

Global Nutrition Targets 2025

Stunting Policy Brief



TARGET:

40% reduction in the number of children under-5 who are stunted



WHO/Antonio Suarez Weise

WHAT'S AT STAKE

In 2012, the World Health Assembly Resolution 65.6 endorsed a *Comprehensive implementation plan on maternal, infant and young child nutrition (1)*, which specified six global nutrition targets for 2025 (2). This policy brief covers the first target: **a 40% reduction in the number of children under-5 who are stunted**. The purpose of this policy brief is to increase attention to, investment in, and action for a set of cost-effective interventions and policies that can help Member States and their partners in reducing stunting rates among children aged under 5 years.

Childhood stunting is one of the most significant impediments to human development, globally affecting approximately 162 million children under the age of 5 years. Stunting, or being too short for one's age, is defined as a height that is more than two standard deviations below the World Health Organization (WHO) child growth standards median (3). It is a largely irreversible outcome of inadequate nutrition and repeated bouts of infection during the first 1000 days of a child's life. Stunting has long-term effects on individuals and societies, including: diminished cognitive and physical development, reduced productive capacity and poor health, and an increased risk of degenerative diseases such as diabetes (4). If current trends continue, projections indicate that 127 million children under 5 years will be stunted in 2025. Therefore, further investment and action are necessary to attain the 2025 World Health Assembly target of reducing that number to 100 million.

Stunting is a well-established risk marker of poor child development. Stunting before the age of 2 years predicts poorer cognitive and educational outcomes in later childhood and adolescence (5, 6), and has significant educational and economic consequences at the individual, household and community levels. Recent longitudinal studies of children from Brazil, Guatemala, India, the Philippines and South Africa associated stunting with a reduction in schooling, where adults who were stunted at the age of 2 years completed nearly one year less schooling than non-stunted individuals (7, 8). Similarly, a study of Guatemalan adults found that those who were stunted as children had less total schooling, lower test performances, lower household per capita expenditure and a greater likelihood of living in poverty (9). For women, stunting in early life was associated with a lower age at first birth and a higher number of pregnancies and children (10). According to World Bank estimates,

a 1% loss in adult height due to childhood stunting is associated with a 1.4% loss in economic productivity (11). It is estimated that stunted children earn 20% less as adults compared to non-stunted individuals (12).

Stunting is linked with the other global nutrition targets (anaemia in women of reproductive age, low birth weight, childhood overweight, exclusive breastfeeding, and wasting). Wasting is caused by the same factors that contribute to stunting. Actions focused on prevention, such as ensuring that pregnant and lactating mothers are adequately nourished, that children receive exclusive breastfeeding during the first 6 months of life, and provision of adequate complementary feeding in addition to breastfeeding for children aged 6–23 months, can help address both stunting and wasting (13).

Conversely, stunted children who experience rapid weight gain after the age of 2 years have an increased risk of becoming overweight or obese later in life. Such weight gain is also associated with a higher risk of coronary heart disease, stroke, hypertension and type 2 diabetes (6). Finally, interventions targeted at increasing exclusive breastfeeding rates, reducing rates of anaemia in women of reproductive age, and reducing the rate of infants born with low birth weight are all associated with a decreased risk of stunting.

Stunting is an enormous drain on economic productivity and growth. Economists estimate that stunting can reduce a country's gross domestic product by up to 3% (11). Policy-makers should consider prioritizing the following actions in order to achieve a **40% reduction in the number of children under-5 who are stunted**:

- improve the identification, measurement and understanding of stunting and scale up coverage of stunting-prevention activities;
- enact policies and/or strengthen interventions to improve maternal nutrition and health, beginning with adolescent girls;
- implement interventions for improved exclusive breastfeeding and complementary feeding practices;
- strengthen community-based interventions, including improved water, sanitation and hygiene (WASH), to protect children from diarrhoeal diseases and malaria, intestinal worms and environmental causes of subclinical infection.

WHAT CAUSES STUNTING?

Factors that contribute to stunted growth and development include poor maternal health and nutrition, inadequate infant and young child feeding practices, and infection. Specifically, these include maternal nutritional and health status before, during and after pregnancy, which influences a child's early growth and development, beginning in the womb (14). For example, intrauterine growth restriction due to maternal undernutrition (estimated by rates of low birth weight) accounts for 20% of childhood stunting (6). Other maternal contributors to stunting include short stature, short birth spacing, and adolescent pregnancy, which interferes with nutrient availability to the fetus (owing to the competing demands of ongoing maternal growth).

- Infant and young child feeding practices that contribute to stunting include suboptimal breastfeeding (specifically, non-exclusive breastfeeding) and complementary feeding that is limited in quantity, quality and variety.
- Severe infectious diseases lead to wasting, which may have long-term consequences for linear growth, depending on the severity, duration and recurrence, particularly if there is insufficient nourishment to support recovery.
- Subclinical infections, resulting from exposure to contaminated environments and poor hygiene, are associated with stunting, owing to nutrient malabsorption and reduced ability of the gut to function as a barrier against disease-causing organisms (15).
- As a result of household poverty, caregiver neglect, non-responsive feeding practices, inadequate child stimulation and food insecurity can all interact to impede growth and development.

