on which a series of indicators are established, requires unit cost estimates to set budgets.

It was determined in the study that idle capacity is not considered in when analysing a budget, which makes it hard to come up with a precise estimate of the requirements for the coverage expansion.

At the same time, for the unit cost of each intervention, it is basically the direct inputs that are considered. The infrastructure and administrative costs incurred by the health clinics are part of the unit costs of the intervention. Regardless of the expenditure made, in economic terms, use of the facility in this intervention constitutes the opportunity cost of not using it in another, so it should be considered as part of the relevant cost of the intervention.

Source: Prepared by the authors.

- (d) Estimate the extra costs associated with the incremental infrastructure, equipment and operating requirements to expand supply. These costs correspond to:

$$\Delta TC_i = \sum (IC_i + OC_i + BC_i)$$

Where,

- ΔTC_i : corresponds to the costs of the necessary increase in supply.
 IC_i : are the institutional costs of expanding supply, related to legal matters, financial management, etc.
 OC_i : refers to the incremental operating costs of production and distribution of the products, including infrastructure, equipment, inputs and human resources.

BC_i : are the costs to be assumed by the users (beneficiary population) of the programme or their relatives, in relation to fares, time and other inputs that are not covered.

- (e) To the extent that implementation of the incremental activities or complementary programmes required to cover the gap and achieve eradication involves periods of more than one year, a flow of costs, analysed using mathematical finance, will be needed to prepare an adequate estimate of costs.

The flow is a table that includes the different sources of the costs associated with implementation of the eradication project. Actions are initiated in the “year zero” period, which is when the investment occurs, and the operation is implemented in the following periods.

Time	t=0	t=1	t=2	t=3	t=4	t=5
Costs	C _I	CO ₁ +CU ₁	CO ₂ +CU ₂	CO ₃ +CU ₃	CO ₄ +CU ₄	CO ₅ +CU ₅

Example:

Time	t=0	t=1	t=2	t=3	t=4	t=5
Costs	150 000	350 000	361 000	378 000	392 000	420 000

To determine the cost of each period, the technical requirements and productivity of the infrastructure and equipment are analysed, as well as the inputs and human resources needed. This analysis is used to estimate the production targets that must be met to reach 100% of the target population and cover the gap, both in coverage and impact. It should be noted that closing the coverage gap is not a guarantee of achieving the impact target of eradication, and operation times may not be the same as impact times.

Once an ex ante estimate of the requirements and costs of each period has been prepared, the flow of costs can be constructed.¹¹

Example:

Time	t=0	t=1	t=2	t=3	t=4	t=5
Initial investment	150 000					
Materials		200 000	210 000	220 000	240 000	240 000
Wages		150 000	150 000	150 000	150 000	150 000
Transport			1 000	2 000	2 000	2 000
Distribution				6 000		28 000
Total cost	150 000	350 000	361 000	378 000	392 000	420 000

Source: Prepared by the authors.

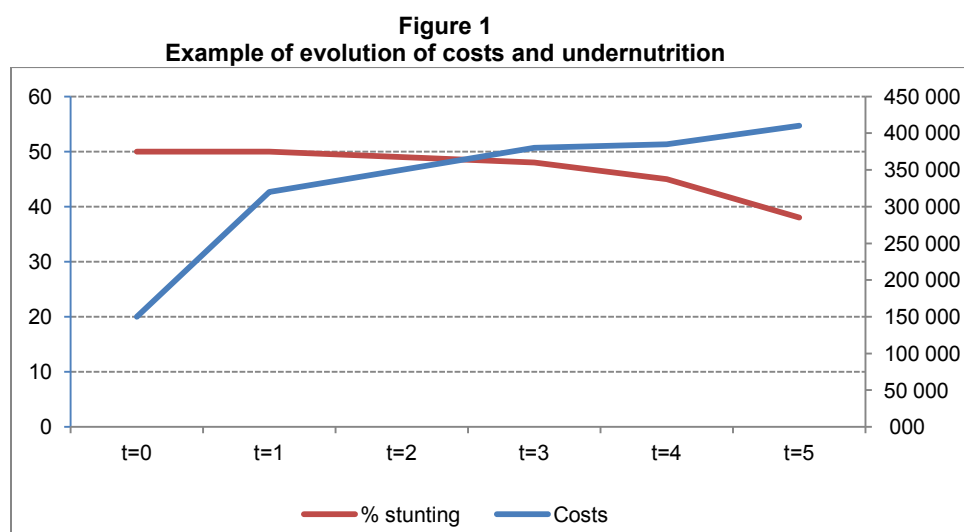
- (f) Based on the above, a summary chart and matrix can be constructed that include the flow of coverage, costs and impact per period.

