

# Summary of Lancet Series on Maternal and Child Undernutrition

Below are short summaries of the recently launched Lancet series of papers on Maternal and Child Undernutrition<sup>1</sup>. This high profile series focuses on the disease burden attributable to undernutrition and the interventions aimed at addressing the problem by strengthening household food availability and use, maternal and child care and control of infectious diseases. Although this series mainly deals with nutritional issues in stable contexts, it is nonetheless a critically important (as well as much criticised) body of work that provides a comprehensive update and snapshot on the state of nutrition globally. Furthermore, while the ENN and Field Exchange are mandated to focus on emergency nutrition, it is recognised both by the editorial team (and almost certainly by our readers) that the distinction between emergencies and stable contexts is often ambiguous and at times quite arbitrary. Clearly, many of the findings in the LANCET series have relevance to emergency contexts. A number of our readers approached us to provide comment on the series, considering the ENN and Field Exchange as good fora for this type of exchange and these are included in the Letters section (Ed).

## Global and regional exposures and health consequences (Paper 1)

The first Lancet paper<sup>2</sup> presents new analyses to estimate the effects of the risks related to measures of malnutrition, as well as to suboptimal breastfeeding practices, on mortality and disease. The authors estimate that stunting, severe wasting, and intrauterine growth restriction together were responsible for 2.2 million deaths and 21% of disability-adjusted life years (DALYs) for children younger than 5 years.

Deficiencies of vitamin A and zinc were estimated to be responsible for 0.6 million and 0.4 million deaths, respectively, and a combined 9% of global childhood DALYs. Iron and iodine deficiencies resulted in few child deaths and combined were responsible for about 0.2% of global childhood DALYs. Iron deficiency as a risk factor for maternal mortality added 115,000 deaths and 0.4% of global total DALYs. Suboptimal breastfeeding was estimated to be responsible for 1.4 million child deaths and 44 million DALYs (10% of DALYs in children under five years).

In an analysis that accounted for co-exposure of these nutrition-related factors, they were together responsible for about 35% of child deaths and 11% of total global disease burden. The high mortality and disease burden resulting from these nutrition-related factors make a compelling case for the urgent implementation of interventions to reduce their occurrence or ameliorate their consequences.

Key related research needs identified by the authors include;

- Prevalence of deficiencies of vitamin A, zinc, iron and iodine in sub-national populations.
- Consequences of nutritional deficiencies for mortality from HIV/AIDS, malaria, and other important infectious diseases.
- Consequences of nutritional deficiencies for immune competence, brain development, cognitive ability and other possible effects.
- Overlap of micronutrients and their joint effects on mortality and morbidity.
- Development of international foetal and newborn growth standards.

## Consequences for adult health and human capital (Paper 2)

The second paper<sup>3</sup> in the Lancet series deals with the potential long-term implications of undernutrition. The paper reviews the association between maternal and child undernutrition and human capital and risk of adult diseases in low-income and middle income countries. Data are analysed from five longstanding prospective cohort studies from Brazil, Guatemala, India, the Philippines and South Africa.

The analysis found that indices of maternal and child undernutrition (maternal height, birth weight, intrauterine growth restriction, and weight, height and body mass index (BMI) at 2 years according to the new WHO growth standards) were related to adult outcomes (height, schooling, income or assets, offspring birth weight, BMI, glucose concentrations, blood pressure). Systematic review of studies from low and middle income countries for these outcomes and for indicators related to blood lipids, cardiovascular disease, lung and immune function, cancers, osteoporosis, and mental illness was undertaken. It was found that undernutrition was strongly associated, both in the review of published work and in new analyses, with shorter adult height, less schooling, reduced economic productivity and for women, lower offspring birth weight. Associations with adult disease indicators were not so clear-cut. Increased size at birth and in childhood were positively associated with adult BMI and to a lesser extent with blood pressure values, but not with blood glucose concentrations.

In the new analysis and in published work, lower birth weight and undernutrition in childhood were risk factors for high glucose concentrations, blood pressure and harmful lipid profiles, once adult BMI and height were adjusted for. This suggests that rapid postnatal weight gain, especially after infancy, is linked to these conditions.

The review of published works indicated that there is insufficient information about long term changes in immune function, blood lipids or osteoporosis indicators. Birth weight is positively associated with lung function and with the incidence of some cancers, and undernutrition could be associated with mental illness.