FRAMEWORK FOR ACTION

Inadequate nutrition is one of the many causes of stunting. Growth failure often begins in utero and continues after birth, as a reflection of suboptimal breastfeeding practices, and inadequate complementary feeding and control of infections (17). Therefore, focusing on the critical 1000-day window from a woman's pregnancy to her child's second birthday is critically important.

Action can be taken across multiple areas to reduce rates of stunting. First, improving optimal breastfeeding practices is key to ensuring a child's healthy growth and development. Early initiation and exclusive breastfeeding for 6 months provides protection against gastrointestinal infections, which can lead to severe nutrient depletion and therefore stunting (18). Breast milk is also a key source of nutrients during infection. Studies in resource-poor settings have associated non-exclusive breastfeeding with poorer growth outcomes, because breast milk is displaced, or replaced, by less nutritious foods that often also expose infants to diarrhoeal infections (19–21). Similarly, continued breastfeeding in the second year contributes significantly to intake of key nutrients that are lacking in low-quality complementary diets in resource-poor settings (22–24).

Second among the most effective interventions for preventing stunting during the complementary feeding period is improving the quality of children's diets. Evidence suggests that greater dietary diversity (25–28) and the consumption of foods from animal sources are associated with improved linear growth (22, 29). While these solutions have not been tried as standalone large-scale programmatic interventions, assessments of nutrition-sensitive agriculture recognize dietary diversification and income generation through family farming as likely pathways through which agriculture and food systems could improve nutrition and reduce stunting. Recent analyses suggest that households that can afford diversified diets, including fortified complementary foods, experience improved nutrient intakes and reduced stunting (11).¹

Thirdly, because stunting results from several household, environmental, socioeconomic and cultural factors, reduction of stunting requires that direct nutrition interventions are integrated and implemented in tandem with nutrition-sensitive interventions. For example, prevention of infections requires household practices such as hand-washing with soap, the success of which depends on behaviour change to adopt the practice (culture), the availability of safe water (water supply), and the affordability of soap (socioeconomic status) (30, 31). Similarly, the availability of high-quality foods (food supply) and affordability of nutrient-rich foods (socioeconomic status) will affect a family's ability to provide a healthy diet and prevent child stunting.

Finally, at the programme level, specific contextual factors should be taken into account, in order to determine the right mix of nutrition-specific and nutrition-sensitive interventions that are most likely to succeed. Important contextual factors include the magnitude of the stunting burden, household wealth, complexity of food value chains and systems' capacity for service delivery (32).

Boxes 1–4 summarize experiences from four countries suggesting that equity-driven nutrition-sensitive programmes that have the ability to improve vulnerable populations' access to and utilization of services achieve high reductions in the national average prevalence of stunting. Such programmes also close gaps between the wealthier and poorer population segments. Political commitment, multisectoral collaboration, integrated service delivery and community involvement in programme activities are all common elements that contributed to success.



¹ The safety of complementary foods is also an important intervention area for preventing microbial contamination due to poor hygiene and mycotoxicity from poor food handling and storage. For the latter, stunting has been linked with the ingestion of aflatoxin-contaminated cereals and nuts, which contribute to stunting through suppression of the immune system (increasing risk of infection) and interference with micronutrient metabolism in the liver.

BOX 1: PROGRESS ON REDUCING CHILD UNDERNUTRITION IN BRAZIL

In the last three decades, Brazil has made significant progress in socioeconomic development, with marked improvements in the living conditions and health status of its population, including a substantial decline in child undernutrition. The number of Brazilians living on less than US\$ 1.25 per day dropped from 25.6% to 4.8% between 1990 and 2008. Stunting among children aged under 5 years also dropped from 37.1% in 1974 to 7.1% in 2007 (33, 34). Undernutrition among children aged between 1 and 2 years fell from 20% to 5% (34), and less than 2% of children currently suffer from wasting (33, 34). Five key factors have contributed to Brazil's successes in combating malnutrition:

- improvements in the purchasing power of families through increases in the minimum wage and expansion of cash-transfer programmes;
- a rise in the rates of female education;
- improvements and expansion of maternal and child health services;
- expansion of water and sanitation systems;
- improvements in the quality and quantity of food produced by small family farms.

Brazil's success was also driven by political leadership, effective decentralization, active civil society involvement and conditional and targeted funding. Not only has the Government of Brazil demonstrated strong political will to combat malnutrition, it has also invested strategically in policies and programmes to improve access to social services. WHO micronutrient supplement providing one RNI (recommended nutrient intake) of micronutrients daily (including 27 mg iron), whether or not they receive fortified rations. Iron and folic acid supplements, when already provided, should be continued.

