Addressing child undernutrition: evidence review

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Addressing child undernutrition: evidence review

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Office of Development Effectiveness

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10 Selected think-tanks

Institute of Development Studies
International Development Research Centre
International Food Policy Research Institute
Overseas Development Institute
Action Contre la Faim (Action Against Hunger)
Feinstein International Centre
Earth Institute—Millennium Villages project

11 Non-government organisations

Contributions of non-government organisations to child undernutrition policy thinking and approaches

12 Country governments

HANCI methodology and approach
Guatemala
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The Philippines
Indonesia
Bangladesh
Myanmar

Part III Child nutrition data

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Afghanistan
Bangladesh
Cambodia
Indonesia
Lao People’s Democratic Republic

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# Abbreviations and acronyms

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<tr>
<td>ACF</td>
<td>Action Contre la Faim</td>
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<tr>
<td>AIDS</td>
<td>acquired immunodeficiency syndrome</td>
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<tr>
<td>CGIAR</td>
<td>formerly the Consultative Group on International Agricultural Research</td>
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<tr>
<td>CIDA</td>
<td>Canadian International Development Agency</td>
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<tr>
<td>DEVCO</td>
<td>Directorate-General for Development and Cooperation</td>
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<tr>
<td>DFID</td>
<td>Department for International Development, United Kingdom</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<td>ECHO</td>
<td>European Community Humanitarian Office</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>GII</td>
<td>Gender Inequality Index</td>
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<td>HANCI</td>
<td>Hunger and Nutrition Commitment Index</td>
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<td>HDI</td>
<td>Human Development Index</td>
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<tr>
<td>HIV</td>
<td>human immunodeficiency virus</td>
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<td>ICBMS</td>
<td>International Code on Breast Milk Substitutes</td>
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<td>IDRC</td>
<td>International Development Research Centre</td>
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<tr>
<td>IDS</td>
<td>Institute of Development Studies</td>
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<td>IFPRI</td>
<td>International Food Policy Research Institute</td>
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<td>JICA</td>
<td>Japan International Cooperation Agency</td>
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<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
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<tr>
<td>NGO</td>
<td>non-government organisation</td>
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<tr>
<td>ODI</td>
<td>Overseas Development Institute</td>
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<tr>
<td>REACH</td>
<td>Renewed Efforts Against Child Hunger and Undernutrition</td>
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<td>SUN</td>
<td>Scaling Up Nutrition</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>UN</td>
<td>United Nations</td>
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<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<tr>
<td>UN SCN</td>
<td>United Nations Standing Committee on Nutrition</td>
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<tr>
<td>WFP</td>
<td>World Food Programme</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Explanation of technical terms

**Malnutrition** is the condition that develops when the body does not get the correct quantity and balance of the calories, protein, vitamins, minerals and other nutrients it needs to maintain healthy tissues, organ function and, in children and adolescents, adequate growth and development. Malnutrition includes both undernutrition and overnutrition.

**Undernutrition** is a consequence of consuming too few essential nutrients, or using or excreting them more rapidly than they can be replaced. In children, the outcome is growth (weight or height) faltering and/or specific symptoms and signs of micronutrient deficiency disorders.

Golden has classified undernutrition into type I and type II nutrient deficiencies.¹

**Type I nutrient deficiencies**

Type I nutrients include iron, calcium, iodine, selenium and all the vitamins. These nutrients, which are stored in the body, are mainly required for specific metabolic functions (biochemical pathways) in the body, rather than for metabolism in general. When a person’s diet is deficient in a type I nutrient, the person initially continues to grow normally. The body store of the nutrient is consumed first. The concentration of the nutrient in the tissues then falls until the specific metabolic function that depends on the nutrient declines and the person becomes ill. The illness is recognised by characteristic signs and symptoms; after this stage is reached, growth may or may not be affected secondary to the overt illness.

We consider here the most common deficiencies affecting the health of children—vitamin A, iodine and iron—as well as thiamine deficiency in some Southeast Asian countries.

**Type II nutrient deficiencies**

Type II nutrients include protein, energy, zinc, magnesium, potassium and sodium. When there is a deficiency in one of the type II or ‘growth’ nutrients, the person stops growing. The body starts to conserve the nutrient—its excretion falls to very low levels so that there is no reduction in the tissue concentration. With continued or severe deficiency, the body starts to break down its own tissues to release the nutrient for use by the rest of the body; this process is associated with reduced appetite. These nutrients have no body stores that can be called on in an emergency and into which excess nutrients can be deposited.

There are three kinds of type II undernutrition in children: stunting, underweight and wasting.²

**Anthropometry** is the study of the measurements and proportions of the human body. In nutrition, anthropometry is the measurement of weight and height to estimate indices that are used to diagnose stunting, underweight, wasting and overweight. Anthropometric measurements also include skin fold thickness, and mid-upper arm and head circumference.

**Z-scores** represent the number of standard deviations by which an individual child’s anthropometric index differs from the median of the World Health Organization international growth reference


population. This is a database that was developed in 2006 based on breast-fed infants and children less than 5 years of age in Brazil, Ghana, India, Norway, Oman and the United States.

**Mid-upper arm circumference** (MUAC) can be used to identify acute malnutrition in women and children aged 6–59 months.

**Body mass index** (BMI, expressed in kg/m²) is an anthropometric measurement commonly used in adults. It is calculated by dividing weight (in kilograms) by the square of height (in metres). Between the ages of 0 and 19 years, BMI-for-age is used.

**Stunting** is defined as a height-for-age z-score of less than –2. It is due to chronic undernutrition and is associated with impaired growth and intellectual development.

**Wasting** is defined as a weight-for-height z-score of less than –2 or a MUAC of less than 125 mm. It is due to acute undernutrition. Severe wasting is defined as a weight-for-height z-score of less than –3 or a MUAC of less than 115 mm, and is associated with high mortality from infectious diseases. A child with bilateral oedema—an observable swelling of fluid accumulation in body tissues, most commonly in the feet and legs[^3^]—is automatically classified as having severe acute undernutrition.

**Underweight** is defined as a weight-for-age z-score of less than –2 and is a result of stunting, wasting or both.

**Overweight** in children is defined as a weight-for-height z-score or BMI-for-age z-score of greater than +2. **Obesity** is defined as a weight-for-height z-score or BMI-for-age z-score of greater than +3.

**Short stature** in adults may be the outcome of stunting in childhood. Short stature refers to an adult who is below the average height for an adult of the same age and sex. In women, a cut-off height of less than 145 cm is commonly used to define short stature.[^4^]

**Low birthweight** is defined as a birthweight of less than 2500 g. The two main causes of low birthweight are premature birth and intrauterine growth retardation.

**Undernourishment** refers to daily dietary energy consumption less than a predetermined threshold. It is measured in terms of the number of kilocalories required to conduct sedentary or light activities. This threshold is country specific. In estimating the rate of undernourishment, the Food and Agriculture Organization of the United Nations (FAO) uses a threshold of 2250 kilocalories per person per day in low- and middle-income countries. The threshold is higher if the average temperature is below 20 °C. **Hunger** is a commonly used synonym for undernourishment.

**Food security** ‘…exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy


Household food security is the application of this concept at the family level, with individuals within households as the focus of concern. From this definition, four main dimensions of food security are defined: food availability, access to food, food utilisation and stability of food security.

Physical availability of food addresses the ‘supply side’ of food security and is determined by the level of food production, stock levels and net trade.

Economic and physical access to food is important because an adequate supply of food at the national or international level does not guarantee household-level food security. Concerns about insufficient food access have resulted in a greater policy focus on incomes, expenditure, markets and prices in achieving food security objectives.

Food utilisation is commonly understood as the way the body makes the most of various nutrients in the food. Sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, diversity of the diet and intrahousehold distribution of food. Combined with good biological utilisation of food consumed, this determines the nutritional status of individuals.

Stability of the other three dimensions over time is needed for food security. Even if food intake is adequate today, a person is still considered to be food insecure if they have inadequate access to food on a periodic basis, risking a deterioration of nutritional status. Adverse weather conditions, political instability or economic factors (e.g. unemployment, rising food prices) may have an impact on food security status. For food security objectives to be realised, all four dimensions must be fulfilled simultaneously.

Nutrition security is achieved when secure access to an appropriately nutritious diet is coupled with a sanitary environment, and adequate health services and care, to ensure a healthy and active life for all household members.

Food and nutrition security is a term commonly used by the FAO to emphasise the links between food and nutrition.

Proximal risk factors for undernutrition are those factors that have a direct (or ‘immediate’) impact on child nutrition. In general, they equate to the food utilisation elements of food security.

Distal risk factors for undernutrition are those factors that have an indirect impact on child nutrition, including the food availability and food access dimensions of food security. Note that our use of the terms ‘proximal’ and ‘distal’ are based on the landmark studies of global burden of disease and risk factors.

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8 Lopez, Mathers, Ezzati, Jamison and Murray
**Nutrition-specific** interventions or programs address the proximal risk factors for fetal and child nutrition and development—adequate food and nutrient intake, feeding, care-giving and parenting practices; and low burden of infectious diseases.\(^9\)

**Nutrition-sensitive** interventions or programs address the distal risk factors for fetal and child nutrition and development—food security; adequate care-giving resources at the maternal, household and community levels; and access to health services, and a safe and hygienic environment. They incorporate specific nutrition goals and action.\(^10\)

**Nutrition-relevant** interventions are those that have an impact on nutrition, including both the preceding categories.

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\(^10\) Maternal and Child Nutrition Study Group
Introduction

This evidence review provides an overview of current evidence-based approaches to addressing child undernutrition and how they may apply to the Australian aid program.

Part I provides an up-to-date overview of the evidence for the ‘proximal’ (direct) and ‘distal’ (indirect) risk factors for child undernutrition, and the effectiveness of tested ‘nutrition-specific’ (direct) and ‘nutrition-sensitive’ (indirect) interventions to reduce child undernutrition. Evidence on the cost-effectiveness of these interventions is also included. These terms are explained in the ‘Explanation of technical terms’ and further elaborated later in this report.

Part II provides an overview of contemporary policy thinking and approaches to addressing childhood undernutrition by development partners, including multilateral organisations, global frameworks and alliances, bilateral donors, and developing country governments. Reference is also made to contemporary nutrition research and programming work by non-government organisations.

Part III summarises data on child nutrition indicators in countries relevant to the Australian aid program. Indicators have been selected to capture type I and type II undernutrition, low birthweight, and the proximal and distal risk factors for child undernutrition. Data for countries most relevant to the Australian aid program are interpreted in supplementary text. Data on overweight and obesity in children are not readily available for most countries of interest to the Australian aid program; however, a global and regional overview is provided.
Part I
Interventions to address child undernutrition

Between one-third and one-half of all deaths in children under 5 years of age are associated with undernutrition. New estimates indicate that undernutrition is the aggregate cause of 3.1 million child deaths annually or 45 per cent of all child deaths in 2011. Although each form of type II undernutrition has adverse consequences on the health of infants and young children, stunting leads to probably irreversible developmental outcomes. The proportion of children stunted is often used as an indicator of socioeconomic progress in a population. The second Lancet series on maternal and child nutrition, published in June 2013, recommends that stunting should replace underweight as the main anthropometric indicator for estimating undernutrition of children in populations. Low birthweight is one of the key determinants of child undernutrition, and intrauterine growth retardation is itself a form of undernutrition.

Nutrition is a product of the balance between food intake and utilisation of energy and nutrients; this balance is influenced by disease and mediated by care. The impact of care on nutrition is particularly important during the 1000-day window between conception and 2 years of age. Care is defined as 'the provision in the household and the community of time, attention and support to meet the physical, mental, and social needs of the growing child and other household members'.

Nutrition security focuses on the health and nutrition status of the population, including health promotion and disease prevention, aspects of caring practices and health services, and healthy environments. It is achieved by adopting a public health approach, incorporating secure access to sufficient and appropriately nutritious food, a sanitary environment, and adequate health services and care. Therefore, food security is one component of nutrition security; the concept of nutrition security enhances the understanding of how food security influences nutrition, by explicitly linking food, disease and care.

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12 Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz and Martorell
13 Maternal and Child Nutrition Study Group
1 Definition of child

The United Nations Convention on the Rights of the Child states that everyone under 18 years of age has all the rights in the convention and can therefore be defined as a child. These rights include ‘the right to good quality health care, clean water, nutritious food and a clean environment so that they will stay healthy’ (Article 24).

However, children aged 0–5 years will be the focus of this evaluation, for two reasons.

› There are more reliable measures and benchmarks of undernutrition for under-fives than for older age groups.
› Evidence suggests that undernutrition in the form of stunting is probably irreversible by the child’s fifth birthday, leading to lifelong physical and intellectual impairment.18

Although nutrition interventions currently focus on the ‘first 1000 days’, from conception to a child’s second birthday, the age at which stunting becomes irreversible varies and may be older than 2 years; consequently, children may benefit from nutrition programs beyond this age.

Other age-related terms used in this document include:
› infant—a child under the age of 1 year
› neonate or newborn—an infant under the age of 28 days.

Adolescent girls (aged 11–19 years) warrant attention as a particularly vulnerable group in the nutrition life cycle because, if they become pregnant, they are more likely than adult women to give birth to a low-birthweight baby. Female adolescents have been included in the conceptual framework presented in the second *Lancet* series on nutrition.

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A number of frameworks seek to describe the complex range of factors that influence child nutrition. One that is widely cited, and included in the original terms of reference for the evaluation, is the United Nations Children’s Fund (UNICEF) framework for improving child nutrition, which was developed 22 years ago. At the core of this framework (Figure 1) are a number of direct determinants of nutrition, called ‘immediate’ causes, followed by a further group called ‘underlying’ causes and, at the periphery, a group of ‘basic’ causes. Basic causes include political, ideological, economic, environmental, resource and technology factors. The UNICEF framework describes ‘short-route’ interventions that address the immediate causes and ‘long-route’ interventions that address underlying and basic causes.

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The recently published (2013) *Lancet* series on maternal and child nutrition expanded and refined this framework—for example, by including adolescent girls in the nutrition life cycle. Rather than the ‘short-route’ and ‘long-route’ interventions described in the UNICEF framework, the *Lancet* series employs the terms ‘nutrition-specific’ and ‘nutrition-sensitive’. We will use the same terms, which are also used by the Scaling Up Nutrition (SUN) Movement. The 2010 SUN Framework for Action outlines the principles and priorities for scaling up global efforts to address undernutrition. This framework is supported by a broad coalition of development partners, including Australia.

In conducting the desk-top study, we found that some of the terms used in the UNICEF framework to describe the causes of undernutrition—immediate, underlying, and basic—were imprecise. In particular, the terms ‘underlying’ and ‘basic’ lack specificity. We have opted to use the terminology employed by Murray and Lopez in their landmark studies of the global burden of disease and classify risk factors for child undernutrition as proximal (direct) and distal (indirect).

Murray and Lopez are the world’s pre-eminent experts on the analysis of causal relationships in health and disease. Traditionally, risk factors have been ranked according to the strength of the quantitative relationship between exposure to a risk factor and disease outcomes (the ‘relative risk’).

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21 Maternal and Child Nutrition Study Group


23 Lopez, Mathers, Ezzati, Jamison and Murray
In 1999, Murray and Lopez described a simplified ‘causal-web’, which includes the various distal (such as socioeconomic), proximal (behavioural or environmental), and physiological and pathophysiological causes of disease (Figure 2). It should be noted that child undernutrition is very rarely caused by intrinsic pathophysiological factors, such as metabolic disorders. Nutrition-specific interventions address proximal risk factors (or ‘causes’), and nutrition-sensitive interventions address distal risk factors.24

**Figure 2** Simplified schema for a causal-web illustrating various levels of disease causation (after Murray and Lopez25)

Geographic variation

The risk factors for child undernutrition are significantly different in south Asia, and to some degree in east Asia and the Pacific, from those in sub-Saharan Africa. Through the other components of this evaluation, we will assess whether nutrition-relevant activities of Australian aid address these differences through evidence-based interventions.

Although inadequate access to the minimal level of dietary energy consumption is one major cause of undernutrition, the association is not exclusive at a population level. The highest rates of undernourishment, or hunger, are in sub-Saharan Africa; rates are lower in south and east Asia. However, rates of child undernutrition are high in south and Southeast Asia, demonstrating that factors other than inadequate access to food influence undernutrition.26

The high rates of child undernutrition in south Asia (the so-called ‘Asian Enigma’) may be due to higher rates of maternal undernutrition than in sub-Saharan Africa, which may in turn be due to

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25 Murray and Lopez
differentially poor intrahousehold access by women and girls to food.\textsuperscript{27} This is discussed in some detail in Section 4.

To address the purpose of this evaluation, it is necessary to explore the relationship between various proximal and distal risk factors and undernutrition, and the interventions that address those risk factors, as part of the conceptual framework. Of key relationships that determine the nutritional status of an infant and young child, one of the most compelling is the intergenerational effect on nutrition (Figure 3).

\textbf{Figure 3} Intergenerational influences on child nutrition

Small adult women (<145 cm in height) are more likely to have low-birthweight babies, in part because maternal size has an important influence on birthweight. Children born with a low birthweight are more likely to have growth failure during childhood. As a result, girls born with a low birthweight are more likely to become adult women with small stature.\textsuperscript{28}

This cycle is accentuated by teenage pregnancy. As many as half of adolescent girls in some countries are stunted, increasing the risk of complications in pregnancy and delivery, and of poor fetal growth. Cultural beliefs may also play a significant role in determining the diets of pregnant and lactating women, infants and young children. Traditional, sometimes harmful, food taboos are common in many societies during pregnancy, lactation, infancy and illness.\textsuperscript{29}

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{27} Ramalingaswami, Jonnson and Rohde
\item \textsuperscript{28} Black, Victoria, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz and Martorell
\item \textsuperscript{29} W Holmes, D Hoy, A Lockley, K Thammavongxay, S Bounnaphol, A Xeuatvongsa and M Toole, Influences on maternal and child nutrition in the highlands of northern Lao PDR. \textit{Asia Pacific Journal of Clinical Nutrition} 16(3):538–546, 2007.
\end{itemize}
\end{footnotesize}
In June 2013, The Lancet published a second series of papers on maternal and child nutrition. Paper 1, ‘Maternal and child undernutrition and overweight in low-income and middle-income countries’, acknowledges the shortfalls of the United Nations Children’s Fund (UNICEF) 1991 conceptual framework in describing only the immediate, underlying and basic causes of undernutrition and not the means to address the causes.\(^{30}\) The series presents an adapted conceptual framework that incorporates nutrition-specific and nutrition-sensitive interventions to address the immediate, underlying and basic causes of undernutrition, as shown in Figure 4.\(^{31}\) Full definitions for nutrition terms used in this section can be found in the ‘Explanation of technical terms’.

Paper 2 of the 2013 Lancet series on maternal and child nutrition, ‘Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?’, includes nutrition-specific interventions to improve nutrition across the life cycle for adolescent girls, women of reproductive age, pregnant women, newborn babies, infants and children.\(^{32}\) We have adopted this framework, with some modifications, as the basis of nutrition-specific interventions.

Nutrition-sensitive interventions have an indirect impact on child nutrition status, by acting on the distal risk factors for child undernutrition, as shown in the scoping framework for child undernutrition used in this review (Figure 5). The distal risk factors for child undernutrition are complex and encompass multiple sectors. Consequently, many nutrition-sensitive interventions are often pre-existing development interventions, such as macroeconomic development and improved primary health care services, that are adjusted to more cogently address nutrition as one of many outcomes.\(^{33}\)

The package of 10 core nutrition-specific interventions outlined in the 2013 Lancet series, if scaled up to 90 per cent coverage, may reduce stunting in children under 5 years of age by one-fifth (20.3 per cent).\(^{34}\) To address child undernutrition fully, nutrition-sensitive interventions must also be employed.\(^{35}\) Indeed, improvements in child undernutrition typically reflect a combination of nutrition-specific and nutrition-sensitive interventions.

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30  Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz and Martorell
31  Maternal and Child Nutrition Study Group
34  Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
35  Department for International Development, The neglected crisis of undernutrition: evidence for action
specific and nutrition-sensitive interventions. This is sometimes called a ‘twin-track’ or ‘multiphase’ approach.

Figure 4   Framework for actions to achieve optimum fetal and child nutrition and development (Black et al. 37)

37 Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz and Martorell
Figure 5 summarises the nutrition-specific and nutrition-sensitive interventions to reduce child undernutrition that will be the focus of this evaluation. This scoping framework reflects several aims:

› to incorporate nutrition within the context of food security
› to emphasise the life-cycle nature of nutritional influences
› to acknowledge the most recent evidence for cost-effective nutrition-specific interventions
› to position improving access by women and adolescent girls to food within the household as a key nutrition-specific intervention.

The scoping framework includes all of the nutrition-specific interventions from the *Lancet* series (listed in the left-hand box of Figure 4) under broad headings. There is an additional intervention—’improved intrahousehold access to food by women and adolescent girls’—because of the strong evidence of its causal relationship to child undernutrition, especially in south Asia.38

The nutrition-sensitive interventions in the *Lancet* series, such as women’s empowerment, social safety nets, child protection, classroom education and women’s mental health, are not included in the review because Australian aid programs in these sectors do not have measured nutrition outcomes. Interventions that address contributing factors, such as poverty, female illiteracy, weak governance and poor infrastructure, are not included for the same reason.

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38 Ramalingaswami, Jonnson and Rohde
Figure 5  Scoping framework of nutrition-specific and nutrition-sensitive interventions for child undernutrition in the context of the three elements of food security

Adolescent girls  Women of reproductive age  Pregnant women  Newborns  Children <5 years

- Appropriate utilisation of food to meet dietary needs
- Improved intrahousehold access to food by women and adolescent girls
- Nutrition education and breastfeeding promotion, micronutrient supplements/fortification, maternal and child food supplements, treatment of acute undernutrition and nutrition interventions in emergencies
- Maternal, neonatal and child health (including disease prevention and treatment) services, and health and nutrition services for adolescent girls

Nutrition-specific

- Clean water, sanitation and hygiene education
- Family planning (delay in first pregnancy and birth spacing)

Nutrition-sensitive

- Availability of food to enable adequate dietary diversity
- Adequate access to nutritious food
- Agriculture, livestock, small animal raising and home gardens
- Rural livelihoods
- Social protection and microfinance

Nutrition governance (enabling environment in the Lancet 2013 framework)

Includes all the nutrition-specific interventions listed in the Lancet series on maternal and child nutrition (6 June 2013), as shown in Figure 4
**Intervention**

For the purposes of this report, a nutrition intervention is an action that has a significant body of evidence demonstrating its impact on child undernutrition. Interventions included in the review are those that have been identified through existing, recent syntheses of the evidence, and for which available evidence indicates a significant\(^\text{39}\) impact on child undernutrition.

Nutrition-specific interventions or programs address the proximal risk factors for fetal and child nutrition and development—adequate food and nutrient intake, feeding, care-giving and parenting practices; and low burden of infectious diseases.\(^\text{40}\)

Nutrition-sensitive interventions or programs address the distal risk factors for fetal and child nutrition and development — food security; adequate care-giving resources at the maternal, household and community levels; and access to health services, and a safe and hygienic environment. They incorporate specific nutrition goals and actions.\(^\text{41}\)

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\(^{39}\) ‘Significant’ refers to the statistical validity of the findings of field trials that demonstrate a reduction in undernutrition associated with the tested intervention.

\(^{40}\) Maternal and Child Nutrition Study Group

\(^{41}\) Maternal and Child Nutrition Study Group
4 Evidence on the risk factors for child undernutrition

Proximal risk factors
As discussed above, child nutrition status is an outcome of the balance between food intake and food requirements, which is influenced by disease and care. Inadequate energy and nutrient intake, infectious disease and inadequate care are thus the proximal risk factors for child undernutrition.

Inadequate energy and nutrient intake
Inadequate energy or nutrient intake leads directly to child undernutrition. Specifically, chronic energy and/or nutrient depletion in young children leads to slowed skeletal growth and a loss of, or failure to accumulate, muscle mass and fat. Deficiencies of specific nutrients, including vitamin A, iron, iodine, zinc and thiamine, are also directly associated with increased risk of morbidity and mortality in infants and young children.

- Vitamin A deficiency may lead to blindness and is also directly associated with increased risk of death before the age of 5 years.
- Iron deficiency is associated with anaemia and increased severity of infectious diseases, such as malaria.
- Iodine deficiency is associated with goitre and cretinism; this is a condition of severely stunted physical and mental growth.
- Zinc deficiency is associated with impaired growth and increased mortality associated with diarrhoea.
- Thiamine deficiency is associated with infantile beriberi, which may prove fatal by causing cardiac failure.

Infectious disease
There is a strong correlation between infectious diseases (including diarrhoea, acute respiratory infections, malaria and measles) and undernutrition in children. Infectious diseases negatively affect child nutrition status, with the impact proportional to the severity of infection.

Infectious diseases can lead directly to child undernutrition in four ways.

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43 Hoddinott, Rosegrant and Torero
Infections can increase a child’s energy or nutrient requirements, making it difficult for them to consume sufficient food. For example, human immunodeficiency virus (HIV)–positive children have 50–100 per cent greater energy requirements than their HIV-negative counterparts because of the increased energy required to combat opportunistic infections.\(^{45}\)

Infections common in low-income settings can reduce the capacity of a child’s body to absorb energy or nutrients from food. Intestinal helminth (worm) infestations can lead to malabsorption, and helminth infection in early childhood has been associated with a growth shortfall of 4.6 cm at 7 years of age.\(^{46}\) Similarly, diarrhoea is strongly linked with growth faltering;\(^{47}\) a study in Brazil found recurring diarrhoea episodes in young children to be associated with a 3.6 cm growth shortfall at 7 years of age.\(^{48}\)

Infections including helminths\(^{49}\) and HIV\(^{50}\) can directly reduce food consumption by reducing appetite. Symptoms such as vomiting, abdominal pain and dry mouth can also decrease the capacity or desire of children to eat. Furthermore, disease can lead to centrally controlled appetite suppression through the release of the cytokine interleukin-1, which is secreted by certain cells of the immune system in response to infection.

Parents often withhold food and fluids from sick children in the belief that this will assist their recovery from illness; this can lead to undernutrition through restricted food intake.

