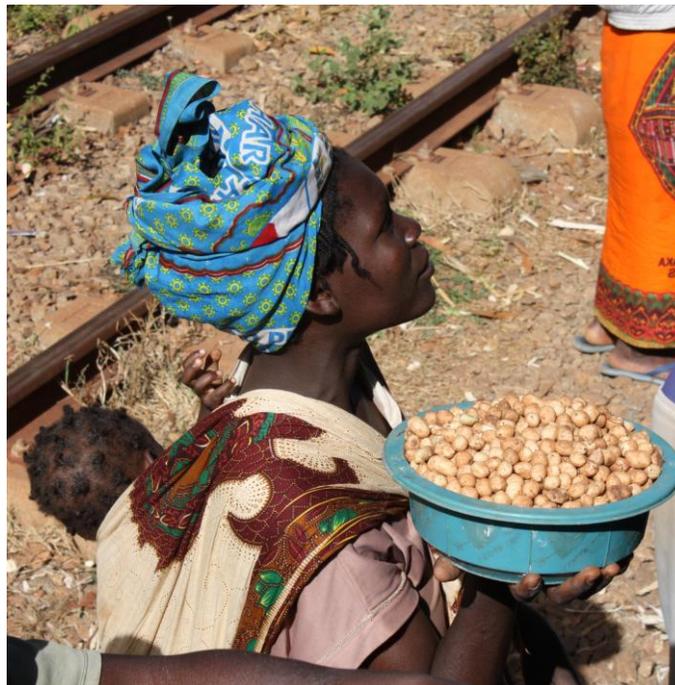


Nutrition Topic Guide

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HEART
HEALTH & EDUCATION ADVICE & RESOURCE TEAM



Authors:
Jessica Meeker, Stephen Thompson, Inka Barnett

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General introduction and overview

This Topic Guide has been compiled to provide an overview of undernutrition in the context of development. It covers the nature, scale and complex range of causes of undernutrition and summarises the evidence for what works to address the problem. The Guide covers direct nutrition interventions (or nutrition specific development as it is often termed), indirect interventions (nutrition sensitive), and the global coordination structures, governance and funding which are essential for an enabling environment within which undernutrition can be successfully reduced. The focus of this Guide is on undernutrition, defined as the outcome of insufficient food intake (hunger) and repeated infectious diseases. Undernutrition includes being underweight for one's age, too short for one's age (stunted), dangerously thin (wasted), and deficient in vitamins and minerals (micronutrient malnutrition). This review does not focus on the other component of malnutrition, which is overnutrition.

Where possible the evidence presented in this Topic Guide was taken from systematic reviews of high quality. Where no systematic reviews were available or appropriate, evidence was included from other sources, including primary and empirical studies, as well as theoretical and conceptual research, deemed to be of high quality. This judgement was reached based on various principles, including conceptual framing, openness, transparency, appropriateness and rigour, validity, reliability and cogency. The body of evidence that has been included is summarised for each section. This assessment is based on the quality, size, content and consistency of the studies included.

This document was written in April and May 2013. The authors are aware of a significant body of evidence, much of which is focused on undernutrition, for example the new Lancet series on maternal and child nutrition, which is planned for publication in June 2013. A second edition of this document will be produced later in 2013, including additional information and new evidence where relevant.

1) The nature of the problem

Undernutrition is one of the world's most serious but least addressed health problems. In developing countries nearly one-third of children are underweight or stunted (low height for their age). The human and economic costs are enormous, falling hardest on the very poor and on women and children. Undernutrition interacts with repeated bouts of infectious disease, causing an estimated 3.5 million preventable maternal and child deaths annually, and its economic costs in terms of lost national productivity and economic growth are huge.

1a) The scale of undernutrition

Child undernutrition is commonly measured by:

- Anthropometric measures, including a child's height relative to the median for its age (a measure of stunting or chronic malnutrition); its weight relative to height (a measure of wasting or acute malnutrition); its weight relative to the median for its age (underweight, a composite measure of stunting and/or wasting), and being born with a low birth rate (under 2.5kg).
- Deficiencies in vitamins and minerals (micronutrient malnutrition) such as vitamin A, iron and zinc.

Key messages

- **Stunting** - Globally, an estimated 165 million children under-5 years of age, or 26 per cent, were stunted in 2011. Over 90 per cent of the world's stunted children live in Africa and Asia.
- **Underweight** - Globally, an estimated 101 million children under-5 years of age, or 16 per cent, were underweight in 2011. The prevalence of stunting and underweight among children under-5 years of age worldwide has decreased since 1990, however overall progress is insufficient and millions of children remain at risk.
- **Wasting** - Globally, an estimated 52 million children under-5 years of age, or 8 per cent, were wasted in 2011, an 11 per cent decrease from an estimated 58 million in 1990. Seventy per cent of the world's wasted children live in Asia, most in south-central Asia. These children are at substantial increased risk of severe acute malnutrition (SAM) and death (UNICEF, WHO, World Bank, 2012).

Body of evidence

The evidence on the scale of the problem is based mostly on statistics compiled by UNICEF and WHO. These are based on country level data and are widely regarded as being reliable sources. The evidence for the causes of malnutrition and progress towards MDGs is based on a systematic analysis of the available literature and data.

Annotated bibliography

UNICEF, WHO, World Bank. *Joint child malnutrition estimates*. UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC; 2012.

The United Nations Children's Fund (UNICEF), World Health Organization (WHO) and the World Bank jointly compiled this report from global and national data on child nutrition. The joint analysis dataset includes 639 nationally representative surveys from 142 countries/territories.

The report covers levels and trends of malnutrition globally, including stunting, wasting, under and overweight. The report is linked to the WHO global database on child growth and malnutrition (www.who.int/nutgrowthdb), where UNICEF and WHO review survey data from the published and grey literature as well as reports from national authorities on a continual basis. This report outlines key facts and figures on the levels of child undernutrition by country and region and tracks progress towards Millennium Development Goal (MDG) indicators.

Gretchen A Stevens, Mariel M Finucane, Christopher J Paciorek, Seth R Flaxman, Richard A White, Abigail J Donner, Majid Ezzati (2012). 'Trends in mild, moderate, and severe stunting and underweight, and progress towards MDG 1 in 141 developing countries: a systematic analysis of population representative data'. *The Lancet* 380:824–83

This paper looks at child anthropometric data on a country by country basis and aimed to estimate trends in the distributions of children's anthropometric status and assess progress towards MDG 1. The data was collated from population-representative data on height and weight-for-age Z-score, from health and nutrition surveys, summary statistics from the WHO Global Database on Child Growth and Malnutrition, and summary statistics from reports of other national and international agencies.

The results show that in developing countries, prevalence of moderate-and-severe stunting declined from 47.2 to 29.9 per cent and underweight from 30.1 to 19.4 per cent. The largest absolute improvements were in Asia and the largest relative reductions in prevalence in southern and tropical Latin America. Anthropometric status worsened in sub-Saharan Africa until the late 1990s and improved thereafter. In 2011, 314 million children under 5 years were mildly, moderately, or severely stunted and 258 million were mildly, moderately, or severely underweight.

The authors conclude that developing countries as a whole have less than a 5 per cent chance of meeting the MDG 1 target; but 61 of these 141 countries have a 50-100 per cent chance.

Nutrition and the Millennium Development Goals

Improving nutrition is essential for the achievement of the Millennium Development Goals (MDGs), many of which are dependent on good nutrition outcomes.

MDG 1: Eradicate extreme poverty and hunger

Reducing prevalence of underweight children under-5 years of age is an agreed target for MDG 1. Reducing undernutrition also increases economic growth.

MDG 2: Achieve universal primary education

Reducing undernutrition increases cognitive development and contributes to learning and school completion rates.

MDG 3: Promote gender equality

Promoting better nutrition practices contributes to empowering women and to reducing discrimination against girls in family feeding practices.

MDG 4: Reduce child mortality

Over 35 per cent of deaths in children under-5 years of age are attributed to undernutrition as the underlying cause, as common childhood diseases become fatal in undernourished children.

MDG 5: Improve maternal health

Maternal undernutrition contributes to maternal mortality and other complications during pregnancy and childbirth. Maternal health can be improved through programmes of behaviour change and micronutrient supplementation.

MDG 6: Combat HIV/AIDS, malaria and other diseases

Undernutrition makes individuals more susceptible to disease, which in turn increases nutritional needs and weakens the capacity of the body to assimilate food. Nutritional care is therefore a key dimension of successful clinical treatment of HIV/AIDS patients.

MDG 7: ensure environmental sustainability

Poor hygiene and sanitation can cause high levels of undernutrition. Clean drinking water can be a significant problem in developing countries. Water, sanitation and hygiene (WASH) is critically important for many reasons, including improved nutrition.

MDG 8: Global partnership for development

Addressing hunger and malnutrition around the world is a key element of, and argument for, the global partnership for development. This applies particularly for the least developed countries, where levels of undernutrition are highest.

While there has been good progress toward MDG 1c (to halve the proportion of people who suffer from hunger) in a number of regions (East Asia and the Pacific, Latin America and the Caribbean and Central and Eastern Europe) progress in South Asia, all regions of Africa, and the Middle East, has been insufficient and is not on track to meet the target by 2015 (UNICEF, 2012).

The Causes of Undernutrition

The causes of undernutrition are complex and span across sectors. Figure 1 illustrates the immediate, underlying and basic causes of undernutrition. Understanding this framework is important, as interventions at every level can have an impact on maternal and child nutrition outcomes.

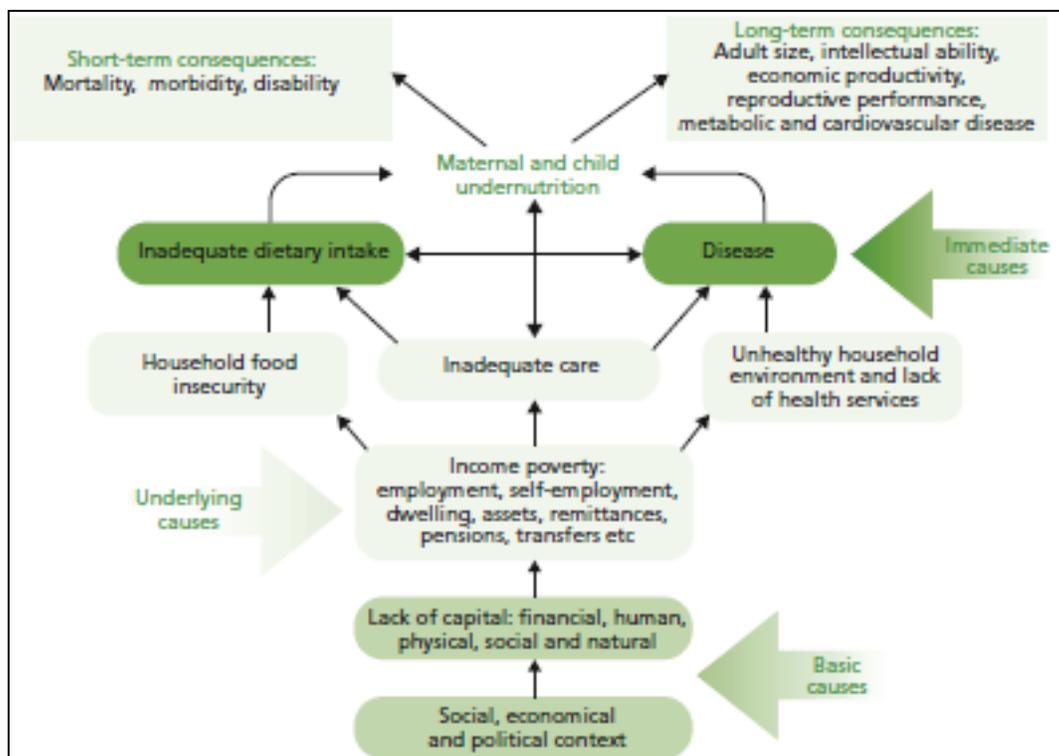


Figure 1. Causal framework of malnutrition (UNICEF 1990, reproduced in Black et al. 2008)

1b) The consequences of undernutrition

Maternal and child undernutrition is highly prevalent in low and middle-income countries, resulting in substantial increases in mortality and overall disease burden. Children who are undernourished in the first two

years of life and who put on weight rapidly later in childhood and in adolescence are at high risk of chronic diseases related to nutrition. Undernutrition weakens the immune system, stunts physical growth and cognitive development and can have a lifelong and intergenerational effect on educational attainment and economic potential for individuals, families and whole nations. It has been estimated that co-exposure to a range of related factors which have undernutrition as their underlying cause (including a weakened immune system and susceptibility to infectious diseases such as malaria, diarrhoea and pneumonia) combined with the effects of growth restriction, micronutrient deficiencies, and suboptimum breastfeeding, accounts for 35 per cent of all child deaths (Black et al. 2008). The consequences of stunting and cognitive development tend to be irreversible after the age of 2, with the period from conception until a child's second birthday becoming known as the 1,000 day 'window of opportunity' to prevent irreversible damage.

