

# THE LANCET

[www.thelancet.com](http://www.thelancet.com)

## Maternal and Child Nutrition

Executive Summary of *The Lancet Maternal and Child Nutrition Series*



“Nutrition is crucial to both individual and national development. The evidence in this Series furthers the evidence base that good nutrition is a fundamental driver of a wide range of developmental goals. The post-2015 sustainable development agenda must put addressing all forms of malnutrition at the top of its goals.”

## Maternal and Child Nutrition

Maternal and child undernutrition, consisting of stunting, wasting, and deficiencies of essential vitamins and minerals, was the subject of a Series of papers in *The Lancet* in 2008.<sup>1-5</sup> In the Series, we quantified the prevalence of these issues, calculated their short-term and long-term consequences, and estimated their potential for reduction through high and equitable coverage of proven nutrition interventions.

The 2008 Series identified the need to focus on the crucial period from conception to a child's second birthday—the 1000 days in which good nutrition and healthy growth have lasting benefits throughout life. The Series also called for greater priority for national nutrition programmes, stronger integration with health programmes, enhanced intersectoral approaches, and more focus and coordination in the global nutrition system of international agencies, donors, academia, civil society, and the private sector.

5 years after the initial series, we re-evaluate the problems of maternal and child undernutrition and also examine the growing problems of overweight and obesity for women and children and their consequences in low-income and middle-income

countries (LMICs). Many of these countries are said to have the double burden of malnutrition—continued stunting of growth and deficiencies of essential nutrients along with the emerging issue of obesity. We also assess national progress in nutrition programmes and international efforts toward previous recommendations.

The first paper<sup>6</sup> examines the prevalence and consequences of nutritional conditions during the life course from adolescence (for girls) through pregnancy to childhood and discusses the implications for adult health. The second paper<sup>7</sup> covers the evidence supporting nutrition-specific interventions and the health outcomes and cost of increasing their population coverage. The third paper<sup>8</sup> examines nutrition-sensitive interventions and approaches and their potential to improve nutrition. The fourth paper<sup>9</sup> discusses the features of an enabling environment that are needed to provide support for nutrition programmes, and how they can be favourably influenced. A set of Comments<sup>10-15</sup> examine what is currently being done, and what should be done nationally and internationally to address nutritional and developmental needs of women and children in LMICs.

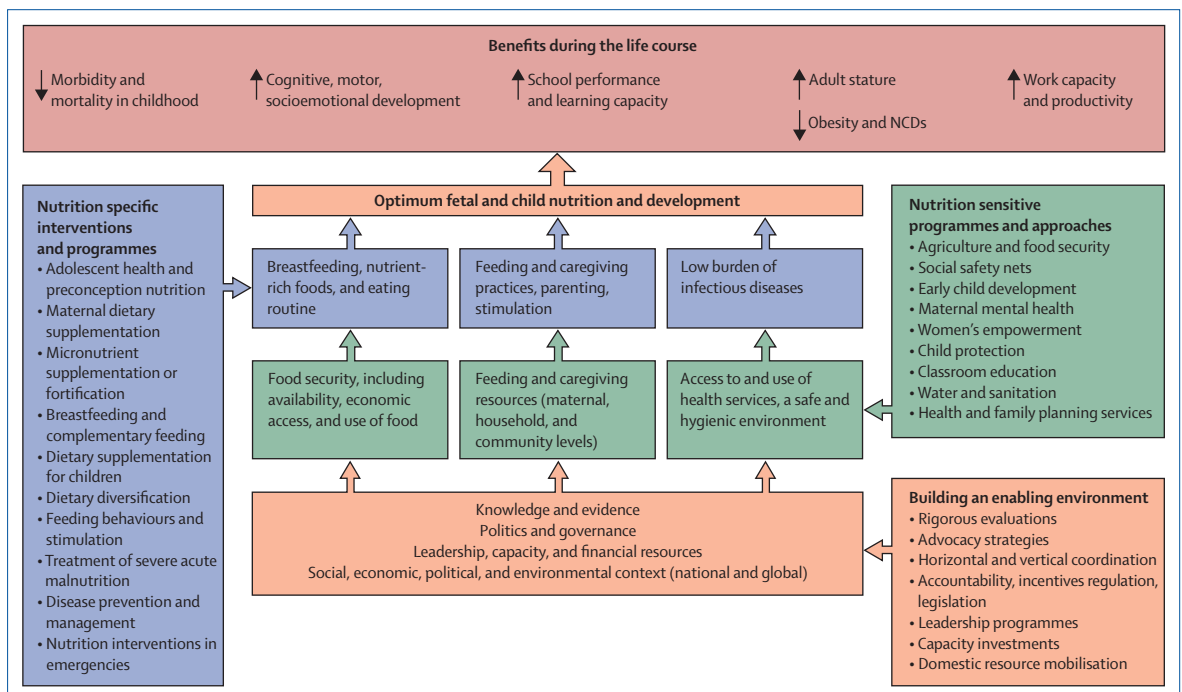


Figure 1: Framework for actions to achieve optimum fetal and child nutrition and development

## A new conceptual framework

The present Series is guided by a framework (figure 1) that shows the means to optimum fetal and child growth and development.<sup>6</sup> This framework outlines the dietary, behavioural, and health determinants of optimum nutrition, growth, and development, and how they are affected by underlying food security, caregiving resources, and environmental conditions, which are in turn shaped by economic and social conditions, national and global contexts, capacity, resources, and governance. The Series focuses on how these determinants can be changed to enhance growth and development, including the nutrition-specific interventions that address the immediate causes of suboptimum growth and development and the potential effects of nutrition-sensitive interventions that address the underlying determinants of malnutrition and incorporate specific nutrition goals and actions (panel 1). It also shows how an enabling environment can be built to support interventions and programmes to enhance growth and development.

## An unfinished agenda for undernutrition

The publication of *The Lancet* Maternal and Child Undernutrition Series 5 years ago stimulated a tremendous increase in political commitment to reduction of undernutrition at global and national levels. Most development agencies have revised their strategies to address undernutrition focused on the 1000 days during pregnancy and the first 2 years of life, as called for in the 2008 Series. One of the main drivers of this new international commitment is the Scaling Up Nutrition (SUN) movement.<sup>18,19</sup> National commitment in LMICs is growing, donor funding is rising, and civil society and the private sector are increasingly engaged.