¹¹ For a more detailed version of the construction of a flow chart of costs, see Cohen and Martínez (2004).

Example:

Time	t=0	t=1	t=2	t=3	t=4	t=5
Population to cover (n)		35 000	38 000	42 000	49 000	60 000
Total costs (\$)	150 000	350 000	361 000	378 000	392 000	420 000
stunting (prevalence)	50	50	50	48	44	38

Source: Prepared by the authors.



Source: Prepared by the authors.

- (g) Estimate the present value of the flows. To compare the information from the flow of costs, the present value must be estimated, that is, the equivalent cost at the time of analysis, or period zero. The present value is the value that a certain amount of money has today that will be spent or recorded in the future. Thus, the total cost is the present value of all the values contained in the flow.

The formula for this estimate is as follows:

$$\Delta TC_i = PV_{Ci} = IC_{i0} + \sum_{t=1}^t \frac{(OC + C)_{it}}{(1+i)^t}$$

Where,

PV_{Ci} : is the present value of the flow of costs.

t : is the total of periods in which the expected target will be met.

i : social discount rate (official rate of the country in which the analysis is being run).

The present value is estimated for the flow of costs for each intervention. The total cost of closing the gap is the sum of the present value of each intervention.

- (h) Estimate the average costs of missing interventions, based on the average cost of the intervention prior to the expansion of supply and the change in costs resulting from the expansion of supply, which will depend on this idle capacity. In other words:

$$AC_{it} = \frac{TC_i + \Delta TC_i}{AP_{Ci} + AP_{NCi}}$$

Where:

- AC_{it} : corresponds to the average cost of intervention i over period t , that is, once supply has been expanded.
- TC_i : corresponds to the total cost of the intervention, which includes the direct and operating costs of the measure that is functioning.
- ΔTC_i : corresponds to the increase in costs resulting from the expansion of supply that is needed.
- AP_{Ci} : corresponds to the beneficiary population that was covered in the previous period.
- AP_{NCi} : corresponds to the beneficiary population not covered by intervention i .

The change in costs (ΔTC_i) depends on the incremental costs and whether there is idle capacity, and costs may even decrease when idle capacity is greater than the deficit. Therefore, when the covered population increases, the average costs in this new situation may be slightly lower, or the cost may rise but at a diminishing rate per unit of product.

In other words, insofar as there is idle capacity, the marginal cost of producing an extra unit may be less than the existing average cost of production, so the total average cost of expanding the supply may be less in this new situation with more beneficiaries covered.

This is important when estimating the total cost of covering the gap. By using the current average cost as a proxy, the total cost of expanding the supply may be over- or under-valued, considering the investment needed to reach places that are not covered and existing idle capacity.

7. Relationships between impact and cost

The above can be used to obtain the impact of the set of necessary interventions and its relationship with the cost associated with eradicating undernutrition.

$$C/I_i = \frac{AC_{it} * AP_i}{I_i}$$

$$C/I = \frac{\sum(AC_{it} * AP_i)}{\sum I_i \pm \sum I_{ij}}$$

Where,

- C/I_i corresponds to the cost-impact ratio of intervention i .
- AC_{it} : corresponds to the average cost of intervention i over period t , that is, once the supply has been expanded.
- AP_i : corresponds to the beneficiary population of intervention i .
- I_i : corresponds to the impact of intervention i .
- I_{ij} : corresponds to the joint impact of intervention i and intervention j .

8. Modeling eradication

So far, the aggregate impacts have been presented based on the partial contributions of each intervention. What is missing is an optimization model of all of the interventions based on their impacts and costs, in order to achieve the eradication target.

$$\text{MAX } C/I \text{ tq } U = 2,5$$

Although there are mathematical and computational tools for developing these models, for these policy objectives, modeling exercises are hindered by the limited availability of data, and, as indicated above, there are major gaps in terms of impact estimates and also protocols and costs.

An alternate method that is simpler and more viable but also less precise in terms of nutritional results involves considering the need for the entire population under the age of five, along with pregnant and nursing mothers, to receive all of the products offered under the various food and nutritional security interventions, in general, and the Scaling Up Nutrition interventions, in particular. In this case, the only requirement is to estimate the cost of the population increments served by each intervention to achieve universal coverage of all services, corresponding to each group, or to cover the most vulnerable population that is not receiving benefits (points 1-4 and 6). This method, however, may return higher costs inasmuch as it cannot estimate the savings derived from the optimized interactions.