Maternal undernutrition and the stress this causes upon the foetus *in utero* (in the womb) can increase the risk of interuterine growth retardation, causing babies to be born Small-for-Gestational Age (SGA), and can have long lasting effects on the health of an individual throughout its life course, and longer term implications for chronic diseases including cardiovascular diseases and type II diabetes (Victoria et al. 2008). Micronutrient or protein deficiencies can also have serious effects during pregnancy. For example, there is also evidence suggesting that iron deficiencies may have a negative effect on maternal health and maternal mortality.

Adolescent pregnancy (for which rates are exceptionally high in some developing countries) have been shown to have a significant impact on nutritional status for both the mother and the child. Adolescents are usually understood to be young people between the ages of ten and 19 years. Adolescent girls have a much higher risk of dying from maternal causes compared to women in their 20s and 30s. These risks increase greatly as maternal age decreases. Moreover, babies born to adolescents also face a significantly higher risk of death compared to babies born to older women. Poor adolescent nutrition combined with stunted growth, resulting in stunted mothers, increases the likelihood of a child being born low birth weight (LBW) and being a stunted child. This intergenerational effect is illustrated in Figure 2.

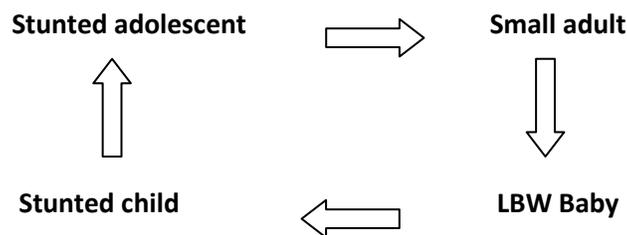


Figure 2. Negative intergenerational effects of undernutrition on growth

Key messages

- Poor foetal growth or stunting in the first two years of life leads to irreversible damage, including shorter adult height, lower attained schooling and reduced adult income.
- During the first two years of life, children who are undernourished are at high risk of chronic diseases.
- Maternal undernutrition has immediate and long-term negative consequences for the offspring.
- Adolescent pregnancy greatly increases the risk of mortality to mother and child.

Body of evidence

The evidence on the consequences of undernutrition presented here is based on *The Lancet* 2008 series on maternal and child nutrition which is a series of peer reviewed papers which review the body of evidence. The evidence is strong for the consequences of undernutrition outlined.

Annotated bibliography

Black, R., Allen, L., Bhutta, Z.A., Caulfield, L., de Onis, M., Ezzati, M., Mathers, C. & Rivera, J. (2008) Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet* 371: 243–60

This is the first paper of *The Lancet* 2008 special series on Maternal and Child Undernutrition and focuses on the magnitude of the problem and the short-term consequences of undernutrition in low- and middle-income countries. The paper uses new analyses of existing data to estimate the effects of the risks related to measures of undernutrition, as well as to suboptimum breastfeeding practices on mortality and disease.

The authors estimated that stunting, severe wasting, and intrauterine growth restriction together were responsible for 2.2 million deaths and 21 per cent of Disability-Adjusted Life-Years (DALYs) for children younger than 5 years. One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.

Deficiencies of vitamin A and zinc were estimated to be responsible for 0.6 million and 0.4 million deaths respectively, and a combined 9 per cent of global childhood DALYs. Iron and iodine deficiencies resulted in few child deaths, and combined, were responsible for about 0.2 per cent of global childhood DALYs. Iron deficiency as a risk factor for maternal mortality added 115,000 deaths and 0.4 per cent of global total DALYs.

Suboptimum breastfeeding was estimated to be responsible for 1.4 million child deaths and 44 million DALYs (10 per cent of DALYs in children younger than 5 years). In an analysis that accounted for co-exposure of these nutrition-related factors, they were together responsible for about 35 per cent of child deaths and 11 per cent of the total global disease burden. The high mortality and disease burden resulting from these nutrition-related factors make a compelling case for the urgent implementation of interventions to reduce their occurrence or ameliorate their consequences.

Victoria, C., Adair, L., Fall, C., Hallal, P., Martorell, R., Richter, L. & Singh Sachdev, H. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet*, Vol. 371

This paper addresses the potential long-term implications of undernutrition through a review of the associations between maternal and child undernutrition with human capital and risk of adult diseases in low and middle-income countries.

Data from Brazil, Guatemala, India, the Philippines and South Africa was analysed and it was found that indices of maternal and child undernutrition were related to adult outcomes (height, schooling, income or assets, offspring birth weight, body-mass index, glucose concentrations, blood pressure).

The data provides strong evidence that adequate nutrition in utero and in the first two years of life is essential for formation of human capital. Undernourished children are more likely to become short adults, to have lower educational achievement and to give birth to smaller infants. Undernutrition is also associated with lower economic status in adulthood. Height-for-age at 2 years was shown to be the best predictor of human capital in adulthood and undernutrition is shown to be associated with lower human capital. The authors conclude that damage suffered in early life leads to permanent impairment, and might also affect future generations. Its prevention will probably bring about important health, educational and economic benefits.

1c) The benefits of scaling up undernutrition reduction

Firstly and most importantly, undernutrition is preventable. Reducing undernutrition not only saves millions of lives, but investing in scaling up represents significant value for money in comparison with other development interventions. The Copenhagen Consensus 2012 – in which economists weigh the value for money of a number of potential development interventions – ranked three nutrition interventions in the top five development solutions in 2008, with vitamin A and zinc micronutrient supplements for children ranked first.

Key messages

- Effective interventions are available to reduce stunting, micronutrient deficiencies, and child deaths. If implemented at sufficient scale, they would reduce Disability-Adjusted Life-Years (DALYs) by about a quarter in the short term.
- Of available interventions, counselling about breastfeeding and fortification or supplementation with vitamin A and zinc have the greatest potential to reduce the burden of child morbidity and mortality.
- Improvement of complementary feeding in food-insecure populations through strategies such as counselling about nutrition for food-secure populations and nutrition counselling, food supplements, conditional cash transfers, or a combination of these, could substantially reduce stunting and related burden of disease.
- Interventions for maternal nutrition (supplements of iron folate, multiple micronutrients, calcium, and balanced energy and protein) can improve outcomes for maternal health and births, but few have been assessed at sufficient scale.
- Although available interventions can make a clear difference in the short term, elimination of stunting will also require long-term investments to improve education, economic status, and empowerment of women.

Body of evidence

The benefits of scaling up nutrition are widely agreed upon and the body of evidence is strong. The evidence presented in this section is based on a review of the evidence, a framework which bases its recommendations on two evidence reviews and a paper released by the Copenhagen Consensus which is a review of the evidence base by an expert panel.

Annotated bibliography

Bhutta, Z.A., Ahmed, T., Black, R.E., Cousens, S., Dewey, K., Giugliani, E., Haider, B.A., Kirkwood, B., Morris, S.S., Sachdev, H.P. & Shekar, M. (2008). What works? Interventions for maternal and child undernutrition and survival. *The Lancet* Feb 2, 371 (9610): 417-40

In this paper, the authors summarise the evidence about interventions with proven effectiveness in addressing undernutrition. These actions span interventions directed at mothers, babies and young children, and include direct nutrition interventions (e.g. provision of micronutrients) as well as indirect interventions, such as behaviour change interventions directed at feeding practices and accompanied by supportive measures such as conditional cash transfers. Together, these interventions could reduce the burden of undernutrition in young children by about 25 per cent in the 36 countries with the highest burden of undernutrition if implemented universally. These key messages are some of the findings presented in this paper.

Hoddinott, J., Rosegrant, M. & Torero, M. (2012). *Hunger and malnutrition. Copenhagen Consensus 2012*

The Copenhagen Consensus is a project that establishes priorities for global welfare. It was set up in 2004 by gathering some of the world's greatest economists to improve prioritisation of the numerous problems the world faces and the process has been repeated every four years. The expert panel's task is to create a prioritised list of solutions to the 10 greatest challenges, showing the most cost-effective investments. This is a way to identify the areas of spending which could achieve the most good, and to bring more attention to them. It is also a way of identifying areas where there isn't enough research, or where the benefits are not as big as might be assumed. The third Copenhagen Consensus 2012 Expert Panel found investments to reduce hunger and undernutrition to have powerful positive benefits, both intrinsically and instrumentally.

Scaling Up Nutrition. A framework for action. 2010

Scaling Up Nutrition (SUN), is a movement founded on the principle that all people have a right to food and good nutrition. It involves the commitment of governments, civil society, the United Nations, donors, businesses and researchers to improve nutrition in a collective effort.

This framework document was created in 2010 in response to poor progress towards MDG 1. It outlines the social and economic consequences of undernutrition, the evidence and rationale for scaling up and recommends areas for prioritised action. The focus is on the evidence around the long-term and irreversible impact of undernutrition both on infant and child mortality and on longer term intellectual, physical and social development.

The framework draws heavily on the set of direct interventions outlined in *The Lancet* 2008 series, and a later review by the World Bank in 2009 which examined the feasibility and cost-effectiveness and identified a more selective package of 13 highly cost-effective interventions. These interventions, it is stated "*could protect the nutrition of vulnerable individuals and communities and benefit millions of people if incorporated into food security, agriculture, social protection, health and education programmes.*" Emphasis is also placed on the need for multi-sectoral cooperation, in recognition that direct, nutrition-specific interventions need to be complimented by a broader approach that includes integrating nutrition in related sectors.

2) Direct interventions – nutrition specific development

Nutrition specific development refers to those interventions which have a direct impact on nutritional outcomes, addressing the immediate causes of undernutrition. There have been countless studies in different contexts looking at the effectiveness of nutrition interventions, with *The Lancet* 2008 series reviewing the evidence base to summarise ‘what works’.

The review categorised the effective interventions into the following two sections:

- 1) Interventions with an evidence base sufficiently strong to warrant the recommendation to implement in 36 of the world’s highest burden countries.
- 2) Interventions those where the evidence was strong in specific contexts.

These interventions are focused on maternal and child health and are outlined in Figure 3.