**Cycle between energy/nutrient intake and infectious disease**

As discussed above, infectious diseases can increase the risk of undernutrition in children. Significantly, however, child undernutrition can also increase the risk of infectious disease.\(^{51}\) Undernutrition weakens the immune system, placing a child at greater risk of contracting an infectious disease and of experiencing more severe or prolonged illness due to disease.\(^{52}\)

As a result, there is a ‘synergistic’ relationship between undernutrition and infectious disease,\(^{53}\) as shown in Figure 6. The risk of death in children aged under 5 years increases manyfold as their undernutrition status becomes more severe.\(^{54}\)

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\(^{48}\) Moore


\(^{50}\) Department for International Development, *The neglected crisis of undernutrition: evidence for action*


\(^{52}\) United Nations Children’s Fund, *Improving child nutrition: the achievable imperative for global progress*

\(^{53}\) Department for International Development, *The neglected crisis of undernutrition: evidence for action*

Inadequate care and feeding practices, including health care seeking behaviours

As technical understanding of child nutrition has improved and the critical importance of good nutrition in the first 1000 days (from conception to the child’s second birthday) has been identified, the role of inadequate care as a cause of child undernutrition has received greater attention.\textsuperscript{55} Because of the dependent status of infants and young children (under 2 years of age), food intake and disease are very strongly influenced by the feeding, care-giving, and health care-seeking practices of the caregiver. As a result, it is not conceptually meaningful to separate, for example, food intake from feeding practices.\textsuperscript{56}

Inappropriate infant and young child feeding practices have a negative impact on child nutrition status. The World Health Organization recommends breastfeeding initiation within 1 hour of birth, exclusive breastfeeding for the first 6 months, and appropriate complementary feeding beginning at 6 months, with breastfeeding continued for 2 years and beyond.\textsuperscript{57} Where these practices are not followed, negative impacts on child nutrition and health can result. A study in Ghana found that 22 per cent of neonatal deaths could have been averted through early initiation of breastfeeding within the first hour of birth.\textsuperscript{58} Infants aged less than 6 months who are not exclusively breastfed are

\textsuperscript{55} United Nations Children’s Fund, \textit{Improving child nutrition: the achievable imperative for global progress}

\textsuperscript{56} Department for International Development, \textit{The neglected crisis of undernutrition: evidence for action}


\textsuperscript{58} Department for International Development, \textit{The neglected crisis of undernutrition: evidence for action}
15 times more likely to die from pneumonia and 11 times more likely to die from diarrhoea than infants who are exclusively breastfed to 6 months of age.59

The health care–seeking practices of caregivers are key to whether or not infants and young children are protected from the harmful impacts of infectious diseases on nutrition status.60 In Sri Lanka, high rates of health care seeking have been associated with low child mortality in a setting with a high prevalence of child undernutrition; this suggests that appropriate health care seeking can reduce the risks of illness and death associated with undernutrition.61 Conversely, poor health care seeking has been implicated in 60–70 per cent of child deaths across diverse settings.62 One study found that children whose caregivers seek health care in a timely way are 19.5 times less likely to die than children whose caregivers do not seek timely care.63

**Inequitable intrahousehold food allocation**

It is difficult to measure gender disparities in access to food within the household.64 Available evidence, however, indicates that inequitable intrahousehold allocation of food between girl and boy children, and women and men, is a major contributing factor to child undernutrition, particularly in south Asia. Given the large absolute numbers of women and children affected by undernutrition in south Asia, inequitable intrahousehold food allocation can be considered a leading proximal cause of child undernutrition at a global level.

In some rural areas of India, there is evidence that the food intake of girl children is consistently of lower quality and/or quantity than that of male children in the same household.65 The inequitable allocation of food between boy and girl children within the household has been recognised by the UNICEF Regional Office for South Asia as sufficiently prevalent to justify the development of advocacy tools targeting this specific issue.66

Inequitable intrahousehold allocation of food also affects adult women. It has been reported that the food intake of adult women in south Asia is routinely of lower quality and/or quantity than that of adult men and boy children within the same household.67 This has been associated with high rates of

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64 Department for International Development, *The neglected crisis of undernutrition: evidence for action*
67 Ramalingaswami, Jonnson and Rohde
anaemia in adult women, particularly during pregnancy; as discussed later in this section, this has an intergenerational effect, leading to low birthweight and child undernutrition.\textsuperscript{68}

**Inadequate maternal, neonatal and child health services**

As discussed above, care seeking can have a protective effect on child health and survival outcomes associated with nutrition status. However, health care seeking can only have an impact if quality care is available. There is, therefore, an association between the quality and accessibility of maternal, neonatal and child health services and child nutrition status.\textsuperscript{69}

In Colombia\textsuperscript{70} and Ghana,\textsuperscript{71} improvements in the quality and accessibility of health services led to substantial improvements in child nutrition status. A cross-country review of successful community-based primary health care services found that they led to an average fall in the prevalence of child underweight of 1–2 per cent per year.\textsuperscript{72}

Furthermore, where quality care exists but is not accessible to all children, those children unable to access care are more likely to experience undernutrition. In India, for example, ‘institutional discrimination’ in health services and among nutrition workers, which excluded children from socially marginalised groups from accessing care, contributed to a substantially higher prevalence of underweight in children within these groups.\textsuperscript{73}

**Distal risk factors**

Distal factors at the household level place children at risk of inadequate food intake, disease, and inadequate care and feeding practices.

\textsuperscript{68} Ramalingaswami, Jonnson and Rohde


\textsuperscript{73} Department for International Development, *The neglected crisis of undernutrition: evidence for action*
Unhealthy household environment—water, sanitation and hygiene

A lack of access to safe water, adequate sanitation facilities and basic hygiene practices results in exposure to repeated water-related diseases, including enteric and helminth infections. Exposure to these diseases in early childhood is associated with stunting. As well, a substantial proportion of wasting in children is caused by acute and chronic diarrhoea that is attributable to inadequate water, sanitation and hygiene practices.

It is estimated that 50 per cent of the total disease burden of undernutrition is attributable to environmental factors, including inadequate water, sanitation and hygiene practices.

Inadequate access to food

Reliable access of households to food has a complex relationship with nutrition, and it is difficult to measure the impact of inadequate household access to food on child undernutrition. However, available evidence indicates that household food insufficiency negatively affects nutrition by restricting food intake.

A multicountry study in Myanmar, Ethiopia, Bangladesh and Tanzania found that the minimum cost of a healthy diet is beyond the means of most poor households, indicating that the required quality or quantity of food is not being consumed in these households. Most of the undernourishment globally is attributable to household food insecurity, since it results from the inability of households to access sufficient food during the annual ‘hungry season’, when food stocks are at their lowest preceding the harvest season.

Low agricultural productivity

There are strong conceptual linkages between agricultural development and child nutrition, but the evidence to support causal pathways is challenging to develop. As a basic principle, low agricultural productivity...
productivity among rural subsistence farmers is understood to lead to child undernutrition by restricting the quantity and/or quality of food intake and generating household food insecurity. Evidence supports the association between agricultural productivity and diet quantity and quality. Where agricultural growth has an impact on food availability, increased agricultural productivity generally increases the quantity of food consumed. However, where increased agricultural productivity is achieved through mono-crop production or increased production of nutrient-poor foods, productivity increases do not have a strong correlation with improved child nutrition outcomes. The likely explanation for this observed association is that mono-cropping and the production of nutrient-poor foods do not directly increase the accessibility of nutrients to children, and therefore may be less likely to avert micronutrient deficiencies.

Available evidence indicates a strong relationship between agricultural productivity and household food sufficiency. A multicountry study found a robust association between agricultural productivity and poverty, such that a 1 per cent increase in agricultural yields reduces the percentage of a country’s population living on less than $1 per day by 0.64–0.91 per cent. Thus, low agricultural productivity can be expected to restrict the financial capacity of households to access food. Additionally, where agricultural yields are insufficient to provide adequate food throughout the year, a hungry season occurs among food producers and groups within the rural economy who rely on producers for their livelihood; this season is associated with substantial acute undernutrition in children.

**Low status of women**

There is a strong and well-established correlation between the status of women and child nutrition status in developing countries. Based on data from 36 developing countries, it is estimated that the regional prevalence in south Asia of underweight in children aged under 3 years would drop by 13 per cent if men and women had equal status; for sub-Saharan Africa, where existing gender disparities...
are generally less sharp, the estimated effect is nearly 3 per cent.\textsuperscript{91} Nationally representative data from Bangladesh show that age at first marriage, maternal height, maternal educational attainment and attitudes towards domestic violence are closely correlated with child stunting.\textsuperscript{92}

One key explanation for the impact of women’s status on child nutrition is the role of women as caregivers. Women are almost always the primary caregivers for infants and young children in developing countries, and as such are closely involved with the quality of feeding, exposure to disease, and care of infants and young children—three of the proximal risk factors for child undernutrition.\textsuperscript{93} Consequently, undernutrition can result where women lack the capacity to support child nutrition.

For example, where women have greater workloads than men, they have less time to provide quality care for children, including optimal feeding practices;\textsuperscript{94} as discussed above, inadequate care and feeding practices impact negatively on child nutrition.\textsuperscript{95} Social stressors on mothers, such as poverty, violence and heavy workloads, can increase undernutrition in their children.\textsuperscript{96} Additionally, where women have little control over how resources are allocated within the household, resources are less likely to be allocated to children’s nutrition and health.\textsuperscript{97} Furthermore, inability of women to access and control the use of resources for their own wellbeing has a significant negative impact on the nutrition and health of their children.\textsuperscript{98}

The low status of women is associated with early childbearing. Adolescent girls are more likely to have underweight babies, who then are at higher risk of undernutrition in childhood.\textsuperscript{99}

Women’s low status is also associated with poor maternal nutrition both before and during pregnancy; as discussed below, this has negative impacts on child nutrition. Poor maternal nutrition is a particular concern in south Asia, as demonstrated by the lower weight gain during pregnancy and

\textsuperscript{91} Smith, Ramakrishnan, Ndiaye, Haddad and Martorell
\textsuperscript{93} Department for International Development, \textit{The neglected crisis of undernutrition: evidence for action}
\textsuperscript{94} United Nations Children’s Fund and Liverpool School of Tropical Medicine, \textit{Gender influences on child survival, health and nutrition: a narrative review}, UNICEF and Liverpool School of Tropical Medicine, New York, 2011.
\textsuperscript{97} United Nations Children’s Fund and Liverpool School of Tropical Medicine, \textit{Gender influences on child survival, health and nutrition: a narrative review}
\textsuperscript{98} United Nations Children’s Fund and Liverpool School of Tropical Medicine, \textit{Gender influences on child survival, health and nutrition: a narrative review}
higher rates of low birthweight in south Asia compared with sub-Saharan Africa.\textsuperscript{100} The intergenerational effects of poor maternal nutrition are discussed below.

Evidence for the effects of women’s status on child undernutrition emerges most strongly from south Asian settings, particularly for poor maternal nutrition outcomes. This is likely to reflect the generally larger inequities in the status of women and men in south Asian settings than in other regions, providing a larger effect that is more easily measured. This interpretation is supported by the results of a multicountry analysis including the regions of south Asia, sub-Saharan Africa, and Latin America and the Caribbean, which found an association at a regional level between the magnitude of the impact of women’s low status on child nutrition and the degree of status inequality between men and women.\textsuperscript{101}

\textbf{Contributing factors at the household level}

Values, beliefs, strategies and trade-offs within individual households can mediate the impact of risk factors on household members’ nutrition.\textsuperscript{102}

For example, the impact of household food insufficiency on child nutrition is mediated by intrahousehold decisions about the allocation of food and feeding practices for young children. Studies have shown that these can have negative\textsuperscript{103} or positive\textsuperscript{104} impacts on child nutrition status. Decisions about care seeking for children are also typically made through intrahousehold bargaining processes, and are therefore influenced by the prevailing values and beliefs of household members.\textsuperscript{105}

Cultural beliefs may play a significant role in determining the diets of pregnant and lactating women, infants and young children. Traditional food taboos are common in some societies and are passed on from generation to generation. A study of eight minority ethnic groups in two remote northern provinces of the Lao People’s Democratic Republic found that certain nutrition behaviours, including food taboos, may contribute to the high prevalence of child malnutrition and micronutrient deficiencies. Ethnic groups gave details of nutrition-related beliefs and practices; many of these are likely to be amenable to change through relatively low-cost nutrition promotion informed by the study’s findings.\textsuperscript{106}

\textbf{Contributing factors at the societal level}

Certain factors at the societal level place households at risk of exposure to the proximal and distal causes of child undernutrition.

\begin{itemize}
\item \textsuperscript{100} Ramalingaswami, Jonnson and Rohde
\item \textsuperscript{101} Smith, Ramakrishnan, Ndiaye, Haddad and Martorell
\item \textsuperscript{102} Le Cuizat and Mattinen
\item \textsuperscript{103} Dasgupta
\item \textsuperscript{104} U Mackintosh, D Marsh and D Schroeder, Sustained positive deviant child care practices and their effects on child growth in Viet Nam. \textit{Food and Nutrition Bulletin} 23(4 (Suppl)):18–27, 2002.
\item \textsuperscript{105} United Nations Children’s Fund and Liverpool School of Tropical Medicine, \textit{Gender influences on child survival, health and nutrition: a narrative review}; Hill, Kirkwood and Edmond, \textit{Family and community practices that promote child survival, growth and development: a review of the evidence}
\item \textsuperscript{106} Holmes, Hoy, Lockley, Thammavongxay, Bounnaphol, Xeuatvongsa and Toole
\end{itemize}
Poverty and inequity

At the national level, poverty is strongly associated with child undernutrition. Countries with high proportions of their populations living in poverty have substantially higher levels of child undernutrition.\textsuperscript{107}

Inequitable distribution of wealth also influences child undernutrition within national populations. A review of 50 developing countries found that severe stunting in children is almost three times higher among the poorest wealth quintile (18.0 per cent) than among the richest wealth quintile (6.2 per cent).\textsuperscript{108}

Poverty places direct constraints on households’ ability to access food and health services, and provide care in the immediate term.\textsuperscript{109} Evidence indicates that poverty also has longer-term impacts on child nutrition by severely limiting households’ capacity to make investments with positive nutritional impacts. For example, a study in south India found that poor rural households typically select low-risk, low-return crops rather than investing in high-risk, high-return crops, because they do not have the financial reserves to manage the higher risk of low yields in the short term.\textsuperscript{110} As described above, household food insufficiency is a strong, if distal, causal factor for child undernutrition.

Poverty and undernutrition are mutually reinforcing. It is well established that a high prevalence of undernutrition constrains economic activity by individuals and economic growth at a national level,\textsuperscript{111} creating a vicious cycle between poverty and undernutrition at the national and household level.

Weak governance

Governance can be expected to affect child nutrition status because it is central to several key domains that influence nutrition: the provision of public goods and services, including water and sanitation; the level of equity in access to health and education services by the poor; multiple inputs to the status of women; and the design and degree of social protection.\textsuperscript{112}

Numerous recent studies have found a correlation between governance and child nutrition status. A robust multivariate analysis of 82 countries found a correlation between lower rates of child undernutrition and higher levels of government effectiveness, political stability and rule of law.\textsuperscript{113} An in-depth study of governance and child undernutrition in Madagascar found that political commitment, accountability, demand for nutrition and nutrition governance, and effective financing

\textsuperscript{107} Headey


\textsuperscript{109} Chastre, Duffield, Kindness, LeJeune and Taylor


\textsuperscript{111} Department for International Development, \textit{The neglected crisis of undernutrition: evidence for action}

\textsuperscript{112} Food and Agriculture Organization of the United Nations, \textit{The state of food insecurity in the world: economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition}, FAO, Rome, 2012.

\textsuperscript{113} C Rokx, \textit{Governance and malnutrition: exploring the contribution of ‘good governance’ to malnutrition reduction in developing countries}, Febo Druk, The Netherlands, 2006.
led to substantial reductions in child undernutrition.\textsuperscript{114} Two separate studies comparing several in-depth country case studies found that governance structures, funding and political will have been key to effective action on nutrition.\textsuperscript{115}

**Contributing factors at the institutional level**

Formal and informal institutions, such as markets and social protection mechanisms, moderate the impact of the causal factors on households and individuals. Undernutrition often results from ‘vulnerability to shocks and long term stresses’.\textsuperscript{116} Institutions can support households and individuals to prevent and cope with these shocks and stresses.\textsuperscript{117}

Amartya Sen’s seminal research on famine in India found that an absence of institutional mechanisms to facilitate access to food led to mass hunger, since there was no legal means to cope with the basic risk factors for undernutrition.\textsuperscript{118} Conversely, market adjustments in Namibia to increase the purchasing power of pensioners and provide incentives for trading in rural or disadvantaged areas have had a positive impact on household nutrition.\textsuperscript{119} In Malawi, changes to the design and management of the national grain reserve have been linked with price spikes and a major famine,\textsuperscript{120} while a subsequent government subsidy program for selected agricultural inputs has been linked with large, rapid declines in staple cereal prices and a decline in the prevalence of child undernutrition.\textsuperscript{121} The case of Malawi demonstrates the substantial mediating influence of institutions on the relationship between underlying poverty and low agricultural productivity and nutrition.

**Intergenerational effects of poor maternal nutrition and health**

The causal and contributing factors described above operate in the context of intergenerational effects of maternal undernutrition.

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\textsuperscript{114} Rokx

\textsuperscript{115} L Haddad, AM Acosta and J Fanzo, *Accelerating reductions in undernutrition: what can nutrition governance tell us?*, In Focus Policy Briefing 22, Institute of Development Studies, Brighton, 2012.

\textsuperscript{116} Le Cuizat and Mattinen


\textsuperscript{118} United Nations Development Programme, *Exploring the role of social protection in enhancing food security in Africa*


The nutritional status of a woman before and during pregnancy directly affects the health of her baby.\textsuperscript{122} This is in addition to the indirect impact on child nutrition of the woman's capacity to provide quality infant care (discussed above).

Maternal ill health during pregnancy can lead directly to low birthweight. In particular, maternal malaria infection during pregnancy has a strong association with low birthweight.\textsuperscript{123}

Poor child or adolescent nutrition results in stunting or thinness in adulthood.\textsuperscript{124} Thin women or women of short stature are more likely to have babies with a low birthweight.\textsuperscript{125} This establishes a cyclical relationship between maternal undernutrition and low birthweight (see Figure 3 in Section 2).

Inadequate maternal energy intake is associated with child undernutrition. Low maternal body mass index before pregnancy is associated with intrauterine growth restriction, which leads to low birthweight and stunting.\textsuperscript{126} Maternal undernutrition during pregnancy is also associated with energy and nutrient deficiencies for the child during pregnancy;\textsuperscript{127} this leads to poor fetal growth, which can lead to stunting in childhood.\textsuperscript{128}

Inadequate maternal nutrient intake is also associated with child undernutrition. Maternal anaemia is a predisposing factor for low birthweight in children,\textsuperscript{129} as demonstrated by studies in India and Pakistan.\textsuperscript{130} Additionally, the concentration of micronutrients, including vitamin A and iodine, in breastmilk is contingent on maternal nutrient status and intake; maternal deficiencies in these nutrients are very likely to lead to infant depletion and deficiencies.\textsuperscript{131} This is particularly relevant for vitamin A deficiency in children, since neonates have low stores of this nutrient. Maternal nutrient

\textsuperscript{122} Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers and Rivera
\textsuperscript{124} United Nations Children's Fund, Improving child nutrition: the achievable imperative for global progress
\textsuperscript{129} Department for International Development, The neglected crisis of undernutrition: evidence for action
\textsuperscript{130} N Ramachandran, Women and food security in South Asia, World Institute for Development Economics Research, United Nations University, Helsinki, 2006.
\textsuperscript{131} Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers and Rivera
deficiencies can be caused or exacerbated by short intervals between pregnancies as well as by poor nutrition.132

132 United Nations Children’s Fund, Improving child nutrition: the achievable imperative for global progress
5 Recent evidence on the benefits and cost-effectiveness of nutrition-specific and nutrition-sensitive interventions

Nutrition-specific interventions targeting type II nutrient deficiencies

Nutrition-specific interventions directly target nutrition outcomes, by acting on the proximal risk factors for child undernutrition. They include interventions targeting mothers during or after pregnancy that directly affect child nutrition status.

Nutrition-specific interventions are best targeted to the 1000-day ‘window of opportunity’ covering pregnancy and the first 2 years of life, since this provides the best chance of reversing the impact of stunting and cognitive impairment.\(^\text{133}\)

Table 1 summarises the strength of evidence for nutrition-specific interventions targeting type II deficiencies, according to the *Lancet* 2013 series.

\(^{133}\) Department for International Development, *An update of ‘The neglected crisis of undernutrition: evidence for action’*
### Table 1  Summary: strength of evidence for nutrition-specific interventions targeting type II deficiencies, according to the *Lancet* 2013 series

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence for impact on child undernutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promotion of early and exclusive breastfeeding in infants</td>
<td>Strong</td>
</tr>
<tr>
<td>Promotion of appropriate complementary feeding in children 6–24 months</td>
<td>Strong</td>
</tr>
<tr>
<td>Growth monitoring</td>
<td>Weak</td>
</tr>
<tr>
<td>Therapeutic zinc supplements for diarrhoea management</td>
<td>Weak; strong evidence of indirect impact</td>
</tr>
<tr>
<td>Routine preventive zinc supplements in young children</td>
<td>Moderate</td>
</tr>
<tr>
<td>Deworming drugs for children</td>
<td>Strong (for children with confirmed infection only)</td>
</tr>
<tr>
<td>Prevention or treatment of moderate acute undernutrition in non-emergency settings</td>
<td>Moderate</td>
</tr>
<tr>
<td>Community-based management of severe acute undernutrition with ready-to-use therapeutic foods in non-emergency settings</td>
<td>Strong</td>
</tr>
<tr>
<td>Facility-based management of severe acute undernutrition according to WHO protocol in non-emergency settings</td>
<td>Strong</td>
</tr>
<tr>
<td>Balanced energy and protein supplements during pregnancy</td>
<td>Strong</td>
</tr>
<tr>
<td>Deworming during pregnancy</td>
<td>Weak</td>
</tr>
<tr>
<td>Maternal education on infant and young child feeding, and child care</td>
<td>Weak; strong evidence of impact when delivered as part of a comprehensive approach</td>
</tr>
<tr>
<td>Special populations: malaria prevention and intermittent treatment during pregnancy in endemic areas—reduces low birthweight</td>
<td>Strong</td>
</tr>
</tbody>
</table>

WHO = World Health Organization

*These classifications are based exclusively on the 2013 *Lancet* series on maternal and child nutrition and include only interventions assessed as having an impact on child undernutrition. Evidence is discussed more broadly in the text, with additional references provided. Some potential interventions not included in the *Lancet* series are also discussed in the text.

### Promotion of early and exclusive breastfeeding

**Definition:** putting the infant to the breast within 1 hour of birth, and breastfeeding exclusively for the first 6 months of life—that is, the infant receives only breastmilk, with no other liquids or solids (including water), with the exception of oral rehydration salts or liquid vitamins, minerals or medicines. A child should be breastfed until at least 2 years of age.

Breastmilk, including colostrum, almost always provides the optimal quality and quantity of nutrients and antibodies for infants; its ingestion therefore supports child nutrition. Early initiation of breastfeeding can protect neonates from acquiring infections, and is an important part of establishing successful breastfeeding. Exclusive breastfeeding is also associated with lower rates of gastrointestinal infection in infants. Given the role of disease, particularly enteric infections, as a proximal risk factor for child undernutrition, exclusive breastfeeding therefore has a positive impact on child nutrition status.

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134 World Health Organization, *e-Library of evidence for nutrition actions (eLENA)*
135 World Health Organization, *e-Library of evidence for nutrition actions (eLENA)*
136 Department for International Development, *The neglected crisis of undernutrition: evidence for action*
137 MS Kramer and R Kakuma, Optimal duration of exclusive breastfeeding. *Cochrane Database of Systematic Reviews* 82012.
Evidence for the impact of interventions to support early initiation of, and exclusive, breastfeeding has recently been updated in a systematic review of more than 100 studies. This review found that counselling or educational interventions increase the rates of exclusive breastfeeding in the first day after birth by 43 per cent, in the first month after birth by 30 per cent, and in 1–6 months after birth by 90 per cent. Counselling or educational interventions have also been associated with declines in the rates of not breastfeeding in the first day after birth by 32 per cent, in the first month after birth by 30 per cent, and in 1–6 months after birth by 18 per cent. Combined individual and group counselling was found to be more effective than either individual or group counselling on its own.

Promotion of appropriate complementary feeding

**Definition**: the introduction of safe, nutritionally adequate foods at 6 months of age, along with breastmilk.

Children aged 6–24 months have high nutrient needs relative to energy intake—foods need to be particularly nutrient rich and contain an appropriate balance of specific nutrients to support optimal growth and cognitive development. Growth faltering, associated with the consumption of foods of low nutrient density, is most evident during this period.

A systematic review of interventions across 25 countries found no single best model for promoting complementary feeding, since feeding practices are highly culture and context specific. Interventions must therefore be carefully designed with reference to the target population to ensure that they are feasible, relevant and appropriate. For example, educational interventions in isolation have been demonstrated to reduce stunting in food-secure populations, whereas educational interventions are most effective in food-insecure populations when combined with food supplements.

Growth monitoring

**Definition**: routine measurements in children less than 5 years of age to detect abnormal growth, combined with some action when abnormal growth is detected.

The 2008 Lancet series on maternal and child nutrition suggested that growth monitoring may be effective as a platform to deliver nutrition counselling and referrals for children identified as affected by undernutrition, but that there is insufficient evidence for a direct impact of stand-alone growth monitoring.

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139 Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Larney and Black

140 Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Larney and Black

141 Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Larney and Black


143 Dewey and Adu-Afarwuah

144 Dewey and Adu-Afarwuah

145 Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar


147 Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
monitoring on child undernutrition. The 2013 Lancet series does not refer to growth monitoring. A Cochrane review updated in 2009 found no difference in nutritional status between children who receive growth monitoring and those who do not; however, the review included only one study, which may have had too little statistical power to detect a difference between intervention and control groups. A systematic review including multiple studies from eight countries in south Asia, Africa and the Caribbean found evidence that children who receive growth monitoring in tandem with access to child health services and maternal nutrition education have better nutrition and survival outcomes than children who do not receive this integrated growth monitoring intervention.

**Therapeutic zinc** supplements for diarrhoea management

**Definition:** zinc supplementation during diarrhoea episodes (20 mg per day for 10–14 days).

There is good evidence that therapeutic zinc supplementation can reduce the duration of acute diarrhoea by 0.5 days, and of persistent diarrhoea by 0.68 days. This is expected to protect children from the negative impact of diarrhoea on nutrition status. However, a Cochrane review found insufficient evidence for the impact of therapeutic zinc supplementation on death or hospitalisation.

**Routine preventive zinc supplements in young children**

**Definition:** zinc supplementation provided daily or weekly to children less than 5 years of age.

Preventive zinc supplementation may reduce the prevalence of diarrhoea at a population level in a population at risk of zinc deficiency. This would be expected to have a positive impact on child nutrition. However, the evidence for impact of routine zinc supplementation on nutrition is currently ambiguous. A 2009 meta-analysis of 40 trials found only weak evidence for the impact of routine zinc

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149 Panpanich and Garner


151 Zinc is considered a type II nutrient, along with energy, amino acids, sodium and potassium, whereas vitamins, iron, iodine, folate and calcium are considered type I nutrients (see M Golden, The nature of nutritional deficiency in relation to growth failure and poverty. *Acta Paediatrica Scandanavica* 374:95–110, 1991.).