III. Final comments

This document has described the main steps required to estimate the resources needed to eradicate stunting in a given country in the region. However, for actual implementation in the context of each country, the procedures described may need to be supplemented with country-specific activities.

The implementation challenge is similar to that involved in any *ex ante* evaluation and design process for a plan, programme or project, regardless of whether the objectives are social or productive in nature. The process requires many individual decisions, and questions arise repeatedly as to the reliability and precision of the estimates. Organizing the information in a way that minimizes these risks is what the model described in this document seeks to achieve, by reducing improvisation and discretion in decision-making and by facilitating the programming of interventions that are supported with scientific evidence as key to fighting stunting and micronutrient deficiencies.

As the experience with the pilot cases shows, the process is not without difficulties in terms of the reliability of the estimates and the collection and processing of basic information. However, based on these very difficulties and the comments arising from discussions on the methodological proposal with professionals in some countries in the region, it can be reasonably concluded that this method can be implemented in all the countries. Beyond implementation, it offers a good opportunity to organize protocols and improve planning and budgeting procedures, both for specific interventions targeting undernutrition and for other areas of action. Thus continues the challenge to document experiences and promote new methods that will support or improve decision-making in order to maximize nutritional impact and minimize costs.

Bibliography

- Bhutta, Z. and others (2013), “Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?”, *The Lancet*, vol. 382, No. 9890, Amsterdam, Elsevier, 3 August.
- _____ (2008), “Maternal and child undernutrition 3. What works? Interventions for maternal and child undernutrition and survival”, *The Lancet*, vol. 371, No. 9610, Amsterdam, Elsevier, 2 February.
- Black, R. and others (2008), “Maternal and child undernutrition: global and regional exposures and health consequences”, *The Lancet*, vol. 371, No. 9608, Amsterdam, Elsevier, 17 January.
- Cohen E. and R. Martínez (2004), “Manual. Formulación, evaluación y monitoreo de proyectos sociales”, Santiago, Economic Commission for Latin America and the Caribbean (ECLAC) [online] http://dds.cepal.org/redesoc/archivos_recursos/242/Manual_dds_200408.pdf.
- De Onis, M., M. Blössner and E. Borghi (2012), “Prevalence and trends of stunting among pre-school children, 1990-2020”, *Public Health Nutrition*, vol. 15, No. 1, Cambridge, Cambridge University Press, January.
- ECLAC/UNICEF (Economic Commission for Latin America and the Caribbean/United Nations Children's Fund) (2006), “Child malnutrition in Latin America and the Caribbean”, *Challenges*, No. 2, Santiago, April.
- Horton, S. and others (2010), *Scaling Up Nutrition, What Will It Cost?*, Washington, D.C., World Bank.
- ICEFI/UNICEF (Central American Institute for Fiscal Studies/United Nations Children's Fund) (2011), “Protegiendo la nueva cosecha. Un análisis del costo de erradicar el hambre en Guatemala, 2012-2021”, *¡Contamos!*, No. 4, Guatemala City, September.
- INCAP (Institute of Nutrition of Central America and Panama) (1999), *La Iniciativa de Seguridad Alimentaria Nutricional en Centro América*, Guatemala City, March.
- Martínez, R. and A. Fernández (2007), “El costo del hambre: impacto social y económico de la desnutrición infantil en Centroamérica y República Dominicana”, *Project Documents*, No. 144 (LC/W.144/Rev.1), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), October.
- Martínez, R. and others (2011), “Modelo de análisis del gasto social y primer Objetivo de Desarrollo del Milenio”, *Manuales series*, No. 71 (LC/L.3350), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), July.
- _____ (2009), “Food and nutrition insecurity in Latin America and the Caribbean”, *Project Documents*, No. 274 (LC/W.274), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), October.