The reviewers also noted that height-for-age at 2 years was the best predictor of human capital and that undernutrition is associated with lower human capital. The authors concluded that damage suffered in early life leads to permanent impairment, and might also affect future generations. Its prevention will probably bring about important health, education and economic benefits. Also, chronic diseases are especially common in undernourished children who experience rapid weight gain after infancy.

A number of areas for future research were highlighted:

- Association between rapid weight and length gain at different age intervals in infancy and childhood with human capital and outcomes related to chronic disease, to define the age after which rapid growth should be avoided.
- Long term effects of weight gain in late childhood stratified in previously stunted and non-stunted children, and for children with and without intrauterine growth restriction.
- Long term effects of micronutrient deficiencies in childhood.
- Association between undernutrition and longterm changes in immune function blood lipids, osteoporosis, and mental illness.
- Improved quantification of the economic effect of undernutrition on adult productivity.
- Interactions between genes and environmental factors in long term outcomes.

## Interventions for maternal and child undernutrition and survival (Paper 3)

In the third paper of the Lancet series<sup>4</sup>, the authors review interventions that affect maternal and child undernutrition and nutrition related outcomes. These interventions included promotion of breastfeeding, strategies to promote complementary feeding, with or without provision of food supplements, micronutrient interventions, general supportive strategies to improve family and community nutrition and reduction of disease burden (promotion of handwashing and strategies to reduce the burden of malaria in pregnancy).

The authors showed that although strategies for breastfeeding promotion have a large effect on survival and are deemed an essential intervention for infants younger than 5.9 months across all populations, the effect of breastfeeding strategies on stunting was small.

In populations with sufficient food, education about complementary feeding increased height-for-age Z score



Mother with her 2 hour old baby, weighing 1.7kg, in Tillaberg, Niger

WFP/Stephanie Savanaud, Niger, 2005

by 0.25 (95% CI 0.01-0.49). However, provision of food supplements (with or without education) in populations with insufficient food increased the height-for-age Z score by 0.41 (0.05-0.76). The authors consider complementary feeding counselling and support strategies in food insecure populations could substantially reduce the burden of stunting and related disease.

Management of severe acute malnutrition according to WHO guidelines reduced the case-fatality rate by 55% (risk ratio 0.45, 0.32- 0.62). Recent studies suggest that newer commodities, such as ready-to-use therapeutic foods, can be used to manage severe acute malnutrition in community settings.

Effective micronutrient interventions for pregnant women included supplementation with iron folate (which increased haemoglobin at term by 12g/L, 2.93-21.07) and micronutrients (which reduced the risk of low birth-weight at term by 16% (relative risk 0.84, 0.74-0.95). Recommended micronutrient interventions for children included strategies for supplementation of vitamin A (in the neonatal period and late infancy), preventive zinc supplements, iron supplements for children in areas where malaria is not endemic and universal promotion of iodised salt.

The authors used a cohort model to assess the potential effect of these interventions on mothers and children in the 36 countries that have 90% of children with stunted linear growth. The model showed that existing interventions that were designed to improve nutrition and prevent related disease could reduce stunting at 36 months by 36%, mortality between birth and 36 months by about 25%, and disability-adjusted life years associated with stunting, severe wasting, intrauterine growth restriction and micronutrient deficiencies by about 25%. To eliminate stunting in the longer term, these interventions should be supplemented by improvements in the underlying determinants of under-nutrition, such as poverty, poor education, disease burden, and lack of women's empowerment.

The authors identified a number of evidence gaps:

1. The effectiveness and cost-effectiveness of nutritional interventions in national health systems need urgent assessment. Both single and packaged interventions that affect general nutrient micronutrient intake in women and children should be assessed for their effect on stunting rates and weight gain.
2. Few nutritional interventions for mothers have assessed a wide range of outcomes at sufficient scale. In particular, those with multiple micronutrients and calcium need to be assessed with long-term tracking of effect on maternal and child health.
3. Few studies of large-scale interventions for promotion of breastfeeding have assessed their effects on feeding patterns and growth outcomes beyond infancy. With the new WHO growth standards, such studies are needed to assess the effectiveness of strategies for breastfeeding promotion and appropriate complementary feeding for growth and morbidity in various age-groups.
4. There is a need for large-scale studies to verify the irreversibility of stunting in children aged 36-49 months and older.
5. Whether the adverse effects associated with stunting, e.g. cognitive impairment or risk of infection disease, can be ameliorated or reversed.
5. Although the efficacy of preventive zinc supplementation is proven, studies of the effectiveness of various zinc delivery strategies (fortification, supplementation, and biofortification) are urgently needed.
7. Since community-based preventive and treatment strategies for severe acute malnutrition have been the subject of only a few studies, robust experiments in this area should be prioritised.