BOX 2: PROGRESS ON REDUCING CHILD UNDERNUTRITION IN PERU

In Peru, CRECER ("grow") – the National Strategy against Child Malnutrition – had an initial target of 9% reduction in stunting between 2005 and 2011 (35). Under the Prime Minister's leadership, the strategy was implemented at national, regional and district levels and involved various sectors, including health, education, water and sanitation, housing, agriculture and nongovernmental partners. An associated programme, JUNTOS ("together"), is a conditional cash-transfer programme targeting the poorest municipalities, with the aim of improving resources at the household level, educational opportunities and the utilization of health and nutrition services. Stunting among children aged under 5 years dropped from 22.9% in 2005 to 17.9% in 2010. Improvements in poor rural areas were larger than the national average, thanks to targeting through JUNTOS (36, 37). Following more than a decade (1995–2005) when the national average rate of stunting remained unchanged (rural prevalence of stunting stagnated at 40% while urban stunting dropped from 16% to 10%), the dramatic improvements in Peru between 2005 and 2010 highlight the positive effect of a policy reform that integrated nutrition into social-protection strategies.

BOX 3: PROGRESS ON REDUCING CHILD UNDERNUTRITION IN THE PLURINATIONAL STATE OF BOLIVIA

Zero Undernutrition in the Plurinational State of Bolivia is a joint programming model involving multiple sectors at national, regional and municipal levels (38). In order to eradicate undernutrition below the age of 2 years, the programme integrates the promotion of exclusive breastfeeding in the first 6 months and the use of fortified complementary foods from 6 to 23 months, in interventions to improve food and nutrition security and access to clean water, sanitation, education, health care and nutrition services. Zero Undernutrition supports sustainable family farming, including raising guinea pigs and chickens and the production of staples, legumes and vegetables. Participating families were encouraged to consume their own produce and to apply "10 keys to safer foods and healthy diets" (39). After 8 months of programme implementation, a survey in 24 food-insecure municipalities found that, in 80% of families, children aged under 5 years consumed one or more family farm products daily (40). An independent evaluation documented a promising trend of sustained yearly decline (2008 to 2011) in stunting among children aged under 2 years (from 18.5% to 13.5%) (41).

BOX 4: PROGRESS ON REDUCING CHILD UNDERNUTRITION IN THE INDIAN STATE OF MAHARASHTRA

India is the country with the largest number of stunted children aged under 5 years – about 61.7 million (4). However, Maharashtra, a state in western India, was able to successfully reduce stunting rates in children aged under 2 years, from 44% in 2005 to 22.8% in 2012. Maharashtra's success is based on a whole-of-government approach launched in 2005: the Rajmata Jijau Mother–Child Health and Nutrition Mission. This is a technical, advisory and training body with a three-part mission: to advocate for the importance of the first 1000 days, to provide policy advice to the government on evidence-based interventions, and to act as a platform to foster convergence among different departments, with a common objective of reducing malnutrition. The mission built sustainability by promoting community-led and community-managed programmes. It also promoted behaviour change through the use of technology and media, as well as traditional media such as printed educational material and word of mouth. Moreover, the Mission encouraged additional data collection to measure progress and reveal gaps.

As illustrated by these examples, multisectoral approaches are required to effectively address stunting. For example, education policies that keep girls in school throughout adolescence may also have an impact on delaying marriage and childbearing and are associated with positive economic and health outcomes. Similarly, laws curtailing the marketing of breast-milk substitutes, and labour laws that provide maternity protection in support of exclusive and continued breastfeeding, including in the workplace, can improve the health of the mother and her children. Additionally, agriculture and food policies and innovations designed to improve household food security, food diversity and food safety can also help contribute to the reduction of stunting.

ACTIONS TO DRIVE PROGRESS IN REDUCING STUNTING

In order to achieve the global stunting target for 2025, countries should begin with a situation analysis to determine how many children aged under 5 years are stunted and assess the determinants of stunting in specific geographical and social contexts, so that actions are tailored to address contextual needs. A deliberate equity-driven policy targeting the most vulnerable populations is an effective strategy for reducing national stunting averages.

The following evidence-informed recommendations should be implemented at scale, in order to achieve progress on stunting reduction in accordance with the World Health Assembly target.

1. Improve the identification, measurement and understanding of stunting and scale up coverage of stunting-prevention activities.

- Develop national stunting targets that are in line with, and will contribute to, the achievement of the global World Health Assembly targets (2, 42).
- Strengthen methods to accurately assess the burden of stunting, in order to effectively plan, design and monitor programmes.

- Incorporate linear growth assessment into routine child health services, to provide critical, real-time information for target setting and progress monitoring.

- Integrate nutrition in health-promotion strategies and strengthen service-delivery capacity in primary health systems and community-based care for prevention of stunting and acute malnutrition, supported by social protection programmes where feasible.

