An integrated approach to malnutrition in childhood

Michael Hendricks (School of Child and Adolescent Health, University of Cape Town)
and Lesley Bourne (Environment and Health Research Unit, Medical Research Council)

Nutrition plays a critical role from early fetal life into adulthood. It is essential for survival, health, growth, mental and physical development, performance and productivity. Malnutrition compromises children's rights to survival and development and perpetuates a cycle of intergenerational poverty. Focusing on adequate nutrition for mothers and children will contribute to achieving the Millennium Development Goals (MDGs) that relate to improving child survival (MDG 4), reducing undernutrition (MDG 1) and ensuring maternal health (MDG 5).[1]

This essay focuses on undernutrition and seeks to answer the following questions:

- How does malnutrition impact on child health?
- What are the causes of malnutrition?
- How can the nutritional status of children be improved?
- What are the recommendations?

How does malnutrition impact on child health?

'Malnutrition' commonly refers to undernutrition (poor growth) rather than overnutrition (overweight and obesity). Anthropometry[i] is used to determine if children are wasted, stunted or underweight[ii]. 'Wasting' indicates acute malnutrition; 'underweight' usually indicates both acute and chronic malnutrition, while 'stunting' indicates chronic malnutrition and may be used as a proxy for poverty as it reflects the health and nutritional status of children over a long period, and of the mother during pregnancy.

Globally, maternal and child malnutrition contributes to 3.5 million deaths annually and to 35% of the disease burden in children under five years. Malnutrition in these groups accounts for 11% of the disability adjusted life years (DALYs).[iii] Most of these deaths are due to stunting, severe wasting, intra-uterine growth restriction[iv], sub-optimum breastfeeding (no breastfeeding or non-exclusive breastfeeding in the first six months of life) and micronutrient deficiencies (especially vitamin A and zinc deficiencies).[2]

The South African National Burden of Disease study showed that underweight contributed to 12.3% (11,808) of deaths and 10.8% of DALYs in children under five years.[3] Furthermore, iron deficiency anaemia accounted for 7.3% of perinatal deaths,[4] while vitamin A deficiency accounted for 28% of deaths from diarrhoeal disease, 23% of deaths from measles and 21% of deaths from malaria[5].

In 2005, the National Food Consumption Survey-Fortification Baseline (NFCS-FB) showed that 9.3% of children aged 1 – 9 years were underweight, 18% were stunted and 4.5% were wasted.[6] Rates were higher among rural children. Based on World Health Organisation (WHO) criteria, these indicate a medium prevalence of underweight and stunting. However, in one study among HIV-infected children before starting antiretroviral therapy, 57% were underweight, 66% were stunted and 20% were wasted.[7] The NFCS-FB showed that despite implementation of a national vitamin A supplementation programme and mandatory fortification of maize meal and wheat flour, 64% of children aged 1 – 6 years were vitamin A deficient. Among children aged 1 – 9 years, 45% were deficient in zinc, 25% had iron deficiency and 15% had iodine deficiency. Once again, the rates of deficiency of these micronutrients were higher in HIV-infected children.[8]