However, this progress has not yet translated into substantially improved outcomes globally. Improvements in nutrition still represent a massive unfinished agenda. The 165 million children with stunted growth have compromised cognitive development and physical capabilities, making yet another generation less productive than they would otherwise be.<sup>6</sup> Countries will not be able to break out of poverty and sustain economic advances without ensuring that their populations are adequately nourished. Undernutrition reduces a nation's economic advancement by at least 8% because of direct

### Panel 1: Definition of nutrition-specific and nutrition-sensitive interventions and programmes

#### Nutrition-specific interventions and programmes

- Interventions or programmes that address the immediate determinants of fetal and child nutrition and development—adequate food and nutrient intake, feeding, caregiving and parenting practices, and low burden of infectious diseases
- Examples: adolescent, preconception, and maternal health and nutrition; maternal dietary or micronutrient supplementation; promotion of optimum breastfeeding; complementary feeding and responsive feeding practices and stimulation; dietary supplementation; diversification and micronutrient supplementation or fortification for children; treatment of severe acute malnutrition; disease prevention and management; nutrition in emergencies

#### Nutrition-sensitive interventions and programmes

- Interventions or programmes that address the underlying determinants of fetal and child nutrition and development—food security; adequate caregiving resources at the maternal, household and community levels; and access to health services and a safe and hygienic environment—and incorporate specific nutrition goals and actions
- Nutrition-sensitive programmes can serve as delivery platforms for nutrition-specific interventions, potentially increasing their scale, coverage, and effectiveness
- Examples: agriculture and food security; social safety nets; early child development; maternal mental health; women's empowerment; child protection; schooling; water, sanitation, and hygiene; health and family planning services

Adapted from Scaling Up Nutrition<sup>18</sup> and Shekar and colleagues, 2013.<sup>17</sup>

productivity losses, losses via poorer cognition, and losses via reduced schooling.<sup>20</sup> We cannot afford for nothing to change.

## Burden of nutritional conditions

### Undernutrition in LMICs

Stunted linear growth has become the main indicator of childhood undernutrition, because it is highly prevalent in nearly all LMICs, and has important consequences for health and development. It should replace underweight as the main anthropometric indicator for children. The prevalence of stunting in children younger than 5 years in LMICs in 2011 was 26%, a decrease from 40% in 1990, and 32% in 2005, the estimate in the previous nutrition Series.<sup>1,6</sup> The number of stunted children has also decreased globally, from 253 million in 1990, to 178 million in 2005, to 165 million in 2011. This represents an average annual rate of reduction of 2.1%.<sup>6</sup>

The World Health Assembly (WHA) called for a 40% reduction in the global number of children younger than 5 years who are stunted by 2025 (compared with the baseline of 2010).<sup>21</sup> This aim would translate into a 3.9% reduction per year and imply reducing the number of stunted children from 171 million in 2010, to about 100 million in 2025.<sup>6</sup> At the present rate of decline,



stunting is expected to reduce to 127 million, a 25% reduction, in 2025. Eastern and western Africa and south-central Asia have the highest prevalence of stunting; the largest number of children affected by stunting, 69 million, live in south-central Asia. In Africa, only small improvements are anticipated on the basis of present trends, with the number of affected children increasing

from 56 to 61 million, whereas Asia is projected to show a substantial decrease in stunting prevalence.

The prevalence of wasting was 8% globally in 2011, affecting 52 million children younger than 5 years, an 11% decrease from an estimated 58 million in 1990.<sup>6</sup> The prevalence of severe wasting was 2.9%, affecting 19 million children.<sup>6</sup> 70% of the world's children with wasting live in Asia, mostly in south-central Asia, where an estimated 15% (28 million) are affected.<sup>6</sup>

Deficiencies of essential vitamins and minerals are widespread and have substantial adverse effects on child survival and development.<sup>6</sup> Deficiencies of vitamin A and zinc adversely affect child health and survival, and deficiencies of iodine and iron, together with stunting, contribute to children not reaching their developmental potential. Much progress has been made in addressing vitamin A deficiency but efforts must continue at present coverage levels to avoid regressing because dietary intake of vitamin A is still inadequate. Additionally, micronutrient deficiencies have an important part to play in maternal health.<sup>6</sup>

Breastfeeding practices are far from optimum, despite improvements in some countries. Suboptimum breastfeeding results in an increased risk for mortality in the first 2 years of life and results in 800 000 deaths annually.<sup>6</sup>

**Maternal, newborn, and child nutrition**

New evidence further reinforces the importance of the nutritional status of women at the time of conception and during pregnancy, both for the health of the mother and for ensuring healthy fetal growth and development. 32 million babies are born small-for-gestational-age (SGA) annually—representing 27% of all births in LMICs. Fetal growth restriction causes more than 800 000 deaths each year in the first month of life—more than a quarter of all newborn deaths.<sup>6</sup> This new finding contradicts the widespread assumption that babies who are born SGA, by contrast with preterm babies, are not at a substantially increased risk of mortality. Neonates with fetal growth restriction are also at substantially increased risk of being stunted at 24 months and of development of some types of non-communicable diseases in adulthood.<sup>6</sup>

Undernutrition (fetal growth restriction, suboptimum breastfeeding, stunting, wasting, and deficiencies of vitamin A and zinc) causes 45% of all deaths of

	Attributable deaths with UN prevalences*	Proportion of total deaths of children younger than 5 years	Attributable deaths with NIMS prevalences†	Proportion of total deaths of children younger than 5 years
Fetal growth restriction (<1 month)	817 000	11.8%	817 000	11.8%
Stunting (1–59 months)	1 017 000*	14.7%	1 179 000†	17.0%
Underweight (1–59 months)	999 000*	14.4%	1 180 000†	17.0%
Wasting (1–59 months)	875 000*	12.6%	800 000†	11.5%
Severe wasting (1–59 months)	516 000*	7.4%	540 000†	7.8%
Zinc deficiency (12–59 months)	116 000	1.7%	116 000	1.7%
Vitamin A deficiency (6–59 months)	157 000	2.3%	157 000	2.3%
Suboptimum breastfeeding (0–23 months)	804 000	11.6%	804 000	11.6%
Joint effects of fetal growth restriction and suboptimum breastfeeding in neonates	1 348 000	19.4%	1 348 000	19.4%
Joint effects of fetal growth restriction, suboptimum breastfeeding, stunting, wasting, and vitamin A and zinc deficiencies (<5 years)	3 097 000	44.7%	3 149 000	45.4%

Data are to the nearest thousand. \*Prevalence estimates from the UN. †Prevalence estimates from Nutrition Impact Model Study (NIMS).