- Promote a holistic view of malnutrition through the understanding that stunting, wasting and micronutrient deficiencies can occur in the same child, family and community, and ensure services for undernutrition are implemented in a more cohesive fashion.

2. Enact policies and/or strengthen interventions to improve maternal nutrition and health, beginning with adolescent girls.

- Implement programmes that deliver weekly iron and folate supplementation, as well as the prevention and treatment of infections and nutrient supplementation during pregnancy.

- Enact labour policies, including maternity protection, in support of exclusive and continued breastfeeding.

- Apply regulatory instruments such as the *Code of marketing of breast-milk substitutes (43)* and food safety regulations in compliance with the *Codex Alimentarius (44)*, to protect infant and young child nutrition.

3. Implement interventions for improved exclusive breastfeeding and complementary feeding practices.

- Protect and promote exclusive breastfeeding in the first 6 months, to provide “secure” nutrition and protect infants from gastrointestinal infections.

- Promote consumption of healthy, diversified diets, including high-quality, nutrient-rich foods¹ in the complementary feeding period (6–23 months).

- Improve micronutrient intake through food fortification, including of complementary foods, and use of supplements when and where needed.

- Foster safe food-storage and handling practices, to avoid infections from microbial contamination and mycotoxins.

4. Strengthen community-based interventions, including improved water, sanitation and hygiene (WASH), to protect children from diarrhoeal diseases and malaria, intestinal worms and environmental causes of subclinical infection.



¹ Animal-source foods are the best sources of high-quality nutrients. In vegetarian diets where cereals and legumes are the main sources protein, nutrient supplements or fortified foods can fill gaps.

ADDITIONAL RESOURCES

Scaling Up Nutrition Movement	<p>Scaling up nutrition in practice: effectively engaging multiple stakeholders. SUN; 2014 (http://scalingupnutrition.org/wp-content/uploads/2014/03/Sun-in-Practice-issue-1.pdf, accessed 6 October 2014) (45).</p> <p>SUN Movement Strategy – 2012 to 2015. SUN; 2012 (http://scalingupnutrition.org/wp-content/uploads/2012/10/SUN-MOVEMENT-STRATEGY-ENG.pdf, accessed 6 October 2014) (46).</p>
Landscape analysis	<p>World Health Organization. Landscape analysis on countries' readiness to accelerate action in nutrition (http://www.who.int/nutrition/landscape_analysis/en/, accessed 6 October 2014) (47).</p>
Mainstreaming Nutrition Initiative	<p>Highlights importance of high-level political attention but also of strengthening the design of interventions and delivery systems, defining targets and giving focus to implementation of nutrition programmes (48).</p>
Lancet series 2008; 2013	<p>These series identify effective actions, costing, and policy and programmatic considerations for addressing maternal and child malnutrition (49, 50).</p>
WHO colloquium on stunting reduction	<p>Childhood stunting: challenges and opportunities. Report of a colloquium. Geneva: World Health Organization; 2014 (http://apps.who.int/iris/bitstream/10665/107026/1/WHO_NMH_NHD_GRS_14.1_eng.pdf?ua=1, accessed 21 October 2014).</p> <p>Horizontal and vertical coherence requires mutually reinforcing processes to foster grassroots participation, subnational-level service delivery and national coordination (51).</p>
Global nutrition policy review	<p>Global nutrition policy review. What does it take to scale up nutrition action? Geneva: World Health Organization; 2013 (http://www.who.int/nutrition/publications/policies/global_nut_policyreview/en/, accessed 21 October 2014).</p> <p>This review provides an overview of the status of nutrition policies and programmes, especially what it takes to scale up nutrition action (52).</p>
Issue 40 of SCN News	<p>Changing food systems for better nutrition. SCN News 2013;40 (http://www.unscn.org/files/Publications/SCN_News/SCNNEWS40_final_standard_res.pdf, accessed 21 October 2014).</p> <p>Papers reflecting on how to change food systems for better nutrition, with examples of countries and cities that are integrating agriculture and nutrition (53).</p>
State of food and agriculture 2013	<p>The state of food and agriculture 2013. Rome: Food and Agriculture Organization of the United Nations; 2013 (http://www.fao.org/docrep/018/i3300e/i3300e.pdf, accessed 6 October 2014).</p> <p>This report provides a very good analysis of nutrition problems by level of development of countries, as well as of food value chains by level of development (54).</p>
World Bank	<p>Horton S, Shekar M, McDonald C, Mahal A, Brooks JK. Scaling up nutrition – what will it cost? New York: World Bank; 2010 (http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/Peer-Reviewed-Publications/ScalingUpNutrition.pdf, accessed 6 October 2014) (55).</p> <p>Improving nutrition through multisectoral approaches. New York: World Bank; 2013 (http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/02/05/000356161_20130205130807/Rendered/PDF/751020WP0Impro00Box374299B00PUBLIC0.pdf, accessed 6 October 2014) (56).</p>
IDS – Fighting Maternal and Child Malnutrition	<p>Acosta AM, Fanzo J. Fighting maternal and child malnutrition. Analysing the political and institutional determinants of delivering a national multisectoral response in six countries. Institute of Development Studies; 2012 (https://www.ids.ac.uk/files/dmfile/DFID_ANG_Synthesis_April2012.pdf, accessed 6 October 2014).</p> <p>This report analyses the political and institution determinants of delivering a national multisectoral response in six countries – 2012 (57).</p>