## Effective action at national level (Paper 4)

Paper 4 in the Lancet series<sup>5</sup> reports on an assessment of actions addressing undernutrition in the countries with the highest burden of undernutrition, drawing on systematic reviews and best-practice reports. Seven key challenges for addressing undernutrition at national level are defined and reported on: getting nutrition on the list of priorities and keeping it there, doing the right things, not doing the wrong things, acting at scale, reaching those in need, data-based decisionmaking and building strategic and operational capacity.

The authors argue that interventions with proven effectiveness that are selected by countries should be rapidly implemented at scale. The period from pregnancy to 24 months of age is a crucial window of opportunity for reducing undernutrition and its adverse effects. Programme efforts, as well as monitoring and assessment, should focus on this segment of the continuum of care. Nutrition resources should not be used to support actions unlikely to be effective in the context of country or local realities. Nutrition resources should not be used to support actions that have not been proven to have a direct effect on undernutrition, such as stand-alone growth monitoring or school feeding programmes.

In addition to health and nutrition interventions, economic and social policies addressing poverty, trade and

agriculture that have been associated with rapid improvements in nutritional status should be implemented. There is a reservoir of important experience and expertise in individual countries about how to build commitment, develop and monitor nutrition programmes, move toward acting at scale, reform or phase-out ineffective programmes, and other challenges. This resource needs to be formalised, shared and used as the basis for setting priorities in problem-solving research for nutrition.

A number of research priorities to support national nutrition actions are suggested.

- Research on strengthening leadership and strategic capacity for advancing national nutritional agendas and actions. Positive experiences in Madagascar, Senegal, Thailand, Chile, Costa Rica and other countries have shown that leadership and strategic capacity are key ingredients for advancing the national nutrition agenda and action. Among other roles, these capacities are crucial for leveraging commitment and resources from government, international partners and the private sector. Research is needed to document the capacities, strategies and tactics present in successful countries, to guide international investments, and to facilitate the exchange of experience between developing countries learning in this important area.
- Large-scale effectiveness assessments that can expand the evidence base for strategies, and tactics to achieve high, sustained and equitable coverage with proven interventions to address undernutrition are also needed.
- Development and assessment of valid indicators and methodologies that can be used at national level and below to provide rapid feedback on progress in generating political commitment, strategies and operational capacities, coverage and effect.
- Links between nutritional status and broader initiatives, such as food for work and micro-credit initiatives, need to be substantiated and used as the basis for assessing their effect on nutrition outcomes.

## Effective international action against undernutrition (Paper 5)

The last paper in the Lancet series (Paper 5)<sup>6</sup> opens with the statement that many transnational organisations work to support efforts to eliminate maternal and child undernutrition in high-burden countries. Financial, intellectual and personal linkages bind these organisations loosely together as components of an international nutrition system. The paper then goes on to argue that such a system should deliver in four functional areas: stewardship, mobilisation of financial resources, direct provision of nutrition services at times of natural disaster or conflict and human and institutional resource strengthening.

The authors review quantitative and qualitative data from various sources to assess the performance of the system in each of these areas, and find substantial shortcomings. Fragmentation, lack of an evidence base for prioritised action, institutional inertia and failure to join up with promising developments in parallel sectors are recurrent themes. Many of these weaknesses can be attributed to systemic problems affecting most organisations working in the field and these are analysed using a problem tree approach. The authors also make recommendations to overcome some of the most important problems. They propose five priority actions for the development of a new international architecture - a new global governance structure, a more effective United Nations (UN), fewer parallel organisations but fewer mandate gaps, more investment in capacity strengthening in high-burden countries, and research leadership in areas that matter.