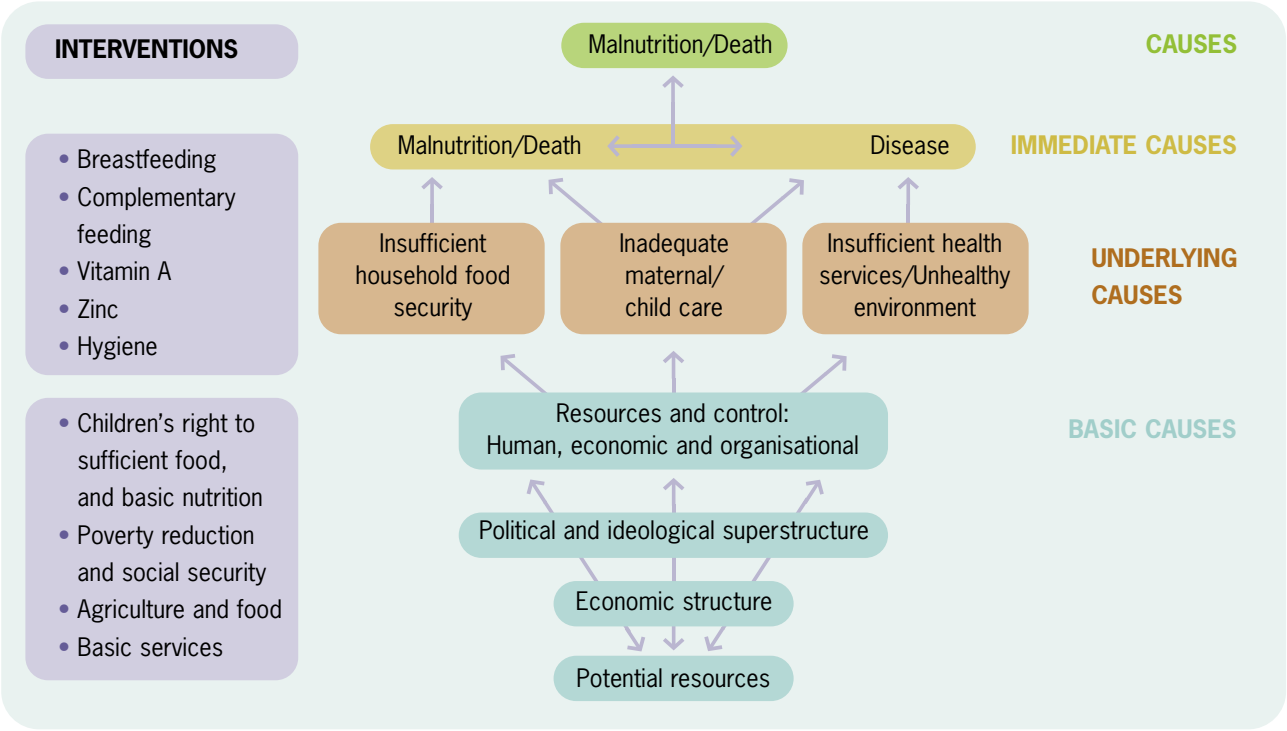
On the other hand, a secondary analysis of the 1999 NFCS data found that 17% of 1 – 9-year-old children were overweight and obese. The highest rate (23%) was found in urban children aged 1 – 3 years, indicating that South Africa's children are affected by a double burden of under- and overnutrition.[9]

What are the causes of malnutrition?

Many complex, interacting factors contribute to malnutrition in children. Figure 6 illustrates the immediate, underlying and basic

i Anthropometry includes assessment of weight, height/length, weight-for-height and head circumference.
ii These use standard deviation (SD) scores with cut-offs of <-2SD for weight-for-height (wasting), height-for-age (stunting) and weight-for-age (underweight).
iii DALY is a composite index of years lived with a disability and years lost due to premature mortality.
iv 'Intra-uterine growth restriction' refers to babies born at term but with a birth weight of less than 2.5 kilograms.

Figure 6: The causes of malnutrition and proposed interventions



Sources: Ruel MT (2008) Addressing the underlying determinants of undernutrition: Examples of successful integration of nutrition in poverty-reduction and agriculture strategies. *In:* Engesveen K (ed) *SCN News*, 36: 21-29. United Kingdom: Lavenham Press; United Nations Children's Fund (1990) *The nutrition strategy*. New York: UNICEF Programme division.

causes of malnutrition as outlined in the United Nations Children's Fund (UNICEF) conceptual framework. It is important that policy-makers and community leaders take into account the causes of malnutrition when planning and prioritising health and nutrition interventions.[10]

Immediate causes

The most significant immediate causes of malnutrition are inadequate food intake and illness.[11] In 2000, the main cause of under-five mortality in South Africa was HIV/AIDS (40%), while low birth weight, diarrhoea, lower respiratory infections and malnutrition accounted for 30% of all under-five deaths.[12] Low birth weight is an important predictor of malnutrition in childhood, and is estimated to be 15.5% nationally.[13]

The malnutrition–infection cycle is a key driver of child mortality because children who are underweight are at an increased risk of infectious diseases such as diarrhoea and pneumonia. The simultaneous presence of malnutrition and infection greatly increases the risk of child mortality.[14]

In terms of dietary intake, only 12% of infants younger than four months were exclusively breastfed in 2003, while 20% were never breastfed.[15] In older children, less than half consumed the recommended energy and micronutrient intakes. These intakes were significantly lower for rural children, compared to urban children.[16]

Underlying causes

Some of the underlying factors which result in poor food intake and illness include poor household food security, inadequate maternal and child care, poor access to basic health services and an unhealthy environment with limited access to clean water and safe waste disposal. In South Africa, there are a number of contradictions regarding food security. While studies have indicated that there is sufficient food available nationally, large sectors of the population experience hunger and food insecurity.