- McLean, E. and others (2009), "Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005", *Public Health Nutrition*, vol. 12, No. 4, Cambridge, Cambridge University Press, April.
- Ministry of Public Health and Social Assistance of Guatemala (2009), "Protocolo para el tratamiento en centros de recuperación nutricional de la desnutrición aguda severa y moderada sin complicaciones en el paciente pediátrico", Guatemala City, November [online] http://www.paho.org/gut/index.php?option=com_docman&view=download&alias=168-protocolo-para-centros-recuperacion-nutricional-mspas2009&category_slug=desnutricion-aguda&Itemid=518.
- Navarro, H. y otros (2006), "Pauta metodológica de evaluación de impacto ex-ante y ex-post de programas sociales de lucha contra la pobreza", *Manuales series*, No. 48 (LC/L.2949-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC)/Latin American and Caribbean Institute for Economic and Social Planning (ILPES), January.
- PAHO (Pan American Health Organization) (2008), *Malnutrition in Infants and Young Children in Latin America and the Caribbean: Achieving the Millennium Development Goals*, Washington, D.C.
- Ruel, M. and H. Alderman (2013), "Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?", *The Lancet*, vol. 382, No. 9891, Amsterdam, Elsevier, 10 August.
- SUN (Scaling Up Nutrition) (2012), "Scaling Up Nutrition (SUN) Movement Strategy, 2012-2015", September [online] <http://docs.scalingupnutrition.org/wp-content/uploads/2012/10/SUN-MOVEMENT-STRATEGY-ENG.pdf>.
- UNICEF (United Nations Children's Fund) (2012), *Infant and Young Child Feeding*, New York, June.
- Victora C. and others (2008), "Maternal and child undernutrition: consequences for adult health and human capital", *The Lancet*, vol. 371, No. 9609, Amsterdam, Elsevier, 26 January.
- WHO (World Health Organization) (2013), *Essential Nutrition Actions: Improving Maternal, Newborn, Infant and Young Child Health and Nutrition*, Geneva.
- _____ (2008), *Worldwide Prevalence of Anaemia 1993–2005. WHO Global Database on Anaemia*, B. de Benoist and others (eds.), Geneva.
- _____ (2007), *Assessing the Iron Status of Populations*, Geneva.
- _____ (2001), *Iron Deficiency Anaemia: Assessment, Prevention and Control. A Guide for Programme Managers*, Geneva.

Annex

Table A. 1
Scaling Up Nutrition (SUN) interventions: impact, product and target population

#	Intervention	Impact or effect (Horton and others, 2010, p. 38)	Product	Target population
1	Breastfeeding promotion and support	Increase in the proportion of exclusive breastfeeding US\$53-153 per disability-adjusted life-year saved (SUN)	Counseling and promotion of exclusive breastfeeding	Pregnant mothers and parents of infants under 6 months of age
2	Complementary feeding	Reduction in deaths caused by malnutrition US\$500-1,000 per disability-adjusted life-year saved	Counseling and promotional campaign for complementary feeding after six months	Pregnant mothers and parents of infants and young children under 2 years of age
3	Improved hygiene practices, including handwashing	Disease reduction	Counseling and promotional campaign	Pregnant mothers and parents of young children under 5 years of age
4	Periodic vitamin A supplementation	US\$3-16 per disability-adjusted life-year saved	Supplements	Children 6–59 months of age
5	Therapeutic zinc supplements for management of diarrhoea	Disease reduction US\$73 per disability-adjusted life-year saved	Supplements	Children 6–59 months of age
6	Micronutrient powders	US\$12.20 per disability-adjusted life-year saved (zinc) 37:1 benefit:cost ratio (iron)	Micronutrient powders (Chispitas)	Children 6–23 months of age
7	Deworming drugs for children	6:1 benefit:cost ratio	Treatment with drugs or immunizations	Children 12–59 months of age
8	Iron-folic acid supplements for pregnant women to prevent and treat anaemia	US\$66–115 per disability-adjusted life-year saved (iron; no estimates known for folic acid)	Supplements	Pregnant women
9	Salt iodization	30:1 benefit:cost ratio	Law	Entire population
10	Iron fortification of staples	8:1 benefit:cost ratio	Law or programme to promote fortification	Entire population
11	Prevention and treatment of moderate malnutrition		Treatment through health or similar services	Populations with high prevalence of children 6-23 months of age with weight-to-age z scores <-2
12	Treatment of severe acute malnutrition with ready-to-use therapeutic (RUTF) foods		Treatment through health or similar services	Children 6-59 months of age with weight-to-height z scores <-3 or with mid-upper arm circumference <110mm

Source: S. Horton and others, *Scaling Up Nutrition, What Will It Cost?*, Washington, D.C., World Bank, 2010.