154 Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Larney and Black
supplementation on child stunting.\textsuperscript{155} whereas a 2011 meta-analysis of 36 studies found a small but significant positive effect on reduction of child stunting.\textsuperscript{156}

Deworming for children

\textbf{Definition:} periodic treatment with deworming drugs.\textsuperscript{157}

For individual children aged 12–59 months with helminth infection, there is evidence that deworming drugs have a positive impact on nutrition. Among these children, deworming drugs lead to improved micronutrient status (haemoglobin levels increased by 1.71 g/L weighted mean difference), reduced stunting (single dose associated with a 0.14 cm increase in height) and weight gain (single dose associated with a 0.24 kg increase in weight, and multiple doses associated with a 0.10 kg increase in weight at up to 12 months followup).\textsuperscript{158}

However, a recent Cochrane review found no evidence that blanket antihelminthic (deworming) campaigns have a beneficial impact on weight gain or haemoglobin levels in children.\textsuperscript{159} This was confirmed in the 2013 \textit{Lancet} series. The review confirmed that evidence indicates a positive impact on weight gain and haemoglobin levels for targeted campaigns that treat children with helminth infection.\textsuperscript{160}

Prevention or treatment of moderate acute undernutrition in non-emergency settings\textsuperscript{161}

\textbf{Definition:} optimal use of locally available foods to improve nutritional status or, in situations of food shortage or where some nutrients are not sufficiently available through local foods, the use of specially manufactured supplementary foods.\textsuperscript{162}

The optimal use of locally available and accessible nutrient-dense foods that provide sufficient energy and nutrients can improve the nutritional status of children and prevent them from becoming severely wasted.\textsuperscript{163}

Under conditions such as drought or harvest failure, where locally available foods provide insufficient energy and/or nutrients, supplementary foods can be used to supplement the regular diet and

\begin{itemize}
    \item \textsuperscript{156} A Imdad and ZA Bhutta, Effect of preventive zinc supplementation on linear growth in children under 5 years of age in developing countries: a meta-analysis of studies for input to the lives saved tool. \textit{BMC Public Health} 11(Suppl 3):S22, 2011.
    \item \textsuperscript{157} World Health Organization, \textit{e-Library of evidence for nutrition actions (eLENA)}
    \item \textsuperscript{158} Bhutta, Ahmed, Black, Cousins, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
    \item \textsuperscript{159} D Taylor-Robinson, N Maayan, K Soares-Weiser, S Donegan and P Garner, Deworming drugs for soil-transmitted intestinal worms in children: effects on nutritional indicators, haemoglobin and school performance (review). \textit{Cochrane Database of Systematic Reviews} \textit{7:CD000371.pub000374}, 2012.
    \item \textsuperscript{160} Taylor-Robinson, Maayan, Soares-Weiser, Donegan and Garner
    \item \textsuperscript{161} ‘Non-emergency’ refers to settings where populations are not affected by war, population displacement, famine or natural disasters.
    \item \textsuperscript{162} World Health Organization, \textit{e-Library of evidence for nutrition actions (eLENA)}
\end{itemize}
improve the intake of required nutrients.\textsuperscript{164} A cluster randomised controlled trial of supplementary feeding of children aged 0–7 years, with followup at age 25–42 years, found that receiving a supplement before 3 years of age was associated with higher cognitive test scores, higher wages and more years of schooling, suggesting improved cognitive development due to better nutrition.\textsuperscript{165} Other studies of the nutritional impact of supplementary feeding have found evidence of a positive impact on child height and weight (for example, in Ghana\textsuperscript{166} and Haiti\textsuperscript{167}), or on child weight but not height (for example, in Ecuador\textsuperscript{168} and Malawi\textsuperscript{169}).

However, there is currently a lack of evidence regarding the required nutrient intake for children with moderate undernutrition, through both locally available and supplementary foods.\textsuperscript{170}

**Community-based management of severe acute undernutrition with ready-to-use therapeutic foods in non-emergency settings**

**Definition:** provision of specially manufactured therapeutic foods to children with severe acute undernutrition (weight-for-height z-score less than –3) in community settings. For children with complications—estimated at up to 15 per cent of cases—the World Health Organization (WHO) recommends facility-based management according to the WHO protocol (see below); community-based management has been recommended for the remaining 85 per cent or more of cases.\textsuperscript{171}

A recent systematic review confirmed that ready-to-use therapeutic foods provide a weight gain of 3 grams per kilogram of bodyweight per day, and that they are safe and effective for use in home and community settings.\textsuperscript{172}

However, the cost-effectiveness of ready-to-use therapeutic foods compared with family foods has not been confirmed. In settings where households are able to access sufficient nutrient-rich foods and

\begin{itemize}
  \item \textsuperscript{169} C Lin, M Manary, K Maleta, A Briend and P Ashorn, An energy-dense complementary food is associated with a modest increase in weight gain when compared with a fortified porridge in Malawian children aged 6–18 months. *Journal of Nutrition* 138:593–598, 2008.
  \item \textsuperscript{171} Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
  \item \textsuperscript{172} T Gera, Efficacy and safety of therapeutic nutrition products for home based therapeutic nutrition for severe acute malnutrition: a systematic review. *Indian Paediatrics* 47(8):709–718, 2010.
\end{itemize}
support from a well-functioning health system, ready-to-use therapeutic foods may be the less preferred option.¹⁷³

**Facility-based management of severe acute undernutrition according to WHO protocol in non-emergency settings**

**Definition:** use of the WHO protocol for facility-based management of severe acute undernutrition. The WHO protocol is a comprehensive set of guidelines for health practitioners ¹⁷⁴ and is recommended for use in cases with complications, estimated at 15 per cent of cases of severe acute undernutrition.¹⁷⁵

Case fatality rates in children treated in accordance with the WHO protocol are as low as 3.4 per cent, although a case fatality rate of 35 per cent was observed in a group of HIV-positive children.¹⁷⁶ Among children with severe acute undernutrition who are treated in facilities but not in accordance with the WHO protocol, case fatality rates of 20–30 per cent are typical.¹⁷⁷

**Balanced dietary supplements during pregnancy**

**Definition:** provision of balanced dietary supplements to women during pregnancy.

The 2008 Lancet series systematic review concluded that the evidence for balanced energy and protein supplements (in which protein accounts for less than 25 per cent of the total energy content) during pregnancy is sufficiently robust to support implementation of this intervention in specific situational contexts. Citing a 2003 Cochrane review, the series reports that balanced protein–energy supplementation is associated with a reduction in risk of infants who are small for gestational age by 32 per cent and a reduction in stillbirth by 45 per cent.¹⁷⁸ Subsequently, a meta-analysis of 11 randomised controlled trials and quasi–randomised controlled trials confirmed that providing pregnant women with balanced protein–energy supplementation (in which protein accounts for less than 25 per cent of total energy) can reduce the risk of infants who are small for gestational age by 31 per cent, especially in malnourished pregnant women.¹⁷⁹ The 2013 Lancet series also included dietary supplements during pregnancy among cost-effective nutrition-specific interventions.

**Deworming during pregnancy**

**Definition:** drug treatment with deworming drugs during pregnancy.

¹⁷⁵  Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
¹⁷⁶  Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
¹⁷⁷  Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
¹⁷⁸  Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
Helminth (worm) infections during pregnancy lead to maternal deficiencies in iron, protein and total energy. These deficiencies lead to maternal anaemia and low weight gain during pregnancy, resulting in a higher risk of low birthweight.\textsuperscript{180}

The 2008 \textit{Lancet} series found that the evidence for deworming in pregnancy was sufficient for implementation of this intervention in specific situational contexts. Deworming during pregnancy is associated with a reduced risk of maternal anaemia. The mean decline in maternal haemoglobin between first and third trimester was found to be 6.6 grams per litre less for women who received deworming treatment than with a placebo.\textsuperscript{181} However, the 2013 series reported that five randomised controlled trials found no significant benefits.

**Maternal education on infant and young child feeding, and child care**

\textbf{Definition}: provision of education to mothers during or after pregnancy, relating specifically to feeding and care practices for infants and young children.

Maternal education on feeding and care can be effective in improving feeding practices. However, this intervention is less likely to be effective when it is delivered in isolation.\textsuperscript{182} Conversely, a randomised controlled trial in Iran demonstrated that specific education on care practices can be highly effective and have a positive impact on child stunting as part of a broader, multisectoral intervention that simultaneously strengthens the capacity of mothers to deliver quality care and develops an enabling environment for appropriate feeding and care practices.\textsuperscript{183} Additionally, evidence from Madagascar indicates that maternal education on feeding and care can be effective where women’s existing social networks are supportive, and where additional professional support exists to maintain the quality of care.\textsuperscript{184}

**Supplementary feeding of adolescent girls**

\textbf{Definition}: provision of micronutrient supplements, nutrient-dense food and/or energy-rich food to adolescent girls, often (but not always) through school-based programs.

Iron–folate supplementation provided to adolescent girls can increase haemoglobin levels, reducing their risk of developing anaemia both before and during pregnancy. A program in India that combined iron–folate supplements with nutrition education was found to reduce anaemia prevalence by up to 20 per cent.\textsuperscript{185} A cluster randomised controlled trial of a school-based supplementary feeding program in Uganda found that adolescent girls aged 10–13 years experienced a significant decline in

\begin{itemize}
\item Department for International Development, \textit{The neglected crisis of undernutrition: evidence for action}
\item Bhutta, Ahmed, Black, Cousins, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
\item R Haider, \textit{Adolescent nutrition: a review of the situation in selected South-East Asian countries}, Regional Office for South-East Asia, World Health Organization, New Delhi, 2006.
\end{itemize}
the prevalence of mild anaemia compared with the control group.\textsuperscript{186} This intervention was not reviewed in the 2013 \textit{Lancet} series.

\textbf{Special populations: malaria prevention during pregnancy in endemic areas}

\textbf{Definition}: malaria prophylaxis and intermittent preventive treatment with an antimalarial drug, or the use of insecticide-treated bed nets, during pregnancy.\textsuperscript{187}

Maternal malaria during pregnancy leads to low birthweight, due to placental infection and/or malaria-induced maternal anaemia.\textsuperscript{188}

A systematic review of randomised controlled trials reported in the 2013 \textit{Lancet} series found that, in malaria-endemic areas, malaria prophylaxis and intermittent preventive treatment for malaria reduced the risk of low birthweight by 43 per cent in babies born to the first or second pregnancy.\textsuperscript{189}

A further systematic review of randomised controlled trials found that the use of insecticide-treated bed nets during pregnancy reduced the prevalence of low birthweight by 23 per cent.\textsuperscript{190}

\textbf{Nutrition-specific interventions targeting type I nutrient deficiencies}

Table 2 summarises the strength of evidence for nutrition-specific interventions targeting type I deficiencies, according to the \textit{Lancet} 2013 series.

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence for impact on child undernutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periodic vitamin A supplements in children 6 months – 5 years</td>
<td>Strong</td>
</tr>
<tr>
<td>Multiple micronutrient supplements for pregnant women</td>
<td>Strong effect on maternal anaemia and low birthweight</td>
</tr>
<tr>
<td>Multiple micronutrient supplementation for children</td>
<td>Moderate effect on anaemia</td>
</tr>
<tr>
<td>Iron–folate supplements for pregnant women to prevent anaemia</td>
<td>Moderate effect on low birthweight and anaemia</td>
</tr>
<tr>
<td>Iodised oil capsules where iodised salt is unavailable</td>
<td>Strong</td>
</tr>
<tr>
<td>Universal salt iodisation</td>
<td>Strong</td>
</tr>
<tr>
<td>Iron fortification of staple foods</td>
<td>Strong</td>
</tr>
<tr>
<td>Biofortification of staple foods</td>
<td>Weak; moderate evidence of indirect impact</td>
</tr>
</tbody>
</table>


\textsuperscript{188} Department for International Development, \textit{The neglected crisis of undernutrition: evidence for action}.

\textsuperscript{189} ter Kuile, van Eijk and Filler

Periodic vitamin A supplements

**Definition:** provision of vitamin A supplements to children aged 6 months to 5 years. In settings where vitamin A deficiency is a public health problem,\(^{191,192}\) WHO recommends high-dose vitamin A supplementation every 4–6 months for infants and children 6–59 months of age, as a public health intervention to reduce child morbidity (including blindness) and mortality.\(^{193}\)

Two Cochrane systematic reviews assessing the effects and safety of vitamin A supplementation in children 6–59 months of age were updated for this WHO guideline.\(^{194}\) One of these evaluated the effectiveness of vitamin A supplements in preventing morbidity and mortality in children 6–59 months of age.\(^{195}\) It showed that giving vitamin A supplements to children reduces the rates of mortality and some diseases.

A meta-analysis of 17 trials (11 in Asia, 5 in Africa and 1 in Latin America) for all-cause mortality indicated that vitamin A supplementation reduces the overall risk of death in children aged 6–59 months by 24 per cent (risk ratio 0.76; 95 per cent confidence interval 0.69–0.83).\(^{196}\) The most recent meta-analysis of vitamin A trials, published in 2011,\(^{197}\) also found a reduction in all-cause mortality of 24 per cent. Seven trials reported a 28 per cent reduction in mortality associated with diarrhoea (risk ratio 0.72; 0.57–0.91). Vitamin A supplementation was associated with a reduced incidence of diarrhoea (risk ratio 0.85; 0.82–0.87) and measles (risk ratio 0.50; 0.37–0.67), and a reduced prevalence of vision problems, including night blindness (risk ratio 0.32; 0.21–0.50) and xerophthalmia (risk ratio 0.31; 0.22–0.45).

When an unpublished cluster randomised trial involving 1 million children in north India (the DEVTA trial) was considered in the meta-analysis, vitamin A supplementation reduced the effect size of all-cause mortality from 24 per cent to 12 per cent (risk ratio 0.88; 0.84–0.94). This trial was subsequently published in *The Lancet* in early 2013.\(^{198}\) The trial’s study methods have been widely

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\(^{192}\) Determination of vitamin A deficiency as a public health problem involves estimating the prevalence of deficiency in a population by using specific biochemical and clinical indicators of vitamin A status. Classification of countries based on the most recent estimates is available in World Health Organization, *Global prevalence of vitamin A deficiency in populations at risk 1995–2005: WHO global database on vitamin A deficiency*.


\(^{194}\) A Imdad, K Herzer, E Mayo-Wilson, M Yakoob and Z Bhutta, Vitamin A supplementation for preventing morbidity and mortality in children from 6 months to 5 years of age. *Cochrane Database of Systematic Reviews* (12):CD008524, 2010.


\(^{196}\) Imdad, Herzer, Mayo-Wilson, Yakoob and Bhutta


\(^{198}\) Mayo-Wilson, Imdad, Herzer, Yakoob and Bhutta

criticised because it was not designed as an efficacy trial. Critics have characterised the study as a program evaluation and challenge its inclusion in a meta-analysis that included many rigorously designed randomised controlled trials.

The effect of vitamin A supplementation on the antibody response to measles vaccination has recently been evaluated in an additional review. A meta-analysis of seven trials indicated that vitamin A supplementation at 6 or 9 months of age did not affect the measles vaccine response (seroconversion rates). No study has prospectively assessed the impact of co-administration of vitamin A and measles vaccine on child mortality.

Children with concurrent vitamin A deficiency and measles can suffer severe complications, and immediate vitamin A therapy significantly reduces the risk of severe complications and mortality. WHO therefore recommends that children be treated with high-dose vitamin A supplements during episodes of measles. All published trials to date suggest two doses of 200 000 IU (international units).

Several trials have found that combining zinc and vitamin A supplements has a greater effect on reducing morbidity from diarrhoeal disease and acute respiratory infections than vitamin A alone. However, routine combined zinc and vitamin A supplementation in children is not yet recommended by WHO.

Multiple micronutrient supplements for pregnant women

**Definition**: provision of three or more micronutrients as a supplement to women during pregnancy. Most programs focus on iron, iodine and vitamin A; WHO and the United Nations Children’s Fund (UNICEF) recommend a total of 15 micronutrients.

A review of randomised controlled trials found that multiple micronutrient supplements provided to women during pregnancy led to a 14 per cent reduction in intrauterine growth restriction. This provides direct evidence of the impact of this intervention on the undernutrition of children in the womb.

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203 Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
205 Vitamins A, B1, B2, B6, B12, C, D and E; and niacin, folic acid, iron, zinc, copper, selenium and iodine.
Additionally, there is strong evidence that multiple micronutrient supplements are effective in reducing maternal anaemia, which is a predisposing factor for low birthweight, by 39 per cent compared with either a placebo or two or fewer micronutrients.\textsuperscript{207} This intervention has a greater impact on low birthweight than iron–folate supplementation, leading to a 12 per cent greater reduction in low birthweight.\textsuperscript{208}

However, multiple micronutrients are most effective in individuals who receive adequate amounts of energy, protein and fat; people with type II undernutrition therefore may not benefit from multiple micronutrient supplements.\textsuperscript{209}

Multiple micronutrient supplementation for children

**Definition:** provision of three or more micronutrients as a supplement to children.\textsuperscript{210} Most programs focus on iron in combination with other micronutrients.\textsuperscript{211}

Compared with two or fewer micronutrients, multiple micronutrient supplementation has been associated with increased height (0.13 cm mean difference) and weight gain (0.14 kg mean difference).\textsuperscript{212} A systematic review of 17 randomised controlled trials\textsuperscript{213} found that multiple micronutrient powders were associated with reduced anaemia (34 per cent reduction) and improved iron and vitamin A status in children aged 6 months – 11 years. However, the same review found a significant association between multiple micronutrient powders and a 4 per cent increase in diarrhoea.\textsuperscript{214} The 2013 *Lancet* series recommends further research into the impacts and safety of multiple micronutrient supplements for children.\textsuperscript{215}

Iron–folate supplements for pregnant women to prevent anaemia

**Definition:** intermittent iron–folate supplementation during pregnancy.\textsuperscript{216}

It is well established that iron–folate supplements increase haemoglobin levels.\textsuperscript{217} The 2013 *Lancet* series found that supplementation reduced the risk of anaemia in pregnant women by 66 per cent.\textsuperscript{218}

\begin{itemize}
\item \textsuperscript{207} Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
\item \textsuperscript{208} Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
\item \textsuperscript{209} JP Habicht and GH Pealto, Multiple micronutrient interventions are efficacious, but research on adequacy, plausibility, and implementation needs attention. *Journal of Nutrition* 142(1):205S–209S, 2012; Thurnham, Multiple micronutrient nutrition: evidence from history to science to effective programs
\item \textsuperscript{210} Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
\item \textsuperscript{211} Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
\item \textsuperscript{212} LH Allen, JM Peerson and DK Olney, Provision of multiple rather than two or fewer micronutrients more effectively improves growth and other outcomes in micronutrient-deficient children and adults. *Journal of Nutrition* 139:1022–1030, 2009.
\item \textsuperscript{213} RA Salam, C MacPhail, JK Das and ZA Bhutta, Effectiveness of micronutrient powders (MNP) in women and children. *BMC Public Health* 13(Suppl 3):S22, 2013.
\item \textsuperscript{214} Salam, MacPhail, Das and Bhutta
\item \textsuperscript{215} Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
\item \textsuperscript{216} World Health Organization, *e-Library of evidence for nutrition actions (eLENA)*
\item \textsuperscript{217} T Sanghvi, P Harvey and E Wainwright, Maternal iron-folic acid supplementation programs: evidence of impact and implementation. *Food and Nutrition Bulletin* 31(2 Suppl):S100–S107, 2010.
\end{itemize}
There is some evidence that iron–folate supplementation from the second trimester of pregnancy, which is when existing programs tend to begin, is insufficient to combat pre-existing anaemia and should therefore not be considered a form of treatment for anaemia.\textsuperscript{219} The potential greater positive impact of multiple micronutrient supplementation\textsuperscript{220} needs to be included in assessments of the cost-effectiveness and opportunity costs of iron–folate supplementation.

**Iodised oil capsules where iodised salt is unavailable**

**Definition:** distribution of oral iodised oil capsules in areas with low coverage of iodised salt. WHO and UNICEF define ‘low coverage’ as less than 20 per cent of households with access to iodised salt, or less than 90 per cent of households with access to iodised salt and no increase in the proportion of households with access to iodised salt over a 2-year period.\textsuperscript{221} WHO and UNICEF recommend iodine supplementation in these settings for pregnant and lactating women, and children 7–24 months of age.\textsuperscript{222}

Iodine deficiency, as a type I nutrient deficiency, is a form of undernutrition.

In a setting where iodised salt was unavailable, oral iodised oil has been associated with a reduction of mortality in infants by 78 per cent during the first 2 months of followup.\textsuperscript{223} Universal salt iodisation replaces this intervention in most settings,\textsuperscript{224} but this intervention is expected to have a substantial impact on child nutrition and health where iodised salt remains inaccessible.

**Universal salt iodisation**

**Definition:** fortification with iodine of all salt used for human and animal consumption.\textsuperscript{225} Universal salt iodisation is an effective intervention to reduce iodine deficiency in children.\textsuperscript{226} Iodine is essential for healthy brain development in the fetus and young child.

The 2008 *Lancet* series found universal salt iodisation to reduce the risk of iodine deficiency in children by 41 per cent.\textsuperscript{227} The cost-effectiveness of this intervention was confirmed in the 2013 *Lancet* series.

\textsuperscript{218} Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Larney and Black

\textsuperscript{219} Department for International Development, An update of ‘The neglected crisis of undernutrition: evidence for action’

\textsuperscript{220} Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar


\textsuperscript{222} World Health Organization and Fund, Reaching optimal iodine nutrition in pregnant and lactating women and young children


\textsuperscript{224} Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar

\textsuperscript{225} World Health Organization, e-Library of evidence for nutrition actions (eLENA)

\textsuperscript{226} Department for International Development, An update of ‘The neglected crisis of undernutrition: evidence for action’

\textsuperscript{227} Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
Iron fortification of staple foods

**Definition:** addition of selected iron compounds to staple foods such as wheat flour, typically during food processing by the food industry.\(^{228}\)

Iron fortification of staple foods increases haemoglobin levels, reducing the risk of anaemia at a population level by up to 63 per cent.\(^{229}\) In children, iron fortification has been shown to reduce the odds of experiencing iron deficiency anaemia by 28 per cent.\(^{230}\)

Educational messages on the fortification of staple foods have been shown to increase children’s dietary intake of fortified foods at a population level.\(^{231}\)

Biofortification of staple foods

**Definition:** the use of conventional breeding techniques and biotechnology to improve the micronutrient quality of staple crops. Current biofortification efforts are focused on the micronutrients iron, zinc and vitamin A.\(^{232}\)

Additional research is needed to develop the evidence base for biofortification.\(^{233}\) However, predictive analyses suggest that this intervention can be cost-effective and provide greatest benefit to the poorest people.\(^{234}\)

There is evidence to support the principle of biofortification. Poor people tend to rely on energy-rich but nutrient-poor staple foods to meet their minimum energy requirements, which leads to the ‘hidden hunger’ of micronutrient deficiencies. A multicountry study found that the minimum cost of a diet that provides sufficient energy and nutrients is beyond the means of the majority of poor households.\(^{235}\) By increasing the micronutrient content of energy-rich staple foods, biofortification is expected to have a significant impact on nutrition status.\(^{236}\)

There is also evidence that it is possible to increase the micronutrient content of some energy-rich staple foods. A high-zinc rice was developed and scheduled for release in Bangladesh in 2012.\(^{237}\) In the Philippines, so-called ‘golden rice’, enriched with vitamin A, is in the process of development and

\(^{228}\) World Health Organization, *e-Library of evidence for nutrition actions (eLENA)*


\(^{230}\) Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar


\(^{233}\) World Health Organization, *e-Library of evidence for nutrition actions (eLENA)*


\(^{235}\) Chastre, Duffield, Kindness, LeJeune and Taylor


\(^{237}\) Meenakshi
regulatory approval. Additionally, there is evidence that the consumption of nutrient-dense foods improves child micronutrient status. The consumption of orange sweet potato, which is naturally rich in vitamin A, was found to reduce vitamin A deficiency in young children.

However, gaps in the evidence base for biofortification remain. It is unclear which staple foods can be fortified with which nutrients, what can be achieved through conventional breeding techniques and what may require the use of biotechnology, and how biofortified crops can be effectively and cost-effectively disseminated.

Special populations: food preparation to address thiamine deficiency (beriberi) in Southeast Asia

Definition: preparation of staple foods in ways that retain their thiamine content.

In Southeast Asia, where rates of infantile beriberi are the highest in the world and white rice is the predominant staple food, the consumption of polished white rice is associated with thiamine deficiency at a population level. Maternal thiamine deficiency can lead to potentially fatal beriberi in breastfed infants through the reduced nutrient content of breastmilk. Rice preparation methods at the household level, such as reducing soaking times and retaining water used for soaking, are associated with reduced thiamine deficiency in breastfed infants. Preparation of food to address thiamine deficiency was not considered in the 2008 or 2013 *Lancet* series but is particularly relevant to populations in Southeast Asia with low dietary diversity.

Special populations: antenatal vitamin A supplementation in HIV-positive women

Definition: targeted provision of vitamin A supplements to HIV-positive women during pregnancy.

The 2008 *Lancet* series found that antenatal vitamin A supplementation has a positive impact on low birthweight in pregnant women who are HIV-positive, although no impact was found in pregnant women who are HIV-negative. The 2013 *Lancet* series did not consider the impact of antenatal

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246 Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
vitamin A supplementation. Since high doses of vitamin A can interfere with fetal development, 3000 µg is recommended as the maximum daily supplement for all pregnant women.\textsuperscript{246}

**Nutrition-sensitive interventions**

Nutrition-sensitive interventions influence nutrition outcomes, in both the short and long term, through action on the distal risk factors of child undernutrition.

It is methodologically more challenging to trace and measure the impact of nutrition-sensitive interventions on child nutrition outcomes than for nutrition-specific interventions.\textsuperscript{247} Nutrition-sensitive interventions have also been far less likely than nutrition-specific interventions to be evaluated for their impact on child nutrition status.\textsuperscript{248} Consequently, the evidence base for nutrition-sensitive interventions is smaller, patchier and more complex.

**Improved water, sanitation and hygiene practices**

Improved water, sanitation and hygiene practices comprise improved water supply and water treatment, improved sanitation facilities, and education on hygiene, including hand-washing.\textsuperscript{249} There is a lack of evidence for the direct impact of hygiene interventions on stunting or underweight in children.\textsuperscript{250} However, there is robust evidence that hygiene interventions are effective in reducing diarrhoea and dysentery, which are known to affect child nutrition status. A meta-analysis of three systematic reviews\textsuperscript{251} has confirmed that hand-washing and hygiene interventions, including water treatment and improved sanitation facilities, reduce the incidence of diarrhoea by 30 per cent.\textsuperscript{252}


\textsuperscript{248} Department for International Development, *The neglected crisis of undernutrition: evidence for action*


\textsuperscript{250} Department for International Development, *An update of ‘The neglected crisis of undernutrition: evidence for action’*


\textsuperscript{252} Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar
Improved access to health services

Evidence for the impact of improved access to health services on child nutrition status is mainly derived from evaluation of conditional cash transfer programs, under which caregivers are provided with a cash incentive to use existing health services. Increased use of health services through conditional cash transfer programs has been associated with significant reductions in stunting. However, a systematic review has established that this positive impact is contingent on households being able to access quality care through health services.