Table 1: Global deaths in children younger than 5 years attributed to nutritional disorders

**Key messages on disease burden due to nutritional conditions**

- Iron and calcium deficiencies contribute substantially to maternal deaths
- Maternal iron deficiency is associated with babies with low weight (<2500 g) at birth
- Maternal and child undernutrition, and unstimulating household environments, contribute to deficits in children's development and health and productivity in adulthood
- Maternal overweight and obesity are associated with maternal morbidity, preterm birth, and increased infant mortality
- Fetal growth restriction is associated with maternal short stature and underweight and causes 12% of neonatal deaths
- Stunting prevalence is slowly decreasing globally, but affected at least 165 million children younger than 5 years in 2011; wasting affected at least 52 million children
- Suboptimum breastfeeding results in more than 800 000 child deaths annually
- Undernutrition, including fetal growth restriction, suboptimum breastfeeding, stunting, wasting, and deficiencies of vitamin A and zinc, cause 45% of child deaths, resulting in 3.1 million deaths annually
- Prevalence of overweight and obesity is increasing in children younger than 5 years globally and is an important contributor to diabetes and other chronic diseases in adulthood
- Undernutrition during pregnancy, affecting fetal growth, and the first 2 years of life is a major determinant of both stunting of linear growth and subsequent obesity and non-communicable diseases in adulthood

children younger than 5 years, representing more than 3 million deaths each year (3.1 million of the 6.9 million child deaths in 2011).<sup>6</sup> Fetal growth restriction and suboptimum breastfeeding together cause more than 1.3 million deaths, or 19.4% of all deaths of children younger than 5 years, representing 43.5% of all nutrition-related deaths (table 1).

Good nutrition early in life is also essential for children to attain their developmental potential; however, poor nutrition often coincides with other developmental risks, in particular inadequate stimulation during early childhood.<sup>6</sup> Interventions to promote home stimulation and learning opportunities in addition to good nutrition will be needed to ensure optimum early development and longer-term gains in human capital.<sup>6</sup>

This new evidence strengthens the case for a continued focus on the crucial 1000 day window during pregnancy and the first 2 years of life. It also shows the importance of intervening early in pregnancy and even before conception. Because many women do not access nutrition-promoting services until month 5 or 6 of pregnancy, it is important that women enter pregnancy in a state of optimum nutrition. The emerging platforms for adolescent health and nutrition might offer opportunities for enhanced benefits.<sup>7</sup>

There is a growing interest in adolescent health as an entry point to improve the health of women and children, especially because an estimated 10 million girls younger than 18 years are married each year.<sup>6</sup> Evidence-based interventions must be introduced in the pre-conception period and in adolescents in countries with a high burden of undernutrition and young age at first pregnancies; however, targeting and reaching a sufficient number of those in need may be a challenge.

#### **Prevention of maternal deaths**

Iron and calcium deficiencies contribute substantially to maternal deaths. Previously reported analyses, confirmed by this Series, showed that anaemia is a risk factor for maternal deaths, probably because of haemorrhage, the leading cause of maternal deaths (23% of total deaths). Additionally there is now sound evidence that calcium deficiency increases the risk of pre-eclampsia, currently the second leading cause of maternal death (19% of total deaths). Thus, addressing deficiencies of these two minerals could result in substantial reduction of maternal deaths.

#### **Emerging burden of obesity**

Overweight in adults and increasingly in children constitutes an emerging burden that is quickly establishing itself globally, affecting both poor and rich populations. The prevalence of maternal overweight has increased steadily since 1980, and exceeds that of maternal underweight in all regions of the world. Maternal overweight and obesity result in increased maternal morbidity and infant mortality.<sup>6</sup>

Overweight and obesity prevalence is increasing in children younger than 5 years globally, especially in developing countries, and is becoming an increasingly important contributor to adult obesity, diabetes, and non-communicable diseases.<sup>6</sup> Although the prevalence of overweight in high-income countries is more than double that in LMICs, most affected children (76% of the total number) live in LMICs. The trends in early childhood overweight are a probably a consequence of changes in dietary and physical activity patterns over time overlaid on risks attributable to fetal growth restriction and stunting.

If trends are not reversed, increasing rates of childhood overweight and obesity will have vast implications, not only for future health-care expenditures but also for the overall development of nations. These findings confirm the need for effective interventions and programmes to reverse these anticipated trends. Early recognition of excessive weight gain relative to linear growth is essential.

#### **Furthering the evidence to improve maternal and child nutrition**

Since the 2008 Series, many nutrition interventions have been successfully implemented at scale, and the evidence base for effective interventions and delivery strategies has grown. At the same time, coverage rates for other interventions are either poor or non-existent. We modelled ten nutrition-specific interventions across the lifecycle to address undernutrition and micronutrient deficiencies in women of reproductive age, pregnant women, neonates, infants, and children to assess the effects and cost of scaling up (figure 2).<sup>7</sup> The interventions were: periconceptual folic acid supplementation, maternal balanced energy protein supplementation, maternal calcium supplementation, multiple micronutrient supplementation in pregnancy, promotion of breastfeeding, appropriate complementary feeding, vitamin A administration and preventive

zinc supplementation in children aged 6–59 months, management of severe acute malnutrition (SAM), and management of moderate acute malnutrition.