The NFCS-FB survey showed that 52% of children aged 1 – 9 years experienced hunger, 28% were at risk of hunger and 20% were food secure.[17] This pattern was relatively unchanged from the previous survey in 1999.[18] Households experiencing hunger were mainly in the Eastern Cape (66.7%), Northern Cape (65.3%) and Limpopo (63.2%) provinces.

The extent of household food insecurity nationally is consistent with recent estimates that 80% of households could not afford to buy an average nutritionally adequate food basket.[19] The high levels of food insecurity in the country are exacerbated by the increase in food prices of staples such as maize meal and bread due to unfavourable climatic conditions, rising fuel prices, biofuel production and trade restrictions. The price increases have a major effect, especially on the urban poor who spend a greater share of household income on food.[20]

Regarding children's access to basic services, data for 2008

showed that 71% of children lived in formal dwellings,[21] 80% had access to electricity,[22] 64% had access to drinking water on site,[23] and 61% had access to basic sanitation[24]. The lack of access to adequate sanitation exposes almost 8 million children to the risk of diarrhoeal disease and malnutrition.

Basic factors

Poverty and lack of resources are basic factors that contribute to malnutrition. In 2008, 64% of children lived in income-poor households[v].[25] This reflected a decline in income poverty since 2002. There was also an increase in the Gini coefficient[vi] from 0.665 in 1994 to 0.666 in 2008, making South Africa one of the countries with the greatest degree of income inequality in the world.[26]

In summary, the multiple causes of malnutrition among South Africa's children require a multi-sectoral approach and collaboration between the Departments of Health; Basic Education; Agriculture, Forestry and Fisheries; and Social Development at local, provincial and national levels.

How can the nutritional status of children be improved?

The UNICEF conceptual framework provides a basis for countries and communities to implement short- and long-term nutrition interventions aimed at reducing malnutrition and improving child survival. Short-term, targeted interventions (short routes) address the immediate causes of malnutrition. Long-term interventions (long routes) include interventions that address the underlying and basic causes of malnutrition.[27]

The government's Integrated Nutrition Programme (INP) focuses on children under six years, pregnant and lactating women and all people with chronic diseases of lifestyle. It has seven main focus areas, which are summarised in table x, and are extensively described and critiqued in a previous publication.[28] The INP was modelled on the UNICEF conceptual framework and integrates both short and long route interventions (figure 6 on the previous page).

v Households with a per capita income of less than R570 per month in 2008.
vi The Gini coefficient is a measure of national income equality. It ranges from 0 (no inequality) to 1 (complete inequality).

Table 6: Focus areas of the Integrated Nutrition Programme

Focus areas	Policies and programmes
Disease-specific nutrition support, treatment and counselling	• Nutrition Supplementation Programme: – Children with faltering growth, or underweight – At-risk pregnant and lactating women • Guidelines for children with undernutrition, overnutrition, tuberculosis and HIV • Department of Health guidelines on the management of children with severe undernutrition
Growth monitoring and promotion	• Growth monitoring and promotion guidelines and training manuals
Control of micronutrient deficiencies	• Vitamin A Supplementation Policy • Iodisation of salt • Food fortification • Dietary diversification • Parasite control (including deworming) • Immunisation
Promotion, protection and support of breastfeeding	• South African Breastfeeding Guidelines for Health Workers • Baby-Friendly Hospital Initiative
Nutrition education, promotion and advocacy	• Nutrition and health promotion materials
Contribution to household food security	• Integrated Food Security and Nutrition Programme • National School Nutrition Programme
Food service management	• Meals in public institutions • Technical support for dieticians in public institutions

Source: Hendricks MK, Eley B & Bourne L (2006) Nutrition. *In*: Ijumba P & Padarath A (eds) *South African Health Review*. Durban: Health Systems Trust.