Family planning

Family planning is defined as use of contraceptive methods, particularly modern methods, and the treatment of involuntary infertility to allow individuals and couples to anticipate and attain their desired number of children, and the spacing and timing of their births.

Family planning can promote child nutrition through birth spacing and delayed childbearing.

Short intervals between pregnancies and having several children may produce or exacerbate maternal nutrient deficiencies, which can then compromise the nutritional status of children. Birth spacing has been found to reduce maternal nutrient depletion and child undernutrition. For example, an analysis of nationally representative household survey data from El Salvador found that, compared with a birth interval of 36–59 months, birth intervals of less than 24 months and 24–35 months increased the odds of stunting in children by 52 per cent and 30 per cent, respectively. A review of the impact of birth spacing on child stunting found that the evidence is inconsistent, with a significant effect not found in all settings. However, for settings for which there was a significant effect, a birth interval of at least 36 months reduced stunting by 10–50 per cent.

Delayed childbearing until at least 20 years of age is also known to reduce child undernutrition because adolescent girls are more likely to give birth to low birthweight infants. There is an association between maternal early age (15–19 years) at first birth and low birthweight in infants, which appears to be independent of confounding factors such as maternal social disadvantage.

Agricultural development

There is an association between agricultural sector growth and improved nutrition status—an annual investment of US$8 billion in the agricultural sector would be expected to reduce the number of

258 Dewey and Cohen
259 Gibbs, Wendt, Peters and Hogue
underweight children globally by 10 million by 2050. However, unpacking and explaining this association is challenging. Complex conceptual linkages exist between agricultural development and child nutrition.

Agricultural development is understood to support improved child nutrition in five ways:

› increased consumption of energy and nutrients
› increased income from the sale of agricultural commodities
› increased empowerment of women as agents of nutrition-positive agricultural change
› reduced real food prices due to aggregate increased production
› increased macroeconomic growth through growth in the agricultural sector.

However, a recent systematic review found that the complexity of these pathways and the generally weak statistical power of studies of agricultural interventions mean that there is currently insufficiently strong evidence to determine the overall impact of agricultural interventions on child nutrition. A review of 19 agricultural development interventions, of which 12 (63 per cent) recorded child nutrition outcomes, found 9 interventions to be associated with improved child nutrition, 2 to be associated with negative impacts on child nutrition and none to be associated with no observed change in child nutrition status. These findings are summarised in Annex 2.

Despite the complexity of this evidence base, there is evidence (detailed below) that agricultural development may have a positive impact on child nutrition in three principal ways:

› increased agricultural productivity
› increased stability of food production
› increased control of women over agricultural assets.

Evidence indicates a link between increased food production and improved nutrition. Cross-country studies have found a robust association between increased agricultural yields and decreased household poverty, or increased household expenditure among the poorest households. This association suggests that increased agricultural production improves household food security, which is expected to have a positive impact on nutrition.

260 Hoddinott, Rosegrant and Torero; Ruel and Alderman
261 Ruel and Alderman
262 Department for International Development, The neglected crisis of undernutrition: evidence for action
263 World Bank, From agriculture to nutrition: pathways, synergies and outcomes
264 World Bank, From agriculture to nutrition: pathways, synergies and outcomes
265 Masset, Haddad, Cornelius and Isanza-Castro, A systematic review of agricultural interventions that aim to improve the nutritional status of children.
266 World Bank, From agriculture to nutrition: pathways, synergies and outcomes
267 Headey
268 Thirtle, Beyers, Lin, McKenzie-Hill, Irz, Wiggins and Piesse
269 Department for International Development, An update of 'The neglected crisis of undernutrition: evidence for action'
In Bangladesh, increased production of rice has been associated with a 15–20 per cent decline in underweight among children aged 6–59 months. However, increases in agricultural productivity can have negative impacts on nutrition. For example, agricultural technologies such as irrigation can increase workload and thereby lead to a net decrease in an individual’s energy. Furthermore, where increased productivity is through mono-crops or increased production of nutrient-poor foods, productivity increases will not necessarily improve nutrition. Conversely, increased production of diverse and micronutrient-rich foods such as fruits, vegetables and livestock can drive down local prices and deliver improvements in micronutrient status.

The majority of acute undernourishment (insufficient dietary energy intake) globally is attributable to a lack of stability in food production across seasons. Through improved technology for food production and storage, agricultural development can increase the stability of food availability across seasons and years, thereby supporting child nutrition. However, the links are not always well documented because many development programs do not measure nutrition outcome indicators.

Where agricultural development increases women’s access to, and control of, agricultural inputs, assets and outputs, there are positive impacts on child nutrition. For example, it is estimated that agricultural productivity would increase by approximately 20 per cent in some areas if women had the same access as men to agricultural inputs such as land, seed and fertiliser. Evidence indicates that the dissemination of agricultural technologies to women has a greater impact on poverty than providing these technologies to men, which indirectly impacts child nutrition.

Home gardens

As a recent systematic review has confirmed, the diversity of home gardens means that it is not feasible to generalise about the nutritional impact of all home garden interventions. It has been noted that meta-analysis is not an ideal mechanism to synthesise the evidence for the impact of home garden programs. However, evidence from individual home garden interventions indicates that some interventions can positively affect child nutrition status. The systematic review identified

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270 Department for International Development, *The neglected crisis of undernutrition: evidence for action*
271 Department for International Development, *The neglected crisis of undernutrition: evidence for action*
272 Department for International Development, *The neglected crisis of undernutrition: evidence for action*
273 World Bank, *Environmental health and child survival: epidemiology, economics and experience*
274 Devereux, Vaitla and Hauenstein Swan
275 Masset, Haddad, Cornelius and Isanza-Castro, *A systematic review of agricultural interventions that aim to improve the nutritional status of children*
278 International Food Policy Research Institute
279 Masset, Haddad, Cornelius and Isanza-Castro, *A systematic review of agricultural interventions that aim to improve the nutritional status of children*
280 Bhutta, Das, Rizvi, Gaffey, Walker, Horton, Webb, Lartey and Black
home garden interventions that had led to increased household income and increased consumption of specific fruits and vegetables.281

Home garden interventions have also been associated with increased access at the household level to greater quantity and quality of food, increased overall diversity of children’s diets, and reduced micronutrient deficiencies in children.282 A home garden program developed by Helen Keller International has increased food availability and improved the micronutrient status of participants, especially women and girls, across several country contexts, although these results have not been observed across all Helen Keller International home garden programs.283

Home garden interventions can have indirect positive impacts on child nutrition—for example, by supporting women’s empowerment and control over resources within the household,284 or by providing a focal point for the integration of agriculture and primary health activities and thus increasing access to health services.285 It is also important to note that home gardens can be more sustainable than other food-based initiatives, such as supplementation or fortification, that rely on sustained external inputs.286

Social protection

Social protection is defined as any policy instrument that seeks to reduce the poverty and vulnerability of individuals and communities, in either the short or long term.287 Social protection can usefully be understood as risk management—that is, preventing households from being exposed to shocks and/or assisting them to cope with shocks.288

Social protection programs are constantly evolving as conceptual approaches to understanding vulnerability and techniques for evaluating and fine-tuning programs develop.289 Social protection is also highly context specific.290 It is therefore challenging to evaluate the evidence for the impact of

281  Masset, Haddad, Cornelius and Isanza-Castro, A systematic review of agricultural interventions that aim to improve the nutritional status of children
283  Department for International Development, The neglected crisis of undernutrition: evidence for action
288  United Nations Development Programme, Exploring the role of social protection in enhancing food security in Africa
289  United Nations Development Programme, Exploring the role of social protection in enhancing food security in Africa
290  Department for International Development, The neglected crisis of undernutrition: evidence for action
social protection on child nutrition. Overall, however, most evaluations of the nutrition impact of social protection programs have found a positive impact.\textsuperscript{291} Indeed, many broad social protection programs have a more positive impact on child nutrition status than nutrition-specific programs that operate at a community level.\textsuperscript{292}

Evidence for the impact of several specific social protection programs is summarised below. Programs were selected on the basis of their inclusion in a recent review of social protection programs prepared by the High Level Panel of Experts on Food Security and Nutrition of the United Nations Committee on World Food Security.\textsuperscript{293} The decision to draw from the work of the panel was designed to align this report’s approach to social protection with the consensus of leading global experts. However, it is important to note that this approach may have biased the findings of this review.

\textbf{Input subsidies} have been used to reduce the price of agricultural inputs to producers, in order to promote household food security in the short term and agricultural productivity in the long term. In the case of Malawi, mentioned above (under ‘Contributing factors at the institutional level’), government subsidies for fertilisers and hybrid maize seeds generated a rapid increase in agricultural productivity and food availability at the national level.\textsuperscript{294} However, a recent review of the impact of input subsidies found that, although they tend to reduce rural poverty and increase food security at the household and national level, they are very expensive to maintain, disproportionately benefit non-poor producers and can have negative impacts on domestic markets.\textsuperscript{295} For these reasons, input subsidies are not considered to be an appropriate intervention to promote nutrition security.\textsuperscript{296}

\textbf{Crop and livestock insurance} is used to support households to make high-risk, high-return investments that will have positive impacts on household food security and household members’ nutrition status—for example, planting high-yield crops that are sensitive to variations in rainfall.\textsuperscript{297} A recent review found no evidence for the impact of these schemes on nutrition.\textsuperscript{298}

\textbf{Public works programs} provide paid work to the poor in exchange for labour on public infrastructure; this is designed to support household food security by supplementing and stabilising income. A large public works program in Maharashtra state, India, has been evaluated as stabilising income in rural

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\textsuperscript{291} Department for International Development, \textit{The neglected crisis of undernutrition: evidence for action}  
\textsuperscript{292} D Sridhar and A Duffield, \textit{A review of the impact of cash transfer programmes on child nutritional status and some implications for Save the Children UK programmes}, Save the Children, London, 2006.  
\textsuperscript{293} High Level Panel of Experts, \textit{Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition}  
\textsuperscript{294} Denning, Kabambe, Sanchez, Malik, Flor, Harawa, Nkhoma, Zamba, Banda, Magombo, Keating, Wangila and Sachs  
\textsuperscript{295} High Level Panel of Experts, \textit{Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition}  
\textsuperscript{296} High Level Panel of Experts, \textit{Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition}  
\textsuperscript{297} Rosenzweig andBinswanger  
\textsuperscript{298} High Level Panel of Experts, \textit{Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition}
households throughout the year and reducing undernutrition within participating households. This program is recognised as an example of best practice.

However, not all public works programs have a positive nutritional impact. In particular, the energy expended performing manual labour is known to reduce the net nutritional impact of the food or cash wages received; one evaluation of a program in Niger found lower body mass index scores for participants than for nonparticipants in the same household, although this may be confounded by intrahousehold power dynamics.

A recent review of the nutritional impact of food subsidies found that generalised food subsidies, available to the entire population, can increase the consumption of staple foods but are inefficient in that they tend to benefit richer households more than poorer households. The alternative approach of providing targeted food subsidies to pre-identified recipients has been found to have a high risk of corruption and leakage of subsidies to the non-poor, as well as high administrative costs. For example, a targeted food subsidy program in India cost nearly six rupees for each one rupee (or equivalent) of income transferred to participating households.

School feeding programs can have direct impacts on the nutrition status of participating children and households. For example, a school snack program in the Philippines increased the calorie consumption of primary-school children by 300 kcal per person per day. A supplementary feeding program in Uganda found a significant decline in the prevalence of anaemia for children aged 10–13 years, as well as women aged over 18 years, in participating households.

Evidence from Bangladesh shows the positive nutrition impacts of take-home rations delivered through a school feeding program on household members, particularly younger siblings. However, these impacts are typically small. Furthermore, school feeding programs reach school children too

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300 United Nations Children’s Fund, Improving child nutrition: the achievable imperative for global progress

301 High Level Panel of Experts, Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition


303 High Level Panel of Experts, Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition

304 High Level Panel of Experts, Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition


307 Adelman, Gilligan, Konde-Lule and Alderman


309 Food and Agriculture Organization of the United Nations, The state of food insecurity in the world: economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition
late to reverse any stunting that has already occurred during pregnancy and the first 2 years of life. A 2007 Cochrane review found school feeding to increase body mass index but not reduce stunting, while the *Lancet* 2008 series found that evidence showed little or no effect of preschool feeding programs on child undernutrition. As most school feeding is done in primary schools, the effects on adolescent nutritional status have not been studied.

**Conditional cash transfers** are payments made to families for an action that is generally relevant to child health or nutrition, such as the vaccination of children. A Cochrane review of conditional cash transfers found them to have a positive impact on the use of health services, and nutrition and health outcomes. Evaluations of the impact of conditional cash transfers on household food security have found a positive effect that is stronger in poorer households—the poorest 30 per cent of participating households in three programs had increased calorie intake by 5.8–12.7 per cent. Reviews of the impact of conditional cash transfers on child nutrition status have found an impact on stunting, although this effect is not observed consistently in all evaluated programs.

**Social transfers**, also known as unconditional cash transfers, are regular and predictable cash transfers targeted to poor and vulnerable households or individuals. Evidence indicates that social transfers improve energy and nutrient intake. An evaluation of a social transfer program in Ethiopia found that three-quarters of participants consumed a better quantity and quality of food than in the previous year. A scheme in Zambia is associated with increased consumption of fats, proteins and vitamins among beneficiaries, and a decline of households living on one meal per day from 19 per cent to 13 per cent.

Evidence also indicates that social transfers improve child nutrition in participating households. Children who are beneficiaries of a social transfer in South Africa have reduced stunting, such that

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311 Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar

312 Bhutta, Ahmed, Black, Cousens, Dewey, Giugliani, Haider, Kirkwood, Morris, Sachdev and Shekar


316 Department for International Development, *The neglected crisis of undernutrition: evidence for action*;


they are anticipated to be 3.5 cm taller as adults.\textsuperscript{319} A social transfer program in Malawi that has been rigorously evaluated is associated with a 9 per cent reduction in child stunting in beneficiary households in one year, compared with no change in control households.\textsuperscript{320}

Furthermore, evidence suggests that social transfers assist households to make investments that benefit nutrition.\textsuperscript{321} For example, consumption among beneficiaries of a social transfer program in Bolivia increased by twice the amount of the benefit, which suggests that the transfer facilitated investment with positive nutritional impacts.\textsuperscript{322} Importantly, there is some evidence that social transfers have a greater positive impact on child nutrition when they are delivered to women rather than men.\textsuperscript{323}

Social protection operates to reduce the vulnerability of individuals and households to the risk factors for undernutrition, but in general has little capacity to directly address these risk factors.\textsuperscript{324} Consequently, the impact of social protection on child undernutrition is greatest when these mechanisms are delivered as part of a comprehensive, integrated approach; this is referred to as a social protection system.\textsuperscript{325}

For example, a program in Bangladesh has effectively supported household nutrition security by reducing extreme poverty in participating households by 30 per cent over 4 years, and has increased the energy intake at household level from 1632 kcal per person per day to 2236 kcal per person per day, well above the minimum requirement. This success has been attributed to the program being integrated across sectors and acting on multiple areas, such as social protection, agricultural productivity and education.\textsuperscript{326}

\section*{Interventions addressing key contributing factors}

This section provides a brief summary of interventions to address key contributing factors that can expose households at risk to the proximal and distal causal factors for child undernutrition, such as female illiteracy, gender inequity, poor governance and poverty.

\begin{itemize}
  \item United Nations Development Programme, \textit{Exploring the role of social protection in enhancing food security in Africa}
  \item High Level Panel of Experts, \textit{Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition}
  \item High Level Panel of Experts, \textit{Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition}
\end{itemize}
Improved women’s education

Improved women’s education comprises both increased participation in formal schooling (e.g. schooling duration or level of educational attainment) and improved educational outcomes (e.g. literacy).

There is a well-established relationship between educational attainment of women and girls, literacy and child nutrition, although analyses of this relationship can be confounded by income.\textsuperscript{327}

A multicountry analysis suggests that 43 per cent of the total reduction in child undernutrition between 1970 and 1995 was attributable to improvements in women’s education.\textsuperscript{328} A review of data from 25 countries indicates that 1–3 years of maternal schooling reduces child mortality by 15 per cent.\textsuperscript{329} Literate mothers are more likely to access health services, understand health promotion messages and have the confidence to ask questions of health workers. Given that more than half of child deaths in developing countries are attributable to undernutrition,\textsuperscript{330} maternal schooling can be understood to have a protective effect on child nutrition.

Countrywide household surveys in India, Pakistan and Sri Lanka confirm the positive impact of maternal education on child nutrition. Analysis of these data indicates that illiterate mothers are associated with the highest incidence of child undernutrition in each country; women who have completed only primary schooling had up to 20 per cent less undernutrition among their children.\textsuperscript{331}

Women’s increased control over assets

Evidence indicates that women’s control over assets is a key pathway through which the status of women is correlated with child nutrition status. There is a strong body of evidence that interventions that increase women’s status and control over assets have positive impacts on child nutrition status.\textsuperscript{332} For example, a study of a microfinance program in Ethiopia found that children of female clients had significantly better nutrition status and household food security than children of male clients and controls; male clients and controls had roughly similar levels of reliance on food aid.\textsuperscript{333} A study in Sri Lanka found that household food consumption is more diversified, which can be expected

\textsuperscript{327} Pridmore and Carr-Hill, \textit{Public Health Nutrition}
\textsuperscript{329} Ramachandran, \textit{Women and food security in South Asia}
\textsuperscript{333} Pridmore and Carr-Hill, \textit{Addressing the underlying and basic causes of child undernutrition in developing countries: what works and why?}
to have positive nutrition impacts, when women have more control over household income.\textsuperscript{334} Furthermore, there is a broad body of evidence that increasing women’s control over resources has a positive effect on family and household welfare, and that this positive effect is particularly strong for child health and nutrition.\textsuperscript{335}

**Strengthened governance and political leadership**

There is a well-established link between good governance and child nutrition.\textsuperscript{336} A study of 82 countries found a strong correlation between higher government effectiveness, political stability and rule of law, and lower child undernutrition.\textsuperscript{337} Recently, several in-depth analyses of country experiences using governance interventions to address child undernutrition have developed an evidence base for the impact of governance on child nutrition.\textsuperscript{338} Based on this evidence, strong national leadership and political will, a multisectoral approach with institutionalised linkages between sectors, vertical integration, sustained funding, a plan that connects short- and long-term interventions, and effective accountability mechanisms, including civil society participation, create an enabling environment in which effective action on child undernutrition is more likely.

These interventions can have a substantial impact on child undernutrition. For example, the rapid reductions in child undernutrition in Thailand have been largely attributed to a supportive policy environment. This includes a comprehensive multisectoral nutrition policy, and effective integration of short- and long-term nutrition priorities within national development planning.\textsuperscript{339} In Brazil, a focused nutrition agenda under the direct control of the president contributed to a reduction in the prevalence of child underweight from 13 per cent in 1994 to 1.7 per cent in 2006.\textsuperscript{340}

**Macroeconomic development**

Economic growth in itself does not have a substantial impact on child undernutrition. On average, the prevalence of child undernutrition declines at half the rate of increases in gross national product per capita; this is four times slower than the decline in poverty rates.\textsuperscript{341} Indeed, in several countries, including India and Egypt, rapid economic growth has produced little or no reduction in


\textsuperscript{335} Food and Agriculture Organization of the United Nations, The state of food insecurity in the world: economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition

\textsuperscript{336} Pridmore and Carr-Hill, Public Health Nutrition

\textsuperscript{337} Rokx


\textsuperscript{339} Rokx; Sanchez-Montero, Ubach and Sullivan, Undernutrition: what works? A review of policy and practice; Sullivan, Lort-Phillips and Tinoco

\textsuperscript{340} Ruel

\textsuperscript{341} Department for International Development, The neglected crisis of undernutrition: evidence for action
malnutrition. However, economic growth in the context of macroeconomic policy reform has been associated with rapid improvements in child health and nutrition.

An extensive cross-country econometric analysis found that macroeconomic development drives improvements in child nutrition when it leads to increased food production, reduced poverty, increased female educational attainment, improved access to health services and reduced fertility rates. This relationship between what Headey terms ‘nutrition-sensitive growth’ and child nutrition has been clearly displayed in China and Thailand, where economic development has led to rapid improvements in child nutrition status.

Cost-effectiveness

The cost-effectiveness of nutrition-specific interventions has been well addressed in the literature. However, the cost-effectiveness of nutrition-sensitive interventions is substantially more challenging to calculate. Annex 1 provides detailed estimates of the cost-effectiveness of nutrition-specific and, where feasible, nutrition-sensitive interventions. It is important to note that Annex 1 draws together estimates of the cost–benefit ratio and cost-effectiveness of nutritional interventions from a range of sources. These sources use a variety of key assumptions to accommodate uncertainties in factors such as food production and utilisation, program coverage rate, treatment-seeking behaviour, outcomes at various stages of the project cycle, acceptance of the program within the target population and cost per unit of analyses. These assumptions vary across regions, study types and study designs, and the comparison of cost-effectiveness across studies—while useful—should be treated with caution.

The Copenhagen Consensus Centre, a United States–based think-tank that ‘publicises the best ways for governments and philanthropists to spend aid and development money’, has attempted to rank the cost-effectiveness of development interventions in its Copenhagen Consensus 2012. The top-ranked investment is ‘interventions to reduce chronic undernutrition in preschoolers’, a package of interventions including micronutrient supplements, complementary feeding, deworming, therapeutic treatment for diarrhoea, and nutrition counselling or behaviour change. This integrated package of nutrition-specific interventions was ranked highest because of its very high cost–benefit ratio—an investment of approximately US$100 per child was calculated to reduce child undernutrition by 36 per cent, equating to a cost–benefit ratio of 1:30 or more. Its approach focuses on the synergy between nutrition and economic development to recommend investment in child nutrition.

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342 Headey
343 Department for International Development, *The neglected crisis of undernutrition: evidence for action*
344 Headey
345 Headey
346 Bryce, Coitinho, Darnton-Hill, Pelletier, Pinstrup-Andersen and Maternal and Child Undernutrition Study Group
347 Ruel
348 *Expert Panel findings*, Copenhagen Consensus 2012, Copenhagen Consensus Center, Copenhagen, Denmark, 2012.
349 *Expert Panel findings*
Part II
Contemporary policy thinking and approaches to nutrition
### Table 3  Key global summits, frameworks and literature relevant to child undernutrition

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1974</td>
<td>World Food Conference identifies <strong>food production</strong> as the solution to world hunger</td>
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<tr>
<td>1979</td>
<td>Convention on the Elimination of All Forms of Discrimination Against Women protects women’s right to adequate nutrition during pregnancy and breastfeeding</td>
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<tr>
<td>1989</td>
<td>Convention on the Rights of the Child identifies children’s right to <strong>food, health and care</strong></td>
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<td>1991</td>
<td>Ending Hidden Hunger Conference focuses on <strong>micronutrient malnutrition</strong></td>
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<tr>
<td>1992</td>
<td>International Conference on Nutrition, the first global intergovernmental conference on nutrition, advocates integrating nutrition objectives into general development programming and addressing nutritional vulnerability</td>
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<td>1996</td>
<td>World Food Summit calls for <strong>food and nutrition security</strong> for all</td>
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<td>2000</td>
<td>Millennium Development Goal 1 calls for a 50% reduction in <strong>child underweight</strong></td>
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<tr>
<td>2001</td>
<td>World Food Summit + 5 focuses on <strong>agricultural development and food production</strong></td>
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<td>2002</td>
<td>A World Fit for Children, a UN special session, draws attention to the intergenerational cycle of undernutrition and poor health</td>
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<td>2003</td>
<td>Global Strategy for Infant and Young Child Feeding focuses on <strong>feeding and care</strong></td>
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<td>2004</td>
<td>FAO Member Countries adopt voluntary guidelines on <strong>national food security</strong></td>
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<td>2006</td>
<td>World Bank publishes <em>Repositioning nutrition as central to development</em>, identifying synergy between nutrition and economic development</td>
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<td>2006</td>
<td>UN Standing Committee on Nutrition annual session focuses on the <strong>double burden of malnutrition</strong></td>
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<td>2007</td>
<td>REACH adopts a <strong>multisectoral, multi-stakeholder</strong> approach to child undernutrition</td>
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<td>2008</td>
<td>The Lancet maternal and child undernutrition series 2008 identifies a set of direct interventions targeting the immediate causes of child undernutrition</td>
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<tr>
<td>2008</td>
<td>Copenhagen Consensus 2008 identifies <strong>zinc and vitamin A supplementation</strong> as the best global development investment</td>
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<td>2008–09</td>
<td>Global food price crisis brings attention to <strong>food production and supply systems</strong>^{350}</td>
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<td>2009</td>
<td>Rome Principles for Sustainable Food Security address <strong>governance of the global food system</strong></td>
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<td>2009</td>
<td>L’Aquila Food Security Initiative mobilises resources for <strong>agricultural development</strong> and <strong>social protection</strong> to support food security</td>
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<tr>
<td>2010</td>
<td>UN High Level Task Force on the Global Food Security Crisis focuses on <strong>nutrition security</strong> for vulnerable populations</td>
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<td>2010</td>
<td>1,000 Days Partnership advocates <strong>action in the first 1000 days</strong></td>
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<td>2010</td>
<td>SUN Road Map is released, focusing on <strong>country ownership, coordination</strong> and a twin-track approach</td>
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<tr>
<td>2012</td>
<td>Copenhagen Consensus 2012 identifies <strong>bundled micronutrient interventions</strong> as the best global development investment</td>
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<tr>
<td>2012</td>
<td>65th World Health Assembly adopts the Maternal, Infant and Young Child Nutrition Comprehensive Implementation Plan, which targets <strong>stunting, anaemia in women of reproductive age, low birth weight, childhood</strong></td>
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overweight, exclusive breastfeeding, and wasting

2012 SUN Revised Road Map and SUN Movement Strategy are released, re-emphasising country ownership, coordination and a twin-track approach, and identifying governance and alignment as key strategic approaches to address undernutrition.

2013 The Lancet Maternal and Child Nutrition Series 2013 includes the double burden of malnutrition, and identifies an enabling environment, nutrition-sensitive and nutrition-specific approaches as requisite for effective action on undernutrition.

FAO = Food and Agriculture Organization of the United Nations; REACH = Renewed Efforts Against Child Hunger and Undernutrition; SUN = Scaling Up Nutrition; UN = United Nations

The conference also addressed household food security, breastfeeding, the negative impacts of disease on child nutrition status, and micronutrient deficiencies.