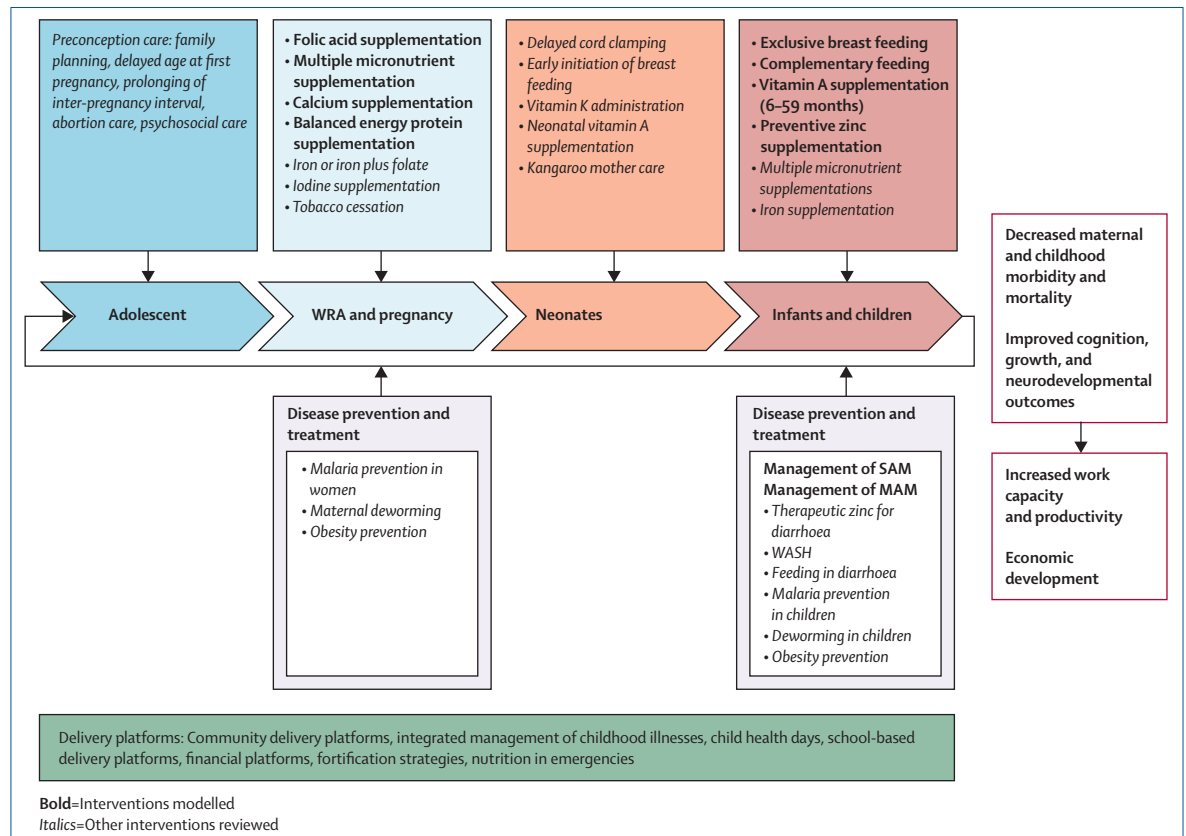
Continued investment in nutrition-specific interventions and delivery strategies to reach poor segments of the population at greatest risk can make a substantial difference. If these ten proven nutrition-specific interventions were scaled-up from existing population coverage to 90%, an estimated 900 000 lives could be saved in 34 high nutrition-burden countries (where 90% of the world’s stunted children live, figure 3) and the prevalence of stunting could be reduced by 20% and that of severe wasting by 60%. This would reduce the number of children with stunted growth and development by 33 million.<sup>7</sup> On top of existing trends, this improvement would comfortably reach the WHA targets for 2025.

**Cost of scaling up proven interventions**

We estimate that the cost of scaling-up this package of ten essential nutrition-specific interventions to

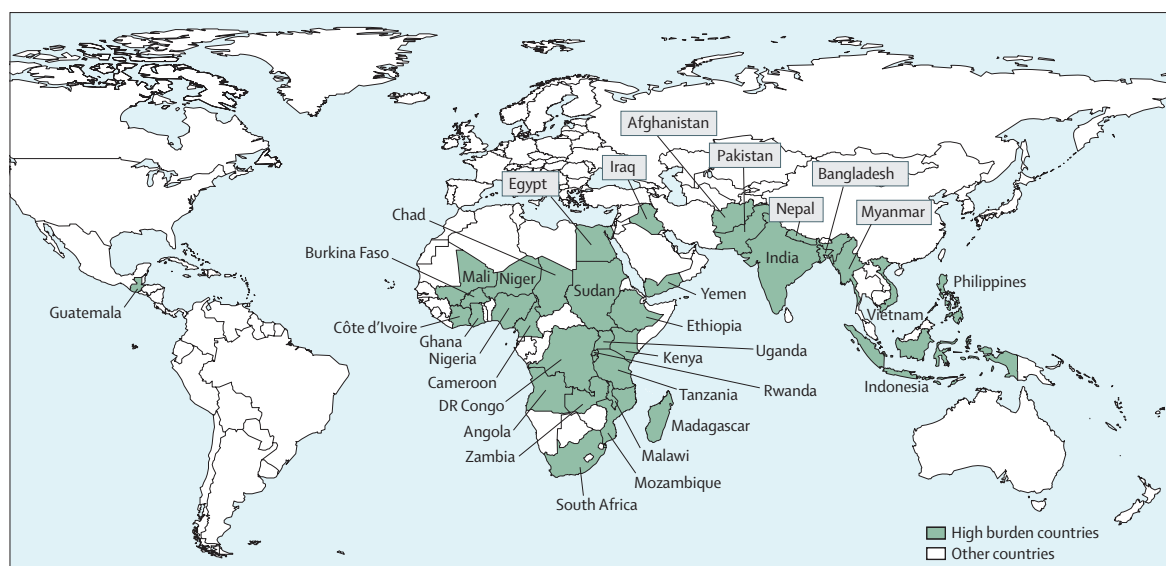
90% coverage in 34 countries is Int\$9.6 billion per year (table 2).<sup>7</sup> Of the \$9.6 billion, \$3.7 billion (39%) is for micronutrient interventions, \$0.9 billion (10%) for educational interventions, and \$2.6 billion (27%) for management of SAM. The remaining \$2.3 billion (24%) accounts for provision of food for pregnant women and children aged 6–23 months in poor households. Since many interventions are being scaled up from negligible coverage, the cost is reasonable; the cost per discounted life-year saved is about \$370 (\$213 per undiscounted life-year saved).

More than half the \$9.6 billion is accounted for by two large countries which will rely heavily on domestic resources (India and Indonesia). Consumables (drugs, or other items such as for transport or administration) account for a little less than half of the \$9.6 billion, and all but the poorest countries can be expected to cover most of the expenditures on personnel. Therefore, \$3–4 billion from external donors could make a substantial difference to child nutrition



**Figure 2: Conceptual framework**

WRA=women of reproductive age. WASH=water, sanitation, and hygiene. SAM=severe acute malnutrition. MAM=moderate AM.