Addressing the basic and underlying causes of malnutrition

South Africa has ratified the United Nations Convention on the Rights of the Child and is committed to realising children's right to adequate nutrition[29] and an adequate standard of living[30]. The Constitution requires the State to introduce measures to realise children's right to basic nutrition.[31] This means the State must ensure that parents and family members caring for children are adequately supported to provide for children's nutritional needs. Parents and family members who are unable to provide for their children's nutritional needs should receive financial support or food aid from the State.

In realising children's right to basic nutrition, the State must ensure the availability of food (national food security), and access or entitlement to food (household food security). Policies therefore need to address the problem of hunger and household food security.[32]

Household Food Security

The Integrated Food Security and Nutrition Programme (IFSNP) aims to eradicate hunger, undernutrition and food insecurity by 2015. The main strategic objectives are to increase household food production, improve income generation and job opportunities, improve nutrition and food safety, provide safety nets and food emergency management systems, and improve information systems.[33]

The programme distributes food parcels as a temporary measure to assist vulnerable and food-insecure households. Beneficiaries include children and child-headed households, orphaned children, HIV-affected households and people with disabilities.

Agriculture is a central and sustainable component of the IFSNP. Agricultural initiatives can contribute to a reduction in malnutrition through increased food production for own consumption, increased household income, lower food prices and macro-economic growth particularly in rural communities.[34] Within the Department of Agriculture, Forestry and Fisheries is the sub-programme for Land Redistribution for Agricultural Development, which provides grants to beneficiaries to access land. The Comprehensive Agricultural Support Programme (CASP) facilitates support after land transfer to previously disadvantaged owners or communities. Some main areas of support are information and knowledge management, capacity development, advisory services, finance and infrastructure. Additionally, the LandCare Programme promotes and supports the sustainable use of natural resources.[35]

To date less than 5 million hectares of a targeted 25 million hectares of land have been transferred. Reasons for the slow progress include the 'willing seller, willing buyer' model, limited budgets and poor institutional co-ordination.[36] Also, the roll-out of the CASP has been uneven and support has concentrated mainly on on-farm infrastructure.

It is estimated that 2.5 million households engage in small-scale agricultural production and that there are 300,000 – 400,000 full-time subsistence farmers. It seems that the main reason for engaging in small-holder farming is to supplement household food; its success varies across the country and is determined by the support that is provided, the quality of natural resources and access to markets. Most people who engage in small-scale farming are women, farmers 15 – 19 years old, and those located in the former 'homeland' areas. These groups need greater support, and constraints such as access to agro-food markets that cater for small-scale producers need to be addressed. Further research is also needed to determine the success factors in household food production and the contribution that it makes to addressing household food security.[37]

The National School Nutrition Programme (NSNP) also addresses household food security. It was implemented primarily to improve school attendance and learning. The programme has had a number of positive outcomes: In 2006/07 it reached 6 million learners in 18,039 schools and 4,000 schools had vegetable gardens. Targets set for the NSNP to reach 95% of targeted schools and learners by 2007 were reached as early as 2003/04.[38] A major challenge to the NSNP is its transformation from a feeding programme to an anti-poverty strategy that will involve the broader community.

Food price stabilisation aims to subsidise foods that are consumed by populations that are vulnerable to food insecurity. In South Africa access to basic foods is facilitated by zero-rating Value Added Tax (VAT) on food such as maize meal, samp, maize rice, brown bread, and unprocessed fruit and vegetables.[39] However, poor households spend a disproportionate portion of their income on food, and can be thrown into a state of chronic food insecurity with increases in food prices, fuel and electricity.

In summary, while the IFSNP hosts several initiatives aimed at improving household food security and alleviating poverty, evaluation and monitoring of the sub-programmes are needed to assess their effectiveness and impact on improving children's nutritional status.

Social assistance and poverty alleviation

Research has shown that social assistance grants can lift households out of poverty and improve access to food, education and basic services.[40] However, at least 50% of seriously hungry households do not receive grants for which they are

eligible.[41] In May 2010, the Child Support Grant – which is one of the government's most successful poverty alleviation programmes – reached more than 9.7 million children under the age of 16.[42] The grant will be extended in phases to all eligible children under 18 years between 2010 and 2012.