WORLD HEALTH ORGANIZATION NUTRITION TRACKING TOOL

To assist countries in setting national targets to achieve the global goals – and tracking their progress toward them – WHO's Department of Nutrition for Health and Development and partners have developed a web-based tracking tool that allows users to explore different scenarios to achieve the rates of progress required to meet the 2025 targets. The tool can be accessed at www.who.int/nutrition/trackingtool (42).

ACKNOWLEDGMENTS

This work was developed and coordinated by Dr Adelheid W. Onyango, Growth Assessment and Surveillance Unit, Department of Nutrition for Health and Development, World Health Organization (WHO). The WHO would like to acknowledge contributions from the following individuals (in alphabetical order): Dr Elaine Borghi, Dr Carmen Casanovas and Dr Mercedes de Onis. WHO would also like to thank 1,000 Days for their technical support, especially Rebecca Olson.

FINANCIAL SUPPORT

WHO would like to thank the Micronutrient Initiative and the Bill & Melinda Gates Foundation for providing financial support for this work.

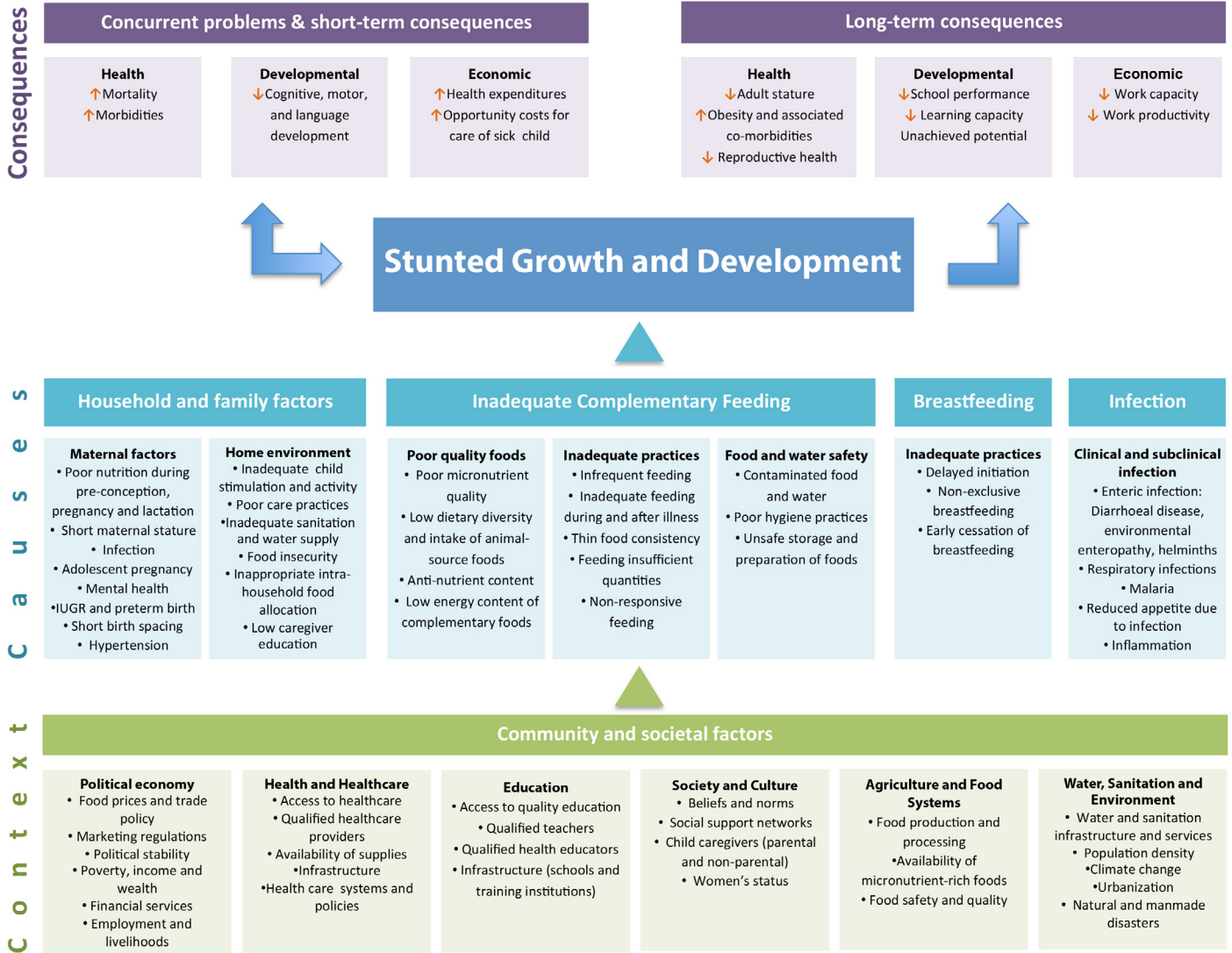
SUGGESTED CITATION

WHO. Global nutrition targets 2025: stunting policy brief (WHO/NMH/NHD/14.3). Geneva: World Health Organization; 2014.



1. Resolution WHA65.6. Comprehensive implementation plan on maternal, infant and young child nutrition. In: Sixty-fifth World Health Assembly Geneva, 21–26 May 2012. Resolutions and decisions, annexes. Geneva: World Health Organization; 2012:12–13 (http://www.who.int/nutrition/topics/WHA65.6_resolution_en.pdf?ua=1, accessed 6 October 2014).
2. World Health Organization. Global targets 2025. To improve maternal, infant and young child nutrition (www.who.int/nutrition/topics/nutrition_globaltargets2025/en/, accessed 6 October 2014).
3. WHO child growth standards and the identification of severe acute malnutrition in infants and children. A joint statement. Geneva: World Health Organization; 2009 (http://apps.who.int/iris/bitstream/10665/44129/1/9789241598163_eng.pdf, accessed 19 November 2014).
4. The state of the world's children 2013. Children with disabilities. New York: United Nations Children's Fund; 2013 (<http://www.unicef.org.uk/Documents/Publication-pdfs/sowc-2013-children-with-disabilities.pdf>, accessed 21 October 2014).
5. Walker SP, Chang SM, Powell CA, Simonoff E, Grantham-McGregor SM. Early childhood stunting is associated with poor psychological functioning in late adolescence and effects are reduced by psychosocial stimulation. *J Nutr.* 2007;137:2464–9.
6. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al.; the Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet* 2013;371:243–60. doi:10.1016/S0140-6736(13)60937-X.