**Figure 3: Countries with the highest burden of malnutrition**  
These 34 countries account for 90% of the global burden of malnutrition.

### The promise of emerging interventions and delivery strategies and platforms

Delivery strategies are crucial to achieving coverage with nutrition-specific interventions and reaching populations in need. A range of channels can provide opportunities for scaling up and reaching large population segments, such as fortification of staple foods and conditional and unconditional cash transfers.<sup>7</sup> Community delivery platforms for nutrition education and promotion, integrated management of childhood illness, school-based delivery platforms, and child health days are other possible channels.

Innovative delivery strategies—especially community-based delivery platforms—are promising for scaling up coverage of nutrition interventions and have the potential to reach poor and difficult to access populations through communication and outreach strategies.<sup>7</sup> These could also lead to potential integration of nutrition with maternal, newborn, and child health interventions, helping to achieve reductions in inequities.

### Unlocking the potential of nutrition-sensitive programmes

In addition to nutrition-specific interventions, acceleration of progress in nutrition will also require increases in the nutritional outcomes of effective, large-scale, nutrition-sensitive development programmes.<sup>8</sup> Nutrition-sensitive programmes address key underlying determinants of nutrition—such as poverty, food

insecurity, and scarcity of access to adequate care resources—and include nutrition goals and actions. They can therefore help enhance the effectiveness, coverage, and scale of nutrition-specific interventions.

Our review of potentially nutrition-sensitive programmes in agriculture, social safety nets, early child

	Number of lives saved*	Cost per life-year saved†
<b>Optimum maternal nutrition during pregnancy</b>		
Maternal multiple micronutrient supplements to all	102 000	\$571 (398–1191)
Calcium supplementation to mothers at risk of low intake‡	(49 000–146 000)	
Maternal balanced energy protein supplements as needed		
Universal salt iodisation‡		
<b>Infant and young child feeding</b>		
Promotion of early and exclusive breastfeeding for 6 months and continued breastfeeding for up to 24 months	221 000 (135 000–293 000)	\$175 (132–286)
Appropriate complementary feeding education in food secure populations and additional complementary food supplements in food insecure populations		
<b>Micronutrient supplementation in children at risk</b>		
Vitamin A supplementation between 6 and 59 months age	145 000	\$159 (106–766)
Preventive zinc supplements between 12 and 59 months of age	(30 000–216 000)	
<b>Management of acute malnutrition</b>		
Management of moderate acute malnutrition	435 000	\$125 (119–152)§
Management of severe acute malnutrition	(285 000–482 000)	

Data are number (95% CI) or cost in 2010 international dollars (95% CI). \*Effect of each of package when all four packages are scaled up at once. †Cost per life-year saved assumes that a life saved of a child younger than 5 years saves on average 59 life-years, based on WHO data (2011<sup>88</sup>) that life expectancy at birth on average in low-income countries is 60, and that most deaths of children younger than 5 years occur in the first year of life. To convert to cost per discounted life-year saved multiply these estimates by 59/32 (ie, 1.84). ‡Intervention has effect on maternal or child morbidity, but no direct effect on lives saved. §Cost per life-year saved by management of severe acute malnutrition only, costs for supplementary feeding for moderate acute malnutrition are currently unavailable.

**Table 2: Effect of packages of nutrition interventions at 90% coverage**

development, and schooling confirms that programmes in these sectors are successful at addressing several of the underlying determinants of nutrition, but evidence of their nutritional effect is still scarce.

Targeted agricultural programmes have an important role in support of livelihoods, food security, diet quality, and women's empowerment, and complement global efforts to stimulate agricultural productivity and thus increase producer incomes while protecting consumers from high food prices.<sup>8</sup> Evidence of effect on nutrition outcomes, however, is inconclusive, with

the exception of effects on vitamin A intake and status from homestead food production programmes and distribution of biofortified vitamin A-rich orange sweet potato. Evidence suggests that targeted agricultural programmes are more successful when they incorporate strong behaviour change communications strategies and a gender-equity focus. Although firm conclusions have been hindered by a dearth of rigorous programme evaluations, weaknesses in programme design and implementation also contribute to the limited evidence of nutritional outcomes so far.

### Key messages on nutrition-specific interventions

- A clear need exists to introduce promising evidence-based interventions in the preconception period and in adolescents in countries with a high burden of undernutrition and young age at first pregnancies; however, targeting and reaching a sufficient number of those in need will be challenging.
- Promising interventions exist to improve maternal nutrition and reduce intrauterine growth restriction and small-for-gestational-age (SGA) births in appropriate settings in developing countries, if scaled up before and during pregnancy. These interventions include balanced energy protein, calcium, and multiple micronutrient supplementation and preventive strategies for malaria in pregnancy.
- Replacement of iron-folate with multiple micronutrient supplements in pregnancy might have additional benefits for reduction of SGA in at-risk populations, although further evidence from effectiveness assessments might be needed to guide a universal policy change.
- Strategies to promote breastfeeding in community and facility settings have shown promising benefits on enhancing exclusive breastfeeding rates; however, evidence for long-term benefits on nutritional and developmental outcomes is scarce.
- Evidence for the effectiveness of complementary feeding strategies is insufficient, with much the same benefits noted from dietary diversification and education and food supplementation in food secure populations and slightly greater effects in food insecure populations. Further effectiveness trials are needed in food insecure populations with standardised foods (pre-fortified or non-fortified) to assess duration of intervention, outcome definition, and cost effectiveness.
- Treatment strategies for severe acute malnutrition with recommended packages of care and ready-to-use therapeutic foods are well established, but further evidence is needed for prevention and management strategies for moderate acute malnutrition in population settings, especially in infants younger than 6 months.
- Data for the effect of various nutritional interventions on neurodevelopmental outcomes is scarce; future studies should focus on these aspects with consistency in measurement and reporting of outcomes.
- Conditional cash transfers and related safety nets can address the removal of financial barriers and promotion of access of families to health care and appropriate foods and nutritional commodities. Assessments of the feasibility and effects of such approaches are urgently needed to address maternal and child nutrition in well supported health systems.
- Innovative delivery strategies, especially community-based delivery platforms, are promising for scaling up coverage of nutrition interventions and have the potential to reach poor populations through demand creation and household service delivery.
- Nearly 15% of deaths of children younger than 5 years can be reduced (ie, 1 million lives saved), if the ten core nutrition interventions we identified are scaled up.
- The maximum effect on lives saved is noted with management of acute malnutrition (435 000 [range 285 000–482 000] lives saved); 221 000 (135 000–293 000) lives would be saved with delivery of an infant and young child nutrition package, including breastfeeding promotion and promotion of complementary feeding; micronutrient supplementation could save 145 000 (30 000–216 000) lives.
- These interventions, if scaled up to 90% coverage, could reduce stunting by 20.3% (33.5 million fewer stunted children) and can reduce prevalence of severe wasting by 61.4%.
- The additional cost of achieving 90% coverage of these proposed interventions would be US\$9.6 billion per year.