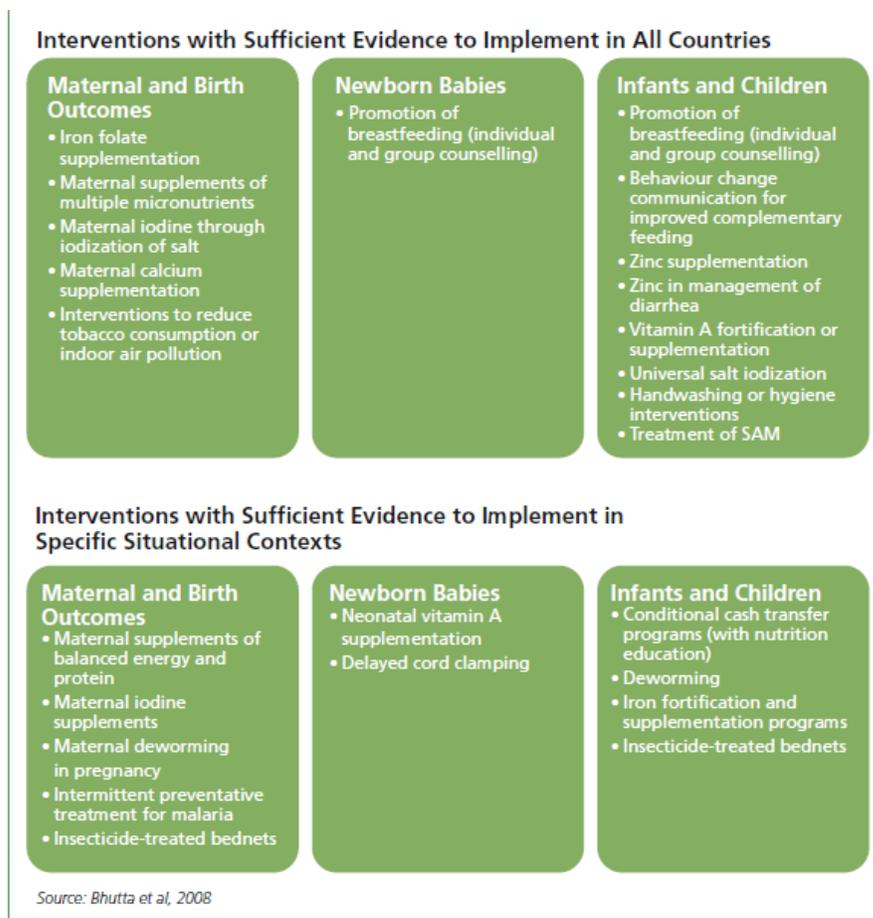


Figure 3. *The Lancet* 2008 – key interventions

2a) Maternal and birth outcomes

The nutritional status of a woman before and during pregnancy is important for a healthy pregnancy outcome and during this time women often become more deficient in nutrients, with the need to provide nutrition for the baby too. Maternal malnutrition is a key contributor to poor foetal growth, low birth weight (LBW) babies and short- and long-term infant morbidity and mortality.

As detailed in *The Lancet* 2008 series, the interventions which have sufficient evidence to recommend implementation in all high burden countries:

- Maternal supplementation with key micronutrients (iron folate, calcium and multiple micronutrients);
- Increasing iodine intake through iodized salt;
- Reduction in tobacco consumption/exposure.

Body of evidence

The evidence for interventions to improve maternal and birth outcomes is strong for those interventions outlined above. This is based on *The Lancet* 2008 review of the evidence base. Also included in this section is evidence from a systematic review and evidence review.

Annotated bibliography

Haider, B. & Bhutta, Z. (2012). *Multiple-micronutrient supplementation for women during pregnancy, intervention review*. The Cochrane library

This review looks at the evidence for multiple micronutrient supplementation of pregnant women and the effect on birth outcomes.

Micronutrient deficiencies are known to interact and a greater effect may be achieved by multiple supplementation rather than single nutrient supplementation, although interactions may also lead to poor absorption of some of the nutrients.

Overall, the review of data showed that multiple-micronutrient supplementation reduced the number Low Birth Weight (LBW) and Small-for-Gestational Age (SGA) babies when compared with iron and folic acid supplements, no supplementation or a placebo.

The authors conclude that whilst multiple micronutrients have been found to have a significant beneficial impact on SGA and LBW babies, more evidence is required to guide a universal policy change and to suggest replacement of routine iron and folate supplementation with a multiple micronutrient supplement. They also suggest that future research should examine the effects on mortality and morbidity and assess the effects of different combinations and dosages of micronutrients.

Imdad A, Bhutta ZA. (2012). Maternal nutrition and birth outcomes: effect of balanced protein-energy supplementation. *Paediatric and Perinatal Epidemiology*.1

This review summarises the evidence for the impact of maternal protein-energy supplementation on birth outcomes such as birth weight, size-for-gestational-age (SGA) and risk for still birth. The data shows a positive mean increase of 73g on birth weight, with the effect more pronounced in women who were undernourished. It also shows a 32 per cent decrease in the risk of low birth weight (LBW), 34 per cent reduction in the risk of SGA and 38 per cent decrease in the risk of still birth. The authors conclude that balanced protein-energy supplementation is an effective intervention to reduce the risk of LBW and SGA births, especially in undernourished mothers. This supports *The Lancet* recommendation that protein-energy supplementation is recommended in certain contexts, i.e. where the proportion of undernourished women is high.

2b) Newborn babies

Infants who are not breastfed are at a far higher risk of infectious diseases, like pneumonia and diarrhoea, and mortality than those who are breastfed. A mother's breast milk provides more than just essential nutrients for the newborn baby, but contains a unique mix of proteins, fats, sugars, enzymes and antibodies to develop the baby's immunity and help its digestive system to grow and function properly. The mother's first milk, called colostrum, is produced only in the first days after birth and contains a powerful and concentrated mix of these immune, growth and tissue repair factors. It is not only ensuring that more babies are breastfed that is important, but the time delay from when breastfeeding is initiated. It is estimated that early initiation of breastfeeding (within the first hour of birth) could prevent 22 per cent of newborn deaths (Edmond et al. 2006). Breastfeeding support was highlighted in *The Lancet* as an effective intervention to increase breastfeeding rates, which in turn have a significant positive effect on child mortality and morbidity. Counselling and education for mothers on breastfeeding has been shown to be effective, and the forum through which this counselling is provided has been shown to be important (Sudfeld et al, 2012).

Key messages

- Breastfeeding is rated as the single most effective intervention to improve neonatal mortality rates.
- Exclusive breastfeeding is when the infant only receives breast milk without any additional food or drink, not even water. Oral rehydration salts (ORS), drops and syrups (vitamins, minerals and medicines) are regarded as an exception to this. Babies who are not exclusively breastfed are at four times higher risk of death.
- Early initiation (within one hour) of breastfeeding could reduce neonatal mortality by 22 per cent.
- Breastfeeding promotion and counselling through (both individual and group) improves rates of exclusive breastfeeding, but promotion programmes should also emphasise early initiation.

Body of evidence

There is a strong evidence base for interventions to improve nutritional status of newborn babies. This is based on *The Lancet* 2008 review of the evidence, a systematic review and meta-analysis, and a peer reviewed study.

Annotated bibliography

Edmond, K M, Zandoh, C, Quigley, M A, Amenga-Etego, S, Owusu-Agyei, S and Kirkwood, B R. 'Delayed breastfeeding initiation increases risk of neonatal mortality'. *Pediatrics*, March 2006, 117(3):e380-6

The objective of this paper was to assess the contribution of the timing of initiation of breastfeeding to any impact. Based on data from Ghana, the results show that the risk of neonatal death was four times higher in children who were not exclusively breastfed (given milk-based fluids or solids in addition to breast milk). Delay in initiation of breastfeeding, from one hour to seven days had an increasing risk of neonatal mortality. The authors state that 16 per cent of neonatal deaths could be saved if all infants were breastfed from day one and 22 per cent saved if breastfeeding started within the first hour. Promotion of early initiation of breastfeeding has the potential to make a major contribution to child survival and achieving the MDGs and breastfeeding-promotion programs should emphasise early initiation as well as exclusive breastfeeding.

Sudfeld CR, Fawzi WW, Lahariya C.(2012). 'Peer support and exclusive breastfeeding duration in low and middle-income countries: a systematic review and meta-analysis. *PLoS One*; 7 (9)

This recent systematic review and meta-analysis examined the effect of peer support on duration of exclusive breastfeeding (EBF) in low and middle-income countries (LMICs). Eleven randomised controlled trials utilising peer support in LMIC were reviewed and assessed for quality. Peer support was shown to significantly decrease the risk of discontinuing exclusive breastfeeding compared to the control groups.

2c) Infants and children

Breastfeeding remains the single most effective intervention to improve infant and young child nutrition. WHO recommends six months of exclusive breastfeeding and up to two years of continued, partial breastfeeding. As discussed above, interventions to promote breastfeeding and increased rates of exclusive breastfeeding through individual or group counselling and education have been shown to be effective and are recommended in all contexts (Sudfeld et al. 2012).

When breast milk is no longer enough to meet the nutritional needs of the infant, complementary foods should be added to the diet of the child. In cases where the nutrient needs of the child are not being met through complementary foods, fortification or supplementation with micronutrients, specifically zinc, vitamin A and iodine has been proven to be effective. The evidence base has tended to be strongest for supplementation with micronutrients, but fortification of staple foods, whether by the manufacturers (such as salt iodization) or at home fortification (often through micronutrient rich powders) is increasingly being shown to be an effective intervention (Bhutta et al. 2008).

Severe acute malnutrition (SAM) which refers to those children with a very low weight for height - below -3 Z-scores of the median WHO growth standards, poses the most immediate threat to child mortality. Treatment of SAM was identified in *The Lancet* 2008 series as a key intervention to be implemented in all high burden countries. The methods for treating acute malnutrition in recent years have evolved and now often a community approach is used, which included the early detection of malnourished children and the use of specifically formulated therapeutic foods (WHO, WFP, UNSCN, UNICEF).

Key messages

- Breastfeeding remains the most effective intervention for infant and young child nutrition.
- Promotion and counselling to improve rates and duration of exclusive breastfeeding is recommended.
- Appropriate complementary feeding, including a sufficient intake of micronutrients is essential.
- Supplementation programmes are effective for improving micronutrient status of children.
- Fortification of foods with micronutrients has also been shown to be effective at improving micronutrient status of children.
- Treatment of SAM through the community based model using specially formulated therapeutic foods has been shown to be effective.

Body of evidence

The evidence for interventions to improve the nutritional status of infants and children is strong for those interventions outlined in this section. This is based on *The Lancet* 2008 review of the evidence base, two systematic reviews and a joint report from the WHO, WFP, UNSCN and UNICEF who review and present the evidence.

Annotated Bibliography

Best C, Neufingerl N, Del Rosso JM, Transler C, van den Briel T, Osendarp S. (2011). Can multi-micronutrient food fortification improve the micronutrient status, growth, health, and cognition of schoolchildren? A systematic review. *Nutrition Reviews* 69 (4)

This review focuses on multiple micronutrient food fortification and examines the impact on school-age children. The authors study the impact on micronutrient status of the children, growth, health and cognitive development. Fortification of food is a practical way to provide extra micronutrients to children. Twelve eligible studies were reviewed, eleven of them tested the effects of multiple micronutrients provided via fortified food compared to unfortified food and one study compared multiple micronutrients to iodine alone. The results of this review show that multiple micronutrient fortification of food can have an impact on various aspects of the health and development of schoolchildren. Considering the vast number of school-age children suffering from multiple micronutrient deficiencies and the consequences, the overall impact of multiple micronutrient interventions in school-age children can be an investment in future generations by helping these children to achieve optimal health and increase their potential to learn.

WHO, WFP, UNSCN and UNICEF (2007). *Community-based management of severe acute malnutrition.*

Severe acute malnutrition (SAM) remains a major killer of children under-5 years of age. Until recently, treatment has been restricted to facility-based approaches, greatly limiting its coverage and impact. However, in recent years, a community-based approach has been developed which allows large numbers of children with

SAM to be treated in their communities without being admitted to a health facility or a therapeutic feeding centre.

The community-based approach involves timely detection of SAM in the community and provision of treatment for those without medical complications with ready-to-use therapeutic foods or other nutrient-dense foods at home. If properly combined with a facility-based approach for those malnourished children with medical complications or below six months and implemented on a large scale, community-based management of SAM can prevent the deaths of hundreds of thousands of children.

Gera T. 'Efficacy and safety of therapeutic nutrition products for home based therapeutic nutrition for severe acute malnutrition a systematic review.' *Indian Pediatrics*. 2010 Aug;47(8):709-18.