Table A. 2
Relationship between the areas of intervention and immediate causes of undernutrition

Thematic areas of intervention	Immediate causes			
	Biological utilization	Food quality	Limited supply	Limited access
1 Food production and access				X
2 Infrastructure			X	X
3 Trade			X	X
4 Food safety and quality	X	X		
5 Food aid		X		X
6 Nutrition and health information and knowledge	X	X		
7 Health care	X			

Source: Prepared by the authors, on the basis of Economic Commission for Latin America and the Caribbean/United Nations Children's Fund (ECLAC/UNICEF), "Child malnutrition in Latin America and the Caribbean", *Challenges*, No. 2, Santiago, April 2006; R. Martínez and others, "Food and nutrition insecurity in Latin America and the Caribbean", *Project Documents*, No. 274 (LC/W.274), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), October 2009.

Table A. 3
Specific interventions and scientific evidence

Area of intervention	Targeted group	Specific interventions	Reference		
			Author	Year	
1. Micronutrient supplementation	Pregnant and nursing women	Iron, or iron plus folic acid	Khan, A. and others	2011	
			Deregil, L. and others	2010	
			Peña-Rosas, J. and others	2012	
			Peña-Rosas, J. and F. Viteri	2009	
		Calcium	Hofmeyr, G. and others	2010	
			Imdad, A. and Z. Bhutta	2012	
		Iodine	Zimmermann, M.	2012	
			Zimmermann, M.	2007	
		Multiple micronutrients	Roberfroid, D. and others	2012	
			Haider, B. and Z. Bhutta	2007	
	Children < 2 years		Iron	Sachdev, H. and others	2005
				Long, H. and others	2012
			Vitamin A (newborns and > 6 years)	Mayo-Wilson, E. and others	2011
				Haider, B. and Z. Bhutta	2011
				Imdad, A. and others	2010
			Zinc	Imdad A. and Z. Bhutta	2011
				Yakoob, M. and others	2011
				Dey, A. and others	2010
			Micronutrient powders	De-Regil, L. and others	2011
				Rah, J. and others	2012
Zlotkin, S. and others	2005				
Vitamin K (newborns)	Puckett, R. and M. Offringa	2000			
2 Breastfeeding and complementary feeding for children from 6 to 23 months of age	Children < 2 years	Fortified blended foods (corn-soy blend, CSB)	Kuusipalo, H. and others	2006	
			Eichler, K. and others	2012	
		Ready-to-use therapeutic foods (RUTF) (Lipid-base nutrient supplementation, LNS)	Adu-Afarwuah, S. and others	2010	
			Chaparro, C. and K. Dewey	2010	
			Isanaka, S. and others	2009	

Table A.3 (concluded)

Area of intervention	Targeted group	Specific interventions	Reference	
			Author	Year
3. Fortification of staple foods	Entire population	Salt (iodine and fluoride)	Charro, B. and others	2012
		Wheat flour	Van Phu, P. and others	2010
		Rice	Lailou, A. and others	2012
			Beinner, M. and others	2009
4. Education strategies, health promotion and communication	Entire population, with special attention on pregnant and nursing women	Children < 6 months: exclusive breastfeeding	Arifeen, S. and others	2009
			Agho, K. and others	2009
			Roy, S. and others	2005
		Children from 6 to 24 months: breastfeeding plus complementary feeding	Bhandari, N. and others	2004
			Dewey, K. and S. Adu-Afarwuah	2008
			Ruel, M. and others	2008
			Sanitation and hygiene	Merchant, A. and others
	Cairncross, S. and others	2010		
	Nutrition – balanced, adequate, varied and healthy diet			
5. Improved health services	Children < 2 years	Delayed clamping of umbilical cord	Rabe, H. and others	2011
			McDonald, S. and Middleton P.	2009
		Deworming for children	Awasthi, S. and others	2000
			Bhoite, R. and U. Iyer	2012
	Immunizations			

Source: Prepared by the authors, on the basis of Scaling Up Nutrition (SUN), "Scaling Up Nutrition: a framework for action", September 2010 [online] <http://siteresources.worldbank.org/NUTRITION/Resources/281846-1131636806329/PolicyBriefNutrition.pdf>; R. Martínez and others, "Food and nutrition insecurity in Latin America and the Caribbean", *Project Documents*, No. 274 (LC/W.274), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), October 2009; Z. Bhutta and others, "Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?", *The Lancet*, vol. 382, No. 9890, Amsterdam, Elsevier, 3 August 2013; M. Ruel and H. Alderman, "Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?", *The Lancet*, vol. 382, No. 9891, Amsterdam, Elsevier, 10 August 2013.

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