Social safety nets provide cash and food transfers to a billion poor people and reduce poverty. They also have an important role in mitigation of the negative effects of global changes, conflicts, and shocks by protecting income, food security, and diet quality. When targeted to women, they enhance several aspects of women's empowerment. Pooled evidence, however, shows limited effects of these programmes on child nutrition, although some individual studies showed effects in younger and poorer children exposed for longer durations.<sup>8</sup> Absence of clarity in nutrition goals, weaknesses in design, and poor quality services probably account for the limited nutritional effects.

Child stunting and impaired cognitive development share many of the same risk factors including nutritional deficiencies, intra-uterine growth restriction, and social and economic conditions, such as poverty and maternal depression.<sup>6</sup> Linear growth and cognitive development also share the same period of peak vulnerability—the first 1000 days of life. Combination of early child development and nutrition interventions therefore makes sense biologically and programmatically, and evidence from mostly small-scale programmes suggests additive or synergistic effects on child development and in some cases on nutrition outcomes.<sup>8</sup>

Interventions to improve maternal mental health also have high potential for nutritional effects and should be incorporated in nutrition-sensitive programmes.<sup>8</sup> Maternal depression is an important determinant of suboptimum caregiving and health-seeking behaviours and is associated with poor nutrition and child development outcomes.

Parental schooling is consistently associated with improved nutrition outcomes and schools provide an opportunity, so far largely untapped, to include nutrition in school curricula for prevention and treatment of undernutrition or obesity.<sup>8</sup> Nutrition-sensitive programmes also offer a unique opportunity to reach girls in adolescence (preconception) and possibly to achieve scale either through school-linked programmes with conditions or home-based programmes.

The potential of nutrition-sensitive programmes to improve nutrition outcomes is clear, but it has yet to be unleashed. Importantly, several of the programmes documented in our analysis<sup>8</sup> were not originally designed with clear nutrition goals and actions from the outset and were retrofitted to be nutrition-sensitive. The

#### Key messages on nutrition-sensitive interventions and programmes

- Nutrition-sensitive interventions and programmes in agriculture, social safety nets, early child development, and education have enormous potential to enhance the scale and effectiveness of nutrition-specific interventions; improving nutrition can also help nutrition-sensitive programmes achieve their own goals.
- Targeted agricultural programmes and social safety nets can have a large role in mitigation of potentially negative effects of global changes and man-made and environmental shocks, in supporting livelihoods, food security, diet quality, and women's empowerment, and in achieving scale and high coverage of nutritionally at-risk households and individuals.
- Evidence of the effectiveness of targeted agricultural programmes on maternal and child nutrition, with the exception of vitamin A, is limited; strengthening of nutrition goals and actions and rigorous effectiveness assessments are needed.
- The feasibility and effectiveness of biofortified vitamin A-rich orange sweet potato for increasing maternal and child vitamin A intake and status has been shown; evidence of the effectiveness of biofortification continues to grow for other micronutrient and crop combinations.
- Social safety nets are a powerful poverty reduction instrument, but their potential to benefit maternal and child nutrition and development is yet to be unleashed; to do so, programme nutrition goals and interventions, and quality of services need to be strengthened.
- Combinations of nutrition and early child development interventions can have additive or synergistic effects on child development, and in some cases, nutrition outcomes. Integration of stimulation and nutrition interventions makes sense programmatically and could save cost and enhance benefits for both nutrition and development outcomes.
- Parental schooling is consistently associated with improved nutrition outcomes and schools provide an opportunity, so far untapped, to include nutrition in school curricula for prevention and treatment of undernutrition or obesity.
- Maternal depression is an important determinant of suboptimum caregiving and health-seeking behaviours and is associated with poor nutrition and child development outcomes; interventions to address this problem should be integrated in nutrition-sensitive programmes.
- Nutrition-sensitive programmes offer a unique opportunity to reach girls during preconception and possibly to achieve scale, either through school-linked conditions and interventions or home-based programmes.
- The nutrition-sensitivity of programmes can be enhanced by improving targeting; using conditions; integrating strong nutrition goals and actions; and focusing on improving women's physical and mental health, nutrition, time allocation, and empowerment.

nutrition-sensitivity of programmes can be enhanced by: improved targeting; use of conditions to stimulate demand for programme services; strengthening of nutrition goals, design, and implementation; and optimisation of women's nutrition, time, physical and mental health, and empowerment.

With guidance on how nutrition-sensitivity can be enhanced and a new generation of nutrition-sensitive programmes, stronger evidence should emerge in the near future. Currently, new agriculture, social safety net programmes, and joint nutrition and early child development programme designs, methods, and packages of interventions are being tested, several of

which integrate complementary inputs that address other constraints to optimum nutrition—such as maternal depression, or scarcity of access to water, sanitation, and hygiene services—and are strengthening links with health services. Rigorous impact evaluations are underway, many of which are based on strong programme theory and impact pathway analysis. They are also addressing key weaknesses encountered in previous evaluations and are assessing outcomes on a range of nutrition and child development outcomes as well as several household and gender outcomes along the impact pathway. The body of evidence generated by these enhanced programmes and evaluations in the next 5–10 years will be of crucial importance to inform future investments in nutrition-sensitive programmes from many sectors.