The review assesses the efficacy and safety of home-based management of SAM using therapeutic nutrition products or ready-to-use therapeutic foods (RUTF); and compares the efficacy of these products in comparison with F-100 (the standard facility based treatment) and home-based diet. The results indicate that systematic reviews and Randomised Controlled Trials (RCTs) showed RUTF to be at least as efficacious as F-100 in increasing weight and more effective in comparison to home based dietary therapies. Data from observational studies showed the energy intake with RUTF to be comparable to F-100 and two consensus statements supported the use of RUTF for home-based management of uncomplicated SAM. The author concludes that use of therapeutic nutrition products for home-based management of uncomplicated SAM appears to be safe and efficacious. However, most of the evidence on this promising strategy has emerged from observational studies conducted in emergency settings in Africa and so more evidence is needed on other contexts.

3) Indirect interventions – nutrition sensitive development

The 1990 UNICEF framework is particularly helpful in identifying the ways in which the basic and underlying determinants of undernutrition move beyond considerations of food and basic care practices, to wider considerations of household income and resources, the role of gender and other factors in the intra-household allocation of these resources, or wider environmental factors affecting health and sanitation. Tackling some of these underlying causes are thus an important part of the response and address the underlying factors that contribute to malnutrition, including hunger, poverty, gender inequality, and poor access to safe water and health services by integrating nutrition actions into other sectors. These include measures ranging from cash transfers (and other forms of social protection) to augment household resources; agricultural development to improve rural incomes and increase basic household food security; women's empowerment; wider health systems strengthening; and improved water and sanitation supply.

3a) Agriculture

Agricultural interventions have long been thought to have an effect on nutrition. Hoddinott (2011) described six pathways commonly associated with agricultural production impacting on nutrition and health:

- i. **Changes to incomes:** When changes in agricultural production lead to increases in household income, the income can be used to purchase goods that affect health status.

- ii. **Changes in crops, farm practices, and markets:** Changes in agricultural production can result in the introduction of new foods into diets.
- iii. **Changes to crop varieties and production methods:** Changes in the types of crops that are grown or changes in production processes may make agricultural work either more or less physically intensive.
- iv. **Changes to the use of time:** Where changes increase the returns to time spent in agriculture, households may increase the amount of labour they devote to agricultural production (often particularly applicable in terms of womens time allocated to care).
- v. **Changes to savings:** Where changes in agricultural production result in higher incomes, individuals and households may choose to save some of these higher incomes in the form of assets that improve health.
- vi. **Changes in intra-household resource allocation:** Changes in agricultural production may result in changes in the allocation of resources within the household. If this change results in women earning greater income, then this may affect how households spend money, how food is allocated, and the types of assets that are accumulated. Holding all other factors constant, this may improve health and nutrition.

However, from the evidence available, the effectiveness of agricultural interventions on nutrition is not clear. Data indicates the relationship is complex, producing either mixed results or demonstrating no impact (Masset et al. 2012). Despite limited empirical evidence surrounding the impact of agricultural interventions on nutrition, there is agreement between stakeholders on main principles that should be included in any programmes designed to improve them both. With regards to planning, it is recommended that explicit nutrition objectives are included in agricultural projects, programmes, and policies. Opportunities must be maximised by multisectoral coordination. Women play an important role, in terms of maximising impact of household income on nutrition, in their roles as the main producers of domestic food in many countries and also with regards to targeting the most vulnerable groups. Effective and transparent monitoring and evaluation of interventions should take place to measure its impact on beneficiaries and enable learning of experience and sharing of knowledge (Herforth, 2012).

Regarding the implementation of programmes, it is recommended that the production of nutrient-dense foods and market access is increased while post-harvest losses and seasonality of food insecurity should be decreased. Women should be empowered through increasing their agency as food producers and consumers. Nutrition education should be incorporated and natural resources are managed for improved productivity and resilience to shocks. Regarding supporting agriculture/nutrition programmes, policy coherence and good governance must be improved to build capacity while at the same time continuing to advocate for nutrition (Herforth, 2012).

Key messages

- Evidence suggests that agricultural interventions may have a positive effect on the production of the agricultural goods promoted, but not on households' total income.
- Agricultural interventions were successful in promoting the consumption of food rich in protein and micronutrients, but the effect on the overall diet of poor people remains unclear.
- No evidence was found of an effect on the absorption of iron, but some evidence exists of a positive effect on absorption of vitamin A.

- Very little evidence was found of a positive effect on the prevalence of stunting, wasting, and underweight among children aged under-5.
- Despite the lack of evidence demonstrating the impact of agricultural interventions on nutrition, most stakeholders are in agreement on main principles regarding good practice for programmes linking the two.

Body of evidence

The body of evidence for the impact of agriculture on nutrition is moderate, with one systematic review, one synthesis paper combining guiding principles from 10 institutions and one conceptual framework paper. While the pathways linking nutrition and agriculture seem well established, the empirical data illustrating the impact of each is limited.

Annotated bibliography

Hoddinott, J. (2011). *Paper 2 agriculture, health and nutrition: toward conceptualizing the linkages. 2020 Conference: Leveraging Agriculture for Improving Nutrition and Health. February 10-12, New Delhi, India*

This conference brief sketches a framework that clarifies the channels through which agriculture affects health and nutrition and vice versa. Three components make up this framework: settings, resources and production processes. The presence of feedback loops within the framework illustrates the possibility that anything that affects agriculture can affect health and nutrition, and anything that affects health and nutrition can affect agriculture. Because there can be no presumption that these effects will be, on balance, beneficial or harmful, policymakers and programme planners need to be cognisant of the multiple pathways through which agriculture can affect health and nutrition.

Masset, E., Haddad, L., Cornelius, A. & Isaza-Castro, J. (2012). *Effectiveness of agricultural interventions that aim to improve nutritional status of children: systematic review. British Medical Journal; 344*

This systematic review focuses on the impact of agricultural interventions that aim to improve children's nutritional status by improving the incomes and the diet of the rural poor. Covering the period 1990-2010, mixed results were found, with limited demonstrable impact of agricultural interventions on nutritional status. This was attributed to methodological weaknesses of the studies reviewed rather than to specific characteristics of interventions. As many as 7,000 studies were identified in the search, but only 23 qualified for final inclusion based on the exclusion criteria set. Most of the 23 studies selected were evaluating home garden interventions. The studies reviewed did not report participation rates or the characteristics of participants in programmes.

The results report that no data is available on participation rates or characteristics of participants in agricultural interventions. As a result, little is known about the impact of these interventions on specific vulnerable groups; the targeting efficiency of the interventions; and the characteristic of programme participants. Agricultural interventions appear to have a positive impact on the production of the food item promoted by the intervention. However, it is less clear whether these interventions have a positive impact on total household income. The evidence available is very weak. Given the generally low response of food consumption and particularly of calories consumption to income changes, it is unlikely that the interventions considered had an impact on nutritional status via a simple income effect.

There is considerable evidence that the interventions analysed are successful in promoting the consumption of specific food items such as vegetables, fish or milk. However, consumers can, for example, compensate for an increase in the consumption of fish with a reduction in the consumption of other protein rich food such as meat. The overall impact of the interventions on the diet of the poor remains unexplored. The impact of agricultural interventions on micronutrients is unclear. There is no evidence of an impact of the interventions on iron intake. There is some evidence of a positive impact on vitamin A intake, but the number of studies available is too small to generate robust results as the summary results are very sensitive to the inclusion of one or two studies. Evaluations of biofortification interventions are positive, but the number of these evaluations is too small to provide conclusive answers. The studies reviewed report little or no impact of agricultural interventions on the nutritional status of children. This result confirms the results of previous systematic reviews on the same topic. However, unlike previous reviews, the authors attribute this result to the lack of statistical power of the studies reviewed rather than to the lack of efficacy of these interventions. The studies reviewed found a greater impact of the intervention on the prevalence of short term indicators of hunger (wasting and underweight) versus long-term indicators (stunting). However, this result could be a consequence of the short time frame adopted by the evaluations, which is not well suited to detect long term effects.

To conclude, this review found the effectiveness of agricultural interventions in improving the nutritional status of children in developing countries to not be clear from the available evidence.

Herforth, A. (2012). *Guiding principles for linking agriculture and nutrition: synthesis from 10 development institutions*. FAO, Rome, Italy.

This synthesis paper aims to provide a comprehensive list of current guidance, institutional strategies, and other publications released by international development institutions and inter-agency UN bodies on maximising nutrition impact through agriculture. It concludes that there is agreement on main principles regarding the link between agriculture and nutrition. It is noted that some stakeholders have voiced concern over the empirical evidence base underlying actions to increase nutrition impact from agriculture programs, but the fact that the majority of international development institutions independently recommend very similar approaches is itself a strong justification to increase action around these principles.

Twenty main messages come out of the synthesis on maximising nutrition impact through agriculture, which are categorised into the following three categories:

- **Planning**
 - Incorporate explicit nutrition objectives into agricultural projects, programmes and policies.
 - Assess the context to identify and build on existing efforts, knowledge and resources.
 - Do no harm.
 - Measure impact through monitoring and evaluation.
 - Maximise opportunities through multisectoral coordination.
 - Maximise impact of household income on nutrition, through increasing women's access to income-generating opportunities and discretionary control of income, and other mechanisms.
 - Increase equitable access to resources through policies and programmes.
 - Target the most vulnerable groups, including smallholder farmers, women, and poor/food insecure households.

- **'Doing' or main activities**

- Diversify production and livelihoods for the improved food access and dietary diversification, natural resource management, and other purposes.
 - Increase production of nutrient-dense foods.
 - Reduce post-harvest losses and improve processing.
 - Increase market access and opportunities.
 - Reduce seasonality of food insecurity.
 - Empower women.
 - Incorporate nutrition education to improve consumption and nutrition effects of interventions.
 - Manage natural resources for improved productivity, resilience to shocks and adaptation to climate change, and increased equitable access to resources through soil, water and biodiversity conservation.
- **Supporting**
 - Improve policy coherence supportive to nutrition.
 - Improve good governance for nutrition.
 - Build capacity.
 - Communicate and continue to advocate for nutrition.

3b) Social protection

Social protection in this context refers to policy instruments used to address poverty and vulnerability, including social assistance, social insurance and efforts at social inclusion, as well as subsidies. Social protection programmes may aim to improve food security by providing ‘entitlement’ to food by means of labour (public works programmes), trade (food price subsidies, grain reserve management), or transfers (school feeding, supplementary feeding, and cash transfers – both conditional and unconditional).

School feeding programmes are a means to augment consumption by vulnerable populations. A recent review found that despite the popularity of school feeding programmes, they remain difficult to assess in terms of effectiveness since their impact is partially on education and partially on school health. Food for education programmes can provide iron and other key micronutrients, but these programmes are not designed to address the most critical nutritional constraints in low-income settings, simply because they are not targeted at the most vulnerable period in child development, which is between conception and 2 years of age. There is extensive evidence that school feeding programmes can complement a good education programme. However, school feeding programmes should not be seen as substitutes for well-organised education systems with well-performing teachers. There is a continuing struggle to identify what makes for a successful programme. It concludes that while school feeding programmes can influence the education of school children and, to a lesser degree, augment nutrition for families of beneficiaries, they are best viewed as social safety nets helping promote human capital investments (Alderman & Bundy, 2011).

Sanfilippo et al. (2012) reviewed the literature on the impact of social protection on children. Evidence suggests that school feeding, which influences the time spent in school as well as the nutritional status of children, is likely to increase their concentration and cognitive capacities. There is also some evidence that, the nutritional status of non-beneficiary households with primary school-age children attending a Food for Education school was slightly worse. Cash transfer programmes have been shown to have a positive impact as recipient households tend to spend much of the transfer on food. However, the extent of the impact on child nutrition

depends on key design features, including the duration of the transfer, the age of the beneficiary (0-24 months being the most critical), and the size of transfer.