At a global level, policy thinking and strategies relevant to child undernutrition have been characterised by diversity and changes in emphasis, as outlined in Table 3. However, it is possible to identify four components of contemporary policy thinking and approaches to child undernutrition that have emerged from this diverse history. These components have informed the Scaling Up Nutrition (SUN) Movement, which is recognised as the current global consensus on how best to approach child undernutrition.351

› Contemporary policy thinking is characterised by an increasingly strategic approach to child undernutrition. Current thinking has shifted from a primary focus on nutrition-specific interventions, such as micronutrient supplements, to encompass systems-based approaches targeting distal risk factors.352 This twin-track approach, advocated by the SUN Movement, focuses on distal risk factors operating at household, national and global levels as much as on proximal risk factors. It also pays greater attention to implementation and operational issues.353

› There has been a longstanding focus on the relationship between food security, rural and agricultural development, and nutrition. Conceptual understanding of this relationship has developed from a focus on food production, to food security, to the current emphasis on food systems.354 Using food systems to support nutrition is a key focus area for current policy thinking.

› Following the 2008–09 food price crisis, the global community has focused increasingly on the concept of nutritional vulnerability to shocks, including food price shocks. Currently, increased attention is paid to risk management, and the linkages between nutrition and social protection interventions.355

› A major recent shift in thinking about nutrition has been the increased attention paid to governance. Governance did not feature on the child undernutrition agenda as late as 2007,356 but now informs approaches to child undernutrition at the national and global level; for example, governance is central to the SUN Movement’s focus on coordination and country ownership.

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352 Kennedy, Webb, Walker, Saltzman, Maxwell, Nelson and Booth
355 Kennedy, Webb, Walker, Saltzman, Maxwell, Nelson and Booth
7 Key multilateral organisations

United Nations Standing Committee on Nutrition

The United Nations Standing Committee on Nutrition (UN SCN) is the peak UN body for nutrition. Its mandate is to harmonise food and nutrition policies within the UN family, and to promote coordination and cooperation in approaches to malnutrition, including child undernutrition, among UN agencies and partner organisations, including country governments.\(^{357}\) Nutrition is framed as a development issue, with undernutrition a barrier to human development.\(^{358}\) This conceptualisation of undernutrition entails a very broad focus on nutrition, which includes proximal and distal risk factors across all sectors.\(^{359}\)

UN SCN actions are focused on governance and multisectoral, multi-stakeholder coordination.\(^{360}\) The organisation also supports the integration of nutrition considerations into broader development activities—that is, nutrition-sensitive development.\(^{361}\) Although not an operational agency, UN SCN provides leadership and plays a critical role within the Scaling Up Nutrition (SUN) framework.

World Health Organization

The World Health Organization (WHO) is a technical agency that is responsible for developing standards, guidelines and operational norms. The agency has a strong focus on nutrition as a child health issue. Nutrition is framed in terms of individual health outcomes and immediate causes of undernutrition affecting the child and mother, including stunting, wasting, low birthweight, maternal anaemia, exclusive breastfeeding and appropriate complementary feeding.\(^{362}\) The focus of nutrition action is the mother–child dyad, with a life cycle approach taken to maternal nutrition and health.\(^{363}\)

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\(^{359}\) R Longhurst, Global leadership for nutrition: the UN’s Standing Committee on Nutrition (SCN) and its contributions, IDS discussion paper 390, Institute of Development Studies, Brighton, 2010.

\(^{360}\) United Nations Standing Committee on Nutrition, Strategic framework 2006–2010

\(^{361}\) United Nations Standing Committee on Nutrition, Strategic framework 2006–2010


Nutrition is described as the result of food intake, micronutrient intake, health status and care.\textsuperscript{364} This entails a focus on the proximal causes of child undernutrition.

The focus of actions is within the 1000 days covering pregnancy and the first 2 years of life. There is a major focus on promoting, protecting and supporting breastfeeding as a critical nutrition action,\textsuperscript{365} and on infant and young child feeding more broadly.\textsuperscript{366} A supplementary, specific focus is on micronutrient intake.\textsuperscript{367} WHO also provides technical guidelines for facility- and community-based management of severe acute malnutrition.\textsuperscript{368} Although WHO publications recognise the longer-term causes of child undernutrition, recommendations for action are made on the basis of the strength of the evidence for specific interventions.\textsuperscript{369} Consequently, recommendations for ‘essential nutrition actions’ are for nutrition-specific interventions targeting mothers and children, for which there is a stronger evidence base than for nutrition-sensitive interventions that have longer causal chains.\textsuperscript{370}

**UNICEF**

The United Nations Children’s Fund (UNICEF) positions nutrition as a critical component of its ‘child survival and development’ focus area.\textsuperscript{371} UNICEF is an operational agency and, like WHO, has a major influence on national policies. Australia is a major donor to UNICEF, especially in the Asia–Pacific region, and is in a position to influence policies and program performance. Nutrition is given a similar priority to the themes of disability, early childhood development and immunisation;\textsuperscript{372} it is considered to be an essential part of child health. Nutrition is described as the outcome of energy and micronutrient intake, health and care,\textsuperscript{373} which supports a focus on proximal risk factors for child undernutrition. UNICEF also has an explicit focus on the rights of women and girls, which supports a life cycle approach to maternal nutrition and a focus on intergenerational causes of child undernutrition.\textsuperscript{374}

UNICEF takes a twin-track approach to nutrition programming, covering both nutrition-specific and nutrition-sensitive approaches. Nutrition-specific interventions that target children cover infant and young child feeding, micronutrients, nutrition security in emergencies (e.g. supplementary feeding), and nutrition and HIV/AIDS.\textsuperscript{375} Nutrition-specific interventions also target mothers, through programs

\textsuperscript{364} World Health Organization, \textit{10 facts on nutrition}  
\textsuperscript{366} World Health Organization, \textit{10 facts on nutrition}  
\textsuperscript{367} World Health Organization, \textit{10 facts on nutrition}  
\textsuperscript{369} World Health Organization, \textit{e-Library of evidence for nutrition actions (eLENA)}  
\textsuperscript{370} World Health Organization, \textit{e-Library of evidence for nutrition actions (eLENA)}  
\textsuperscript{371} M Di Ciommo, \textit{The aid financing landscape for nutrition}, Development Initiatives, 2013.  
\textsuperscript{373} United Nations Children’s Fund, \textit{Nutrition: the big picture}  
\textsuperscript{374} United Nations Children’s Fund, \textit{Nutrition: the big picture}  
\textsuperscript{375} United Nations Children’s Fund, \textit{Nutrition: the big picture}
to prevent low birthweight, such as multiple micronutrient supplementation.\textsuperscript{376} Nutrition-sensitive interventions address the distal risk factors for maternal undernutrition and poor health, predominantly through programs targeting women’s education, workload and emotional wellbeing, as well as their physical health and nutrition status.\textsuperscript{377}

**Food and Agricultural Organization of the United Nations**

The Food and Agricultural Organization of the United Nations (FAO) takes a food-based approach to nutrition.\textsuperscript{378} Nutrition is conceptualised through its linkages with food and agriculture,\textsuperscript{379} using the central organising concept of food security.\textsuperscript{380} Importantly, while the FAO recognises that health status and care affect nutrition status, these are conceptualised as mediating rather than causal factors; food security is conceptualised as the dominant cause of undernutrition.\textsuperscript{381} Nutrition is framed at a population level, with no strong, specific focus on child undernutrition.\textsuperscript{382} Women, as a population group, are considered important for their role in food production and preparation, but maternal nutrition as an intergenerational cause of child undernutrition is not directly considered.\textsuperscript{383} The FAO identifies nutrition as central to the achievement of broader development goals, and engages with the complex feedback loops between agricultural development, food and nutrition status; however, these analyses are primarily focused on food security rather than on nutrition.

The majority of FAO nutrition actions involve food production and agriculture to increase the production, nutrient density and bioavailability of food, including home gardens, small livestock production, and education and technological development to improve food preservation.\textsuperscript{384} The FAO thus addresses the availability and utilisation dimensions of food security. It also targets the accessibility dimension of food security through a focus on food supply systems—for example, through increasing market access to affordable food.\textsuperscript{385}

**World Food Programme**

Under its 2008–2013 Strategic Plan, the World Food Programme (WFP) renewed its broad focus on nutrition.\textsuperscript{386} Tackling hunger and undernutrition is now a strategic objective.\textsuperscript{387} Nutrition is framed in

\textsuperscript{376} United Nations Children’s Fund, *Nutrition: the big picture*
\textsuperscript{377} United Nations Children’s Fund, *Nutrition: the big picture*
\textsuperscript{379} B Thompson and L Amoroso, *FAO’s approach to nutrition-sensitive agricultural development*, Food and Agriculture Organization of the United Nations, Rome.
\textsuperscript{380} Food and Agriculture Organization of the United Nations, *Nutrition*
\textsuperscript{381} B Thompson, L Amoroso and J Meerman, *Promoting the expression ‘food and nutrition security (FNS)’*, Strategy note, Nutrition and Consumer Protection Division - AGN, Food and Agriculture Organization of the United Nations, Rome.
\textsuperscript{382} Thompson, Amoroso and Meerman
\textsuperscript{383} Thompson and Amoroso; Thompson, Amoroso and Meerman
\textsuperscript{384} Food and Agriculture Organization of the United Nations, *Nutrition*
\textsuperscript{385} Food and Agriculture Organization of the United Nations, *Nutrition*
terms of energy and nutrient intake; since 2008, nutrient intake has been established as a key component of WFP thinking. Additionally, the WFP has recently expanded to address nutrition security, applying a social protection framework to design interventions that build resilience to food shocks.

The WFP recognises that the causes of undernutrition cover multiple sectors, but focuses its activities on food-based approaches to nutrition. Most actions target food intake, a proximal risk factor for undernutrition, through direct, nutrition-specific interventions, such as the provision of ready-to-use micronutrient-fortified powder to households. The WFP also implements school feeding programs in a number of countries in the Asia–Pacific region. Activities designed to promote nutrition security integrate food distribution with social protection mechanisms, such as cash or voucher schemes; however, activities under this integrated, social protection–focused approach are still developing and at this stage reach only a small minority of program beneficiaries.

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387 World Food Programme
388 World Food Programme
389 World Food Programme
391 World Food Programme
392 Di Ciommo
393 World Food Programme, Mid-term review of the WFP strategic plan (2008–2013)
8 Joint and global approaches to nutrition

Facts for life

*Facts for life* is a publication issued jointly by the United Nations Children’s Fund (UNICEF); the World Health Organization (WHO); the United Nations Educational, Scientific and Cultural Organization (UNESCO); the United Nations Population Fund; the United Nations Development Programme; the Joint United Nations Programme on HIV/AIDS (UNAIDS); the World Food Programme (WFP); and the World Bank. It presents a broad, global consensus on topics relevant to child health and development. The most recent edition was published in 2010.

Nutrition is conceptualised in terms of its impacts on child growth. The 2010 edition frames undernutrition as the result of energy and nutrient deficiencies. The focus is on the mother–child dyad, with mothers and children seen as very closely linked in terms of nutrition interventions and outcomes. Household food insecurity, and poor access to water, sanitation and hygiene at a household level are described as the factors that place children at greatest risk of undernutrition. Good infant and young child feeding practices, and micronutrient supplementation are the leading recommended nutrition-specific interventions.

2003 Global Strategy for Infant and Young Child Feeding

The 2003 Global Strategy for Infant and Young Child Feeding was developed jointly by WHO and UNICEF, and remains endorsed and strongly promoted by both.

Nutrition is described as central to child development and a human right. Nutrition outcomes and interventions are very strongly framed in terms of the mother–child dyad, which is described as ‘a biological and social unit’. Consequently, there is a strong focus on women’s nutrition, including maternal nutrition, and the broader contextual factors—including legal frameworks, cultural norms and social policies—on which women’s nutrition depends.

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395 United Nations Children’s Fund
396 United Nations Children’s Fund
397 United Nations Children’s Fund
398 United Nations Children’s Fund
399 United Nations Children’s Fund
and health service accessibility—that support or constrain women’s infant and young child feeding practices.\textsuperscript{402}

The fortification of staple foods or condiments, and micronutrient supplementation are listed as effective actions to support nutrition\textsuperscript{403}. However, the stated preferred option is to provide a nutritionally adequate diet through breastmilk and locally sourced family foods.\textsuperscript{404}

\textbf{2009 Rome Principles for Sustainable Food Security}

The Rome Principles for Sustainable Food Security were adopted at the 2009 World Summit on Food Security, hosted by the Food and Agriculture Organization of the United Nations (FAO) and attended by delegates from more than 180 countries.

The Rome Principles position nutrition as an agriculture and food security issue, without reference to the impact of health or care on nutrition status.\textsuperscript{405} Furthermore, the focus is on hunger rather than nutrition; this entails a focus on energy rather than nutrients.\textsuperscript{406} The focus is on the causes of food insecurity, with a twin-track approach recommended to alleviate hunger in the immediate term while also acting on longer term causes.\textsuperscript{407} The three key areas for action are identified as agricultural productivity and food production systems; coordination and governance at national, regional and global levels; and country ownership of integrated food security plans.\textsuperscript{408}

\textbf{1,000 Days Partnership}

The 1,000 Days Partnership is an ‘advocacy hub’ that brings together governments, multilateral organisations and non-government organisations.\textsuperscript{409}

The 1,000 Days approach is strongly informed by the UNICEF framework of child undernutrition, with nutrition conceptualised in terms of the mother–child dyad, occurring at the intersection of food, health and care, and impacted by proximal and distal risk factors.\textsuperscript{410} However, the partnership diverges from the UNICEF framework in focusing on direct, nutrition-specific interventions that target

\textsuperscript{402} World Health Organization and United Nations Children’s Fund, \textit{Global strategy for infant and young child feeding}

\textsuperscript{403} World Health Organization and United Nations Children’s Fund, \textit{Global strategy for infant and young child feeding}

\textsuperscript{404} World Health Organization and United Nations Children’s Fund, \textit{Global strategy for infant and young child feeding}


\textsuperscript{406} Food and Agriculture Organization of the United Nations, \textit{Declaration of the World Summit on Food Security}, World Summit on Food Security

\textsuperscript{407} Food and Agriculture Organization of the United Nations, \textit{Declaration of the World Summit on Food Security}, World Summit on Food Security

\textsuperscript{408} Food and Agriculture Organization of the United Nations, \textit{Declaration of the World Summit on Food Security}, World Summit on Food Security

\textsuperscript{409} 1,000 Days, \textit{What we do}, 1,000 Days, accessed 9 May 2013, www.thousanddays.org/about/what-we-do.

\textsuperscript{410} 1,000 Days, \textit{Why 1,000 days}, 1,000 Days, accessed 9 May 2013, www.thousanddays.org/about.
proximal risk factors for child undernutrition within the 1000 days covering pregnancy and the first 2 years of life.\textsuperscript{411}

\textbf{REACH}

Renewed Efforts Against Child Hunger and Undernutrition (REACH) is a joint United Nations initiative to support achievements towards Millennium Development Goal 1: to halve the proportion of underweight children under 5 years of age by 2015.\textsuperscript{412} REACH was jointly developed by WHO, UNICEF, the FAO and the WFP, with supplementary advice from the International Fund for Agricultural Development.\textsuperscript{413} REACH thus represents an approach to child undernutrition agreed upon by the four United Nations agencies with mandates most closely related to nutrition.

REACH draws strongly on the UNICEF framework for child undernutrition—equal weight is given to food, health and care as causes of undernutrition, and nutrition-specific actions in the immediate term are considered to include action on both maternal and child health.\textsuperscript{414} REACH is also linked with the 1,000 Days Partnership.\textsuperscript{415} REACH approaches child undernutrition through governance and a multisectoral approach.\textsuperscript{416} It is premised on the understanding that the causes of child undernutrition cross multiple sectors, and that therefore strong nutrition governance is required to effectively develop and deliver multisectoral responses.\textsuperscript{417} REACH focuses on the coordination of multiple government sectors, as well as coordination between development partners.\textsuperscript{418}

\textbf{Scaling Up Nutrition Movement}

The Scaling Up Nutrition (SUN) Movement is a partnership between ‘developing countries, academic and research institutions, civil society organizations, the private sector, bilateral development agencies, United Nations specialized agencies (FAO, UNICEF, WFP, and WHO), nutrition-specific collaboration organizations of the United Nations (SCN and REACH), and the World Bank’.\textsuperscript{419} The movement provides a framework to mobilise and guide action on child undernutrition.

SUN takes a twin-track approach to child undernutrition, combining a focus on proximal risk factors, to be targeted within the 1000-day window, with a focus on distal risk factors, to be targeted through

\textsuperscript{411} 1,000 Days, What we do
\textsuperscript{412}  B Pearson and B Ljungqvist, REACH: an effective catalyst for scaling up priority nutrition interventions at the country level, \textit{Food and Nutrition Bulletin} 32(2 (Suppl)):S115–S127, 2011.
\textsuperscript{414}  Pearson and Ljungqvist
\textsuperscript{415}  Pearson and Ljungqvist
\textsuperscript{416}  Pearson and Ljungqvist
\textsuperscript{417}  REACH Secretariat, \textit{Summary brief}, REACH, Italy.
\textsuperscript{418}  World Food Programme, \textit{About REACH}; REACH Secretariat, \textit{Summary brief}
nutrition-sensitive interventions across multiple sectors. Under the SUN framework, sectors most relevant to nutrition-sensitive interventions are agriculture, social protection and health. Education, gender, governance, water, sanitation and hygiene are considered relevant but less closely linked to nutrition outcomes. SUN also extends the understanding of nutrition-sensitive approaches to include a whole-of-government ‘do no harm’ approach, to ensure that actions across all sectors do not have negative impacts on nutrition outcomes. SUN advocates country ownership and a centralised governance structure, with an emphasis on coordination and the inclusion of civil society and other stakeholders in decision-making. The SUN Movement Strategy 2012–2015 emphasises governance and alignment as key modalities for national and global action on child undernutrition.

Maternal, Infant and Young Child Nutrition Comprehensive Implementation Plan

The Maternal, Infant and Young Child Nutrition Comprehensive Implementation Plan was developed by WHO and adopted at the 65th World Health Assembly in 2012.

The plan sets six global targets, to be achieved by 2025:

- 40 per cent reduction of stunting in children under 5 years of age
- 50 per cent reduction of anaemia in women of reproductive age
- 30 per cent reduction of low birthweight
- no increase in childhood overweight
- rate of exclusive breastfeeding in the first 6 months increased to 50 per cent
- childhood wasting reduced to less than 5 per cent.

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423 Scaling Up Nutrition Road Map Task Team, A road map for Scaling-Up Nutrition (SUN)


427 World Health Organization
These targets focus on the interconnections between maternal and child nutrition across the life cycle, and the double burden of malnutrition.

428  World Health Organization
9 Selected donors who are signatories to the SUN framework

Although this section focuses on bilateral aid agencies, as a reference for the Australian Government Department of Foreign Affairs and Trade, it should be noted that some development banks are also an important source of funding. The World Bank takes a ‘systems’ approach to health, population and nutrition, but also provides loans and technical assistance for nutrition-focused programs in a number of countries, including Senegal and Peru. The World Bank is a signatory to the Scaling Up Nutrition (SUN) Framework.

In June 2013, the Institute for Development Studies published a new Donor Hunger and Nutrition Commitment Index, measuring a wide range of factors to determine overall political commitment of donor countries to tackling hunger and undernutrition. These include the amount of aid given for agriculture, food security and nutrition, and policies and treaties that could impact on hunger and nutrition levels in poor countries. Out of 23 members of the Organisation for Economic Co-operation and Development (OECD), the donor countries in Table 4 ranked as follows in their level of commitment: United Kingdom (UK) (1st), Canada (2nd), Denmark (3rd), Ireland (5th), Japan (15th) and the United States (18th).

Australia ranked 12th, and the European Commission (EC) was not ranked.429

The UK particularly owes its high ranking—just above that of Canada and Denmark—to its strong performance on policy, program and legal indicators. It does well for supporting the SUN Movement, and for its biodiversity protecting agreements and relatively low levels of protection of domestic agricultural markets. In terms of spending, the UK has a strong record of delivering on its commitments for nutrition; its official development assistance support for nutrition (although not the highest) has been stable and enduring over the past decade.

However, the UK scores poorly compared with other countries on several spending indicators: its levels of aid funding for agricultural development, food security and climate change are comparatively low.

Canada does well on policies, programs and legal indicators. It supports the SUN Movement, does well in terms of low protection of agricultural markets, sets relatively low biofuel blending mandates and is among the top performers in delivering on its greenhouse gas emission reduction pledges. Its performance on spending indicators is variable. Canada leads in terms of its enduringly stable financial support for agriculture and food security over the past decade. However, Canada also shows weak spending performance on social protection, and climate change adaptation and mitigation.

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Denmark scores well for spending indicators. It gives a solid performance in terms of supporting nutrition, and this support is stable and enduring. It also invests well in climate change adaptation and mitigation. Denmark does poorly in terms of delivering on its greenhouse gas emission reduction pledges, yet is leading on the development of domestic climate change adaptation strategies and plans.

Ireland gains especially strong scores on biodiversity and endorsement of SUN, and is among the top donors investing in social protection. Ireland also shows enduring and stable financial support for agriculture and food security.

Table 4  Summary: major focus of nutrition-related work by selected donors

<table>
<thead>
<tr>
<th>Donor (HANCI ranking)</th>
<th>Thematic location of nutrition activities</th>
<th>Type of nutrition programming</th>
<th>Strategic approach</th>
<th>Major research focus area(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada (#2)</td>
<td>Food security</td>
<td>Twin-track</td>
<td>Avert child deaths</td>
<td>Micronutrients</td>
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<td></td>
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<td></td>
<td></td>
<td>Agricultural productivity</td>
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<td></td>
<td></td>
<td></td>
<td>Infant and young child feeding</td>
</tr>
<tr>
<td>Denmark (#3)</td>
<td>Social development</td>
<td>Nutrition-sensitive</td>
<td>Address distal risk factors</td>
<td>Nutrition-sensitive programming</td>
</tr>
<tr>
<td>European Commission (na)</td>
<td>Food security</td>
<td>Twin-track</td>
<td>Develop resilience</td>
<td>Agricultural productivity</td>
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<td></td>
<td>Social protection</td>
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<td>Food production systems</td>
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<td></td>
<td>Humanitarian</td>
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<tr>
<td>Ireland (#5)</td>
<td>Hunger</td>
<td>Twin-track</td>
<td>High-level advocacy on hunger</td>
<td>Agricultural productivity</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Align with the SUN framework</td>
<td>Food production systems</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Nutrition governance</td>
</tr>
<tr>
<td>Japan (#15)</td>
<td>Rural development</td>
<td>Nutrition focus not clearly articulated</td>
<td>Nutrition approach not clearly articulated</td>
<td>Agricultural productivity</td>
</tr>
<tr>
<td></td>
<td>Maternal, neonatal and child health</td>
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</tr>
<tr>
<td>United Kingdom (#1)</td>
<td>Nutrition</td>
<td>Twin-track</td>
<td>Align with the SUN framework</td>
<td>Nutrition-sensitive programming</td>
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<tr>
<td></td>
<td>Mainstreamed</td>
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<td></td>
<td>Agricultural productivity</td>
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<tr>
<td>United States (#18)</td>
<td>Health</td>
<td>Twin-track</td>
<td>Support rural development</td>
<td>Agricultural productivity</td>
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<tr>
<td></td>
<td>Food security</td>
<td></td>
<td></td>
<td>Food production systems</td>
</tr>
</tbody>
</table>

HANCI = Hunger and Nutrition Commitment Index; na = not applicable; SUN = Scaling Up Nutrition

Canada

The Canadian International Development Agency (CIDA) addresses nutrition through its food security focus area. Large food security initiatives, such as the development of food supply systems to ensure the availability and stability of food, could be considered to be nutrition interventions. However, there are few nutrition outcomes or indicators integrated into food security initiatives; rather, nutrition is addressed through action on its immediate causes, with an almost exclusive focus on micronutrient supplementation (including micronutrients delivered through dietary diversification, fortification and school feeding) and deworming. It is important to note that undernutrition is

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430 S Mutuma, E Fremont and A Adebayo, *Aid for nutrition: can investments to scale up nutrition actions be accurately tracked?*, ACF International, 2012.


432 Mutuma, Fremont and Adebayo; Canadian International Development Agency, *Increasing food security: CIDA’s food security strategy*

Nutrition programming is developed separately from programs addressing infant and young child feeding, which are grouped within child survival under the children and youth focus area.\footnote{Foreign Affairs, Trade and Development Canada, \textit{Nutrition}; Di Ciommo} CIDA supports research related to micronutrients, agricultural productivity and broader food security issues. Much of its research funding is channelled through the global research bodies CGIAR (formerly the Consultative Group on International Agricultural Research) and HarvestPlus.\footnote{Foreign Affairs, Trade and Development Canada, \textit{Nutrition}; Di Ciommo} Key research areas are basic research in the biofortification of staple foods and the development of drought-resistant crop varieties.\footnote{Di Ciommo}

**Denmark**

Denmark’s international development agency, Danida, does not identify nutrition as a major organisational priority. Rather, the agency focuses on broader development goals, which align closely with the basic causes of child undernutrition: governance, macroeconomic development, social development and social protection.\footnote{Di Ciommo} Within this framework, nutrition is explicitly addressed through agricultural programs, which sit under social development.\footnote{Di Ciommo} Programs are nutrition-sensitive, rather than nutrition-specific, and include developing food production systems and strengthening property rights to agricultural inputs such as land.\footnote{Di Ciommo} Danida also addresses nutrition in humanitarian and emergency settings through food aid.\footnote{Di Ciommo}

Danida has supported research to identify effective interventions targeting the distal risk factors for child undernutrition; this aligns with its organisational focus on broad development goals.\footnote{Pridmore and Carr-Hill, \textit{Addressing the underlying and basic causes of child undernutrition in developing countries: what works and why?}} Danida has also supported research addressing specific nutrition issues as identified by country partners, such as techniques to increase dietary diversity within a specific local context.\footnote{Ministry of Foreign Affairs of Denmark, \textit{Lessons learned from Danida supported research for health in development}, Ministry of Foreign Affairs of Denmark (Danida), Copenhagen, 2010.}
The EC addresses nutrition through two separate organisations: the European Community Humanitarian Office (ECHO), which is responsible for humanitarian and emergency settings, and the Directorate-General for Development Cooperation (DEVCO), which is responsible for development activities. Currently, nutrition programming across these two organisations is unified through the concept of resilience to shocks that affect food security—humanitarian programming strengthens recovery from shocks, and development programming strengthens resistance to shocks. Under this strategy, nutrition is closely linked with the frameworks of food security and social protection, as well as the humanitarian approach of mitigating the impacts of undernutrition to avert deaths.

ECHO places nutrition under the focus area of humanitarian aid and civil protection. The focus of ECHO actions is to reduce deaths from undernutrition, which is generally addressed through increasing food intake in the immediate term, often through ready-to-use therapeutic foods.

