

Tackling the drivers of child undernutrition in developing countries: What works and how should interventions be designed?

Abstract

The drivers of undernutrition in developing countries are poverty and social inequities. This paper presents the findings from a structured literature review of 58 controlled evaluations and studies in developing countries to assess what works and why in nutrition programming to address these drivers. The evaluations and studies were selected because they are methodologically sound, recent (reported within the last ten years), report on nutritional status, cover a wide range of interventions and are implemented by a range of different agencies. The findings showed that there are a range of indirect interventions that can reduce child undernutrition but for all these interventions context is all-important. It argues that efforts should now be directed more towards improving implementation at scale and provides a detailed discussion and analysis of the constraints to implementing and assessing effective programmes at the macro (national and global) meso (local government/district) and micro (individual/family/household) levels and how these constraints can be addressed. Finally, the paper presents a detailed menu of areas for further research defining a range of questions that need to be explored.

Introduction

Access to adequate food and nutrition is a basic human right and yet the global burden of child undernutrition is high driven by poverty and social inequities. The problem needs to be addressed urgently because the food, fuel and financial crises, coming together on top of climate changes, are threatening the livelihoods of millions of people in developing countries. Governments also need to pay more attention to nutrition because it is a crucial input for achieving the Millennium Development Goals to reduce poverty and because nutrition is now recognised to be a governance issue (WHO 2008).

The series of articles on Maternal and Child Undernutrition published in the Lancet in 2008 defined the extent of child undernutrition and showed that the consequences are long-term, irreversible and impact human capital development. They also found that the problem is of low national priority in nearly all high burden countries and that there are cost-effective, direct interventions (e.g. vitamin A and zinc supplementation for children, and multiple micronutrient supplementation for pregnant women) but these are not being implemented at scale. (Black et al., 2008; Vitoria et al., 2008; Bhutta et al., 2008; Bryce et al., 2008)

However, these articles did not go far enough in addressing the underlying and basic causes of child undernutrition and there have since been calls for a review of the available evidence on how to address these causes (Ruel, 2008). This paper responds to these calls by reviewing evidence from a structured review of 58 controlled evaluations and studies (surveys, reviews etc) of nutrition programmes that addressed child undernutrition indirectly and have been selected because they are methodologically sound, reported within the last ten years, have reported on nutritional status and cover a wide range of interventions implemented by a range of different agencies. Methodological details and outcomes were extracted by the two authors of this Study who independently assessed the quality of the papers. (Full details of the search strategy, the criteria for selecting the studies and evaluations and the framework for analysis are available from the authors.)

Drawing on the findings from the literature review this paper goes on to provide a detailed discussion and analysis of the constraints to implementing and assessing effective programmes at the macro (national and global) meso (local government/district) and micro (individual/family/household) levels and how these constraints can be addressed. Finally, the paper presents a detailed menu of areas for further research defining a range of questions that need to be explored.

Evidence for the effectiveness of indirect interventions

The conceptual framework for understanding the causes of child undernutrition, originally developed by UNICEF (1990) but is now agreed to by most stakeholders, has been used to structure the analysis and presentation of the findings. Underlying causes are lack of household

access to and use of nutritious foods, health services, water and sanitation and poor child care practices. Root causes are the structural barriers in society caused by the unfair institutional structures, political and ideological frameworks and economic structures that lead to social injustice and reduce women's status and autonomy.

Increasing household food production and nutrient consumption: Biofortification programmes to increase the micronutrient density and bioavailability of staple food crops are still at the experimental stage. The HarvestPlus initiative is playing a key role in research and development. Predictive analyses suggest biofortification could be one of the most cost-effective ways to provide micronutrients to families that are poor and do not have good access to health services (McClafferty & Russell, 2002; Nestel et al., 2006) but that it is imperative to integrate the biofortification approach into existing programs as much as possible and demonstrate on-the-ground cost-effectiveness of biofortification in comparison to alternative interventions (Potts & Nagujja, 2007). There is evidence that home gardening interventions can increase the diversity of children's diets and reduce micronutrient deficiencies (Bhattacharjee, Kumar, & Nandi, 2007) and that these programmes can lead to the empowerment of women (Bushamuka et al., 2005; World Bank & IFPRI, 2007) and have been used to integrate agriculture and primary health activities (Faber et al., 2002).

Improving the quality of care given to young children: Although maternal education to improve child-care practices has not always been shown to be effective on its own, a study in Madagascar showed that it can be effective where participatory approaches are used, networks of women's groups are supportive and the quality of the child-care services delivered is improved by training local community nutrition workers (Galasso & Umapathi, 2007). But the type of networks and other pathways that support the translation of maternal education into improved child nutrition needs to be further clarified.