Addressing the immediate causes of malnutrition

The INP focus areas (table x) that address the immediate causes of malnutrition include the promotion, protection and support of breastfeeding; disease-specific support, treatment and counselling; growth monitoring and promotion; and the control of micronutrient deficiencies such as vitamin A, iron, iodine and zinc deficiencies.[43] Several of these interventions are delivered through the Integrated Management of Childhood Illness (IMCI) strategy at primary health care facilities. Evidence shows that the promotion of breastfeeding and complementary feeding (with or without food supplementation), vitamin A and zinc supplementation, and the appropriate management of severe malnutrition are able to reduce child mortality by a quarter, and stunting by a third when implemented at scale.[44]

Successes of the INP

Certain aspects of the INP have been successful. Folic acid fortification of staple foods such as maize meal and wheat flour has reduced the prevalence of neural tube defects,[vii] thereby reducing the costs of morbidity and mortality in affected children. There has been a significant increase in the dietary intake of iodine following mandatory iodisation of salt and reductions in goitre and intellectual disability in children who were iodine deficient. However, children's iodine intake was excessive in six of the provinces, which underlines the importance of monitoring the levels of salt iodisation.[45] Targets set for 2007 that have been achieved include a reduction in stunting from 21.6% to 18% and the number of baby-friendly hospitals, which currently stands at 42% – well above the 15% target that was set for 2007 nationally.[46]

The Department of Health, in collaboration with academic institutions, has also developed food-based dietary guidelines for adults and children over seven years to prevent undernutrition, overnutrition and nutrition-related chronic diseases of lifestyle. Guidelines have also been developed for children under seven years and published as a series of articles.[47] These guidelines, which still need to be finalised, are consistent with recommendations of the joint Food and Agricultural Organisation/World Health Organisation, the South African National Burden of Disease study and the IMCI strategy.[48] Attention needs to be given to the promotion of key nutrition messages contained in the guidelines to the broader public and especially to children of school-going age.

Challenges to the INP

The 2005 NFCS-FB survey showed an increase in vitamin A deficiency in children aged 1 – 5 years. Contributing to this is poor implementation of the Vitamin A Supplementation Programme among children aged 12 – 59 months, with coverage of only 20.5%.[49] A decline in clinic attendance following the completion of immunisations may be one of the factors accounting for the poor coverage. Other factors that have been implicated in missed opportunities for vitamin A supplementation include lack of mothers' awareness of the programme and benefits of supplementation, lack of vitamin A capsules and difficulties in implementing the programme.[50] The implementation of outreach initiatives such as national child health days will ensure the provision of vitamin A supplements and immunisations at least twice a year to this group of children.

While almost half the hospitals nationally are considered baby-friendly, this has not translated into improvements in exclusive breastfeeding rates.[51] Contributing to this is the delay in legislating the WHO International Code of Marketing of Breast Milk Substitutes, which was adopted locally but is implemented on a voluntary basis. Violations of the code by infant food companies have been reported. While the payment of maternity benefits to working mothers is protected by international labour legislation, working mothers in South Africa who choose to breastfeed are forced to use their unemployment benefits.[52] Achieving higher rates of exclusive breastfeeding also requires a more comprehensive strategy that will provide health workers at all levels with the necessary skills to counsel and support breastfeeding mothers effectively. A communication strategy using the mass media could also contribute positively to improving rates of exclusive breastfeeding.

Poor implementation of guidelines on the management of severe malnutrition has resulted in high fatality rates. Contributing factors are high turnover of hospital staff, errors in management and lack of supervision.[53] While the in-patient treatment of severely malnourished children requires improvement, attention should also be given to the early identification and rehabilitation of these children in the community by using ready-to-use therapeutic food. This approach has been effectively implemented in resource-poor settings.[54]

In summary, while the INP has been designed to address the causes of malnutrition comprehensively, it has had limited

vii Neural tube defects are congenital abnormalities of the brain and spinal cord in which folic acid deficiency and other causes have been implicated.

success. There are several challenges that impede the effective implementation of the programme and compromise children's nutritional status and survival. A key factor is the lack of human resources: 40% of professional nurses' posts and 35% of medical practitioners' posts are vacant in the public health sector.[55] Incentives are needed to attract and retain nurses and doctors in the public sector. Also, there is a need for innovative ways to improve coverage of the key nutrition interventions by strengthening community IMCI and by developing posts for nutritionists to support community-based nutrition interventions.