In the past, DEVCO has addressed nutrition through action across multiple program areas, including maternal and child health; poverty reduction; and water, sanitation and hygiene. Under the current focus on resilience, most nutrition actions are framed through food security. Actions address all four dimensions of food security: availability, accessibility, utilisation and stability. Within fragile or vulnerable countries, actions to promote nutrition through food security are also integrated with social protection mechanisms, including social transfers and infrastructure development. Additionally, DEVCO works to promote food security through strengthening the governance of global, regional and national food supply systems. Furthermore, DEVCO recognises the multisectoral nature of nutrition, and has scope to develop nutrition-sensitive interventions across multiple sectors, including rural development, public health and education.

EC support for research on nutrition is focused on agricultural research and technologies to support agricultural productivity and rural development, as a way to improve food security through

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444 Dangour, Diaz, Connolly, Miller and Lam
447 European Commission, *Addressing undernutrition in emergencies*, EC, Brussels, 2013; Mutuma, Fremont and Adebayo
449 European Commission, *Thematic strategy paper (update) and multiannual indicative programme 2011–2013*, Food Security Thematic Programme, EC, Brussels, 2010; Mutuma, Fremont and Adebayo
450 European Commission, *Thematic strategy paper (update) and multiannual indicative programme 2011–2013*
451 European Commission, *Thematic strategy paper (update) and multiannual indicative programme 2011–2013*
452 European Commission, *Thematic strategy paper (update) and multiannual indicative programme 2011–2013*
453 Di Ciommo
strengthening the agricultural sector.\textsuperscript{454} This includes both basic research (e.g. research into the impacts of horticulture and biodiversity interventions on the nutritional adequacy of food) and implementation research into food production and food supply systems (e.g. research into how value chains and market access can support rural development).\textsuperscript{455} Most EC nutrition research funding is channelled through CGIAR.\textsuperscript{456}

Ireland

‘Hunger’ is a cornerstone of Ireland’s foreign and aid policies, and policies to support action on hunger have been adopted in both Irish Aid and the Department of Foreign Affairs.\textsuperscript{457} The government has established an expert Hunger Task Force and appointed a Special Envoy on Hunger. Irish Aid has a centralised Hunger Unit\textsuperscript{458} and has a commitment to spend 20 per cent of official development assistance on hunger by 2013.\textsuperscript{459} There are conceptual differences between nutrition and hunger—hunger focuses on satiation from food, whereas nutrition focuses on energy and nutrients; thus, not all hungry people have undernutrition and vice versa.\textsuperscript{460} Irish Aid’s hunger and food security agenda has three focus areas: smallholder agriculture, maternal and infant undernutrition, and governance and leadership.\textsuperscript{461} Nutrition relates to all three areas, but is directly addressed through maternal and infant undernutrition. This separates nutrition-specific programming from agriculture and governance strategies, although these are also designed with reference to hunger.

Irish Aid’s nutrition-specific interventions are designed with reference to the 1000-day window and with a focus on the mother–child dyad.\textsuperscript{462} Nutrition objectives are also included in many nutrition-relevant programs, particularly agriculture and livelihood, making these programs nutrition-sensitive.\textsuperscript{463} A major nutrition-sensitive approach is Irish Aid’s strong focus on women smallholder farmers within its agriculture programs.\textsuperscript{464} Irish Aid also works with governments to encourage the prioritisation of nutrition in national agendas.\textsuperscript{465}

\begin{itemize}
\item[454] European Commission, \textit{Thematic strategy paper (update) and multiannual indicative programme 2011–2013}
\item[455] European Commission, \textit{Thematic strategy paper (update) and multiannual indicative programme 2011–2013}
\item[456] European Commission, \textit{Thematic strategy paper (update) and multiannual indicative programme 2011–2013}
\item[458] Farrell
\item[459] Farrell
\item[461] Farrell
\item[464] Irish Aid
\item[465] Di Ciommo; Farrell
\end{itemize}
Irish Aid supports research focused on agricultural innovation and local agricultural productivity across a number of countries. It provides core funding to CGIAR and funds CGIAR programs in selected countries. Research areas include the development of drought-resistant and biofortified crops, improved crop yields and more sustainable farming practices. Other research addresses the theme of climate change and hunger reduction through adaptation of food production systems. Across all research, there is a focus on dissemination of results to producers, particularly smallholder farmers.

Japan

The Japan International Cooperation Agency (JICA) does not appear to prioritise nutrition as a program area. JICA anticipates positive nutrition outcomes from two of its program areas: rural development; and maternal, neonatal and child health. However, neither of these program areas has a strong focus on nutrition. Rather, rural development programs are framed in terms of their impact on food security and economic growth, while health programs focus on health system strengthening and country-led approaches. JICA does not have a stated nutrition strategy or agenda within either of these program areas.

JICA supports basic research to improve rice yields through high-yield varieties, as well as improved cultivation techniques and mechanisation. JICA also supports research into aquaculture technologies, with a focus on dissemination of results to small-scale producers; given the importance of fish as a protein source in low-income countries, this research is considered by JICA to address nutrition issues.

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466 Farrell
467 Farrell
468 Irish Aid, Agriculture
470 Irish Aid, Agriculture
474 Di Ciommo
United Kingdom

The Department for International Development (DFID) has a strong focus on child undernutrition and a detailed nutrition strategy. DFID adopts a twin-track approach to child undernutrition, informed by a life cycle approach to women’s and maternal health. The department draws strongly on the SUN framework, which is identified as a policy consensus at the global level.

Adolescent girls, pregnant women and children under 5 years of age are targeted with nutrition-specific interventions that are cost-effective and have a well-developed evidence base, including interventions that are recommended for use within the 1000-day window covering pregnancy and the first 2 years of life. Many of these nutrition-specific interventions are channelled through health and humanitarian program areas. This direct approach is complemented by indirect, nutrition-sensitive actions in multiple sectors, including agriculture, environment and social protection, as well as extreme poverty.

From 2011, DFID has reoriented its approach to focus more strongly on the role of the private sector in expanding the coverage of nutrition-specific interventions such as the fortification of staple foods, as well as nutrition-sensitive interventions such as developing food supply systems. However, DFID has identified a need to clarify its position on the role of the private sector. DFID identifies civil society as key to generating demand for nutrition and holding country governments to account. Following the SUN framework, DFID also identifies political leadership and collaboration as key to action on child undernutrition.

Much of DFID’s research is designed to develop the evidence base for nutrition-sensitive programming. DFID has funded systematic reviews of the impact of nutrition-sensitive programs, large trials to assess the effectiveness of particular interventions, and evaluations of its own nutrition-sensitive programs. DFID also supports impact evaluations conducted by the World Bank, to generate evidence on the nutrition impacts of nutrition-sensitive World Bank programs in sectors

478 Department for International Development, Scaling up nutrition: the UK’s position paper on undernutrition
479 Mutuma, Fremont and Adebayo
480 Department for International Development, Scaling up nutrition: the UK’s position paper on undernutrition
481 Department for International Development, Scaling up nutrition: the UK’s position paper on undernutrition
482 Department for International Development, Scaling up nutrition: the UK’s position paper on undernutrition
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486 Department for International Development, Scaling up nutrition: the UK’s position paper on undernutrition
487 Department for International Development, Scaling up nutrition: the UK’s position paper on undernutrition
including agriculture, social protection, child development and environmental health.\textsuperscript{488} In addition, DFID supports basic research to improve agricultural productivity, focused on biofortification and drought-resistant crops, through HarvestPlus and CGIAR.\textsuperscript{489} Finally, DFID has funded two research program consortia over 5 years (2011–16) to investigate particularly challenging areas of nutrition research: maintaining the effectiveness of proven interventions in diverse contexts, and the linkages between agricultural development and nutrition in south Asia.\textsuperscript{490}

United States

The United States Agency for International Development (USAID) has a technical resource facility for nutrition: the Food and Nutrition Technical Assistance (FANTA) project.\textsuperscript{491} FANTA provides technical support to USAID, country governments and non-government organisations in the areas of maternal and child health and nutrition, in both emergency and development contexts; food security and livelihood strengthening; agriculture and nutrition linkages; and emergency assistance in nutrition crises.\textsuperscript{492} Predominantly, however, USAID addresses child undernutrition through two large-scale programs: the Global Health Initiative and Feed the Future.\textsuperscript{493}

Where the Global Health Initiative operates in food-insecure countries, specific health areas, including HIV/AIDS, malaria, and maternal and child health, are adjusted to become nutrition-sensitive.\textsuperscript{494} However, nutrition is a minor priority within the Global Health Initiative, receiving only 1 per cent of its budget over 2010–13.\textsuperscript{495}

The majority of USAID nutrition programming is delivered through Feed the Future, a hunger and food security program with a global focus, which delivers integrated agriculture, nutrition and health programs with nutrition indicators and outcomes as high-level reporting indicators.\textsuperscript{496} Nutrition is thus framed in terms of food security, rural development and agricultural productivity. Areas of focus for programming include agricultural technologies to increase productivity and food supply systems, with an emphasis on the role of the private sector in developing value chains and market access.\textsuperscript{497} These approaches support agriculture-led economic growth, which is a key strategic goal of USAID’s approach to nutrition through improved food security and rural livelihoods.\textsuperscript{498} To supplement this indirect approach, USAID also supports direct nutrition-specific interventions with a well-developed evidence base that target the 1000-day window covering pregnancy and the first 2 years of life; these

\textsuperscript{488} Department for International Development, \textit{Scaling up nutrition: the UK’s position paper on undernutrition}
\textsuperscript{489} Di Ciommo
\textsuperscript{490} Department for International Development, \textit{Scaling up nutrition: the UK’s position paper on undernutrition}
\textsuperscript{491} About the Food and Nutrition Technical Assistance III Project (FANTA), accessed 15 May 2013, www.fantaproject.org/about.
\textsuperscript{492} About the Food and Nutrition Technical Assistance III Project (FANTA)
\textsuperscript{495} Di Ciommo
\textsuperscript{496} USAID, \textit{US investments in global nutrition: fact sheet}
\textsuperscript{497} USAID, \textit{Feed the Future guide}, USAID and Feed the Future, 2010.
\textsuperscript{498} USAID
include infant and young child feeding, fortification of staple foods, and targeted micronutrient supplementation.\footnote{USAID} 

USAID supports research focused on increasing agricultural productivity and agricultural sector growth, with an emphasis on the role of the private sector. This includes basic research on the development of new crop varieties, and research into food production systems, including post-harvest value chains, increasing market access, and reducing risk and vulnerability.\footnote{USAID} Much of this research funding is channelled through CGIAR.\footnote{USAID}
### Table 5  Summary: major focus of recent research across selected think-tanks

<table>
<thead>
<tr>
<th></th>
<th>Nutrition policy and governance</th>
<th>Nutrition and agriculture</th>
<th>Nutrition, household poverty and nutrition security</th>
<th>Nutrition in emergency contexts</th>
<th>Prevention through mothers and/or children</th>
<th>Treatment of child undernutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute of Development Studies</td>
<td>X</td>
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<tr>
<td>International Food Policy Research Institute</td>
<td>X</td>
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<tr>
<td>Overseas Development Institute</td>
<td>X</td>
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<td>Action Contre la Faim</td>
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</table>

**Institute of Development Studies**

Located at the University of Sussex in the United Kingdom (UK), the Institute of Development Studies (IDS) is a not-for-profit organisation that focuses on international development research, teaching and communication. Nutrition is a key research theme for the IDS, with research activity focused on how to build political commitment to addressing undernutrition, mobilising financial and human resources to address undernutrition, and strategies for promoting research uptake. The IDS is a signatory to the Scaling up Nutrition (SUN) Movement.

Much of the IDS’s research focuses strongly on nutrition governance. Recent publications have argued that effective interventions to address undernutrition are relatively well known, and that the real need is to develop effective and accountable systems through which governments can deliver these interventions in a cost-effective and sustainable way.\(^{502}\) Four key components of nutrition governance are identified: intersectoral cooperation, vertical coordination between different levels of government, sustainable funding, and monitoring and advocacy. This leads to the following four key policy recommendations for ensuring effective nutrition governance and reducing child undernutrition.\(^{503}\)

1. Ensure strong executive leadership by country governments to drive intersectoral collaboration.

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\(^{502}\) Haddad, Acosta and Fanzo

\(^{503}\) Haddad, Acosta and Fanzo
› Establish effective bodies with appropriate political support and funding sources to coordinate action on undernutrition across government ministries.

› Secure predictable, sustainable and transparent funding for nutrition programs.

› Invest in monitoring and advocacy, including developing a single narrative around the burden of undernutrition and the targets, to gain political commitment from all stakeholders.

The IDS produces the Hunger and Nutrition Commitment Index (HANCI), which ranks low- and middle-income country governments and donor countries on their political commitment to tackling hunger and undernutrition. The index is intended as a tool for advocacy, and to promote transparency and accountability (see Section 12).

The IDS has strongly advocated for giving nutrition indicators a greater role in a post-2015 development framework, and for aligning a post–Millennium Development Goal (MDG) framework with the work of the SUN Movement. The IDS argues strongly that nutrition and undernutrition can be viewed in partnership with food security, but that nutrition should not be a component of food security targets, because “undernutrition is linked to but different from hunger, and they are both of equal importance”.

### International Development Research Centre

The International Development Research Centre (IDRC) is a Canadian Crown Corporation created by the Parliament of Canada. The IDRC supports research in developing countries to promote growth and development, with a focus on assisting these countries to use science and technology to find solutions to local problems. It supports practical research to combat hunger and malnutrition in developing countries, including production of more robust and nutritious crops, increasing the sustainability and productivity of agriculture, and using science and technology to increase consumption of nutritious foods.

### International Food Policy Research Institute

The International Food Policy Research Institute (IFPRI), a think-tank in Washington DC, focuses on food policy research, capacity strengthening and policy communication. IFPRI research covers a broad spectrum, from agricultural research, research to reduce household poverty and build food and nutrition security, research into the effectiveness of therapeutic interventions to treat child undernutrition, and policy research. Other topics include the effect of biofortification of crops on childhood nutrition and supplements for preventing undernutrition. The IFPRI is a signatory to the SUN Movement.

Recent IFPRI research has highlighted the lack of global focus on scaling up effective agriculture, development and nutrition interventions. This research highlights the need to involve diverse actors in...
scale-up efforts, including different levels of government, civil society, donors, the private sector, and farmers and rural communities.\textsuperscript{507}

The IFPRI stresses the need to work multisectorally across agriculture and health to address undernutrition. The MDGs have been criticised for failing to provide a policy framework, strategy and implementation plan to guide multisectoral action, and failing to sufficiently spotlight inequity in progress.\textsuperscript{508} Previous IFPRI work has attempted to outline characteristics of successful multisectoral undernutrition programs, including efforts to build a shared understanding of the local nutrition situation; strong leadership on nutrition policy; and the availability of organisations with strong technical, administrative and financial capacity that value collaboration and provide incentives for action.\textsuperscript{509}

After the 2008–09 global food price crisis, the IFPRI conducted research on global food production and supply systems, and developed a set of recommendations to adjust these global systems to avert and mitigate future food price shocks.\textsuperscript{510} These recommendations cover action in three areas: food production, food markets and trade, and aspects of the foreign aid system relating to food policies. Specific recommendations include changes to biofuel policies, the elimination of bans and restrictions for agricultural exports, and large and well-distributed grain reserves.

With Concern Worldwide, Welthungerhilfe (a German non-government organisation) and Green Scenery, the IFPRI releases the annual Global Hunger Index, which measures undernourishment, child underweight and child mortality.\textsuperscript{511}

The IFPRI also leads the Transform Nutrition Research Programme Consortium, which aims to assist diverse stakeholders in the most affected countries to use high-quality research in addressing undernutrition.\textsuperscript{512} Other consortium partners include the IDS, the International Centre for Diarrhoeal Disease Research Bangladesh, the Public Health Foundation of India, Save the Children UK, the University of Nairobi and the UK Department for International Development (DFID). Transform Nutrition works to strengthen the evidence base and its use in addressing undernutrition, with a focus on scaling up direct nutrition interventions, leveraging indirect interventions and creating an enabling environment. The consortium also engages in capacity development and efforts to improve research uptake.

\begin{enumerate}
\item \textsuperscript{507} J Linn, \textit{Scaling up in agriculture, rural development, and nutrition}, 2020 Focus 19, International Food Policy Research Institute, Washington, DC, 2012.
\item \textsuperscript{508} J von Braun, MT Ruel and S Gillespie, \textit{Bridging the gap between the agriculture and health sectors}, Leveraging agriculture for improving nutrition and health: conference brief 14, International Food Policy Research Institute, Washington, DC, 2011.
\item \textsuperscript{509} J Garrett and M Natalicchio, \textit{Working multisectorally in nutrition: principles, practices, and case studies}, International Food Policy Research Institute, Washington, DC, 2011.
\item \textsuperscript{510} D Headey and S Fan, \textit{Reflections on the global food crisis: How did it happen? How has it hurt? And how can we prevent the next one?}, research monograph 165, International Food Policy Research Institute, Washington, DC, 2010.
\item \textsuperscript{511} K von Grebmer, C Ringler, M Rosegrant, T Olofinbiyi, D Wiesmann, H Fritschel, O Badiane, M Torero, Y Yohannes, J Thompson, C von Oppeln and R Rahall, 2012 \textit{Global Hunger Index: the challenge of hunger: Ensuring sustainable food security under land, water, and energy stresses}, IFPRI, Concern Worldwide, Welthungerhilfe and Green Scenery, Washington, DC, 2012.
\end{enumerate}
The Overseas Development Institute (ODI) is an independent non-government think-tank, based in London, whose research focuses on international development and humanitarian issues. The ODI’s nutrition-related work predominantly focuses on agriculture, social protection, and nutrition responses in emergency and transitional contexts. The ODI is not currently a SUN Movement partner.

In a report commissioned by Save the Children and the United Nations Children’s Fund (UNICEF), the ODI emphasises that economic growth is not enough to address child undernutrition. It highlights the role of focused action on health and nutrition, improvements in gender equity, political will, and well-planned and resourced programs for achievements in child nutrition. The report promotes complementary action on reducing poverty; improving access to nutritious food, and water, sanitation and hygiene; increasing equitable access to health services; and reducing inequalities by targeting health, nutrition and food security interventions.

In an analysis for the UK Government of current and future challenges and opportunities in addressing food and nutrition insecurity, the ODI notes that the interventions to address undernutrition across a range of sectors are relatively well known, cost-effective and simple to implement. The real challenges are building awareness and political will at the community and national levels, and building an understanding that child undernutrition and food crises are avoidable. The authors argue that agricultural innovations and greater availability of food and nutrition data by civil society are key opportunities for addressing food insecurity and undernutrition in the next two decades. The report further highlights the importance of an early-intervention approach, ensuring that women, pregnant mothers and infants in the first 1000 days are well nourished.

The ODI has also undertaken work with the Hunger Alliance on the contribution of sustainable smallholding agriculture to improving food security and nutrition. This research finds that smallholders are disproportionately vulnerable to food insecurity and malnutrition, but that smallholder agriculture can contribute to improvements in food security and nutrition outcomes while being environmentally sustainable. The impact of smallholder agriculture on food security and nutrition is increased by focusing on empowerment of women, home gardens and small-scale livestock that increase the home consumption of diverse foods, coupling agricultural programs with education and communication, health services, water and sanitation.

Recent research by the ODI’s Humanitarian Policy Group highlights the relative dearth of evidence on the effectiveness of nutrition interventions, including cash transfers, in emergency settings. However, the review finds that, under the right circumstances, cash transfers can increase the volume and quality of food consumption, and that vouchers are more likely than cash to be effective in addressing micronutrient deficiencies.

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Action Contre la Faim (Action Against Hunger)

Action Contre la Faim (ACF) is an international NGO with a mission to save lives through the prevention, detection and treatment of malnutrition, particularly during and following disasters and conflicts. While technically not a think-tank, ACF undertakes significant research to improve the effectiveness of nutrition interventions. ACF is a signatory to the SUN Movement.

ACF research into policies and practices that support progress in addressing child undernutrition highlight a range of factors conducive to success, including strong political leadership, civil society organisations ensuring accountability, multisectoral and multiphase approaches, coordination between institutional stakeholders, and the need for continuous, sustainable funding.516

ACF has also worked with the Institute of Development Studies and Save the Children on research into financing for nutrition. This research stressed the need for proper costing of nutrition programs at country level, and called on donors to provide long-term, sustainable financing for comprehensive nutrition programs, to improve monitoring and evaluation of nutrition financing, and to improve accountability for nutrition financing.517 ACF has further called on donors to address inadequate funding for undernutrition programs, and highlighted the general lack of funding for comprehensive direct nutrition programs, poor targeting of nutrition aid to countries with the highest need, and lack of transparency in nutrition financing due to poor reporting.518 The donors that form the Organisation for Economic Co-operation and Development’s (OECD’s) Development Assistance Committee have also been criticised for allowing poor coding of nutrition spending.519 The ASF research further highlights a gap in research into the effectiveness of indirect interventions that tackle the distal risk factors for undernutrition.520

Feinstein International Centre

The Feinstein International Centre at Tufts University in the United States aims to develop and promote operational and policy responses to protect and strengthen the lives and livelihoods of people in crisis-affected and marginalised communities. Nutrition and food security are key areas of research. Current and recent research areas include the effectiveness of food supplementation programs for people living with HIV, household food access and availability, and nutrition of children.521

In 2011, a paper by Feinstein highlighted the complex structural factors that influence nutrition, framing individual and population nutrition status as the result of a complex social and political system.522 The authors argue that addressing nutrition must move beyond single interventions and take a systems approach that considers the wide variety of constraints and drivers of nutrition. A more robust system of responding to food crises is needed, in which local actors use a mix of market-
based mechanisms for food delivery and safety nets, coupled with longer-term incentives for food production and distribution. The authors further argue that research funding needs to be allocated to implementation and operational research questions about how known nutrition interventions should be delivered, and how to support the complex social and political environment in order to achieve good nutrition. Subsequent work by Feinstein in Malawi on an Integrated Food Security Programme found that integrated, multisectoral programs that seek to leverage improvements in agriculture, nutrition and health simultaneously can be very effective in addressing child undernutrition, as well as relatively cost-effective.

**Earth Institute—Millennium Villages project**

The Millennium Villages project takes an integrated, community-led approach to rural development, seeking to simultaneously address the challenges of extreme poverty through agriculture, education, health, infrastructure, gender equality and business development. The project is led by Millennium Promise, a non-government organisation focused on accelerating progress towards the MDGs, and the Earth Institute at Columbia University, in collaboration with a range of multilateral, public and private organisations. Millennium Village projects in nine sub-Saharan countries have demonstrated significant improvements in household food security and diet diversity, as well as some improvements in child care and disease-control measures, culminating in very large decreases in child stunting (a 43 per cent reduction in stunting in children under 2 years of age across all sites). Findings from this project highlight the effectiveness of community-led multisectoral interventions in addressing child undernutrition.

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523 Webb, *Achieving food and nutrition security: lessons learned from the Integrated Food Security Programme (IFSP), Mulanje, Malawi*


11 Non-government organisations

Contributions of non-government organisations to child undernutrition policy thinking and approaches

Numerous international non-government organisations (NGOs) are engaged in nutrition programming, policy analysis, famine early warning systems, advocacy and operational research. A comprehensive audit of NGO policy and research activities is beyond the scope of this study; however, brief examples are provided, as well as a longer summary of the work of Action Contre la Faim, an NGO exclusively devoted to nutrition.

Médecins sans Frontières has conducted extensive field studies, including randomised controlled trials, to establish the efficacy of ready-to-use therapeutic food (PlumpyNut®). MSF’s open-access research site lists 41 nutrition research publications. Concern Worldwide has been a leader in nutrition for many years, often in partnership with the International Food Policy Research Institute (IFPRI). For example, the RAIN project in Zambia, a collaborative effort with IFPRI, aims to reduce the prevalence of stunting in children through integrated agriculture, health and nutrition interventions during the 1000-day window covering pregnancy and the first 2 years of life.

Save the Children has been active in nutrition research, field programs and advocacy. For example, the 2012 edition of the State of the world’s mothers report was titled Nutrition in the first 1000 days. Moreover, Save the Children is a core partner in the Transform Nutrition Research Programme Consortium (see Section 10). Pioneering work by Helen Keller International (HKI) in the 1970s revealed the connection between vitamin A deficiency and child survival. HKI continues to conduct nutrition research in 17 countries, including Bangladesh, Cambodia, Indonesia and the Philippines. Oxfam has been active in advocacy research, especially around the global food price crisis. World Vision has made nutrition a top priority for its work and has published a number of valuable evidence-based nutrition guidelines. World Vision’s Nutrition Centre of Expertise provides strategic leadership to this initiative.

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HANCI methodology and approach

The Hunger and Nutrition Commitment Index (HANCI) ranks low- and middle-income country governments and donor countries on their political commitment to tackling hunger and undernutrition. The index is intended as a tool for advocacy and to promote transparency and accountability.

HANCI provides separate rankings for hunger and nutrition, because of the conceptual differences between them. However, for this review, the combined hunger and nutrition commitment ranking is more relevant, since HANCI conceptualises hunger in terms of agriculture and health services.527

HANCI considers three areas of government action: policies and programs, legal frameworks, and public expenditures (Table 6).528 These three areas reflect different stages of the implementation of political commitment. Equal weight is given to each stage in calculating the score, to effectively capture the multistage nature of political commitment.529 HANCI scores are calculated using data provided by country governments.

527 te Lintelo, Haddad, Lakshman and Gatelloer, The Hunger and Nutrition Commitment Index (HANCI 2012): measuring the political commitment to reduce hunger and undernutrition in developing countries
528 te Lintelo, Haddad, Lakshman and Gatelloer
529 te Lintelo, Haddad, Lakshman and Gatelloer
Table 6  Indicators used to measure hunger and nutrition commitment

<table>
<thead>
<tr>
<th>Policies and programs</th>
<th>Legal frameworks</th>
<th>Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vitamin A coverage</td>
<td>• International Code of Marketing of Breastmilk Substitutes</td>
<td></td>
</tr>
<tr>
<td>• Complementary feeding</td>
<td>in domestic law</td>
<td>• Nutrition budget</td>
</tr>
<tr>
<td>• Access to improved drinking water</td>
<td>• Constitutional right to food</td>
<td>• Public expenditures on agriculture</td>
</tr>
<tr>
<td>• Access to sanitation</td>
<td>• Women’s access to agricultural land</td>
<td>• Public expenditures on health</td>
</tr>
<tr>
<td>• Skilled birth attendance</td>
<td>• Constitutional right to social security</td>
<td></td>
</tr>
<tr>
<td>• Civil registration of live births</td>
<td>• Women’s economic rights</td>
<td></td>
</tr>
<tr>
<td>• Status of safety nets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Security of access to land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Access to agricultural extension services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Nutrition in national development policies/strategies</td>
<td></td>
<td></td>
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<tr>
<td>• National nutrition plan or strategy</td>
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<tr>
<td>• Time-bound nutrition targets</td>
<td></td>
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<tr>
<td>• National nutrition survey</td>
<td></td>
<td></td>
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<tr>
<td>• Multisectoral and multi-stakeholder coordination mechanism</td>
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</table>

It should be noted that some high-ranking countries continue to have poor child nutrition indicators—the ranking reflects nutrition governance that is appraised to be the basis for future improvements. While 45 countries are included in the HANCI ranking, we provide detailed information on 6 countries:

› Guatemala because it ranks first out of 45
› Malawi because it ranks second and is located in southern Africa, where food security is an Australian aid priority
› the Philippines, Indonesia and Bangladesh, because they rank in the top 25 per cent of countries and are priority countries for Australian aid
› Myanmar, because it ranks poorly and is a high priority for Australian aid.