7. Martorell R, Horta BL, Adair LS, Stein AD, Richter L, Fall CH et al. Weight gain in the first two years of life is an important predictor of schooling outcomes in pooled analyses from five birth cohorts from low- and middle-income countries. *J Nutr.* 2010;140:348–54. doi:10.3945/jn.109.112300.
8. Adair LS, Fall CHD, Osmond C, Stein AD, Martorell R, Ramirez-Zea M et al.; COHORTS Group. Associations of linear growth and relative weight gain during early life with adult health and human capital in countries of low and middle income: findings from five birth cohort studies. *Lancet.* 2013;382:525–34. doi:10.1016/S0140-6736(13)60103-8.
9. Hoddinott J, Alderman H, Behrman JR, Haddad L, Horton S. The economic rationale for investing in stunting reduction. *Matern Child Nutr.* 2013;9(Suppl. 2):69–82. doi:10.1111/mcn.12080.
10. Hoddinott J, Maluccio JA, Behrman JR, Flores R, Martorell R. Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. *Lancet.* 2008;371:411–16. doi:10.1016/S0140-6736(08)60205-6.
11. Repositioning nutrition as central to development: a strategy for large-scale action. Washington DC: The World Bank; 2006 (<http://siteresources.worldbank.org/NUTRITION/Resources/281846-1131636806329/NutritionStrategy.pdf>, accessed 21 October 2014).
12. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B; International Child Development Steering Group. Developmental potential in the first 5 years for children in developing countries. *Lancet.* 2007;369:60–70.
13. Bloem M. Preventing stunting: why it matters, what it takes. In: Eggersdorfer M, Kraemer K, Ruel M, Biesalski HK, Bloem M et al., editors. The road to good nutrition. Basel: Karger; 2013:13–24 (http://www.karger.com/ProdukteDB/Katalogteile/isbn3_318/_025/_49/road_04.pdf, accessed 21 October 2014).
14. Özaltın E, Hill K, Subramanian SV. Association of maternal stature with offspring mortality, underweight, and stunting in low- to middle-income countries. *JAMA.* 2010;303(15):1507–16. doi:10.1001/jama.2010.450.
15. Prendergast AJ, Rukobo S, Chasekwa B, Mutasa K, Ntozini R, Mbuya MNN et al. Stunting is characterized by chronic inflammation in Zimbabwean infants. *PLoS One.* 2014;9(2):e86928. doi:10.1371/journal.pone.0086928.
16. WHO Multicentre Growth Reference Study Group. WHO child growth standards. Length, height-for-age, weight-for-age, weight-for-length and body mass index-for age. Methods and development. Geneva: World Health Organization; 2006 (http://www.who.int/childgrowth/standards/Technical_report.pdf, accessed 20 October 2014).
17. Victora CG, de Onis M, Hallal PC, Blössner M, Shrimpton R. Worldwide timing of growth faltering: revisiting implications for interventions using the World Health Organization growth standards. *Pediatrics.* 2010;125:e473–80. doi:10.1542/peds.2009-1519.
18. Kramer MS, Kakuma R. Optimal duration of exclusive breastfeeding. *Cochrane Database Syst Rev.* 2012;(8):CD003517. doi:10.1002/14651858.CD003517.pub2.