Other factors limiting the effectiveness of the INP include the lack of both pre- and in-service training of primary health care (PHC) workers; poor implementation of policies and guidelines largely due to lack of support and supervision; poor quality of care; lack of leadership; low staff morale; the increased burden of and focus on HIV/AIDS; and the absence of a nutritional surveillance system which provides information on the impact of interventions on children's nutritional status.[56]

What are the recommendations?

Strengthening the health system and improving implementation of existing programmes such as the IMCI could improve the outcome of the focus areas of the INP. To achieve this, the following are recommended:

Improve delivery of the INP

- Provide effective leadership and a clear vision of the nutrition goals and targets, which may require a restructuring of the INP and its focus areas.
- Develop capacity of PHC workers through adequate pre- and in-service training in nutrition.
- Employ adequate numbers of PHC workers and nutritionists so that the various nutrition interventions are not compromised.
- Provide incentives to attract and retain PHC workers skilled in nutrition.
- Support community health and nutrition programmes that focus on key nutrition interventions such as exclusive breastfeeding, complementary feeding, micronutrient supplementation and identification and referral of children with severe malnutrition.
- Market programmes such as vitamin A supplementation, immunisations, deworming, exclusive breastfeeding and food-based dietary guidelines.
- Consider distributing vitamin A supplements through crèches, pre-schools and community IMCI workers, and on child health days.[57]
- Legislate and implement the South African code on marketing of breast milk substitutes, including the necessary provisions to protect working mothers who breastfeed.
- Integrate food-based dietary guidelines into the primary and secondary school curricula.
- Monitor and evaluate the INP on an ongoing basis by:
  - Establishing district nutritional surveillance sites;
  - Improving collection and use of health and nutrition information at district level;
  - Complying with regulations, eg the National Food Fortification Programme.
- Establish structures at district level that will monitor and take the necessary action in achieving desired nutrition outputs.

Improve household food security

- Devise a feasible food security monitoring system as part of the General Household Survey to identify vulnerable households.
- Improve the capacity of institutions to implement and evaluate programmes relating to land reform and development in rural areas effectively.
- Continue to fund, support and evaluate small-scale agricultural production and its links to improved food security.
- Consider zero-rating food coupled with increased tax on other commodities, or increase VAT on commodities or services used by high income households.

Improve access to social assistance, particularly for marginalised low income households.

Conclusion

The INP is designed to address the multiple causes of malnutrition in children comprehensively. However, the programme is not being effectively implemented at district level. There is inadequate coverage of many of the basic nutrition interventions that can positively impact on children's health and nutritional status and achieve the MDGs. These include the promotion of exclusive breastfeeding in the first six months, appropriate complementary feeding, vitamin A and zinc supplementation, and the management of severe malnutrition.

It is essential to strengthen the health system to implement and audit the INP focus areas that relate to these interventions. The broader problem of food insecurity needs to be addressed through more effective implementation, monitoring and evaluation of existing programmes as well as ensuring adequate social assistance for marginalised low income households.