The gender of the recipient has also been shown to be an important factor, with programme designs often favouring women, with the aim of increasing their control over the intra-household allocation of resources, which has been shown to impact on child health and nutrition status. However, the programme design must be handled with care, with some studies reporting an increase in household violence when women are targeted as cash recipients (Richards et al. 2011). It is important to understand that policy instruments are seldom used in isolation and children are seldom exposed to a single social programme, meaning that the effect of single policy interventions may very well be influenced by their combination with other instruments. This point is important when considering the impact of a social protection programme, in the context of nutrition.

There is increasing interest in what can be achieved by giving resources to the poorest and most vulnerable members of society to improve nutrition and achieve other objectives. Cash transfers can be direct and predictable non-contributory cash payments that help poor and vulnerable households to even out food consumption and income over the year. Despite challenges such as the lag time between the intervention and a measureable outcome, there is consistent evidence that households receiving transfers spend more on food, resulting in significant gains in children's weight and height in several countries. Despite a range of methodologies making it hard to generalise about the magnitude of impact, it is clear that cash transfer programmes have a positive impact on nutrition. Cash transfers can also impact supply by generating increased demand and stimulating producers to respond. (Arnold et al. 2011)

A recent review focused on the impact of conditional cash transfer (CCT) programmes on child nutrition outcomes found that all the programmes reviewed had positive impacts on most of the key underlying and immediate determinants of child nutrition assessed – poverty; food security and diet quality; women's knowledge, awareness, and control over resources; use of health and education services; and diet and health – all of which are along the impact pathways by which CCTs are hypothesised to improve nutrition. The data showed that these effects had a greater impact on stunting than wasting, and that the largest benefit is seen when the programmes are targeted at younger children, highlighting the critical first 1,000 days. None of the evaluations, however, specifically modelled these pathways to assess their relative importance in improving child nutrition outcomes. A gap in knowledge about the mechanisms by which CCT programmes improve nutrition was identified, and stakeholders were recommended to ensure that programmes have a better defined set of nutrition actions grounded in programme theory (Leroy et al. 2009).

A literature review that examined 10 papers on CCTs concluded that overall the evidence suggests that CCTs show a positive impact on the use of health services, nutritional status and health outcomes. How effective the programmes would be if replicated in different settings remains unclear (Largarde et al. 2009). In addition to CCTs, unconditional cash transfers may have a nutritional impact. Unconditional programmes assume that easing financial constraints will result in increased utilisation of health services, education and food consumption (Bailey and Hedlund 2012).

Key messages

- School feeding programmes are popular, but the evidence of their effectiveness is weak and there is no agreement on best practice for implementation.

- CCT programmes provide a potentially powerful delivery mechanism for improving child nutrition, but require clearer nutrition objectives and actions, as well as monitoring and evaluation if they are to meet their potential.
- CCTs are found to have positive impact on nutrition but it is unclear how dependent their success is on the context in which they are implemented and how effective they would be if they were replicated in a different setting.
- Some forms of social insurance, including allowances for families with children, are especially relevant in improving health and nutritional status during early childhood, providing a high return on investment in human capital.

Body of evidence

The body of evidence comprises four systematic reviews and three literature reviews. There is a large body of high quality evidence on the various aspects of social protection, but limited evidence on the general concept. The evidence suggests the various aspects of social protection have a positive impact on nutritional outcomes, but the impact of each aspect is not clear.

Annotated bibliography

Alderman, H. & Bundy, D. (2011). *School feeding programs and development: are we framing the question correctly?* The World Bank Research Observer

This paper analyses the recent evidence from in-depth studies on school feeding programmes. It finds that while school feeding programmes can influence the education of school children and, to a lesser degree, augment nutrition for families of beneficiaries, they are best viewed as transfer programmes that can provide a social safety net and help promote human capital investments.

Arnold, C., Conway, T. & Greenslade, M. (2011). *DFID cash transfers literature review*. Policy Division, DFID, London, UK

This evidence paper analyses the existing literature focused on the impact of cash transfers on various development outcomes, including nutrition. While various methodologies are employed in the literature reviewed, the evidence suggests that recipients of cash transfers spend more on food, resulting in significant gains in children's weight and height.

Bailey, S. & Hedlund, K. (2012). *The impact of cash transfers on nutrition in emergency and transitional contexts: a review of evidence*. Overseas Development Institute, London

This study looks at how cash interventions affect the immediate and underlying causes of malnutrition. It is based on a review of 54 evaluations and documents from humanitarian programmes since 2004. It states that theoretically there are a variety of ways that cash transfers could help protect and improve nutritional status, address immediate and underlying causes of malnutrition, including people having the ability to buy more and better-quality food, have more time to care for children in the household, take children to health clinics and use cash in other ways to improve nutrition. There are very positive indications that transfers improve dietary intake, but too little evidence to determine how cash improves care practices and health environment. Even if

the evidence of cash interventions on nutritional outcomes is lacking, there is an overwhelming body of evidence that cash transfers, where appropriate, are very effective in meeting food and other needs.

Sanfilippo, M., de Neubourg, C. & Martorano, B. (2012). *The impact of social protection on children: a review of the literature*. UNICEF, Italy.

This literature review is based on an extensive analysis of the existing evidence on the impact of social protection programmes in the developing world. It assesses how the benefits of social protection could be maximised with specific regard to the different dimensions of children's well-being. It was found that social protection can play a vital role in ensuring adequate nutrition and access to and utilisation of social services. Existing evidence shows that social protection programmes successfully address several dimensions of child well-being – often in an indirect way. However, a move towards a more “child sensitive” approach to social protection has recently been advocated at the highest level in the international development community.

Leroy, J., Ruelb, M. &Verhofstadt, E. (2009). *The impact of conditional cash transfer programmes on child nutrition: a review of evidence using a programme theory framework*. *Journal of Development Effectiveness*, 1: 2, 103 – 129

This paper reviews the evidence regarding the impact of conditional cash transfer (CCT) programmes on child nutrition outcomes. It was found that CCT programmes significantly improve child anthropometry but have very little impact on micronutrient status. The programmes also have a positive impact on several of the outcomes in the pathways to improved nutrition. Gaps in knowledge about the mechanisms by which CCT programmes improve nutrition were found. Programmes need to have a better defined set of nutrition actions grounded in programme theory in order to reach their potential.

The evidence suggests that CCT programmes provide a potentially powerful delivery mechanism for improving child nutrition. However if CCT programmes are ever to reach their full potential, they will need to have clearer nutrition objectives, a better defined set of nutrition actions, an implementation and integration plan grounded in a strong programme theory framework, and an effective monitoring and evaluation system.

Richards, E. et al. (2011). *Gender influences in child survival, health and nutrition: a narrative review*. UNICEF

There is increasing recognition in the field of international health and nutrition that gender inequities and dynamics are a major social determinant of health and nutrition outcomes. However, reviews of evidence to date have tended to concentrate on comparisons of health and nutrition outcomes, healthcare utilisation or coverage of services/programmes between boys and girls or women and men. This review of the literature and accompanying guidance document respond to a range of questions exploring more broadly the ways in which gender influences household dynamics in relation to aspects of young child health and nutrition.

The review covers micro-credit and cash transfer schemes, their design features in relation to gender and the outcomes, both positive and negative. The literature review and guidance document highlight the importance of considering three areas in health and nutrition work; women's status and bargaining power; gender divisions of labour; and gender norms, values and identities

Lagarde, M., Haines, A. & Palmer, N. (2009). *The impact of conditional cash transfers on health outcomes and use of health services in low and middle income countries (Review)*. The Cochrane Library, Issue 4

This review paper assesses the effectiveness of CCT in improving access to care and health outcomes, in particular for poorer populations in low and middle income countries. The evidence strongly suggests that CCTs could be an effective approach to improving access to preventive services. Their effectiveness in various settings and the ability to replicate them in different contexts and settings is unclear.

3c) Child nutrition

Over the past two decades, many governments and organisations have renewed efforts to develop more effective school-based health and nutrition programmes in low-income countries. There is a growing body of evidence linking children's health and education; and the impact of school health and nutrition. Poverty and associated health, nutrition, and social factors prevent at least 200 million children in developing countries from attaining their developmental potential. The prevalence of the risk factors and their effect on development and human potential are substantial. Furthermore, risks often occur together or cumulatively, with concomitant increased adverse effects on the development of the world's poorest children. The following are key risk factors where the need for intervention is urgent:

Stunting – Research has shown that poor foetal growth or stunting in the first two years of life leads to irreversible damage, including shorter adult height, lower attained schooling, reduced adult income, and decreased offspring birth weight. Also, children who are undernourished in the first two years of life and who put on weight rapidly later in childhood and in adolescence are at high risk of chronic diseases related to nutrition. However, there is no evidence that rapid weight or length gain in the first two years of life increases the risk of chronic disease, even in children with poor foetal growth. It is believed that the prevention of maternal and child undernutrition is a long-term investment that will benefit the present generation and their children (Victoria et al. 2008).

Iodine supplementation – Iodine deficiency is believed to be the main cause of potentially preventable mental retardation in childhood, as well as causing goitre and hypothyroidism in people of all ages. A review into the effects of iodine supplementation used for the prevention of iodine deficiency disorders in children found that despite some methodological weakness of the primary studies, available evidence suggests that iodine supplementation (especially iodised oil) is an effective means of decreasing goitre rates and improving iodine status in children. Indications of positive effects on physical and mental development and mortality were seen, although results were not always significant. Adverse effects were generally minor and transient. Insufficient evidence was available on non-oil supplements (Angermayr & Clar, 2004).

Iron supplementation – Approximately 600 million preschool and school-age children are anaemic worldwide with half of these cases being caused by a lack of iron. Iron deficiency anaemia during childhood may slow down growth, reduce motor and brain development, and increase risk of illness and death. If anaemia is not treated promptly, these problems may persist later in life. Taking supplements containing iron (sometimes combined with folic acid and other vitamins and minerals) on a daily basis has shown to improve children's health but its use has been limited because supplements may produce side effects such as nausea, constipation or staining of the teeth. It has been suggested that giving iron one, two or three times a week (known as 'intermittent' supplementation) may reduce these side effects and be easier to remember, and thus encourage children to continue taking the iron supplements.

A recent review (De-Regil et al. 2011), critically assessed and synthesised the evidence from 33 trials of mixed quality involving 13,314 children (49 per cent of whom were females) from 20 countries in Latin America, Africa and Asia. The aim was to assess the effects of intermittent iron supplementation, alone or in combination with

other vitamins and minerals, on nutritional and developmental outcomes in children from birth to 12 years of age compared with a placebo, no intervention or daily supplementation. Despite the studies being of mixed quality, the results indicate that giving children supplements with iron alone or in combination with other vitamins and minerals one, two or three times a week approximately halves their risk of having anaemia in comparison with receiving no iron supplements or a placebo. Giving children supplements on an intermittent basis was as effective as daily supplementation for improving haemoglobin and ferritin concentrations, although, children receiving iron supplements intermittently were at higher risk of having anaemia. The effect of intermittent supplementation on illness, death, and school and physical performance, were not clear, with insufficient information provided by the studies to make conclusions. In summary, intermittent iron supplementation is efficacious to improve haemoglobin concentrations and reduce the risk of having anaemia or iron deficiency in children younger than 12 years of age when compared with a placebo or no intervention, but it is less effective than daily supplementation to prevent or control anaemia. Intermittent supplementation may be a viable public health intervention in settings where daily supplementation has failed or has not been implemented. Information on mortality, morbidity, developmental outcomes and side effects, however, is still lacking (De-Regil et al. 2011).

Deworming – Screening children for intestinal helminths and then treating infected children appears promising, but the evidence base is small. Routine deworming drugs given to school children has been more extensively investigated, and has not shown benefit on weight in most studies, except for substantial weight changes in three trials conducted 15 years ago or more. Two of these trials were carried out in the same high prevalence setting. For haemoglobin levels and cognition, community deworming seems to have little or no effect, and the evidence in relation to school attendance, and school performance is generally poor, with no obvious or consistent effect (Taylor-Robinson et al. 2012).