A randomized controlled trial of a multidisciplinary programme in Iran also showed that maternal education can be effective child as part of broad-based multidisciplinary actions. The study showed that stunting could be significantly reduced by educating mothers about child care, growth and hygiene, strengthening women's literacy, promoting home gardening and consumption of

healthy foods, establishing co-operative stores, improving opportunities for employment and income generation and providing inputs to improve water and sanitation. (Sheikholeslam et al., 2004). These actions were implemented through non-governmental organisations (NGOs).

Increasing access to and appropriate use of adequate health services, water and sanitation: A systematic review by Lagarde, Haines and Palmer (2007) of cash transfers to disadvantaged families conditional upon carers using maternal and child care health (MCH) services found that they significantly reduced stunting in Mexico and Nicaragua where carers had access to quality services. This review endorses the findings of researchers (Gertler, 2004; Rivera et al., 2004).

However, an analysis of census data, mortality registries, the nominal registry of children and national nutrition surveys in Mexico found that these conditional cash transfer (CCT) programmes have been most successful as one in a series of cost-effective interventions taken incrementally (together with universal child immunisation, clean water programmes and vitamin A distribution) and when they have been part of comprehensive social and economic policy development strategies (Sepulveda et al., 2007).

Strengthening governance to create an enabling environment and increasing community influence over decision-making: Evidence from a quantitative analysis of country level data found that countries with higher scores on government effectiveness, political stability and rule of law have lower levels of child undernutrition (Rokx, 2006). Rokx also developed an in-depth case-study of governance in Madagascar which found that ‘voice’ can be created through building local support and creating demand for improved nutrition, and that lower levels of undernutrition can be achieved when this voice is used to increase political commitment, accountability and financing for nutrition.

There is some evidence that participatory methodologies can also be a cost-effective, and sustainable way to reduce child undernutrition. A randomised controlled trial in Nepal showed that participatory methodologies can harness the creativity, self interest, and self-organising activities of women who are poor to significantly reduce neonatal and maternal mortality through changes in home-care practices and health-care seeking (Manandhar et al., 2004). A study by

Havemann (2005) in Kenya showed that multisectoral teams from relevant line ministries formed at district and divisional levels can significantly reduce child undernutrition by strengthening the capacity of people living in poor communities to have a voice in decision-making processes and by increasing their access to basic government services. However, an extensive review and analysis of experience by Ismail et al. (2003) concluded that to be successful these methodologies need to be embedded within community-driven programmes in an enabling environment provided by policies and interventions at all levels.

Raising woman's status in society: There is strong evidence that increasing women's status can reduce child undernutrition. An analysis of Demographic and Health Survey Data in 36 countries (in South Asia, Sub-Saharan Africa, and Latin America and the Caribbean), found that increasing the status of women had a significant, positive effect on children's nutritional status in all three regions. The findings also showed that the very high rates of child undernutrition in South Asia, compared to sub-Saharan Africa, are associated with the much lower status of women in South Asia. Combined with the impact of poor sanitation, and rapid urbanization, this lower status has a strong impact on extensive range of interventions have been found to be cost-effective (Smith, Ramakrishnan et al., 2003). A more recent review of interventions that have been well evaluated and have credible evidence to show that within a short period of time women have been empowered identified four key policy options: (i) microfinance targeted to women (ii) cash transfers targeted to women conditional on girls' attendance at school (iii) the reservation of positions for women in legislative bodies and (iv) providing support for women's reproductive role (King, Klassen & Porter, 2008).

Social protection policies: An analysis of twenty case studies in Sub-Saharan Africa found that attempts to use cash transfers to strengthen social cohesion in poor communities have had varied results. They have sometimes proved to be socially divisive leading to beneficiaries losing previous support from family or community and have also fallen victim to 'elite capture'. However, there was some evidence that old-age pensions can increase the nutritional status of children. (Devereux, Ellis, & White, 2007)

Macro-economic policy reform: In China, where dramatic reductions in child undernutrition have been achieved over the past two decades, macro-economic policy reforms that have successfully stimulated economic growth, reduced poverty and addressed trade, and agriculture have been associated with rapid improvements in child nutritional status (Bryce et al., 2008). However, these reforms have been complemented by policies to support large scale implementation of effective nutrition, health, family-planning, water and sanitation and education interventions (Ruel 2008). In Thailand dramatic reductions in child undernutrition have been largely attributed to a supportive policy environment included a comprehensive nutrition policy, effective integration of nutrition within the National Economic and Social Development Plan and linkages between agriculture and nutrition for sustainability, together with successful and community-level involvement and strong monitoring and evaluation (Ruel, 2008).