References

1 United Nations Children's Fund (2009) *Tracking progress on maternal and child nutrition: A survival and development priority*. New York: UNICEF Programme division.
2 Black RE, Allen LH, Bhutta Z, Caulfield LE, de Onis M, Ezzati M, Mathers C & Rivera J, for the Maternal and Child Undernutrition Study Group (2008) Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet*, 371(9608): 243-260.
3 Nannan N, Norman R, Hendricks M, Dhansay MA, Bradshaw D & South African Comparative Risk Assessment Collaborating Group (2007) Estimating the burden of disease attributable to childhood and maternal undernutrition in South Africa in 2000. *South African Medical Journal*, 97: 733-739.
4 Nojilana B, Norman R, Dhansay MA, Labadarios D, van Stuijvenberg ME, Bradshaw D & South African Comparative Risk Assessment Collaborating Group (2007) Estimating the burden of disease attributable to iron deficiency anaemia in South Africa in 2000. *South African Medical Journal*, 97: 741-746.
5 Nojilana B, Norman R, Bradshaw D, van Stuijvenberg ME, Dhansay MA, Labadarios D & South African Comparative Risk Assessment Collaborating Group (2007) Estimating the burden of disease attributable to vitamin A deficiency in South Africa in 2000. *South African Medical Journal*, 97: 748-753.
6 Labadarios D (2007) *National Food Consumption Survey-Fortification Baseline (NFCS-FB): South Africa 2005*. Pretoria: Directorate: Nutrition, Department of Health.
7 Eley BS, Davies M, Apolles P, Cowburn C, Buys H, Zampoli M, Finlayson H, King S & Nuttall J (2006) Antiretroviral treatment for children. *South African Medical Journal*, 96: 988-993.
8 See no. 7 above.
9 Steyn NP, Labadarios D, Maunder E, Nel J, Lombard C & Directors of the National Food Consumption Survey (2005) Secondary anthropometric data analysis of the National Food Consumption Survey in South Africa: The double burden. *Nutrition*, 21: 4-13.
10 United Nations Children's Fund (1990) *The nutrition strategy*. New York: UNICEF Programme division.
11 See no. 10 above.
12 Bradshaw D, Bourne D & Nannan N (2003) What are the leading causes of death among South African children? *MRC Policy Brief*, no. 3. Cape Town: Medical Research Council.
13 Day C & Gray A (2008) Health and related indicators. *In:* Barron P & Roma-Reardon J (eds) *South African Health Review*. Durban: Health Systems Trust.
14 Schroeder D (2008) Malnutrition. *In:* Semba RD & Bloem MW (eds) *Nutrition and health in developing countries*. 2nd edition. Totowa NJ: Humana Press.
15 Department of Health (2004) *South African Demographic and Health Survey. Preliminary report 2003*. Pretoria: DoH.
16 Labadarios D (2000) *The National Food Consumption Survey (NFCS): Children aged 1 – 9 years, South Africa, 1999*. Pretoria: Directorate: Nutrition, Department of Health.
17 See no. 6 above.
18 See no. 16 above.
19 Jacobs PT (2009) The status of household food security targets in South Africa. *Agrekon*, 48(4): 410-433.
20 International Monetary Fund (2008) *Food and fuel prices – Recent developments, macroeconomic impact and policy responses*. Washington DC: IMF Fiscal Affairs, Policy Development and Review & Research departments.
21 Statistics South Africa (2009) General Household Survey 2009. *In:* Hall K (2010) *Housing and services – Housing type*. Children Count – Abantwana Babalulekile website, Children's Institute, University of Cape Town. Accessed on 18 May 2010: www.childrencount.ci.org.za/indicator.php?id=2&indicator=10.
22 Statistics South Africa (2009) General Household Survey 2009. *In:* Hall K (2010) *Housing and services – Access to electricity*. Children Count – Abantwana Babalulekile website, Children's Institute, University of Cape Town. Accessed on 18 May 2010: www.childrencount.ci.org.za/indicator.php?id=3&indicator=43.
23 Statistics South Africa (2009) General Household Survey 2009. *In:* Hall K (2010) *Housing and services – Access to adequate water*. Children Count – Abantwana Babalulekile website, Children's Institute, University of Cape Town. Accesssed on 18 May 2010: www.childrencount.ci.org.za/indicator.php?id=3&indicator=41.
24 Statistics South Africa (2009) General Household Survey 2009. *In:* Lake L & Hall K (2010) *Housing and services – Access to basic sanitation*. Children Count – Abantwana Babalulekile website, Children's Institute, University of Cape Town. Accessed on 18 May 2010: www.childrencount.ci.org.za/indicator.php?id=3&indicator=42.