School feeding – In addition to the previous social protection and cash transfers sections, this section focuses on evidence from a systematic review that suggests that early malnutrition and/or micronutrient deficiencies affect physical, mental, and social aspects of child health. School feeding programmes are designed to improve attendance, achievement, growth, and other health outcomes. Results indicate that school feeding in low-income countries resulted in a weight gain of 0.39 kg over an average of 19 months and 0.71 kg over 11.3 months respectively. For height, school feeding resulted in the greatest height gain for younger children. School feeding was found to increase average attendance between 4 to 6 days per year. Maths gains were consistently higher for children who were fed and in short-term studies, small improvements in some cognitive tasks were found. It can be concluded that school meals may have some small benefits for disadvantaged children, but further research is needed (Kristjansson et al. 2007).

Key messages

- Community deworming seems to have little or no effect on haemoglobin and cognition, and the evidence in relation to school attendance and school performance is generally poor, with no obvious or consistent effect.
- Children who are fed at school attend school more frequently than those who are not fed.
- School feeding increases weight and has the greatest impact on growth on young children.
- School meals may have small physical and psychosocial benefits for disadvantaged pupils.

- Children who were fed at school gained more on maths achievement and on some short-term cognitive tasks than children who were not fed.
- Intermittent iron supplementation is efficacious to improve haemoglobin concentrations and reduce the risk of having anaemia or iron deficiency in children younger than 12 years of age when compared with a placebo or no intervention, but it is less effective than daily supplementation to prevent or control anaemia.
- Intermittent Iron supplementation may be a viable public health intervention in settings where daily supplementation has failed or has not been implemented.
- Iodine supplementation is an effective means of decreasing goitre rates and improving iodine status in children.
- Stunting in the first two years of life leads to irreversible damage, including shorter adult height, lower attained schooling, reduced adult income, and decreased offspring birth weight.
- Children who are undernourished in the first two years of life and who put on weight rapidly later in childhood and in adolescence are at high risk of chronic nutrition related diseases.
- There is no evidence that rapid weight or length gain in the first two years of life increases the risk of chronic disease, even in children with poor fetal growth.
- Preventing undernutrition is a long-term investment with intergenerational benefits.

Body of evidence

This body of evidence consists of four systematic reviews and one review that analyses data from five long-standing prospective cohort studies. The papers included address various aspects of child nutrition. The evidence suggests that school feeding has a positive impact on nutrition, but the level of impact is not clear. Preventing undernutrition in children is a long-term investment, with benefits that may be experienced in generations to come. Community deworming was found to have little or no effect on haemoglobin and cognition. The evidence linking deworming to school attendance and performance is generally poor, indicating no consistent effect.

Annotated bibliography

Angermayr, L. & Clar, C. (2004). *Iodine supplementation for preventing iodine deficiency disorders in children*. Cochrane Database of Systematic Reviews, Issue 2. (Updated in 2009 – no changes to conclusions).

Iodine deficiency has been found to result in mental retardation in children as well as an enlarged thyroid gland (goitre) and sometimes deficiencies in thyroid hormones in people of all ages. This review focuses on 26 studies with a comparison group of iodine supplementation in children. The quality of the studies was found to be generally poor. One study suggested a reduction in infant mortality. In some studies there was a trend towards better developmental outcomes after iodine prophylaxis. There was some concern in studies using iodised salt that small children may not eat enough salt to achieve adequate iodine status. Adverse effects were reported,

although most of them were minor and did not last long. It was concluded that more high quality long term studies measuring outcomes related to child development, to deaths associated with iodine-deficiency, and to intervention programmes relevant to children in developed countries, are needed.

De-Regil, L.M., Jefferds, M. E. D., Sylvetsky, A. C. & Dowswell, T. (2011). *Intermittent iron supplementation for improving nutrition and development in children under 12 years of age*. Cochrane Database of Systematic Reviews, Issue 1

This review assessed the effects of intermittent iron supplementation, alone or in combination with other vitamins and minerals, on nutritional and developmental outcomes in children from birth to 12 years of age compared with a placebo, no intervention or daily supplementation. It found that intermittent iron supplementation is efficacious to improve haemoglobin concentrations and reduce the risk of having anaemia or iron deficiency in children younger than 12 years of age when compared with a placebo or no intervention, but it is less effective than daily supplementation to prevent or control anaemia. Intermittent supplementation may be a viable public health intervention in settings where daily supplementation has failed or has not been implemented. Information on mortality, morbidity, developmental outcomes and side effects, however, is still lacking.

Kristjansson, B., Petticrew, M., MacDonald, B., Krasevec, J., Janzen, L., Greenhalgh, T., Wells, G. A., MacGowan, J., Farmer, A.P., Shea, B., Mayhew, A., Tugwell, P. & Welch, V. (2007). *School feeding for improving the physical and psychosocial health of disadvantaged students*. Cochrane Database of Systematic Reviews, Issue 1

The objective of this systematic review was to determine the effectiveness of school feeding programmes in improving physical and psychosocial health for disadvantaged school pupils. Early malnutrition and/or micronutrient deficiencies can negatively affect many aspects of child health and development. School feeding programmes are designed to provide food to hungry children and to improve their physical, mental and psychosocial health. This review included eighteen studies; nine were performed in higher income countries and nine in lower income countries. In the highest quality studies (randomised controlled trials (RCTs) from low income countries, children who were fed at school gained an average of 0.39 kg more than controls over 19 months; in lower quality studies (controlled before and after trials – CBAs), the difference in gain was 0.71 kg over 11.3 months. Children who were fed at school attended school more frequently than those in control groups; this finding translated to an average increase of four to six days a year per child. For educational and cognitive outcomes, children who were fed at school gained more than controls on maths achievement, and on some short-term cognitive tasks. Results from higher-income countries were mixed, but generally positive. For height, results from lower income countries were mixed; in RCTs, differences in gains were important only for younger children, but results from the CBAs were large and significant overall. Results for height from high-income countries were mixed, but generally positive. School meals may have small physical and psychosocial benefits for disadvantaged pupils.

Taylor-Robinson, D.C., Maayan, N., Soares-Weiser, K., Donegan, S. & Garner, P. (2012). *Deworming drugs for soil-transmitted intestinal worms in children: effects on nutritional indicators, haemoglobin and school performance (review)*. Cochrane review, Issue 7

This review summarises the effects of giving deworming drugs to children to treat soil-transmitted intestinal worms (nematode geohelminths) on weight, haemoglobin and cognition; and the evidence of impact on physical well being, school attendance, school performance, and mortality. It was found that the main soil-transmitted

worms are roundworms, hookworms and whipworms. Infections are common in tropical and subtropical areas, particularly in children from low-income areas where there is inadequate sanitation, overcrowding, low levels of education, and lack of access to health care. These infections may cause malnutrition, poor growth and anaemia in children, and some experts believe they cause poor performance at school. Improvements in water and sanitation have been shown to be vital, but drugs for deworming might play a role too. In one approach, individuals found to be infected on screening were treated. Evidence from these trials suggests this probably improves weight and may improve haemoglobin values, but the evidence base is small. In another approach, currently recommended by the WHO, and much more extensively investigated, all school children are treated. In trials that follow up children after a single dose of deworming, and after multiple doses with follow up for over a year, we do not know if these programmes have an effect on weight, height, school attendance, or school performance; they may have little or no effect on haemoglobin or cognition.

Victoria, C., Adair, L., Fall, C., Hallal, P., Martorell, R., Richter, L. & Singh Sachdev, H. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet*, 371

This paper reviews the associations between maternal and child undernutrition with human capital and risk of adult diseases in low- and middle-income countries. It was found that indices of maternal and child undernutrition (maternal height, birth weight, intrauterine growth restriction and weight, height and body-mass index at 2 years according to the new WHO growth standards) were related to adult outcomes (height, schooling, income or assets, offspring birth weight, body-mass index, glucose concentrations, blood pressure). Height-for-age at 2 years was the best predictor of human capital and that undernutrition is associated with lower human capital. Damage suffered in early life leads to permanent impairment, and might also affect future generations. Its prevention will probably bring about important health, educational, and economic benefits. Chronic diseases are especially common in undernourished children who experience rapid weight gain after infancy.

3d) Water, sanitation and hygiene (WASH)

A growing body of evidence has demonstrated the critical importance of water, sanitation and hygiene (WASH) for children for many reasons, including improved nutrition. Along with several other factors, poor hygiene and sanitation cause high levels of maternal and child undernutrition in developing countries (Ahmed et al. 2012). The total number of deaths caused directly and indirectly by malnutrition induced by unsafe water, inadequate sanitation and insufficient hygiene is estimated at 860,000 deaths per year in children under-5 years of age (Prüss-Üstün et al. 2008).

Diarrhoea is a major cause of death and disease, especially among young children in low-income countries. Many of the microbial agents associated with diarrhoea are transmitted via the faecal-oral route and are associated with exposure to human faeces. A review by Clasen et al. (2010) found that interventions to improve excreta disposal are effective in preventing diarrhoeal disease, but that the quality of the evidence is generally poor and does not allow for quantification of any such effect. The authors acknowledge that the review does not address the potential contribution of improved excreta disposal to preventing important health threats associated with inadequate sanitation, including malnutrition.

Key messages

- 860,000 deaths per year in children under-5 years of age are caused directly and indirectly by malnutrition induced by unsafe water, inadequate sanitation and insufficient hygiene.

- Interventions to improve excreta disposal are effective in preventing diarrhoeal disease, and are likely to have a positive impact on nutritional status, but the potential effectiveness of excreta disposal on diarrhoea is not currently known.
- One tenth of the global disease burden is preventable by achievable improvements in the way we manage water, meaning improvements are crucial to improve nutritional status.

Body of evidence

The body of evidence includes two systematic reviews and one unclassified paper. While it is suggested there is a likely link between improved hygiene and nutritional status, the evidence linking the two is weak.

Annotated bibliography

Ahmed, T., Hossain, M. & Istiaque Sanin, K. (2012). Global burden of maternal and child undernutrition and micronutrient deficiencies. *Annals of Nutrition and Metabolism* 61(1) 8–17

Poverty, food insecurity, ignorance, lack of appropriate infant and young child feeding practices, heavy burden of infectious illnesses, and poor hygiene and sanitation are factors responsible for the high levels of maternal and child undernutrition in developing countries. These factors can be controlled or removed by scaling up direct nutrition interventions and eliminating the root conditions including female illiteracy, lack of livelihoods, lack of women's empowerment, and poor hygiene and sanitation.

Clasen, T.F., Bostoen, K., Schmidt, W.P., Boisson, S., Fung, I.C.H., Jenkins, M.W., Scott, B., Sugden, S. & Cairncross, S. (2010) *Interventions to improve disposal of human excreta for preventing diarrhoea*. *Cochrane Database of Systematic Reviews*, Issue 6

In low-income countries, diarrhoea among young children is a major cause of death and disease, and is often the result of exposure to human faeces. This review found that in low-income settings, among the estimated 2.6 billion people who lack basic sanitation. The evidence suggests that excreta disposal interventions are effective in preventing diarrhoeal diseases. However, major differences among the studies, including the conditions in which they were conducted and the types of interventions deployed, as well as methodological deficiencies in the studies themselves, makes it impossible to estimate with precision the protective effectiveness of sanitation against diarrhoea.

Prüss-Üstün, A., Bos, R., Gore, F. & Bartram, J. (2008). *Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health*. World Health Organization, Geneva, Switzerland

This document summarises the evidence and information related to water and health, encompassing drinking-water supply, sanitation, hygiene, and the development and management of water resources. It collects the ingredients that support policy decisions, namely the disease burden at stake, the effectiveness of interventions, their costs and impacts, and implications for financing. It finds that one tenth of the global disease burden is preventable by achievable improvements in the way we manage water. Cost-effective, resilient and sustainable solutions have proven to alleviate that burden. Water-related improvements are crucial to improve health and nutritional status in a sustainable way.

4) Implementation, international architecture and the enabling environment

This section gives an outline to the coordination structures that exist to address undernutrition. In addition, it considers how both governance and funding impacts on the challenge of addressing undernutrition.