19. Espo M, Kulmala T, Maleta K, Cullinan T, Salin M-L, Ashorn P. Determinants of linear growth and predictors of severe stunting in rural Malawi. *Acta Paed.* 2002;91:1364–70.
20. Kerr RB, Berti PR, Chirwa M. Breastfeeding and mixed feeding practices in Malawi: timing, reasons, decision makers, and child health consequences. *Food Nutr Bull.* 2007;28:90–9.
21. Saha KK, Frongillo EA, Alam DS, Arifeen SE, Persson LÅ, Rasmussen KM. Appropriate infant feeding practices result in better growth of infants and young children in rural Bangladesh. *Am J Clin Nutr.* 2008;87:1852–9.
22. Marquis GS, Habicht J-P, Lanata CF, Black RE, Rasmussen KM. Breast milk or animal-product foods improve linear growth of Peruvian toddlers consuming marginal diets. *Am J Clin Nutr.* 1997;66:1102–9.
23. Onyango AW, Receveur O, Esrey SA. The contribution of breast milk to toddler diets in western Kenya. *Bull World Health Organ.* 2002;80:292–9.
24. Krebs NF, Mazariegos M, Tshefu A, Bose C, Sami N, Chomba E et al.; Complementary Feeding Study Group. Meat consumption is associated with less stunting among toddlers in four diverse low-income settings. *Food Nutr Bull.* 2011;32:185–91.
25. Arimond M, Ruel MT. Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys. *J Nutr.* 2004;134:2579–85.
26. Ruel MT, Menon P. Child feeding practices are associated with child nutritional status in Latin America: innovative uses of the demographic and health surveys. *J Nutr.* 2002;132:1180–7.
27. Steyn NP, Nel JH, Nantel G, Kennedy G, Labadarios D. Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy? *Public Health Nutr.* 2006;9:644–50.
28. Onyango AW, Borghi E, de Onis M, Casanovas MD, Garza C. Complementary feeding and attained linear growth among 6–23-month-old children. *Public Health Nutr.* 2013;19:1–9. doi:10.1017/S1368980013002401.
29. Dror DK, Allen LH. The importance of milk and other animal-source foods for children in low-income countries. *Food Nutr Bull.* 2011;32:227–43.
30. Dewey KG, Adu-Afarwah S. Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. *Matern Child Nutr.* 2008;4:24–85. doi:10.1111/j.1740-8709.2007.00124.x.
31. Fink G, Gunther I, Hill K. The effect of water and sanitation on child health: evidence from the demographic and health surveys 1986–2007. *Int J Epidemiol.* 2011;40:1196–204. doi:10.1093/ije/dyr102.
32. FAO, IFAD, WFP. The state of food insecurity in the world 2013. The multiple dimension of food security. Rome: Food and Agriculture Organization of the United Nations; 2013 (<http://www.fao.org/docrep/018/i3434e/i3434e.pdf>, accessed 21 October 2014).
33. Monteiro CA, D'Aquino Benicio MH, Conde WL, Konno S, Lovadino AL, Barros AJD et al. Narrowing socioeconomic inequality in child stunting: the Brazilian experience, 1974–2007. *Bull World Health Organ.* 2010;88:305–11. doi:10.2471/BLT.09.069195.