Guatemala

In the 2012 HANCI, Guatemala was ranked first. Guatemala has one of the world’s highest stunting rates, and vitamin and mineral deficiencies are a major challenge. The high ranking is based on

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530  te Lintelo, Haddad, Lakshman and Gatelloer
significant investment in health, with funding earmarked for nutrition. Budgetary allocations are complemented by a coherent nutrition plan, with strong support for implementation, including a national nutrition strategy with time-bound nutrition targets, and a multisectoral and multi-stakeholder coordination mechanism—recognised in the region as an example of good practice. The government has also recently undertaken a national nutrition survey.

Guatemala has a very high level of access to safe drinking water (92 per cent) and a high level of access to sanitation (78 per cent). Infant and young child feeding practices are politically well supported, and health services reach almost all women during pregnancy (93 per cent of pregnant women receive skilled care at least once during pregnancy). Food accessibility is well supported through social protection mechanisms; citizens enjoy a constitutional right to social security and a well-developed constitutional right to food.

Despite this evidence of political commitment, Guatemala did not score highly on all indicators. Women’s access to land and economic rights relative to men were ranked as moderate, and the country has low vitamin A coverage (36 per cent) and very low public spending on agriculture (1.4 per cent).

**Malawi**

Malawi ranked second in the 2012 HANCI. Key factors for success included a strong, centralised focus on nutrition, with good support for implementation, including a national nutrition policy or strategy document and a very high profile of nutrition within the broader national development strategy. Malawi also has a separate nutrition budget line and a moderately high health expenditure: 14.2 per cent of government spending is on health. Malawi ranked well on action to address distal risk factors for undernutrition. Policy implementation is well supported by a multisectoral and multi-stakeholder coordination mechanism, time-bound nutrition targets in the national strategy, and the recent completion of a national nutrition survey.

HANCI authors also note a solid enabling environment for nutrition security in Malawi, including a very well established constitutional right to food and a constitutional right to social security. In 2012, Malawi performed consistently across all indicators. Weaker areas of performance included food and agriculture indicators, and women’s empowerment.

**The Philippines**

The Philippines ranked sixth. It scored highly in relation to nutrition policy and implementation, based on the availability of a national nutrition strategy or policy with time-bound nutrition targets, and a multisectoral and multi-stakeholder coordination mechanism. The Philippines also recognises the constitutional right to social security and has well-developed safety nets. The country has also shown strong political commitment to infant and young child feeding, gaining the highest ranking for inclusion of the International Code of Marketing of Breastmilk Substitutes (ICBMS) in domestic law and government support for complementary feeding.

Maternal neonatal and child health services in the Philippines report high rates of skilled birth attendance (91 per cent), vitamin A coverage (91 per cent), and access to water (92 per cent) and sanitation (74 per cent). Further, HANCI ranked the country highly in gender equity in economic rights, in both laws and law enforcement.

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531 te Lintelo, Haddad, Lakshman and Gatelloer
In 2012, the Philippines was held back in HANCI rankings by low scores in public expenditure on agriculture (5 per cent) and health (7.6 per cent), and lack of a nutrition budget line.

**Indonesia**

Indonesia ranked seventh in 2012 and performed highly in many areas. Although nutrition policy and implementation are not well funded, the country ranked highly in these areas thanks to a national nutrition policy or strategy with time-bound nutrition targets, a separate nutrition budget line, and a multisectoral and multi-stakeholder coordination mechanism. The constitutional right to social security is also well recognised, and appropriate safety nets are well developed.

The majority of citizens have access to safe drinking water (82 per cent). Indonesia performs well in relation to gender equity in access to agricultural land and was one of only five countries to be recognised for achieving such high standards. Indonesia scored only moderately, however, in relation to gender equity in economic rights.

Regarding infant feeding, the Indonesian Government has achieved a high rate of skilled care during pregnancy (93 per cent of pregnant women receive skilled care at least once during pregnancy) and a high rate of inclusion of ICBMS in domestic law; the government also promotes complementary feeding.

Indonesia’s 2012 HANCI ranking was undermined by a lack of centralised focus on nutrition, the low priority afforded nutrition in national development policies, underfunding of nutrition and hunger-related programs, low birth registration (53 per cent of children aged less than 5 years), and low public spending on agriculture (5 per cent) and health (7.8 per cent).

**Bangladesh**

Bangladesh ranked twelfth. It has demonstrated legal and policy commitment to nutrition, and direct nutrition interventions are well supported. Bangladesh has a national nutrition policy or strategy with time-bound nutrition targets, a nutrition budget line and a reasonably high profile for nutrition in national development plans, and has undertaken a national nutrition assessment (within a Demographic and Health Survey) after 2008. Bangladesh also has a multisectoral and multi-stakeholder coordination mechanism and a constitutional right to food. Direct nutrition interventions have strong political commitment, evidenced by extremely high (100 per cent) vitamin A coverage, government support for complementary feeding and good inclusion of ICBMS in domestic law.

However, some aspects of an enabling environment are less well developed; this can undermine the potential of existing commitments. Although the constitutional right to social security is recognised and the government provides moderate safety nets, these are undermined by extremely low levels of birth registration (10 per cent, the third lowest after Liberia and Ethiopia). The government spends little on agriculture (7.3 per cent) and health (7.4 per cent).

**Myanmar**

Myanmar ranked very low on the 2012 HANCI, at 41. Myanmar has a nutrition policy, although it is almost 20 years old, and a multisectoral and multi-stakeholder coordination mechanism, and completed a national nutrition assessment within a Multiple Indicator Cluster Survey in 2009–10. The low ranking is partly based on lack of a nutrition budget line, lack of time-bound nutrition targets, and low priority given to nutrition in national development policy and strategy. Government spending on
health is also extremely low (1 per cent, the lowest of all countries included in HANCI), and spending on agriculture is low (8.3 per cent). There is also no constitutional right to social security, extremely low security of access to land and little access to agricultural extension services.

Despite these poor rankings, Myanmar has achieved reasonably high access to improved water (83 per cent) and sanitation (76 per cent), and good access to health services and registration—80 per cent of pregnant women receive skilled care at least once during pregnancy, 94 per cent of children receive vitamin A coverage, and 72 per cent of children aged under 5 years are completely vaccinated. The government also promotes complementary feeding and is ranked highly on inclusion of ICBMS in domestic law.

It is important to note that the HANCI study found a link between political commitment and the level of government effectiveness,\(^{532}\) in that no country with a very low government effectiveness score (10 or less, out of a maximum possible score of 100)—a group that includes Myanmar—had a moderate or high political commitment to hunger and nutrition.

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\(^{532}\) Countries’ government effectiveness score was sourced from the World Bank’s World governance indicators 2011 (see reference to Lintelo, Haddad, Lakshman and Gatelloer, The Hunger and Nutrition Commitment Index (HANCI 2012): measuring the political commitment to reduce hunger and undernutrition in developing countries).
Part III
Child nutrition data
13 Child nutrition status in selected countries

A summary table of data on key nutrition indicators, covering child nutrition status and relevant contextual measures, for all low- and middle-income countries east of (and including) Afghanistan, as far east as the Pacific Island countries, and southern Africa, is provided in Annex 3.

These nutrition data need to be interpreted with caution for two main reasons. First, it is not clear whether the datasets excluded outliers using the World Health Organization (WHO) recommended cut-offs for biologically implausible z-scores. This is significant because such implausible z-scores tend to inflate the observed prevalence of malnutrition. Second, where trend data have been reported, it is not clear whether the baseline and followup prevalence values have been calculated using the same reference population.

This is particularly important, because the 2006 WHO reference values (based on multisite healthy breastfed infants) are different from the United States National Centre for Health Statistics reference values used earlier. The reference population used when calculating prevalence can have a substantial impact on results. Use of the older reference population may underestimate or overestimate undernutrition, depending on the age of the child.533 The 2013 report Levels and trends in child malnutrition (WHO, United Nations Children’s Fund and World Bank) employs the most recent WHO Growth Standards and includes converted estimates for data older than 2006.534

A further issue in measuring child nutrition status is data availability. In settings with a high proportion of home births, low birth registration, and/or poor data collection and management systems, statistics can be based on incomplete or unrepresentative data.

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14 Interpretation of child nutrition data for selected countries

Table 7 presents the prevalence cut-off values for the public health significance of child undernutrition in populations. The source is the World Health Organization Global Database on Child Growth and Malnutrition. This section presents a brief analysis of the child nutrition status of selected countries relevant to the Australian aid program and located in the Asia–Pacific region, as well as the region of southeastern Africa where rates of child undernutrition are high and food security is a priority for Australian aid.

Table 7 Classification for assessing severity of malnutrition by prevalence range among children under 5 years of age

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Severity of undernutrition by prevalence range (%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Stunting</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Underweight</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Wasting</td>
<td>&lt;5</td>
</tr>
</tbody>
</table>

Afghanistan

- Progress against Millennium Development Goal 1, Target C (MDG1c): the percentage of children under 5 years of age who are underweight decreased from 44.9 per cent (in 1997) to 32.9 per cent (in 2004).

Based on 2004 data, there is a very high prevalence of stunting (59 per cent of children under 5 years of age) and underweight (33 per cent). The prevalence of wasting is medium, with 9 per cent wasted. No nationally representative data on low birthweight are available. In 2004, more

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536 To halve, between 1990 and 2015, the proportion of people who suffer from hunger. This target is measured by the percentage of children under 5 years of age who are moderately or severely underweight, as well as the percentage of the population who cannot access sufficient food to meet their minimum daily energy requirements.


539 World Health Organization
than one-third (38 per cent) of children aged 6–59 months had anaemia.\textsuperscript{541} There is moderate iodine deficiency at a population level, as indicated by the median urinary iodine concentration in school-age children of 49 µg/L (2004 figures)—below the optimal range of 100–199 µg/L.\textsuperscript{542}

Afghanistan performs poorly across multiple indicators for the distal risk factors for child undernutrition. Afghanistan is ranked 36 (of 45) in the Hunger and Nutrition Commitment Index (HANCI) (2011 figures),\textsuperscript{543} and nutrition governance is ranked as weak (2009).\textsuperscript{544} Political stability reaches the lower limit of the measurement index, at −2.51 (2011).\textsuperscript{545} Gender inequality is very high, with a Gender Inequality Index (GII) score of 0.707 (2011).\textsuperscript{546} The country’s Human Development Index (HDI) score is very low, at 0.398 (2011).\textsuperscript{547} Additionally, access to safe water and sanitation facilities, a significant nutrition-sensitive intervention, is 50 per cent and 37 per cent, respectively (2010).\textsuperscript{548}

**Bangladesh**

› Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 61.5 per cent (in 1990) to 41.3 per cent (in 2007).\textsuperscript{549}

Based on 2007 data, the prevalences among children under 5 years of age of stunting (44 per cent), underweight (42 per cent) and wasting (18 per cent) are very high.\textsuperscript{550} More than one-fifth (22 per cent) of babies are born with low birthweight (2006 figures).\textsuperscript{551} Almost half (47 per cent) of all children aged 6–59 months have anaemia (2001).\textsuperscript{552}

There are notable inequalities in child nutrition status. Young children from the poorest households are almost 2.5 times as likely to be underweight as those from the richest households (risk ratio 2.41; 2011).\textsuperscript{553} Young girl children are 12 per cent more likely to be underweight than boys, and young children from rural areas are 38 per cent more likely to be underweight than urban children

\textsuperscript{540} World Health Organization


\textsuperscript{542} World Health Organization, *Nutrition Landscape Information System: country profile* te Linteloo, Haddad, Lakshman and Gatelloer


Bangladesh is one of the few countries (along with Solomon Islands) where girls are more likely to be underweight than boys. Maternal ill health and undernutrition—an intergenerational influence on child undernutrition—is a major health issue in Bangladesh. Almost one-third (30 per cent) of adult women are underweight (2007), and almost half (47 per cent) of pregnant women have anaemia (2001). Furthermore, despite strong nutrition governance (2009) and a relatively high HANCI rank of 12 (out of 45) (2011), Bangladesh receives moderately low scores in human development (HDI 0.500; 2011) and political stability (−1.5; 2011), and a moderately high score for gender inequality (GII 0.550; 2011). Additionally, while 64 per cent of infants are exclusively breastfed under 6 months, and 9 out of 10 young children are breastfed until 2 years of age (2011), almost two-thirds (64 per cent) do not initiate breastfeeding within 1 hour of birth (2006).

Cambodia

Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 42.6 per cent (in 1996) to 29 (in 2010). Based on 2010–11 figures, the prevalence of stunting among children under 5 years of age is very high, at 41 per cent, while the prevalence of underweight and wasting is high, at 29 and 11 per cent, respectively. Some 9 per cent of babies are born with low birthweight (2008 figures). There is also a very high prevalence of anaemia, with 55 per cent of children aged 6–59 months found to be anaemic (2010). There is only a 2 per cent disparity in the prevalence of underweight between young girl and boy children (2010). However, young rural children are 60 per cent more likely to be underweight than

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554 United Nations Children’s Fund
557 World Health Organization, Nutrition Landscape Information System: country profile
558 te Lintelo, Haddad, Lakshman and Gatelloer
559 World Health Organization, Nutrition Landscape Information System: country profile
560 Food and Agriculture Organization of the United Nations, FAO—food security indicators
561 World Health Organization, Nutrition Landscape Information System: country profile
563 United Nations Children’s Fund, Infant and young child feeding
565 United Nations Statistics Division, Millennium Development Goals indicators
566 World Health Organization, Nutrition Landscape Information System: country profile
567 World Health Organization, Nutrition Landscape Information System: country profile
569 United Nations Children’s Fund, Underweight disparities
their urban counterparts, and children from the poorest households are more than twice as likely as children from the richest households to be underweight (risk ratio 2.23; 2010).570

Several distal risk factors for child undernutrition appear to be present to a moderate degree. The country has a moderately low HDI score (0.523; 2011)571 and is relatively politically unstable (–0.44; 2011).572 Nutrition governance was rated weak in 2009,573 although Cambodia has since been ranked 18 of 45 countries in HANCI (2011).574 Less than two-thirds (64 per cent) of people have access to improved water sources, and less than one-third (31 per cent) have access to adequate sanitation—this is among the lowest in Asia (2010).575 Furthermore, 45 per cent of pregnant women have anaemia (2010),576 which is a risk factor for low birthweight.

**Indonesia**

- Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 29.8 per cent (in 1992) to 19.6 per cent (in 2007).577

Based on 2011 data, the prevalence of underweight is rated medium, at 19 per cent.578 However, the prevalence of stunting (39 per cent) and wasting (12 per cent) is high (2011 figures).579 Nine per cent of babies are born with low birthweight (2007).580 Iodine overconsumption is a public health issue that indicates a risk of iodine-induced hyperthyroidism, with the median urinary iodine concentration in school-age children at 229 µg/L (2003),581 above the optimal range of 100–199 µg/L.582

Young girls are 13 per cent less likely to be underweight than boys, and young rural children are 36 per cent more likely to be underweight than their urban counterparts (2010).583 The largest recorded disparities exist across wealth quintiles, with children from the poorest households more than twice as likely to be underweight as children from the richest households (risk ratio 2.18; 2010).584

Indonesia has a moderately high HDI score (0.617; 2011).585 Nutrition governance is ranked medium (2011),586 with a relatively high HANCI rank of 7 (2011).587 However, Indonesia performs poorly

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570 United Nations Children’s Fund, *Underweight disparities*
571 World Health Organization, *Nutrition Landscape Information System: country profile*
572 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*
573 World Health Organization, *Nutrition Landscape Information System: country profile*
574 te Lintelo, Haddad, Lakshman and Gatelloer
575 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*
577 United Nations Statistics Division, *Millennium Development Goals indicators*
578 World Health Organization, *Nutrition Landscape Information System: country profile*
579 World Health Organization, *Nutrition Landscape Information System: country profile*
580 World Health Organization, *Nutrition Landscape Information System: country profile*
581 World Health Organization, *Nutrition Landscape Information System: country profile*
583 United Nations Children’s Fund, *Underweight disparities*
584 United Nations Children’s Fund, *Underweight disparities*
585 World Health Organization, *Nutrition Landscape Information System: country profile*
against key proximal risk factors for child undernutrition. Despite the reasonably high (82 per cent) access to improved water sources, almost half the population (46 per cent) does not have access to adequate sanitation facilities (2010). Furthermore, breastfeeding practices are poor, with breastfeeding initiation rates very low, at 29 per cent (2010), and less than one-third (32 per cent) of children exclusively breastfed until 6 months (2007).

**Lao People’s Democratic Republic**

Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 39.8 per cent (in 1993) to 31.6 per cent (in 2006).

Based on 2006 data, the prevalences of stunting and underweight in the Lao People’s Democratic Republic (PDR) are very high, with almost one-third (32 per cent) of children aged under 5 years underweight and almost half (48 per cent) stunted. The prevalence of wasting is rated medium, affecting 7 per cent of children under 5 years of age (2006 figures). More than 1 in 10 babies (11 per cent) are born with low birthweight. Based on 2000 data, micronutrient deficiencies are common, with close to half of all children aged 6–59 months anaemic (48 per cent) or vitamin A deficient (45 per cent).

Young girls are 6 per cent less likely to be underweight than boys, and young rural children are 69 per cent more likely to be underweight than urban children (2006). Underweight disparities are particularly sharp across wealth quintiles, with children from the poorest households almost three times as likely to be underweight as their counterparts from the richest households (2006).

Lao PDR has a moderately low score for human development (HDI 0.524; 2011) and a moderately high score for gender inequality (GII 0.513; 2011). Additionally, approximately one-third of the population does not have access to improved water sources (33 per cent) or adequate sanitation facilities (37 per cent) (2010). Furthermore, indicators for infant and young child feeding are particularly poor for Lao PDR. More than two-thirds (70 per cent) of neonates do not initiate

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586 World Health Organization, *Nutrition Landscape Information System: country profile*
587 te Lintelo, Haddad, Lakshman and Gatelloer
588 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*
589 United Nations Children’s Fund, *Early initiation of breastfeeding (newborns put to the breast within one hour of birth)*
590 United Nations Children’s Fund, *Infant and young child feeding*
591 United Nations Statistics Division, *Millennium Development Goals indicators*
592 World Health Organization, *Nutrition Landscape Information System: country profile*
593 World Health Organization, *Nutrition Landscape Information System: country profile*
594 World Health Organization, *Nutrition Landscape Information System: country profile*
597 United Nations Children’s Fund, *Underweight disparities*
598 United Nations Children’s Fund, *Underweight disparities*
599 World Health Organization, *Nutrition Landscape Information System: country profile*
600 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*
breastfeeding within 1 hour of birth (2006); almost three-quarters (74 per cent) are not exclusively breastfed until 6 months; and less than half (41 per cent) receive the recommended introduction to complementary foods by 6–8 months of age.

Myanmar

Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 32.5 per cent (in 1990) to 29.6 per cent (in 2003).

Based on 2009–10 figures, the prevalence of stunting and underweight in Myanmar is high, with 35 per cent of children under 5 years of age stunted and 23 per cent underweight; the prevalence of wasting is ranked medium, with 8 per cent of children under 5 years of age wasted. Nine per cent of children are born with low birthweight (2009–10 figures).

Young girls are 4 per cent less likely than boys to be underweight (2009–10). Young children in rural areas are 29 per cent more likely to be underweight than their urban counterparts (2009–10). The most significant disparities are seen across wealth quintiles, with the poorest children almost two-and-a-half times more likely to be underweight than children from the richest households (risk ratio 2.45; 2009–10).

Myanmar performs poorly against indicators for distal risk factors for child undernutrition. Based on 2011 figures, human development (HDI 0.483) and political stability (−1.16) are scored reasonably low. Although Myanmar received a nutrition governance ranking of medium in 2009, the recent HANCI ranked the country at 41 (of 45) (2011 figures). Additionally, more than three-quarters (76 per cent) of infants are not exclusively breastfed for 6 months.

Nepal

Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 42.6 per cent (in 1995) to 38.8 per cent (in 2006).

Based on 2011 data, the prevalence of stunting in Nepal is very high, at 41 per cent, while the prevalences of underweight and wasting are high, at 29 per cent and 11 per cent, respectively.

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601 United Nations Children’s Fund, *Early initiation of breastfeeding (newborns put to the breast within one hour of birth)*

602 United Nations Children’s Fund, *Infant and young child feeding*

603 World Health Organization, *Nutrition Landscape Information System: country profile*

604 United Nations Statistics Division, *Millennium Development Goals indicators*

605 World Health Organization, *Nutrition Landscape Information System: country profile*

606 World Health Organization, *Nutrition Landscape Information System: country profile*

607 United Nations Children’s Fund, *Underweight disparities*

608 United Nations Children’s Fund, *Underweight disparities*

609 United Nations Children’s Fund, *Underweight disparities*

610 World Health Organization, *Nutrition Landscape Information System: country profile*

611 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*

612 te Lintelo, Haddad, Lakshman and Gatelloer

613 United Nations Children’s Fund, *Infant and young child feeding*

614 United Nations Statistics Division, *Millennium Development Goals indicators*
More than one-fifth (21 per cent) of children are born with low birthweight (2006 figures).616 Almost half (46 per cent) of children aged 6–59 months of age have anaemia (2011).617 Between 2006 and 2011, there was an annual reduction in the proportion of children under 5 years of age who are underweight of 1.9 per cent.618 However, sharp disparities between population groups exist. Young rural children are 82 per cent more likely to be underweight than young urban children, and young children from the poorest households are more than four times more likely to be underweight than children from the richest households (risk ratio 4.03; 2011).619 Young girls are 5 per cent less likely to be underweight than boys (2011).620

Across several proximal risk factors, Nepal performs poorly. Maternal health and nutrition is poor, with almost one-fifth (18 per cent; 2011) of adult women underweight621 and almost half (48 per cent) of pregnant women anaemic (2011).622 Fewer than half (45 per cent; 2011) of neonates initiate breastfeeding within 1 hour of birth.623

Nepal’s performance across key indicators relating to the distal risk factors for child undernutrition is moderate to poor, with an HDI score of 0.458,624 a GII score of 0.558625 and a political stability score of –1.55 (2011).626 Nutrition governance is ranked as medium (2009),627 and Nepal was ranked 18 in the 2011 HANCI index.628 Access to sanitation facilities is 31 per cent (2010).629

**Papua New Guinea**

› Progress against MDG1c: a lack of baseline data, and issues with data quality and collection, mean that it is not feasible to indicate progress.630

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615 World Health Organization, *Nutrition Landscape Information System: country profile*
616 World Health Organization, *Nutrition Landscape Information System: country profile*
618 World Health Organization, *Nutrition Landscape Information System: country profile*
619 United Nations Children’s Fund, *Underweight disparities*
620 United Nations Children’s Fund, *Underweight disparities*
621 World Health Organization, *Global database on body mass index*
623 United Nations Children’s Fund, *Early initiation of breastfeeding (newborns put to the breast within one hour of birth)*
624 World Health Organization, *Nutrition Landscape Information System: country profile*
625 World Health Organization, *Nutrition Landscape Information System: country profile*
626 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*
627 World Health Organization, *Nutrition Landscape Information System: country profile*
628 te Lintelo, Haddad, Lakshman and Gatelloer
629 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*

Based on data from the national nutrition survey in 2005, the prevalence of stunting in children under 5 years of age is very high, at 44 per cent, while the prevalence of underweight is medium, at 18 per cent, and the prevalence of wasting is low, at 4 per cent.\textsuperscript{631} One in 10 babies is born with low birthweight.\textsuperscript{632} Limited data are available on micronutrient deficiencies, but 1998 figures indicate that 11 per cent of children aged 6–59 months are vitamin A deficient.\textsuperscript{633}

Young children in rural areas are 60 per cent more likely to be underweight than their urban counterparts (2005 figures).\textsuperscript{634} No data are available on underweight disparities based on gender or wealth quintiles.\textsuperscript{635}

Papua New Guinea has a low human development score (HDI 0.466),\textsuperscript{636} a moderately low score for political stability (−0.89)\textsuperscript{637} and a high score for gender inequality (GII 0.674; 2011).\textsuperscript{638} Additionally, only 40 per cent of the population has access to improved water sources, the lowest in all countries reviewed here with the exception of Somalia; 45 per cent have access to adequate sanitation facilities (2010).\textsuperscript{639} Although data from a 2005 national nutrition survey indicate that 84 per cent of neonates initiate breastfeeding within 24 hours of birth,\textsuperscript{640} only 56 per cent of infants are exclusively breastfed until 6 months (2006).\textsuperscript{641}

### The Philippines

- Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 29.9 per cent (in 1990) to 20.7 per cent (in 2008).\textsuperscript{642}

Based on 2008 data, there is a high prevalence of stunting (32 per cent) and underweight (21 per cent) among children under 5 years of age in the Philippines, while the prevalence of wasting is rated medium, at 7 per cent.\textsuperscript{643} More than one-fifth (21 per cent) of children are born with low birthweight (2008 figures).\textsuperscript{644} Approximately two-thirds of children aged 6–59 months have anaemia (36 per

\textsuperscript{631} World Health Organization, Nutrition Landscape Information System: country profile

\textsuperscript{632} World Health Organization, Nutrition Landscape Information System: country profile

\textsuperscript{633} World Health Organization, Global prevalence of vitamin A deficiency in populations at risk 1995–2005: WHO global database on vitamin A deficiency

\textsuperscript{634} United Nations Children’s Fund, Underweight disparities

\textsuperscript{635} United Nations Children’s Fund, Underweight disparities

\textsuperscript{636} World Health Organization, Nutrition Landscape Information System: country profile

\textsuperscript{637} Food and Agriculture Organization of the United Nations, FAO—food security indicators

\textsuperscript{638} World Health Organization, Nutrition Landscape Information System: country profile

\textsuperscript{639} Food and Agriculture Organization of the United Nations, FAO—food security indicators


\textsuperscript{641} United Nations Children’s Fund, Infant and young child feeding

\textsuperscript{642} United Nations Statistics Division, Millennium Development Goals indicators

\textsuperscript{643} World Health Organization, Nutrition Landscape Information System: country profile