4a) Coordination structures

The global architecture of organisations and institutions focusing on tackling nutrition, and more specifically undernutrition, has changed over the years. So have the targets and frameworks that define their work. In May 2012, Ministers of Health attending the World Health Assembly (WHA) agreed a range of maternal, infant and young child-focused undernutrition targets to be achieved by 2025, including a target to reduce stunting by 40 per cent (WHO, 2012).

Scaling Up Nutrition (SUN) is a movement founded on the principle that all people have a right to food and good nutrition. It involves the commitment of governments, civil society, the United Nations (UN), donors, businesses and researchers to improve nutrition in a collective effort. As of March 2013, the governments of 34 countries have committed to SUN (SUN, 2013).

The SUN framework supports the specific nutrition interventions of support for exclusive breastfeeding up to 6 months of age and continued breastfeeding, together with appropriate and nutritious food, up to 2 years of age; the fortification of foods; micronutrient supplementation; and the treatment of severe acute malnutrition (SAM). It also supports the nutrition-sensitive approaches including agriculture, clean water and sanitation, education and employment, health care, support for resilience and women's empowerment (SUN, 2013).

In response to a global food crisis, world leaders convened in Rome in 2009, at the UN Food and Agriculture Organization (FAO) Headquarters for the World Summit on Food Security. They unanimously adopted a declaration pledging renewed commitment to eradicate hunger from the face of the earth sustainably and at the earliest date. It was agreed to work to reverse the decline in domestic and international funding for agriculture and promote new investment in the sector, to improve governance of global food issues in partnership with relevant stakeholders from the public and private sector, and to proactively face the challenges of climate change to food security (FAO, 2013).

In 2012, leaders of the world's wealthiest eight countries (the G8) and African leaders committed to the New Alliance for Food Security and Nutrition, a shared commitment to achieving global food security. The goals are to increase responsible domestic and foreign private investments in African agriculture, take innovations that can enhance agricultural productivity to scale, and reduce the risk borne by vulnerable economies and communities. The significance of the critical role played by smallholder farmers, especially women, in transforming agriculture and building thriving economies is recognised.

The New Alliance for Food Security and Nutrition is a shared commitment to achieve sustained and inclusive agricultural growth and raise 50 million people out of poverty over the next 10 years by aligning:

- the commitments of Africa's leadership to drive effective country plans and policies for food security;
- the commitments of private sector partners to increase investments where the conditions are right;

- the commitments of the G-8 to expand Africa’s potential for rapid and sustainable agricultural growth (Feed the future, 2012).

There are also several broad approaches and partnerships focused on improving nutrition, including the Renewed Efforts Against Child Hunger and undernutrition (REACH) initiative and 1,000 Days. REACH was established in 2008 as an approach that UN agencies adopt to better provide joint and coherent support to governments of countries with a high burden of child and maternal undernutrition. It aims to help them to accelerate the scaling up of food and nutrition actions. As of April 2013 it operates in 12 countries. The UN agencies involved in the consortium are the FAO, the UN Children’s Fund (UNICEF), the World Food Programme (WFP), and the World Health Organization (WHO). The International Fund for Agricultural Development (IFAD) joined REACH later on with an advisory role (REACH, 2013).

The 1,000 Days partnership brings together a wide range of partners including NGOs, donors, and the private sector. It aims to create lasting improvements in maternal and child nutrition. It transcends a variety of sectors including health, agriculture and food security, water, sanitation and hygiene, economic development and gender equality. It is based on the principle that the 1,000 days between a woman’s pregnancy and her child’s second birthday offer a unique window of opportunity to shape healthier and more prosperous futures. The right nutrition during this 1,000 day window can have a profound impact on a child’s ability to grow, learn, and rise out of poverty. It can also shape a society’s long-term health, stability and prosperity (Thousand Days, 2013).

Relevant websites

Feed the future, 2012, G8 and Africa Leaders Announce Expansion and Progress of the New Alliance for Food Security and Nutrition. Accessed 12.04.2013

<http://feedthefuture.gov/article/g8-and-africa-leaders-announce-expansion-and-progress-new-alliance-food-security-and>

Webpage detailing how the New Alliance, a commitment by G8 nations, African countries, and private sector partners to support agricultural development, aims to help lift 50 million people in sub-Saharan Africa out of poverty in the next 10 years.

Food and Agriculture Organization (FAO) of the United Nations, 2013, World Summit on Food Security. Accessed 11.04.2013

http://www.fao.org/wsfs/world-summit/en/?no_cache=1

This webpage details the 2009 the World Summit on Food Security that was held in Rome.

REACH, based at World Food Programme in Rome, Italy. Accessed 11.04.2013

<http://www.reachpartnership.org/en/about-reach>

This webpage details REACH, the approach that UN agencies adopt to better provide joint and coherent support to governments of countries with a high burden of child and maternal undernutrition.

Scaling Up Nutrition (SUN), 2013. Accessed 11.04.2013

<http://scalingupnutrition.org/about>

This webpage details Scaling Up Nutrition (SUN), a movement founded on the principle that all people have a right to food and good nutrition.

Thousand Days, 2013. Accessed 12.04.2013

<http://www.thousanddays.org/about/>

This webpage details the 1,000 Days partnership, which promotes targeted action and investment to improve nutrition for mothers and children in the 1,000 days between a woman's pregnancy and her child's second birthday when better nutrition can have a life-changing impact on a child's future and help break the cycle of poverty.

World Health Organization, 2012. *Global targets 2025: To improve maternal, infant and young child nutrition.* WHO, Geneva, Switzerland

http://www.who.int/nutrition/topics/nutrition_globaltargets2025/en/index.html

This webpage details the WHO's Member States endorsement of global targets for improving maternal, infant and young child nutrition and are committed to monitoring progress. The targets include a target to reduce stunting by 40 per cent. The targets are regarded as vital for identifying priority areas for action and catalysing global change.

4b) Governance

It is doubtful that the world will be able to feed its growing population in a nutritious way without a substantial scale up of political commitment (Haddad, 2013). In recent years, the context or the wider 'enabling environment' for undernutrition reduction at national level has drawn increasing interest. This is believed in part to be down to the recognition that systemic capacity constraints at the governance level need to be addressed if the burden of undernutrition is to be permanently and sustainably reduced.

The Hunger and Nutrition Commitment Index (HANCI) is one result of the recent drive towards researching the enabling environment. It was launched in 2013. It ranks governments on their political commitment to tackling hunger and undernutrition and measures what is being achieved and which policies are failing in an effort to provide greater transparency and public accountability. It praises governments where due, and highlight areas for improvement. The HANCI findings support civil society to reinforce and stimulate additional commitment towards accelerating the reduction of hunger and undernutrition. It also assesses whether improving commitment levels lead to a reduction in hunger and undernutrition. An important finding was that economic growth has not necessarily led to a commitment from governments to tackle hunger and undernutrition and conversely low wealth or slow economic growth in a country does not necessarily imply low levels of political commitment. Significantly, within areas of high and growing hunger and undernutrition prevalence, some countries are clearly showing much greater political commitment to address these problems than others. There is also variation between relative commitment to hunger reduction and the relative commitment to nutrition (te Lintelo et al. 2013).

The research base on how to improve the enabling environment for nutrition is small. A review of four recent principal research streams finds that all note the importance of visibility, commitment and accountability but do not provide much guidance how they should be attained, suggesting further research is needed (Haddad, 2013).

Previous work on the enabling environment found that capability, accountability and responsiveness are three key aspects of effective nutrition governance. Capability in this context refers to coordination between government ministries to improve diet, sanitation, health and education. Undernutrition is often invisible until it becomes highly acute. As such, citizens may need to generate public awareness and demand officials take accountability and deliver appropriate action. The window of opportunity for preventing irreversible damage from undernutrition is only 1,000 days, so a rapid government response is needed to address the needs of the most vulnerable in society (Haddad et al. 2012).

Pelletier et al. (2012) found that while high-level political attention to nutrition can be generated in a number of ways, the generation of political commitment and system commitment requires sustained efforts from policy entrepreneurs and champions. Also, mid-level actors from ministries and external partners had great difficulty translating political windows of opportunity for nutrition into concrete operational plans, due to capacity constraints, differing professional views of undernutrition and disagreements over interventions, ownership, roles and responsibilities. The pace and quality of implementation was severely constrained in most cases by weaknesses in human and organisational capacities from national to frontline levels. Heavy investment to identify efficacious nutrition interventions is unlikely to reduce the burden of undernutrition unless or until these systemic capacity constraints are addressed, with an emphasis initially on strategic and management capacities.

Key messages

- To reduce undernutrition, governments need strong executive leadership to promote effective intersectoral cooperation.
- The right structures need to be in place to support coordination among different levels of government.
- Predictable funding sources need to be secured to sustain nutrition interventions.
- Investment is needed in monitoring and advocacy.
- High priority should be given to strengthening strategic capacities leading to advanced commitment-building, agenda setting, policy formulation, capacity-building for operations.
- Economic growth does not automatically result in commitment from governments to tackle hunger and undernutrition and conversely low wealth or slow economic growth in a country does not necessarily imply low levels of political commitment.
- There is variance between the political commitment of different countries to address hunger and malnutrition. There is also variation between commitment to hunger reduction and the commitment to reducing undernutrition.

Body of evidence

The body of evidence for this section comes from a range of study types with varying methodologies. The consensus is that strong governance is needed to reduce undernutrition, with predictable and stable funding sources being available to facilitate this. One study provides evidence that suggests economic growth does not automatically result in commitment from governments to tackle hunger and undernutrition. Further research is needed on the relationship between governance and nutrition.

Annotated bibliography

Haddad, L., Acosta, A.M. & Fanzo, J. (2012). *Accelerating reductions in undernutrition: what can nutrition governance tell us?* In Focus Policy Briefing – Issue 22, IDS, Brighton, UK

This briefing informs government leaders, policymakers and key stakeholders of the Scaling Up Nutrition movement, how they can better mobilise political commitment for undernutrition reduction and how they can facilitate cooperation across national and local institutions, and among nutritionists, civil society and the private sector. It is based on evidence from six countries (Bangladesh, Brazil, Ethiopia, India, Peru and Zambia). The following key recommendations are issued for ensuring successful governance and undernutrition reduction:

- Governments need strong executive leadership to promote effective intersectoral cooperation.
- Ensure the right structures are in place to support coordination among different levels of government.
- Provide predictable funding sources to sustain nutrition interventions.
- Investment in monitoring and advocacy.

Haddad, L. (2013). *How can we build an enabling political environment to fight undernutrition?* *European Journal of Development Research* 25, 13–20

This article outlines why political commitment is especially vital for undernutrition reduction compared with other development outcomes. It suggests some of the reasons for this lack of commitment and puts forward a number of approaches to be tested on how such commitment can be fostered as part of an overall enabling environment for undernutrition reduction. It provides a brief review of four relevant research streams. It concludes that while the evidence base is small, the consensus is that the importance of visibility, commitment and accountability are recognised, but guidance is lacking to indicate how to attain these desired features of the enabling environment.

te Lintelo, D., Haddad, L., Laksham, R. & Gatellier, K. (2013). *The Hunger And Nutrition Commitment Index (HANCI 2012). Measuring the political commitment to reduce hunger and undernutrition in developing countries.* Institute of Development Studies, UK

The Hunger and Nutrition Commitment Index (HANCI) ranks governments on their political commitment to tackling hunger and undernutrition. The index was created to provide greater transparency and public accountability by measuring what governments achieve, and where they fail, in addressing hunger and undernutrition. Guatemala (which was ranked first by the index) displayed substantial political commitment to reducing hunger and undernutrition, expressed through a range of efforts including:

- ensuring high level of access to drinking water
- ensuring good levels of access to improved sanitation
- promoting complementary feeding practices, and ensuring over nine out of ten pregnant women are visited by a skilled health personnel at least once before delivery

- investing substantially in health and having a separate nutrition budget line to make its spending accountable to all
- putting in place a Zero Hunger Plan that aims to reduce chronic malnutrition in children less than 5 years of age by per cent in 2016
- ensuring that public policy is informed by robust and up-to-date evidence on nutrition statuses
- establishing a multi-sectoral and multi-stakeholder coordination mechanism that is regionally recognised as an example of good practice.