### Building an enabling environment to deliver nutrition results

The nutrition landscape has shifted fundamentally since 2008. The 2008 Series showed that the stewardship of the nutrition system was dysfunctional and deeply

fragmented in terms of messaging, priorities, and funding.<sup>5</sup> Much progress has been made since then, largely driven by the new evidence introduced in the 2008 Series, which identified the first 1000 days of life as the window for outcomes, pinpointed a package of highly effective interventions for reduction of undernutrition, and proposed a group of high-burden countries as priorities for increased investment.

The launch of the SUN movement in 2010 represented a major step toward improved stewardship of the global nutrition architecture.<sup>18,19</sup> SUN brings together more than 100 entities across the organisational spectrum of the nutrition community. Up to now, more than 30 countries (representing 35% of the global child stunting burden) have joined SUN, committing to scaling-up direct nutrition interventions and advancing nutrition-sensitive development. Although it is too soon to evaluate SUN's effect on rates of reduction of undernutrition, it is clear that through SUN, many countries have made advances in building multistakeholder platforms across sectors, aligning nutrition-relevant programmes within a common results framework, and mobilising national resources.

Additionally, nutrition has been greatly elevated on the global agenda. Nearly every major development agency has published a policy document on undernutrition, and donors have increased official development assistance to basic nutrition by more than 60% between 2008 and 2011, in a very difficult fiscal climate. Nutrition is now more prominent on the agendas of the UN, the G8 and G20, and supporting civil society.

Nowadays, the impetus for improving nutrition is even stronger than it was 5 years ago. The WHA targets for reducing stunting, wasting, low birthweight, anaemia, and overweight, and increasing exclusive breastfeeding in the first 6 months of life can be achieved by 2025 with sufficient support.<sup>21</sup> Central to this scaled-up support is the creation of an enabling environment to build commitment and ensure that it is translated into outcomes.

### Improvement of data, research, and accountability for results

The availability of timely and credible nutrition data, presented in accessible ways, can help governments and other actors to be responsive to challenging circumstances, and help civil society organisations to hold them accountable for the effectiveness of

#### Key messages on enabling environments for nutrition

- Emerging country experiences show that rates of undernutrition reduction can be accelerated with deliberate action
- Politicians and policymakers who want to promote broad-based growth and prevent human suffering should prioritise investment in scale-up of nutrition-specific interventions, and should maximise the nutrition sensitivity of national development processes
- Findings from studies of nutrition governance and policy processes broadly concur on three factors that shape enabling environments: knowledge and evidence, politics and governance, and capacity and resources
- Framing of undernutrition reduction as an apolitical issue is myopic and self-defeating. Political calculations are at the basis of effective coordination between sectors, national and subnational levels, private sector engagement, resource mobilisation, and state accountability to its citizens
- Political commitment can be developed in a short time, but commitment must not be squandered—conversion to results needs a different set of strategies and skills
- Leadership for nutrition, at all levels, and from a variety of perspectives, is fundamentally important for creating and sustaining momentum and for conversion of that momentum into results on the ground.
- Acceleration and sustaining of progress in nutrition will not be possible without national and global support to a long-term process of strengthening systemic and organisational capacities
- The private sector has substantial potential to contribute to acceleration of improvements in nutrition, but efforts to realise this have to date been hindered by a scarcity of credible evidence and trust. Both these issues need substantial attention if the positive potential is to be realised
- Operational research of delivery, implementation, and scale-up of interventions, and contextual analyses about how to shape and sustain enabling environments, is essential as the focus shifts toward action

their interventions.<sup>9</sup> Advances in health management information systems and the growing availability of newer technologies can help with the real-time monitoring of nutrition outcomes and programme coverage and quality, and should be researched. Additionally, although much progress has been made to work out the costs of addressing undernutrition, continued work to contextualise and specify these costs for different countries is essential, along with stronger designation of donor and government spending to improve tracking of investments and results in nutrition.

Improved data for micronutrient deficiencies and other nutritional conditions are needed at national and subnational levels. This improvement should involve the development and use of improved biomarkers that could be used to describe nutritional conditions and increase knowledge of how they affect health and development. Such information is needed to guide intervention programmes in countries and priorities for support globally.

Although substantial progress has been made to establish the needs around nutrition, no systematic process exists for bringing together the implementation-related evidence for how to scale up the vast array of nutrition-specific and nutrition-sensitive interventions with quality and equity (so-called implementation science). This evidence is essential to ensure that future investments are directed toward proven pathways to outcomes.

Beyond this evidence, service providers, governments, donors, and the private sector need strong national monitoring and assessment platforms to hold them accountable for the quality and effectiveness of their investments in nutrition.<sup>9</sup> Boosting nutrition commitment and accountability can be achieved through assessing and implementing innovative new instruments and mechanisms, including computer-based monitoring systems, commitment indices, and social accountability mechanisms.

#### **Engagement and regulation of the private sector**

The scale, know-how, reach, financial resources, and existing involvement of the private sector in actions that affect nutrition status is well known.<sup>9</sup> Yet there are still too few independent and rigorous assessments of the effectiveness of involvement of the commercial sector in nutrition. Distrust of the private sector—especially

the food industry—remains high and is linked, partly, to the decades-long tussle related to the marketing of breastmilk substitutes in developing countries and around continued marketing of sugar-sweetened beverages and fast foods worldwide.

This troubled history has made it more difficult for the private sector to be a major contributor to the collective creation and sustenance of momentum for reduction of malnutrition. In view of the needs and substantial resources, influence, and convening power of the private sector, it might represent a missed opportunity. Opportunities exist for collaboration around advocacy, monitoring, value chains, technical and scientific collaboration, and staple-food fortification that are uncontentious and deserve further exploration. Knowledge in this area must be expanded rapidly to guide the private sector toward more positive effects for nutrition.

Regulatory and fiscal efforts are essential when the private sector is involved in marketing of products that are detrimental to optimum nutrition. The experience gained with the International Code of Marketing of Breastmilk Substitutes should be applied to the promotion of other harmful, widely-consumed food products that are being marketed for young children.