25 Statistics South Africa (2009) General Household Survey 2008. *In:* Hall K (2010) *Income and social grants – Children living in poverty*. Children Count – Abantwana Babalulekile website, Children's Institute, University of Cape Town. Accessed on 18 May 2010: www.childrencount.ci.org.za/indicator.php?id=2&indicator=14.
26 Office of the President (2009) *Development indicators 2009*. Pretoria: The Presidency.
27 Ruel MT (2008) Addressing the underlying determinants of undernutrition: Examples of successful integration of nutrition in poverty-reduction and agriculture strategies. *In:* Engesveen K (ed) *SCN News*, 36: 21-29. United Kingdom: Lavenham Press.
28 Hendricks MK, Eley B & Bourne L (2006) Nutrition. *In:* Ijumba P & Padarath A (eds) *South African Health Review*. Durban: Health Systems Trust.
29 Office of the High Commissioner of the Rights of the Child (1989) *Article 24(2): Convention on the Rights of the Child. UN General Assembly resolution 44/25*. Geneva: United Nations.
30 Office of the High Commissioner of the Rights of the Child (1989) *Article 27: Convention on the Rights of the Child. UN General Assembly resolution 44/25*. Geneva: United Nations.
31 Constitution of the Republic of South Africa. Act 108 of 1996, section 28(1)(c).
32 Brand D (2004) Budgeting and service delivery in programmes targeted at the child's right to basic nutrition. *In:* Coetzee E & Streak J (eds) *Monitoring child socio-economic rights in South Africa*. Cape Town: Institute for Democracy in South Africa.
33 Kuzwayo P (2008) Food and nutrition security. *In:* Steyn NP & Temple N (eds) *Community nutrition textbook for South Africa: A rights-based approach*. Cape Town: Food and Agricultural Organisation & Medical Research Council.
34 See no. 27 above.
35 Friedman I & Bhengu L (2008) *Fifteen year review of income poverty alleviation programmes in the social and related sectors*. Durban: Health Systems Trust.
36 Jacobs PJ, Aliber M, Hart T & O'Donovan M (2008) *Review of rural development: A 15 year review of economic and social sector programmes*. Cape Town: Human Sciences Research Council.
37 Altman M, Hart TGB & Jacobs PT (2009) Household food security status in South Africa. *Agrekon*, 48(4): 345-361.
38 See no. 35 above.
39 See no. 33 above.
40 Samson M, Lee U, Ndlebe A, Mac Quene K, Van Niekerk I, Gandhi V, Harigaya T & Abrahams C (2004) *The social and economic impact of South Africa's social security system*. Economic Policy Research Institute paper no. 37. Pretoria: Department of Social Development.
41 See no. 37 above.
42 Statistics South Africa (2010) SOCPEN database. *In:* Hall K (2010) *Current statistics on grants for children*. Children Count – Abantwana Babalulekile website, Children's Institute, University of Cape Town. Accessed on 20 May 2010: www.childrencount.ci.org.za/social_grants.php.
43 See no. 28 above.
44 Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, Haider BA, Kirkwood B, Morris SS, Sachdev HPS, Shekar M, for the Maternal and Child Undernutrition Study Group (2008) What works? Interventions for maternal and child undernutrition and survival. *The Lancet*, 371 (9610): 417-440.
45 See no. 6 above.
46 Personal communication. Behr A, Department of Health, 23 February 2010.
47 Bourne LT (2007) South African paediatric food-based dietary guidelines. *Maternal and Child Nutrition*, 3: 227-229.
48 Hendricks MK, Goeiman H & Dhansay A (2007) Food-based dietary guidelines and nutrition interventions for children at primary healthcare facilities in South Africa. *Maternal and Child Nutrition*, 3: 251-258.
49 See no. 6 above.
50 Hendricks MK, Beardsley J, Bourne L, Mzamo B & Golden B (2007) Are opportunities for vitamin A supplementation being utilized at primary health care clinics in the Western Cape Province of South Africa? *Public Health Nutrition*: 10(10): 1082-1088.
51 See no. 28 above.
52 See no. 28 above.
53 Ashworth A, Chopra M, McCoy D, Sanders D, Jackson D, Karaolis N, Sogaula N & Schofield C (2004) WHO guidelines for management of severe malnutrition in rural South African hospitals: Effect on case fatality and the influence of operational factors. *The Lancet*, 363: 1110-1115.
54 See no. 1 above.
55 See no. 13 above.
56 See no. 13 above;
Harrison D (2010) *An overview of health and healthcare in South Africa 1994 – 2010: Priorities, progress and prospects for new gains, 2010*. A discussion document commissioned by the Henry J. Kaiser Family Foundation.
57 Horton S, Alderman H & Rivera JA (2008) *Hunger and malnutrition*. Copenhagen Consensus 2008 challenge paper, Copenhagen Consensus Centre.