Discussion

The foregoing review has presented evidence for the effectiveness of a range of indirect interventions to address the drivers of child undernutrition, which are poverty and social injustice. For all these interventions context is all-important. Efforts should now be directed more towards improving implementation.

The key challenges are *how* effective programmes can be implemented **at scale** in high burden countries and *how* these programmes can be assessed at the macro (national and global) meso (local government/district) and micro (individual /family/ household) levels. This requires gaining high level commitment to harness reliable, long term funding and ensuring that funding of the technological fixes that directly improve nutritional status does not preclude funding of the indirect interventions that are crucial for sustainable improvement. It also requires increased recognition of the link between macro-economic and social policies and child undernutrition; and the need to provide good management on the ground and effective use of information for awareness creation, monitoring, learning and evaluation. The challenge is exacerbated by impediments to effective action such as HIV/AIDS and weak infrastructure.

Key issues and challenges

Overhauling the nutrition architecture: There is a growing consensus that meeting the challenges of scaling up effective interventions will require a radical overhaul of the nutrition architecture. Any change needs to deliver stronger leadership, greater policy visibility, better coordination, clear messages, more effective technical support, significantly more financial resources and stronger linkages into country systems. A key challenge here is to achieve a more aggressive involvement of the nutrition community in finding new ways to work more effectively across sectors so that collaborative approaches can be designed.

Choosing an appropriate entry point: The choice of sector (e.g. agriculture, health, social development, local government) depends on which is most effective at the local level in a specific context. A key challenge here is to ensure that the interventions are culturally appropriate and cost-effective and that there are supportive national government policies and high level political commitment to harness funds. Buy-in at the local level by community members is also needed for programme sustainability and the use of participatory methodologies, and other strategies to increase demand side factors to make governments more accountable for undernutrition.

Making cross-sectoral collaboration work: The causes of undernutrition are known to be complex and to operate at different levels and across different sectors. They cannot, therefore, be addressed by any sector alone and multisectoral programmes are needed. Cross-sectoral collaboration has proved difficult in the past but given the urgent need to take action there is no choice but to document successes and try again. Successful cross-sectoral interventions have been implemented by NGOs and by multisectoral teams from relevant line ministries. The key challenge is to build more multidisciplinary networks in high burden countries and strengthen their capacity for nutrition advocacy and action. Incentives are also needed to encourage cross-sectoral actions, such as community development funds dispersed through the district level that are ring-fenced for cross-sectoral actions.

Assessing the cost-effectiveness of different interventions: There is some evidence that community driven programmes to raise women's status can be cost-effective but there are little systematic costing data available and even less on costing community participation. There is notable variability with wide ranges in cost-benefit estimates. CCT programmes to increase uptake of MCH services are promising but have only been shown to reduce stunting in middle income countries. They may also be cost-effective in low-income countries depending on the threshold value of the cash transfer needed to reduce child undernutrition and the cost of strengthening the health system to deliver adequate, quality services. In the case of CCTs to increase girls' attendance in school, additional costs may arise from the need to improve the quality of teaching and learning in the schools.

Areas for further research and policy

Dissemination: Country experiences on how to build commitment and develop and monitor multisectoral nutrition programmes need to be synthesised and disseminated. This should include experiences on how to move towards implementing cost-effective programmes at scale and how to reform or phase-out ineffective programmes. There is also a need to better document successes (not just programme impact, but also impact-pathways, using well defined programme theory frameworks); and to develop a tool box of simple instruments to show policy makers the benefits of supporting nutrition from a political 'win-win' situation in regards to good governance, macro-economic/financial benefits and economic benefits from a livelihoods/peoples perspective.

Methodology: There needs to be a consensus on procedures for costing (especially where there is real community participation) and for making cost effectiveness estimates. There is also a need to increase recognition that randomised controlled trials cannot be used to assess the importance of most of the underlying causes and some basic causes of child undernutrition, and to gain consensus on an attainable minimum of rigor. There is a need for greater clarity in research reports on the use of the term community involvement and for it to be related to a typology because of the importance of factoring in community participation as a valued democratic outcome in itself. There is a need to further develop and assess valid indicators and

methodologies that can be used at national level and below to provide rapid feedback on progress in generating political commitment, strategic and operational capacities, coverage, and effect.