Pelletier, D.L., Frongillo, E.A., Gervais, S., Hoey, L., Menon, P., Ngo, T., Stoltzfus, R.J., Ahmed, A.M. & Ahmed, T. (2012). Nutrition agenda setting, policy formulation and implementation: lessons from the Mainstreaming Nutrition Initiative. *Health Policy Plan* 27 (1): 19-31

This paper reports on the findings from studies in Bangladesh, Bolivia, Guatemala, Peru and Vietnam which sought to identify the challenges in the policy process and ways to overcome them, notably with respect to commitment, agenda setting, policy formulation and implementation. The key findings were as follows:

- Strengthening the full spectrum of policy activities is necessary if large-scale and sustained reductions in undernutrition are to be achieved.
- Within this policy spectrum, high priority should be given to strengthening strategic capacities because these are fundamental for advancing commitment-building, agenda setting, policy formulation, capacity-building for operations, and all other aspects of a long-term nutrition agenda at country level.
- These conclusions are especially relevant for major global initiatives currently under development that seek to address nutrition through country-led processes and convergence among multiple organisations.
- The extensive investments in documenting the efficacy of nutrition interventions are unlikely to produce sustainable reductions in undernutrition unless or until these weaknesses in the policy spectrum are better understood and addressed.

4c) Funding

Evidence suggests nutrition interventions have the potential to have a significant impact on health and education, preserving human capital. Yet the investment by national governments, non-government organisations and international donors is not currently enough to end undernutrition. Between 2005 and 2009, 10 of the world's leading bilateral and multilateral donors contributed an average of US\$73 million per year to direct nutrition interventions which address the immediate determinants of undernutrition. This represents just a fraction of the estimated need and is dwarfed by investment in indirect nutrition interventions (US\$365 million), which address the underlying causes of undernutrition. Investments in aid to tackle the escalating challenge of undernutrition remain inadequate (Mutuma et al. 2012).

With a growing global population, the problem is likely to get worse without increased investment. In the current climate, there is increased competition for funding but also increased expectation to invest in the most cost effective interventions. As much as US\$10.3 billion of funding is believed to be needed to scale up 13 direct nutrition interventions that have demonstrated effectiveness (Horton et al. 2010). However, some interventions

were found to be more cost effective than others. Interventions such as micronutrient supplementation and fortification were found to have the lowest unit cost, high cost-effectiveness and high benefit-cost ratios. These micronutrient interventions are also known to work well, even when capacities are constrained. The 2008 Copenhagen Consensus also ranking the provision of young children with micronutrients as the most cost effective way to advance global welfare (Lake, 2012).

In some cases, nutrition aid is not being invested in countries with the highest rates of undernutrition and some donors frequently do not honour their commitments. In addition, there is a major lack of transparency in nutrition aid, highlighting the need for donors to be more accountable to their electorates (Mutuma et al. 2012). Improvement of the monitoring and evaluation of the nutrition financing activities of donors is required, to allow 'best practices' to be identified, understood and replicated. Accountability also needs to be improved. It is also suggested that efforts of those working in various sectors including donors, academia and civil society, are combined when dealing with the financing of scaling up nutrition to avoid a fragmented approach. If the current dearth of funds is ever to be overcome, long-term, sustainable and predictable funding will be needed for the full nutrition package which is aligned with complementary initiatives in health, food security and agriculture (Spratt, 2012).

Key messages

- Undernutrition imposes a significant global human and economic cost.
- Investments in aid to tackle the escalating challenge of undernutrition remain inadequate and significant extra funding is needed to implement direct nutrition interventions that have demonstrated effectiveness.
- Micronutrient supplementation and fortification are found to be cost effective implementations and to work well even when capacities are constrained, making them a sensible option for further investment.
- Complementary feeding programmes are shown to only have a modest effect on deaths.
- The most costly intervention per child is treatment of SAM.
- Conditional cash transfers are not an alternative to nutrition interventions; rather they can be complementary.
- There is a major lack of transparency in nutrition aid, highlighting the need for donors to be more accountable to their electorates.
- OECD needs to improve monitoring and evaluation of the nutrition financing activities of donors to allow 'best practices' to be identified, understood and replicated. Accountability also needs to be improved.
- Donors, academia and civil society need to work together to avoid a fragmented approach to solving undernutrition.
- Innovative financing to provide long-term, sustainable and predictable funding for the full nutrition package which is aligned with complementary initiatives in health, food security and agriculture is suggested.

Body of evidence

There is a mixture of study types on the relationship between funding and nutrition. While there is some evidence available on various aspects, such as undernutrition imposing a significant global human and economic cost and the lack of transparency on data, it is clear more research is needed into the relationship between nutrition and funding.

Annotated bibliography

Horton, S., Shekar, M., McDonald, C., Mahal, A. & Krystene Brooks, J. (2010). *Scaling Up Nutrition, what will it cost?* World Bank

Despite the evidence suggesting that nutrition interventions have the potential to have a positive impact in health and education and on preserving human capital in crises-stricken countries for generations to come, official development assistance for nutrition remains minimal. This report estimates the cost of scaling up a minimal package of 13 proven nutrition interventions from current coverage levels to full coverage of the target populations in the 36 countries with the highest burden of undernutrition. These countries account for 90 per cent of all children whose growth has been stunted by inadequate nutrition. Adding another 32 smaller high-burden countries with levels of stunting and/or underweight exceeding 20 per cent would increase these cost estimates by 6 per cent. It states that undernutrition imposes a staggering cost worldwide, both in human and economic terms. It is responsible for the deaths of more than 3.5 million children each year (more than one third of all deaths among children under 5) and the loss of billions of dollars in forgone productivity and avoidable health care spending. Individuals lose more than 10 per cent of lifetime earnings, and many countries lose at least 2–3 per cent of their gross domestic product to undernutrition. The current economic crisis and its potential impact on the poor make investing in child nutrition more urgent than ever to protect and strengthen human capital in the most vulnerable developing countries.

The 13 direct nutrition interventions selected for this costing exercise that have demonstrated effectiveness in many countries by reducing child mortality, improving nutrition outcomes, and protecting human capital are categorised into one of three groups: i) Behaviour change interventions; ii) Micronutrient and deworming interventions; and iii) Complementary and therapeutic feeding interventions. It was concluded that an additional US\$10.3 billion from domestic and donor resources for the proposed scale-up. Investments in micronutrient supplementation and fortification were found to have the lowest unit cost (a cost per child per year of about US\$5) and to have high cost-effectiveness (US\$10 per disability-adjusted life year for vitamin A supplementation, and US\$73 per disability-adjusted life year for therapeutic zinc supplementation) and high benefit:cost ratios (8:1 for iron fortification of staples; 30:1 for salt iodization). These micronutrient interventions are also known to work well, even when capacities are constrained. Complementary feeding for children 6–23 months of age is more expensive, between US\$40 and US\$80 per child per year. Complementary feeding programs have had only a modest effect on deaths.

The most costly intervention per child is treatment of severe acute malnutrition (SAM), at US\$200 per child treated, which has a cost-per-death averted of US\$1,351, corresponding to around US\$41 per disability-adjusted life year saved. The reason this intervention is the last priority relates to weak national capacities and delivery systems, as well as the high cost and implementation difficulties of scaling it up. However, when the scale-up becomes tractable with enhanced capacities, this is a high-priority intervention to save lives. Conditional cash transfers can provide additional demand-side support to nutrition interventions, although research on them is

currently lacking. Conditional cash transfers are not an alternative to nutrition interventions; rather they can be complementary. Transfers set up to be social safety nets for the poor, for example, can require the use of critical nutrition services, thereby increasing demand for them.

Lake, A. (2012). *Investing in nutrition security is key to sustainable development. UNICEF Executive Director speech at G8: The Camp David Summit – Route 2012: The Road to Recovery.* Courtesy of the G8 Research Group at the Munk School of Global Affairs, University of Toronto accessed 16.04.2013
http://www.unicef.org/media/media_62452.html

This speech focuses on addressing poor nutrition, with a specific focus on stunting. It states that the 2008 Copenhagen Consensus recommended priorities for confronting the top 10 global challenges, ranking the provision of young children with micronutrients as the most cost-effective way to advance global welfare. The author urges governments to invest in programmes to prevent stunting or risk diminishing the impact of other investments in education, health and child protection. It suggests that governments, international agencies and non-governmental organisations should work together to improve their collective ability to implement, as well as monitor, the results that these programmes are achieving, identify the barriers to progress and coordinate efforts to overcome them. This, in turn, maximises the effectiveness of aid dollars and budget allocations at a time when economic adversity makes every dollar count more than ever. Making nutrition a global priority and stunting a thing of the past is a cost-effective opportunity for a big global development win – an opportunity that nobody can afford to lose.

Mutuma, S., Fremont, E. & Adebayo, A. (2012). *Aid for nutrition: Can investments to scale up nutrition actions be accurately tracked?* Action Against Hunger / ACF International

Investments in aid to tackle the escalating challenge of undernutrition remain inadequate. This report calls for all major donors to disburse more overseas development assistance to programmes which treat undernutrition and address its underlying causes in countries where the need is greatest. It found that between 2005 and 2009, 10 of the world's leading bilateral and multilateral donors contributed an average of US\$73 million per year to direct nutrition interventions which address the immediate determinants of undernutrition. This represents just a fraction of the estimated need and is dwarfed by investment in indirect nutrition interventions (US\$365 million), which address the underlying causes of undernutrition.

The report also found that the nutrition aid that is being delivered is not being invested in countries with the highest rates of undernutrition and that some donors frequently do not honour their commitments. This paper assesses the transparency, quantity and effectiveness of nutrition funding which has been reported in the Organisation for Economic Cooperation and Development's Creditor Reporting System database and provides recommendations, including both general and donor-specific, on the actions needed to more adequately address undernutrition. It also found that there is a major lack of transparency in nutrition aid, highlighting the need for donors to be more accountable to their electorates.

Spratt, S. (2012). *Aid for nutrition: Using innovative financing to end undernutrition.* Action Against Hunger / ACF International

This report explores the future financing of nutrition interventions. It finds that if full and timely investment is made in these key interventions, then countries with high burdens of undernutrition stand a much greater chance of saving the lives of millions of children and providing them with the opportunity to lead full, healthy lives and furthering their own development. A number of financing options are proposed without one option

being recommended in particular. Domestic and external donors and national governments are provided with proof that the costs of scaling up nutrition are not insurmountable. It discusses the implications of splitting the costs for scaling up nutrition between domestic and national sources and various innovative financing options. The recommendations of this report are particularly targeted at the member countries and organisations of the Scaling Up Nutrition movement.

To conclude the following recommendations are made:

- Given the chronic underinvestment in proven, cost-effective, nutrition-specific interventions donors and national governments must scale up investments in nutrition in both development and humanitarian contexts.
- Donors should explore and trial innovative financing to provide long-term, sustainable and predictable funding for the full nutrition package which is aligned with complementary initiatives in health, food security and agriculture.
- The SUN signatory countries must demonstrate their commitment to scaling up nutrition by costing national nutrition plans by the end of 2012.
- The SUN Leadership, donors and SUN signatory countries should work together to develop a systematic, equitable and transparent mechanism for the sharing of costs between domestic and external sources so that countries receive adequate assistance in proportion to their needs.
- The OECD needs to improve monitoring and evaluation of the nutrition financing activities of donors to allow 'best practices' to be identified, understood and replicated.
- The OECD should align domestic and external reporting procedures in order to improve accountability for nutrition financing.
- Donors, academia and civil society should complement the extensive research on direct interventions with a similar process for indirect interventions that will address the underlying drivers of undernutrition in order to avoid tackling the issue with a fragmented approach.

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