#### **Mobilisation of resources**

High-burden countries, together with donors, multilaterals, and the private sector, have a responsibility to increase allocations to nutrition-specific and nutrition-sensitive programmes. Meeting the estimated \$9.6 billion financing gap will require an increase in donor spending, alongside an equal or greater increase of spending by LMICs and the establishment of nutrition budget lines in all high-burden countries.<sup>7</sup> To achieve this aim will be politically challenging, hence the need to build leadership, commitment, and accountability at national and international levels.<sup>9</sup> However, the financing gap is unlikely to be closed by these sources alone. Innovation is needed across all sectors to leverage private-sector and public-sector resources and generate additional funding. The nutrition sector can draw on several innovative ideas from other sectors, including advance market contracts to promote investment, market levies, and taxes in the effort. Additional resources must be directed not only to interventions, but also to the creation of environments to enable advancement of nutrition, including capacity and leadership at all levels of government.<sup>9</sup> A political

economy approach to prioritisation of such investments is crucial if sustainable, supportive environments for long-term nutrition agendas are to be created.

Nutrition is crucial to both individual and national development. The evidence in this Series furthers the evidence base that good nutrition is a fundamental driver of a wide range of development goals. The post-2015 sustainable development agenda must put addressing all forms of malnutrition at the top of its goals.

Now is our crucial window of opportunity to scale-up nutrition.<sup>22</sup> National and international momentum to address human nutrition and related food security and health needs has never been higher. We must work together to seize this opportunity.

### References

- Black RE, Allen LH, Bhutta ZA, et al, for the Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet* 2008; **371**: 243–60.
- Bhutta ZA, Ahmed T, Black RE, et al, for the Maternal and Child Undernutrition Study Group. What works? Interventions for maternal and child undernutrition and survival. *Lancet* 2008; **371**: 417–40.
- Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. *Lancet* 2008; **371**: 340–57.
- Bryce J, Coitinho D, Darnton-Hill I, et al, for the Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: effective action at national level. *Lancet* 2008; **371**: 510–26.
- Morris SS, Cogill B, Uauy R, for the Maternal and Child Undernutrition Study Group. Effective international action against undernutrition: why has it proven so difficult and what can be done to accelerate progress? *Lancet* 2008; **371**: 608–21.
- Black RE, Victora CG, Walker SP, and the Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)60937-X](http://dx.doi.org/10.1016/S0140-6736(13)60937-X).
- Bhutta ZA, Das JK, Rizvi A, et al, The Lancet Nutrition Interventions Review Group, and the Maternal and Child Nutrition Study Group. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)60996-4](http://dx.doi.org/10.1016/S0140-6736(13)60996-4).
- Ruel MT, Alderman H, and the Maternal and Child Nutrition Study Group. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)60843-0](http://dx.doi.org/10.1016/S0140-6736(13)60843-0).
- Gillespie S, Haddad L, Mannar V, Menon P, Nisbett N, and the Maternal and Child Nutrition Study Group. The politics of reducing malnutrition: building commitment and accelerating progress. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)60842-9](http://dx.doi.org/10.1016/S0140-6736(13)60842-9).
- Maternal and Child Nutrition Study Group. Maternal and child nutrition: building momentum for impact. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)60988-5](http://dx.doi.org/10.1016/S0140-6736(13)60988-5).
- Horton R, Lo S. Nutrition: a quintessential sustainable development goal. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)61100-9](http://dx.doi.org/10.1016/S0140-6736(13)61100-9).
- Lemna F, Matji J. Delivery platforms for sustained nutrition in Ethiopia. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)61054-5](http://dx.doi.org/10.1016/S0140-6736(13)61054-5).
- Taylor A, Dangour AD, Reddy KS. Only collective action will end undernutrition. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)61084-3](http://dx.doi.org/10.1016/S0140-6736(13)61084-3).
- Nabarro D. Global child and maternal nutrition—the SUN rises. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)61086-7](http://dx.doi.org/10.1016/S0140-6736(13)61086-7).
- Pinstrup-Andersen P. Nutrition-sensitive food systems: from rhetoric to action. *Lancet* 2013; published online June 6. [http://dx.doi.org/10.1016/S0140-6736\(13\)61053-3](http://dx.doi.org/10.1016/S0140-6736(13)61053-3).
- Scaling Up Nutrition. Progress report from countries and their partners in the Movement to Scale Up Nutrition. New York: UN, 2011.
- Shekar M, Ruel-Bergeron J, Herforth A. Module A. Introduction. In: Improving nutrition through multisectoral approaches. Washington, DC, International Bank for Reconstruction and Development, International Development Association of The World Bank, 2013.
- Scaling Up Nutrition. A framework for action. [http://www.unscn.org/files/Announcements/Scaling\\_Up\\_Nutrition-A\\_Framework\\_for\\_Action.pdf](http://www.unscn.org/files/Announcements/Scaling_Up_Nutrition-A_Framework_for_Action.pdf) (accessed April 2, 2013).
- Bezanson K, Isenman P. Scaling up nutrition: a framework for action. *Food Nutr Bull* 2010; **31**: 178–86.
- Horton S, Steckel R. Global economic losses attributable to malnutrition 1990–2000 and projections to 2050. In: Lomborg B, ed. How much have global problems cost the world? Cambridge: Cambridge University Press, 2013.
- WHO. Proposed global targets for maternal, infant and young child nutrition. WHO Discussion Paper. Geneva: World Health Organization, 2012.
- Dube L, Pingali P, Webb P. Paths of convergence for agriculture, health, and wealth. *Proc Natl Acad Sci USA* 2012; **109**: 12294–301.

### Acknowledgments

*Maternal and Child Nutrition Study Group:* Robert E Black (Johns Hopkins Bloomberg School of Public Health, USA), Harold Alderman (International Food Policy Research Institute, USA), Zulfikar A Bhutta (Aga Khan University, Pakistan), Stuart Gillespie (International Food Policy Research Institute, USA), Lawrence Haddad (Institute of Development Studies, UK), Susan Horton (University of Waterloo, Canada), Anna Lartey (University of Ghana, Ghana), Venkatesh Mannar (The Micronutrient Initiative, Canada), Marie Ruel (International Food Policy Research Institute, USA), Cesar Victora (Universidade Federal de Pelotas, Brazil), Susan Walker (The University of the West Indies, Jamaica), Patrick Webb (Tufts University, USA)

*Funding:* Funding for the preparation of the Series was provided to the Johns Hopkins Bloomberg School of Public Health through a grant from the Bill & Melinda Gates Foundation. The sponsor had no role in analysis or interpretation of the evidence.

Cover image copyright: AFP/Getty Images

Second printing with corrections.