Questions to indicate areas for further substantive research:

What is the on-the-ground cost-effectiveness of biofortified crops produced and consumed by households? How can biofortified foods be made more acceptable to producers and consumers so that they increase their intake?

What is the cost-effectiveness of CCTs linked to uptake of maternal and child health services in improving child nutritional status in different low income countries? How can the targeting of CCTs avoid both 'elite capture' and further stigmatization of the poorest and most vulnerable (including those affected by HIV)?

What type of networks and other pathways support the translation of maternal education into improved child nutrition in different contexts?

How can people's participation be assessed and ensured from the organisational and legal aspect, including ensuring access to data? What other strategies are effective in strengthening the demand side of governance at the local government level?

What are the capacities, strategies and, tactics present in countries that have been successful in advancing national nutrition agendas and actions, to guide national and international investments?

How can cost-effective approaches to increasing women's status be implemented at scale? What approaches are effective for working with men on inequalities between men and women?

What are the policy processes and the political and social conditions that contribute to improved child nutrition? What is the effect of changes in agricultural technologies and policy on nutritional outcomes in children? What are the linkages between nutrition outcomes and global

change processes such as climate change, trade liberalisation, international migration and remittances, and long-term trends in fuel prices?

Questions on implementation

What funding strategies can be used to encourage cross-sectoral programming? What multisectoral strategies can be used to effectively integrate long and short-routes to improved child nutrition?

How can capacity be built to deliver effective programmes at scale using different aid modalities/public-private partnerships?

Conclusion

The problem of child undernutrition can be tackled through a range of effective interventions implemented at scale but the following preconditions need to be met for this to happen. At the international (super-macro) level, donors need to keep to their commitments both in dollar terms and in terms of the Paris Declaration in order to ensure the most effective use of international aid. At the national (macro) level, governance structures and institutions need to be in place which supports an enabling environment for nutrition. Such an environment requires a culture of evidence based decision-making, accountability at all levels, inclusivity of private and voluntary sectors, promotion of the equal rights of all and efforts to especially redress the inferior status of women in many societies.

At the meso (sub-national) level, well trained personnel need to be given the space to use their local knowledge in order to generate the best solutions for implementation, in exchange for being accountable to the local population. And at the micro (community) level, the chains of accountability have to be transparent; and the active involvement of households in decision-making processes is essential for the sustainability of any proposed intervention.

Child undernutrition in the 21st century contravenes human rights. It is simply embarrassing. The short term solutions are known. Medium to long term solutions depend on our ability and willingness to collaborate and organise across sectors and across levels. Any further research has to be focused on implementation problems. Funding of interventions should choose from above menus but with strong monitoring and evaluation components.

References

- Bhattacharjee, L., Kumar, S. K., & Nandi, B. (2007). *Food-based nutrition strategies in Bangladesh: Experience of integrated horticulture and nutrition development*. Bangkok: FAO, Regional Office for Asia and the Pacific.
- Bhutta, Z. A., Ahmed, T., Black, R. E., Cousens, S., Dewey, K., Morris, S. S., Sachdev, S. P. S., & Shekar, M. (2008). What works? Interventions for maternal and child undernutrition and survival. *The Lancet. Series: Maternal and child undernutrition* 371, 417-440.
- Black, M. M., Walker, S. P., Wachs, T. D., Ulker, N., Gardner, J. M., Grantham-McGregor, S., Lozoff, B., Engle, P. L., & de Mello, M. C. (2008). Policies to reduce undernutrition include child development. *Lancet*, 371(9611), 454-455.
- Bryce, J., Coitinho, D., Darnton-Hill, I., Pelletier, D., Pinstrip-Andersen, P., & Maternal Child Undernutrition Study Group. (2008). Maternal and child undernutrition: effective action at national level. *Lancet*, 371, 510-526.
- Bushamuka, V. N., de Pee, S., Talukder, A., Kiess, L., Panagides, D., Taher, A., & Bloem, M. (2005). Impact of a homestead gardening program on household food security and empowerment of women in Bangladesh. *Food & Nutrition Bulletin*, 26(1), 17-25.
- Devereux, S., Ellis, F., & White, P. (2007). *Regional Lesson Learning from the Case Studies', Case Study Briefs, Regional Evidence Building Agenda*. Johannesburg: Regional Hunger and Vulnerability programme (RHVP).
- Faber, M., Phungula, M. A. S., Venter, S. L., Dhansay, M. A., & Benade, A. J. S. (2002). Home gardens focusing on the production of yellow and dark-green leafy vegetables increase the serum retinol concentrations of 2-5-y-old children in South Africa. *American Journal of Clinical Nutrition*, 76(5), 1048-1054.