\textsuperscript{644} World Health Organization, Nutrition Landscape Information System: country profile
cent; 2003)\textsuperscript{645} or vitamin A deficiency (40 per cent; 2003).\textsuperscript{646} No data are available on underweight disparities.\textsuperscript{647}

The Philippines performs relatively well against indicators reflecting distal risk factors, with a reasonably high HDI score of 0.644 (2011 figures), a moderately low GII score of 0.427 (2011), a nutrition governance ranking of strong (2009)\textsuperscript{648} and a HANCI rank of 6 (of 45) (2011).\textsuperscript{649} Access to water and sanitation facilities is also relatively good, at 92 per cent and 74 per cent, respectively (2010).\textsuperscript{650}

However, the Philippines performs poorly against maternal nutrition and health indicators. Adult women are 34 per cent more likely to be underweight than men, with 14 per cent of all adult women underweight (2003 and 2004).\textsuperscript{651} Some 44 per cent of pregnant women have anaemia, which reflects poor maternal nutrition and is a predisposing factor for low birthweight.\textsuperscript{652} Additionally, breastfeeding practices are generally poor, with more than 40 per cent of infants not receiving recommended breastfeeding care across all three key indicators (2008).\textsuperscript{653}

**Solomon Islands**

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\overset{\triangleright}{\text{Progress against MDG1c: the percentage of children under 5 years of age who are underweight decreased from 23 per cent (in 1990) to 11.5 per cent (in 2010).}}\textsuperscript{654}
\]

Based on 2006–07 figures, the prevalence of stunting is high, with one-third of children under 5 years of age stunted, while the prevalence of underweight is medium (12 per cent), and the prevalence of wasting is low (4 per cent).\textsuperscript{655} One in eight children (13 per cent) is born with low birthweight (2006–07 figures).\textsuperscript{656}

Young girls are 29 per cent more likely to be underweight than young boys (2007 figures).\textsuperscript{657} Young rural children are 49 per cent more likely to be underweight than urban children, and young children

\begin{footnotesize}


647 United Nations Children’s Fund, *Underweight disparities*

648 World Health Organization, *Nutrition Landscape Information System: country profile*

649 te Lintelo, Haddad, Lakshman and Gatelloer

650 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*

651 World Health Organization, *Global database on body mass index*


655 World Health Organization, *Nutrition Landscape Information System: country profile*

656 World Health Organization, *Nutrition Landscape Information System: country profile*

657 United Nations Children’s Fund, *Underweight disparities*
\end{footnotesize}
from the poorest households are 40 per cent more likely to be underweight than those from the richest households (2007).\textsuperscript{658}

Solomon Islands has moderate to low scores for human development (HDI 0.510; 2011)\textsuperscript{659} and political stability (0.34; 2011).\textsuperscript{660} Infant and young child feeding practices are reasonably good: based on 2007 figures, approximately three-quarters of neonates initiate breastfeeding within 1 hour of birth (75 per cent)\textsuperscript{661} and are exclusively breastfed until 6 months (74 per cent),\textsuperscript{662} while 84 per cent of infants are breastfed until 1 year of age,\textsuperscript{663} and more than two-thirds (67 per cent) are breastfed until 2 years of age.\textsuperscript{664}

Southeastern Africa

- Progress against MDG1c: aggregate figures for sub-Saharan Africa indicate that the percentage of children under 5 years of age who are underweight decreased from 29 per cent (in 1990) to 22 per cent (in 2010).\textsuperscript{665}

This section collates data relating to Ethiopia, Kenya, Malawi, Mozambique, Somalia, South Sudan, Tanzania, Uganda, Zambia and Zimbabwe. There are very high levels of stunting across the region, with almost half (42–48 per cent) of all children under 5 years of age stunted in the majority of countries.\textsuperscript{666} The exceptions are Kenya (35 per cent stunted; 2008–09 figures), Uganda (34 per cent; 2011) and Zimbabwe (32 per cent; 2010–11).\textsuperscript{667} The prevalence of underweight and wasting is more variable across countries. Most countries had a prevalence of underweight ranked medium (10–18 per cent across countries), with the exception of Ethiopia (ranked high, at 29 per cent; 2010–11) and Somalia (ranked very high, at 33 per cent; 2006).\textsuperscript{668}

The prevalence of wasting across most countries was ranked low (3–5 per cent), with the exception of Zambia (ranked medium, at 6 per cent; 2007), Kenya (ranked medium, at 7 per cent; 2005–06), Ethiopia (ranked high, at 10 per cent; 2010–11) and Somalia (ranked high, at 13 per cent; 2006).\textsuperscript{669}

The prevalence of low birthweight ranges from a low of 8 per cent in Kenya (2008–09) to a high of 20 per cent in Ethiopia (2005).\textsuperscript{670} For those countries with data on micronutrient deficiencies, with the exception of Zimbabwe, 53–75 per cent of children aged 6–59 months are anaemic,\textsuperscript{671} and 24–
84 per cent of young children under 5 years of age are vitamin A deficient. Based on median urinary iodine concentration, iodine status at population level ranges from moderate deficiency in Ethiopia (25 µg/L; 2005) to excessive intake in Uganda (464 µg/L; 2005).

Across all countries (with the exception of South Sudan, for which there were no data), young girls were less likely to be underweight than boys by between 8 per cent (Somalia; 2006) and 25 per cent (Zambia; 2007). Young children in rural areas are more likely to be underweight than their urban counterparts by between 20 per cent (Zambia; 2007) and 226 per cent (Uganda; 2011). Young children in the poorest households are more likely to be underweight than those from the richest households, with risk ratios varying from 1.29 (Malawi; 2010) to 3.03 (Somalia; 2006). Performance across indicators for the distal risk factors for child undernutrition is generally poor, but varies substantially across countries. For example, the HANCI ranking of countries varied from 2 (Malawi) to 34 (Kenya) (2011). The countries in this region are net food exporters, and have the lowest access to water and sanitation facilities—particularly sanitation—across all countries reviewed. With the exception of Zimbabwe, in each country for which data are available, approximately half of pregnant women have anaemia in each country, including Zimbabwe, at least 9 per cent of adult women are underweight.

Timor-Leste

Progress against MDG1c: the percentage of children under 5 years of age who are underweight increased from 40.6 per cent (in 2002) to 45.3 per cent (in 2010).

Based on 2009–10 data, Timor-Leste has a very high prevalence of underweight (44 per cent), stunting (58 per cent) and wasting (19 per cent). Some 10 per cent of neonates are born with low birthweight (2009 figures), and more than one-third (38 per cent) of children aged 6–59 months are anaemic (2009).

Young girls are 4 per cent less likely to be underweight than boys. Children in rural areas are 36 per cent more likely to be underweight than their urban counterparts, and children in the poorest

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673 World Health Organization, *Nutrition Landscape Information System: country profile*

674 United Nations Children’s Fund, *Underweight disparities*

675 United Nations Children’s Fund, *Underweight disparities*

676 United Nations Children’s Fund, *Underweight disparities*

677 *te Linteloo, Haddad, Lakshman and Gatelloer*

678 World Health Organization, *Nutrition Landscape Information System: country profile*

679 Food and Agriculture Organization of the United Nations, *FAO—food security indicators*


681 World Health Organization, *Global database on body mass index*

682 United Nations Statistics Division, *Millennium Development Goals indicators*

683 World Health Organization, *Nutrition Landscape Information System: country profile*

684 World Health Organization, *Nutrition Landscape Information System: country profile*

households are 40 per cent more likely to be underweight than their counterparts from the richest households (2009–10).686

Infant and young child feeding practices are variable, with 2009–10 figures revealing relatively high rates of breastfeeding initiation (82 per cent),687 while the rate of exclusive breastfeeding until 6 months is 52 per cent.688 Poor maternal nutrition and health is a major health issue: 27 per cent of adult women are underweight (2009),689 and 21 per cent of pregnant women are anaemic (2003).690

Data for many of the distal risk factors are not available, although the HDI score of 0.495 (2011)691 indicates a moderately low level of basic services. Just over one-third (31 per cent) of the population has access to an improved water source, while less than half (47 per cent) has access to adequate sanitation facilities (2010).692

Vanuatu

- Progress against MDG1c: the percentage of children under 5 years of age who are underweight increased from 10.6 per cent (in 1996) to 11.7 per cent (in 2007).693

Based on 2007 figures for Vanuatu, the prevalences in children under 5 years of age of stunting (26 per cent), underweight (12 per cent) and wasting (6 per cent) are medium.694 One in 10 children (10 per cent) is born with low birthweight (2007 figures).695

Girl children are 40 per cent less likely to be underweight than boy children (2007).696 There are minimal differences in the prevalence of underweight between rural and urban children (risk ratio 0.96), and children from the poorest households are 18 per cent more likely to be underweight than those from the richest households (2007).697

Vanuatu has reasonably high scores for human development (HDI 0.617; 2011)698 and political stability (1.13; 2011).699 However, although access to improved water sources is reasonably high (90 per cent), access to adequate sanitation facilities is low (57 per cent) (2010).700 Additionally, based on 2007 figures, more than one-quarter (28 per cent) of children do not initiate breastfeeding

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686 United Nations Children’s Fund, Underweight disparities
687 United Nations Children’s Fund, Early initiation of breastfeeding (newborns put to the breast within one hour of birth)
688 United Nations Children’s Fund, Infant and young child feeding
689 World Health Organization, Global database on body mass index
691 World Health Organization, Nutrition Landscape Information System: country profile
692 Food and Agriculture Organization of the United Nations, FAO—food security indicators
693 United Nations Statistics Division, Millennium Development Goals indicators
694 World Health Organization, Nutrition Landscape Information System: country profile
695 World Health Organization, Nutrition Landscape Information System: country profile
696 United Nations Children’s Fund, Underweight disparities
697 United Nations Children’s Fund, Underweight disparities
698 World Health Organization, Nutrition Landscape Information System: country profile
699 Food and Agriculture Organization of the United Nations, FAO—food security indicators
700 Food and Agriculture Organization of the United Nations, FAO—food security indicators
within 1 hour of birth,701 almost two-thirds (60 per cent) are not exclusively breastfed until 6 months,702 and almost one-third (32 per cent) do not receive the recommended introduction to complementary foods by 6–8 months of age.703

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701 United Nations Children’s Fund, *Early initiation of breastfeeding (newborns put to the breast within one hour of birth)*

702 United Nations Children’s Fund, *Infant and young child feeding*

703 World Health Organization, *Nutrition Landscape Information System: country profile*
15 Overweight children

The World Health Organization estimates that, globally, more than 42 million children under the age of 5 years were overweight in 2010. Close to 35 million of these are in developing countries.704

A recent systematic review found that the worldwide prevalence of childhood overweight and obesity increased from 4.2 per cent in 1990 to 6.7 per cent in 2010. This trend is expected to reach 9.1 per cent—around 60 million children—in 2020. The estimated prevalence of childhood overweight and obesity in Africa was 8.5 per cent (7.6 per cent in southern Africa) in 2010 and is expected to reach 12.7 per cent in 2020. The prevalence is lower in Asia (4.9 per cent in 2010) than in Africa, but the number of affected children (18 million) is higher. Based on studies in seven Pacific countries (excluding Australia and New Zealand), the authors estimated that the prevalence of childhood overweight and obesity in the Pacific region was 3.5 per cent in 2010, the equal lowest prevalence of all United Nations regions. The region with the highest prevalence was northern Africa (17 per cent).705

This evidence review will form the basis of a forthcoming evaluation of Australia’s support for child undernutrition.
# Appendix 1 Cost-effectiveness of interventions

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Target</th>
<th>Type of intervention</th>
<th>Impact</th>
<th>Cost per participant ($US)</th>
<th>Benefit: cost ratio</th>
<th>Cost-effectiveness (US$ per DALY averted)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition-specific interventions</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Lactating mothers and children &lt;6 months</td>
<td>Integrated breastfeeding support programs (e.g. including community-based management of respiratory infections)</td>
<td>Not available</td>
<td>Not available</td>
<td>221–568</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complementary feeding</td>
<td>Children &gt;6 months</td>
<td>Education to mothers on the appropriate complementary feeding practices (in addition to breastfeeding) using platforms such as community nutrition programs</td>
<td>Effective</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>R Laxminarayan, J Chow, SA Shahid-Salles, D Jamison, J Breman, A Measham, G Alleyne, M Claeson, D Evans and P Jha, Intervention cost-effectiveness: overview of main messages. In: Disease control priorities in developing countries, D Jamison, J Breman, A Measham, G Alleyne, M Claeson, D Evans, P Jha, A Mills and P Musgrove (eds), 2nd edition, World Bank, Washington, DC, 2006, 35–86. KF Michaelsen, L Weaver, F Branca and A Robertson, Feeding and nutrition of infants and young children: guidelines for the WHO European Region, with emphasis on the former Soviet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education to mothers with growth monitoring and promotion</td>
<td>Reduction in deaths of children &lt;5 years by about 6%</td>
<td>Not available</td>
<td>Not available</td>
<td>Cost-effective</td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>Target</td>
<td>Type of intervention</td>
<td>Impact</td>
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<tr>
<td>Vitamin A</td>
<td>Preschool</td>
<td>Supplementation</td>
<td>30% reduction in all-cause mortality; 39% reduction in deaths from diarrhoeal diseases; 70% reduction in deaths from respiratory disease; 34% reduction in deaths from other causes 30% reduction in diarrhoea-specific mortality in children &lt;5 years Neonatal vitamin A supplementation results in a 20% reduction in infant</td>
<td>1.01–2.55</td>
<td>100:1</td>
<td>6–12</td>
<td>R Laxminarayan, J Chow, SA Shahid-Salles, D Jamison, J Breman, A Measham, G Alleyne, M Claeson, D Evans and P Jha, Intervention cost-effectiveness: overview of main messages. In: Disease control priorities in developing countries, D Jamison, J Breman, A Measham, G Alleyne, M Claeson, D Evans, P Jha, A Mills and P Musgrove (eds), 2nd edition, World Bank, Washington, DC, 2006, 35–86. P Glasziou and D Mackerras, Vitamin A supplementation in infectious diseases:</td>
</tr>
<tr>
<td>Intervention</td>
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</tr>
<tr>
<td>Children</td>
<td>Supplementation, with measles immunisation</td>
<td>50–62% reduction in measles mortality</td>
<td>Not available</td>
<td>Not available</td>
<td>1–5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>Universal food fortification</td>
<td>Not available</td>
<td>0.05–0.15</td>
<td>Not available</td>
<td>33–35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapeutic zinc supplements</td>
<td>Children</td>
<td>Supplementation</td>
<td>Reduction in deaths of children &lt;5 years by about 4% 20% reduction in mean duration of diarrhoea Significant and positive</td>
<td>1</td>
<td>13.8:1</td>
<td>73</td>
<td></td>
</tr>
</tbody>
</table>

Disease Control Priorities Project, Eliminating malnutrition could reduce poor countries’ disease burden by one-
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Target</th>
<th>Type of intervention</th>
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<th>Referencea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deworming</td>
<td>Children</td>
<td>Treatment</td>
<td>If the prevalence of soil-transmitted helminths is 50% or more, deworming leads to significant extra gains in weight, height, mid-upper arm circumference and skinfold thickness. In schools, deworming leads to an additional 13.9 years of education for every $100 spent. Deworming children at school decreases absenteeism by 25%. Blanket campaigns had little or no impact on haemoglobin, cognition, school attendance or school performance.</td>
<td>0.5</td>
<td>6:1</td>
<td>2–9</td>
<td>third, DCPP, Washington, DC, 2007.</td>
</tr>
<tr>
<td>Intervention</td>
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</tr>
<tr>
<td>Iodine</td>
<td>All</td>
<td>Universal salt iodisation (all)</td>
<td>Reduction in fetal wastage and cretinism; increased cognition in children</td>
<td>0.20–0.50</td>
<td>30:1</td>
<td>34–36</td>
<td>Disease Control Priorities Project, Eliminating malnutrition could reduce poor countries’ disease burden by one-third, DCPP, Washington, DC, 2007.</td>
</tr>
<tr>
<td></td>
<td>Women of reproductive age</td>
<td>Supplementation with iodised oil capsules</td>
<td></td>
<td>0.5</td>
<td>35:1</td>
<td>1250</td>
<td>Disease Control Priorities Project, Eliminating malnutrition could reduce poor countries’ disease burden by one-third, DCPP, Washington, DC, 2007.</td>
</tr>
<tr>
<td>Balanced energy and protein supplements during pregnancy</td>
<td>Pregnant women</td>
<td>Biscuits or seeds and oils mixes, distributed by lay health workers or via outreach</td>
<td>38% reduction in stillbirths; 32% reduction in low birthweight among undernourished women; 31% reduction in the risk of giving birth to small-for-gestational-age infants Weight gain among undernourished women No effect on neonatal mortality rate (RR = 0.68, 95%CI 0.43–1.07), preterm birth (RR = 0.96, 95%CI 0.8–1.16) or pre-eclampsia</td>
<td>Not available</td>
<td>Not available</td>
<td>&gt;1000 per maternal, neonatal and child DALY averted</td>
<td>E Ota, R Tobe-Gai, R Mori and D Farrar, Antenatal dietary advice and supplementation to increase energy and protein intake. Cochrane Database of Systematic Reviews (9):CD0000032, 2012.</td>
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</thead>
<tbody>
<tr>
<td>Supplementary feeding for adolescent girls</td>
<td>Adolescents</td>
<td>Supplements—to improve the current nutritional status of adolescents, as well as improving iron stores</td>
<td>Improved iron and folic acid status; effects on anthropometry still contentious (limited data)</td>
<td>Not available</td>
<td>Not available</td>
<td>13–24</td>
<td>S Horton, M Shekar, C McDonald, A Mahal and J Brooks, Scaling up nutrition: what will it cost?, World Bank, Washington, DC, 2010.</td>
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</table>

(RR = 1.48, 95%CI 0.82–2.66)
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</thead>
<tbody>
<tr>
<td><strong>Nutrition-sensitive interventions</strong></td>
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<tr>
<td>Conditional cash transfer</td>
<td>Families, mainly mothers</td>
<td>Monetary transfer conditional on a particular behaviour or action, such as making a visit to a health facility for regular check-ups</td>
<td>Significant increase in the uptake of antenatal care, routine well-child check-ups, and growth monitoring visits for children, by 18%, 19% and 15%, respectively Positive impact on health care utilisation, with a 19.5% increase after 1 year and an 11% increase after 2 years in the proportion of infants (0–3 years) taken to health centres in the past 6 months Reduction in the magnitude of stunting (net average</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>J Maluccio and R Flores, Impact evaluation of a conditional cash transfer program: the Nicaraguan Red de Protección Social, FCND discussion paper 184, International Food Policy Research Institute, Washington, DC, 2005. J Behrman, P Segupta and P Todd, Progressing through PROGRESA: an impact assessment of a school subsidy experiment, PIER working paper 01-033, Penn Institute for Economic Research, Philadelphia, 2001. JR Behrman, SW Parker and PE Todd, Do conditional cash transfers for schooling generate lasting benefits?</td>
</tr>
<tr>
<td>Intervention</td>
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</tr>
<tr>
<td><strong>Social transfer (e.g. South Africa’s Child Support Grant)</strong></td>
<td>Families and community</td>
<td>Tax-financed (and/or aid-supported) policy instruments designed to address poverty and vulnerability</td>
<td>Improvement in height for age of children 0–24 months, but not of children 24–72 months (Colombia). Positive impacts on height for age in children 0–36 months (South Africa and Ecuador). 5.2% reduction in stunting among children &lt;5 years in Nicaragua, but no impact in Mexico. 127.3 g higher birthweight and 4.6% reduction in low birthweight in Mexico. No impact on weight for age or weight for height.</td>
<td>Not available</td>
<td>1.4–2.5:1</td>
<td>53–153</td>
<td>A Barrientos, Social transfers and growth: what do we know? What do we need to find out? World Development 40(1):11–20, 2012. M Niño-Zarazúa, Social transfers against poverty and malnutrition: what do we know about their effectiveness?, World Institute for Development Economics Research, United Nations University, Place Published, 2011, <a href="http://www.wider.unu.edu/events/research-presentations/seminars/en_GB/03-04-2012/">www.wider.unu.edu/events/research-presentations/seminars/en_GB/03-04-2012/</a>.</td>
</tr>
</tbody>
</table>

| **Social protection system (e.g. Bangladesh/BRAC’s Challenging the Frontiers of Poverty Reduction)** | Families and community | Entitlements, e.g. provision of income (cash) or consumption (food); transfers to the poor, such as food for work. Protection of the vulnerable against livelihood risks, such as food price stabilisation. Enhancement of the social status and rights of the excluded and marginalised. | Households receiving cash transfers are 52% more likely to achieve food security, with chronic malnutrition falling by approximately 30% among children <6 years and by approximately 62% in infants 6–11 months (Brazil). 9% reduction in stunting and 2.2% reduction in wasting (Malawi). | Not available | Not available | Not available | High Level Panel of Experts, Social protection for food security: a report by the High Level Panel of Experts on Food Security and Nutrition, HLPE report 4, Committee on World Food Security, Rome, 2012. |

Improvement in the height-for-age z-score by 0.17 and the proportion of underweight children aged 0–5 years (net impact of 6% after 2 years). No impact on wasting.
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Target</th>
<th>Type of intervention</th>
<th>Impact</th>
<th>Cost per participant ($US)</th>
<th>Benefit: cost ratio</th>
<th>Cost-effectiveness (US$ per DALY averted)</th>
<th>Reference^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home garden program (e.g. Helen Keller Institute’s Homestead Food Production program)</td>
<td>Households</td>
<td>Demonstration vegetable gardens &lt;br&gt; Genetic improvement of vegetables &lt;br&gt; AVRDC—the World Vegetable Center’s Approach to Alleviate Malnutrition</td>
<td>Favourable effect on maternal knowledge of vitamin A nutrition, and dietary intake of pro-vitamin A–rich vegetables</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>M Faber and S Laurie, A home gardening approach developed in South Africa to address vitamin A deficiency. In: <em>Combating micronutrient deficiencies: food-based approaches</em>, B Thompson and L Amoroso (eds), CAB International and Food and Agriculture Organization of the United Nations, Rome, 2011, 163–182.</td>
</tr>
</tbody>
</table>

CI = confidence interval; DALY = disability-adjusted life year; RR = relative risk

^a These references are for both impact and cost-effectiveness data

^b Only two out of five studies were conducted in low- and middle-income countries.
## Appendix 2 Selected agricultural development interventions and their links with child nutrition

<table>
<thead>
<tr>
<th>Country</th>
<th>Intervention</th>
<th>Nutrition data collected</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Homestead gardening with provision of seeds, farming education and nutrition education</td>
<td>Yes</td>
<td>Slight decrease in night blindness, indicating improved vitamin A status</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>Homestead gardening with vegetables, training in agriculture, and provision of seeds and nutrition education</td>
<td>Yes</td>
<td>Improvements in stunting and in underweight</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>Vegetable production, fish ponds, and credit and agricultural training</td>
<td>Yes</td>
<td>No change in haemoglobin in any group, implying no change in iron status</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Training in agriculture; food preparation sessions; and provision of seeds, and health and nutrition education</td>
<td>Yes</td>
<td>Lower prevalence of clinical signs of vitamin A deficiency in treatment area</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Provision of seeds, extension services and nutrition education for the promotion of vitamin A–rich foods</td>
<td>No</td>
<td>No data collected on nutrition indicators (only dietary indicators)</td>
</tr>
<tr>
<td>India</td>
<td>Homestead gardening and nutrition and health education</td>
<td>Yes</td>
<td>Decrease in ocular signs and symptoms of vitamin A deficiency</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Social marketing with mass media and 1-on-1 communication to increase intake of targeted vitamin A–rich foods</td>
<td>Yes</td>
<td>Increased serum retinol with increased egg consumption; dose–response relationship indicated improved vitamin A status</td>
</tr>
<tr>
<td>Kenya</td>
<td>Introduction of a new variety of sweet potatoes, training in food-processing techniques and nutrition education</td>
<td>No</td>
<td>No data collected on nutrition indicators (only dietary indicators)</td>
</tr>
<tr>
<td>Nepal</td>
<td>Homestead gardening, irrigation, agriculture extension and provision of seeds</td>
<td>Yes</td>
<td>Deterioration of nutritional status of children during study (no control)</td>
</tr>
<tr>
<td>Nepal</td>
<td>Promotion of home production, and multimedia education campaign promoting consumption of vitamin A–rich foods</td>
<td>No</td>
<td>No data collected on nutrition indicators (only dietary indicators)</td>
</tr>
<tr>
<td>Peru</td>
<td>Nutrition education in community kitchen with capacity building</td>
<td>Yes</td>
<td>Reduction in prevalence of anemia</td>
</tr>
<tr>
<td>Philippines</td>
<td>Promotion of production of vitamin A–rich fruits and vegetables, with provision of seeds and seedlings, and advice on agricultural practices</td>
<td>Yes</td>
<td>Improved weight-for-height and decrease in severe wasting. No change in serum retinol or clinical eye signs of severe vitamin A deficiency</td>
</tr>
<tr>
<td>Philippines</td>
<td>Promotion of homestead gardens, provision of seeds and cuttings, mass media campaigns, social marketing and nutrition education</td>
<td>No</td>
<td>No data collected on nutrition indicators (only dietary indicators)</td>
</tr>
<tr>
<td>Senegal</td>
<td>Promotion of homestead gardens and sale of produce, and provision of nutrition and agriculture education</td>
<td>No</td>
<td>No data collected on nutrition indicators (only dietary indicators)</td>
</tr>
<tr>
<td>Country</td>
<td>Intervention</td>
<td>Nutrition data collected</td>
<td>Findings</td>
</tr>
<tr>
<td>-------------</td>
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<td>--------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Promotion of home production, consumption and storage of vitamin A–rich foods; and health and nutrition education</td>
<td>Yes</td>
<td>Lower serum vitamin A and higher helminths in treatment area. (Overall, higher intake of vitamin A–rich foods, associated with higher serum vitamin A)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Promotion of solar driers; nutrition and health education</td>
<td>No</td>
<td>No data collected on nutrition indicators (only dietary indicators)</td>
</tr>
<tr>
<td>Thailand</td>
<td>Seed distribution; training of women farmers; promotion of gardens, fish ponds and raising chickens; nutrition education; and social marketing</td>
<td>Yes</td>
<td>Increased serum retinol and decreased vitamin A deficiency (in schoolgirls). Increased mean hemoglobin and decreased anemia</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Homestead gardens, fish ponds, and animal husbandry and nutrition education</td>
<td>No</td>
<td>No data collected on nutrition indicators (only dietary indicators)</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Promotion of homestead gardens with a focus on vitamin A–rich crops, and nutrition education for mothers</td>
<td>Yes</td>
<td>Clinical eye signs of severe vitamin A deficiency decreased to almost zero, implying improved vitamin A status</td>
</tr>
</tbody>
</table>

Appendix 3 Child nutrition status data summary table

See separate file or click on the icon below

Child nutrition status data summary table
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