34. Acosta AM. Examining the political, institutional and governance aspects of delivering a national multi-sectoral response to reduce maternal and child malnutrition. Analysing nutrition governance: Brazil country report. Brighton: Institute of Development Studies; 2011 (http://www.ids.ac.uk/files/dmfile/DFID_ANG_Brazil_Report_Final.pdf, accessed 21 October 2014).
35. Lutter C, Casanovas C, Pena M, Diaz A. Landscape analysis on countries' readiness to accelerate action to reduce maternal and child undernutrition: the Peru assessment. SCN News. 2009;37:49–54 (<http://www.bvsde.paho.org/texcom/nutricion/scnnews49.pdf>, accessed 21 October 2014).
36. Mejia AA. Analysing success in the fight against malnutrition in Peru. Brighton: Institute of Development Studies; 2011 (<http://www.ids.ac.uk/files/dmfile/Wp367.pdf>, accessed 21 October 2014).
37. Chaparro MP, Estrada L. Mapping the nutrition transition in Peru: evidence for decentralized nutrition policies. Rev Panam Salud Publica. 2012;32(3):241–4.
38. Ministerio de Salud y Deportes, Estado Plurinacional de Bolivia. Plan estratégico 2007–2011 del Programa Multisectorial de Desnutrición Cero. La Paz: Ministerio de Salud y Deportes; 2009.
39. Five keys to safer food manual. Geneva: World Health Organization, 2006 (http://www.who.int/foodsafety/publications/consumer/manual_keys.pdf, accessed 21 October 2014).
40. Comité Técnico del Consejo Nacional de Alimentación y Nutrición. Programa Multisectorial Desnutrición Cero. Informe anual gestión 2010. Estado Plurinacional de Bolivia; 2010.
41. Laforce J, Silva E. Informe de Evaluación del programa Desnutrición Cero. Número de Proyecto ACDI: A033957. Douala: CAC International; 2013 (<http://www.uascc.bo/archivos/pmdc/1-PMDC%20Informe%20final%202013-03-20.pdf>, accessed 21 October 2014).
42. World Health Organization. Global targets tracking tool (<http://www.who.int/nutrition/trackingtool>, accessed 6 October 2014).
43. International code of marketing of breast milk substitutes. Geneva: World Health Organization; 1981 (http://www.who.int/nutrition/publications/code_english.pdf, accessed 6 October 2014).
44. World Health Organization, Food and Agriculture Organization of the United Nations. Codex alimentarius. International food standards (<http://www.codexalimentarius.org/standards/en/>, accessed 6 October 2014).
45. Scaling up nutrition in practice: effectively engaging multiple stakeholders. SUN; 2014. (<http://scalingupnutrition.org/wp-content/uploads/2014/03/Sun-in-Practice-issue-1.pdf>, accessed 6 October 2014).
46. SUN Movement Strategy – 2012 to 2015. SUN; 2012 (<http://scalingupnutrition.org/wp-content/uploads/2012/10/SUN-MOVEMENT-STRATEGY-ENG.pdf>, accessed 6 October 2014).
47. World Health Organization. Landscape analysis on countries' readiness to accelerate action in nutrition (http://www.who.int/nutrition/landscape_analysis/en/, accessed 21 October 2014).
48. Pelletier DL, Frongillo EA, Gervais S, Hoey L, Menon P, Ngo T et al. Nutrition agenda setting, policy formulation and implementation: lessons from the Mainstreaming Nutrition Initiative. Health Policy Plan 2012;27:19–31. doi:10.1093/heapol/czr011.
49. Maternal and child undernutrition. Lancet. 2008 (<http://www.thelancet.com/series/maternal-and-child-undernutrition>, accessed 6 October 2014).
50. Maternal and child nutrition. Lancet. 2013 (<http://www.thelancet.com/series/maternal-and-child-nutrition>, accessed 6 October 2014).
51. Childhood stunting: challenges and opportunities. Report colloquium. Geneva: World Health Organization; 2014 (http://apps.who.int/iris/bitstream/10665/107026/1/WHO_NMH_NHD_GRS_14.1_eng.pdf?ua=1, accessed 21 October 2014).
52. Global nutrition policy review. What does it take to scale up nutrition action? Geneva: World Health Organization; 2013 (http://www.who.int/nutrition/publications/policies/global_nut_policyreview/en/, accessed 21 October 2014).
53. Changing food systems for better nutrition. SCN News 2013;40 (http://www.unscn.org/files/Publications/SCN_News/SCNNEWS40_final_standard_res.pdf, accessed 21 October 2014).
54. The state of food and agriculture 2013. Rome: Food and Agriculture Organization of the United Nations; 2013 (<http://www.fao.org/docrep/018/i3300e/i3300e.pdf>, accessed 6 October 2014).
55. Horton S, Shekar M, McDonald C, Mahal A, Brooks JK. Scaling up nutrition – what will it cost? New York: World Bank; 2010 (<http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/Peer-Reviewed-Publications/ScalingUpNutrition.pdf>, accessed 6 October 2014).
56. Improving nutrition through multisectoral approaches. New York: World Bank; 2013 (http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/02/05/000356161_20130205130807/Rendered/PDF/751020WP0Impro00Box374299B00PUBLIC0.pdf, accessed 6 October 2014).
57. Acosta AM, Fanzo J. Fighting maternal and child malnutrition. Analysing the political and institutional determinants of delivering a national multi-sectoral response in six countries. Institute of Development Studies; 2012 (https://www.ids.ac.uk/files/dmfile/DFID_ANG_Synthesis_April2012.pdf, accessed 6 October 2014).



WHO/Anna Kari

For more information, please contact:

Department of Nutrition for Health and Development

World Health Organization

Avenue Appia 20, CH-1211 Geneva 27, Switzerland

Fax: +41 22 791 4156

Email: nutrition@who.int

www.who.int/nutrition