- Galasso, E., & Umapathi, N. (2007). *Improving nutritional status through behavioral change: lessons from Madagascar*. Washington DC: World Bank.
- Gertler, P. J. (2004). Do conditional cash transfers improve child health? Evidence from Progresa's controlled randomized experiment. *American Economic Review*, 94, 331-336.
- Havemann, K. (2005). 'Effective Participation for Health Development'. PhD thesis. London: Institute of Education, University of London.
- Ismail, S., Immink, M., Mazar, I., & Nantel, G. (2003). *Community-based food and nutrition programmes: what makes them successful?* Rome: Food and Agriculture Organization of the United Nations.
- King, E., Klassen, S., & Porter, M. (2008). *Women and Development*. Copenhagen: Copenhagen Consensus Centre.
- Lagarde, M., Haines, A., & Palmer, N. (2007). Conditional cash transfers for improving uptake of health interventions in low-and middle income countries. A systematic review. *Journal of American Medical Association*, 298 (16), 1900-1910.
- Manandhar, D., Osrin, D., Shrestha, B., Mesko, N., Morrison, J., Tumbahangphe, K., Tamang, S., Thapa, S., Shrestha, D., Thapa, B., Shrestha, J. R., Wade, A., Borghi, J., Standing, H., Manandhar, M., & Costello, A. (2004). The effect of a participatory intervention with women's groups on birth outcomes in Nepal: cluster randomized controlled trial. *Lancet*, 364, 70-369.
- McClafferty, B., & Russell, N. (2002). *Biofortification: harnessing agricultural technology to improve health of the poor*. Washington DC: International Food Policy research Institute.
- Nestel, P., Bouis, H., Meenakshi, J., & Pfeiffer, W. (2006). Biofortification of staple food crops. *Journal of Nutrition*, 136(4), 1064-1067.
- Potts, M. J., & Nagujja, S. (2007). *A Review of Agriculture and Health Policies in Uganda with Implications for the Dissemination of Biofortified Crops*. Washington DC: HarvestPlus.
- Rivera, J. A., Sotres-Alvarez, D., Habicht, J. P., Shamah, T., & et al. (2004). Impact of the Mexican program for education, health. and nutrition (Progresa) on rates of growth and anemia in infants and young children: a randomized effectiveness study. *JAMA*, 291, 2563-2570.

- Rokx, C. (2006). 'Governance and Malnutrition: Exploring the Contribution of 'Good Governance' to Malnutrition Reduction in Developing Countries'. *PhD Thesis*. The Netherlands, Enschede: University of Maarstricht.
- Ruel, M. T. (2008). Addressing the underlying determinants of undernutrition: Examples of successful integration of nutrition in poverty-reduction and agriculture strategies. *UN ACC/SCN, News*(36), 18-21.
- Sepulveda, J., Bustreo, F., Tapia, R., Rivera, J., Lozano, R., Olaiz, G., Partida, V., Garcia-Garcia, M. D., & Voldespino, J. L. (2007). Improvement of child survival in Mexico: the diagonal approach. *Salud Publica De Mexico*, 49, S110-S125.
- Sheikholeslam, R., Kimiagar, M., Siasi, F., Abdollahi, Z., Jazayeri, A., Keyghobadi, K., Ghaffarpoor, M., Noroozi, F., Kalantari, M., Minaei, N., Eslami, F., & Hormozdyari, H. (2004). Multidisciplinary intervention for reducing malnutrition among children in the Islamic Republic of Iran. *Eastern Mediterranean Health Journal*, 10(6), 844-852.
- Smith, L. C., Ramakrishnan, U., Ndiaye, A., Haddad, L., & Martorell, R. (2003). *The importance of women's status for child nutrition in developing countries*. Washington, D.C.: IFPRI.
- UNICEF (United Nations Children's Fund). (1990). *Strategy for Improved Nutrition of Children and Women in Developing Countries*. A UNICEF policy review. New York: UNICEF.
- Victora, C., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., & Sachdev, H. S. (2008). Maternal and child undernutrition: consequences for adult health and human capital *The Lancet*, 371(9609), 340 - 357.
- WHO. (2008). *Closing the Gap in a Generation: Final Report of the Commission on the Social Determinants of Health*. Geneva: World Health Organisation.
- World Bank, & IFPRI. (2007). *From Agriculture to Nutrition: Pathways, Synergies and Outcomes*. Washington, DC: World Bank.

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