The authors also make a number of interesting observations and points about emergency nutrition work, including:

Emergency food aid went principally to just six countries between 2000 and 2004 - Ethiopia, Sudan, Afghanistan, Angola, Iraq and North Korea. They claim that this clearly shows a politicised distribution and that food aid allocations at the macro level have traditionally served primarily domestic agricultural interests and foreign policy objectives. They also emphasise that information on coverage of nutrition services in emergencies is difficult to obtain. The dynamic nature of emergencies, and their resulting disrupted and



A WFP shipment of 14,000 MT of rice arriving at the Iraqi port of Umm Qasr in 2003.

mobile populations, makes estimating coverage challenging, and some have questioned the ethics of doing even applied research in these environments.

The authors also suggest that assessments and reviews of nutrition actions in emergencies have largely focussed on the effect of various feeding programmes on nutrition outcomes, such as growth and micronutrients status. What is often lacking is a clear analysis of the cost-effectiveness of different interventions. This would enable recommendations on the optimum rations composition, targeting and exit criteria, and the appropriate mix of complementary activities to improve health and nutrition outcomes.

They state that one key challenge is the absence of an agency with responsibility for taking an overview of the effectiveness and cost effectiveness of different types of intervention. Nutrition in emergencies is a mix of multiple agencies, agendas, protocols, and methods. The general lack of coordination and leadership has allowed the institutional status quo to prevail. Thus, agencies that have built up expertise and mandates around certain types of intervention (or intervention design) will continue to practice these interventions in emergencies without serious examination or challenge.

Several groups - including the UN Inter- Agency Standing Committee Nutrition Cluster, the Sphere Project, SMART, ReliefWeb, and the Emergency Nutrition Network - are providing guidance on best practice in emergency settings. Building on and consolidating these experiences will generate a minimum set of operational standards and a source of much needed documentation.

On research, the authors state there is a lack of rigorous programme evaluation data on which to build strong evidence-based guidance for nutritional nutrition programmes. Market forces and institutional barriers in international research centres have conspired to distort the research agenda away from solution-oriented analysis of the problems that contribute to the greatest burden of disease and lost human potential. Improving the quality and relevance of nutrition research is a crucial part of strengthening the international nutrition system.

The authors single out the following research priorities:

- Research into the accountability and responses of governments to their nutrition relevant commitments under international conventions.
- Rigorous analysis of the linkages between nutrition outcomes and global change processes such as climate change, trade liberalisation, etc.
- Research into the quantity and effectiveness of international aid for improved nutrition.
- Evaluation and prioritisation of interventions to ensure timely and relevant emergency responses. This should include improved problem analysis, more efficient sampling methods for estimation of prevalence of severe acute malnutrition and targeting of interventions, and cost-effectiveness studies of different food commodities and therapeutic foods.
- Research on the gap between current and required manpower, training capacity and training resources, at national, regional and global levels.
- Research on best practices for designing and delivering the pre-service training, continuing education, and knowledge management system that practitioners need to address undernutrition effectively.
- Meaningful self-assessment and peerassessment of the effectiveness of individual organisations involved in designing and delivering goods, services, and ideas relevant to the elimination of maternal and child undernutrition.



North Korean dock workers bagging donated wheat - part of a 39,500 tonne shipment in 2003.

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<sup>1</sup> <http://www.globalnutritionseries.org/>

<sup>2</sup> Black et al, 2008. Maternal and Child Undernutrition 1. Maternal and child undernutrition: global and regional exposures and health consequences. Published Online January 17, 2008. DOI:10.1016/S0140-6736(07)61690-0

<sup>3</sup> Victoria et al (2008). Maternal and Child Undernutrition 2. Maternal and child undernutrition: consequences for adult health and human capital. Published Online January 17, 2008 DOI:10.1016/S0140-6736(07)61692-4



<sup>4</sup>Bhutta et al (2008). Maternal and Child Undernutrition 3. What works? Interventions for maternal and child undernutrition and survival. Published Online January 17, 2008DOI:10.1016/S0140-6736(07)61693-6

<sup>5</sup>Bryce et al (2008). Maternal and Child Undernutrition 4. Maternal and child undernutrition: effective action at national level. Published Online. January 17, 2008DOI:10.1016/S0140-6736(07)61694-8

<sup>6</sup>Morris et al (2008). Effective international action against undernutrition: why has it proven so difficult and what can be done to accelerate progress? Published Online. January 17, 2008. DOI: 10.1016/S0140-6736(07)61695-X

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<http://fex.ennonline.net/33/summary.aspx>

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