

Invited Review

Importance of Nutrition in Achieving the Millennium Development Goals

GL Khor

*Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia*

ABSTRACT

The Millennium Development Goals (MDGs) provide a global agenda for the international and national agencies and non-government organisations to work together towards promoting human development as the key to sustaining social and economic progress. There are eight MDGs to be achieved by the year 2015: Goal 1- Eradicate extreme poverty and hunger; Goal 2 - Achieve universal primary education; Goal 3- Promote gender equality and empower women; Goal 4- Reduce child mortality; Goal 5- Improve maternal health; Goal 6- Combat HIV/AIDS, malaria and other diseases; Goal 7- Ensure environmental sustainability; and Goal 8- Develop a global partnership for development. Each MDG is accompanied by one or more targets, which in turn are monitored by specific measurable indicators. Several of these indicators are closely linked to nutrition, thus underscoring the paramount importance that nutrition plays in influencing the success of the MDGs, especially those aimed at reducing hunger and poverty, improving education attainment, gender equality, child mortality, maternal health and combating diseases. Adequate nutrition including key micronutrients is crucial for optimum growth and development from infancy through childhood and adolescence. Improving maternal health is also critical as impaired health during pregnancy can bring about an inter-generational effect on human capital. Gender equality is said to bring about a 'double dividend' in benefiting both women and children. Access to safe water and living in a sanitary environment are necessary conditions for ensuring people do not run the risk of infections and diseases arising from an unclean environment. Incorporating nutrition considerations into government development policies and budgets is essential towards enhancing the achievement of the health-related MDGs by 2015.

Keywords: Millennium Development Goals, nutrition

INTRODUCTION

The origins of the Millennium Development Goals (MDGs) may be traced to several global summit conferences on economic and social development hosted by the United Nations system during the 1990s. The goals of the various summits were collectively called the International Development Goals.^[1] These summits include the New York World Summit for Children in 1990, the Cairo International Conference on Population and Development in 1994, the Copenhagen World Summit for Social Development in 1995, the Beijing World Conference on Women in 1995, and the World Food Summit in 1996.^[2] In the World Food

Corresponding author: khorgl@medic.upm.edu.my

Summit, country leaders endorsed a comprehensive plan of action on eradication of poverty and inequality, investment in agriculture, creation of a fair and market-oriented world trading system, and conservation of ecological foundations. Unfortunately, the implementation of these commitments was slow and uneven globally.

Thus, at the turn of the new millennium, world leaders decided it was timely to reaffirm their commitments towards eradicating poverty and other critical socio-economic and environmental problems. In September 2000, at the Millennium Summit held at the United Nations General Assembly in New York, 189 member states signed the Millennium Declaration reaffirming their dedication to a set of time-bound and measurable goals and targets for combating poverty, hunger, disease, illiteracy, discrimination against women and environmental degradation.^[3] These goals are known as the Millennium Development Goals.

The MDGs provide a global agenda for the entire United Nations system and other international agencies to work together with governments and non-government organisations towards “promoting human development as the key to sustaining social and economic progress in all countries.”^[3] The interdependence between growth, poverty reduction and sustainable development constitutes a major thrust in the MDGs.

There are eight MDGs to be achieved by the year 2015:

- Goal 1: Eradicate extreme poverty and hunger
- Goal 2: Achieve universal primary education
- Goal 3: Promote gender equality and empower women
- Goal 4: Reduce child mortality
- Goal 5: Improve maternal health
- Goal 6: Combat HIV/AIDS, malaria and other diseases
- Goal 7: Ensure environmental sustainability
- Goal 8: Develop a global partnership for development

Each MDG is accompanied by one or more quantifiable targets, which in turn, have a number of measurable indicators for monitoring purposes. The entire list of 8 MDGs, 18 targets and 48 indicators are outlined in detail in Appendix 1.

NUTRITION AND THE MDGs

Nutrition plays an important role in affecting the success of several of the MDGs, especially those aimed at reducing hunger and poverty, improving education attainment, gender equality, child mortality, maternal health and combating diseases. This article will elaborate on the importance of nutrition in achieving the MDGs. In this respect, relevant targets and indicators for each of the MDGs will be identified for elaboration.

Millennium Development Goal 1

The first two targets for the first MDG are aimed at halving the proportion of people living in extreme poverty (on less than USD1 a day), and the proportion of people suffering from

Table 1. MDG 1: Eradicate extreme poverty and hunger

	Target	Indicators
Target 1:	Halve between 1990 and 2015 the proportion of people whose income is less than USD 1 a day	i. Proportion of population below USD1 ii. Poverty gap iii. Share of poorest quintile in national consumption
Target 2:	Halve, between 1990 and 2015, the proportion of people who suffer from hunger	i. Prevalence of underweight children under five years of age ii. Proportion of population below minimum level of dietary energy consumption

Table 2. Changes in proportion of population living on less than USD1 a day between 1990 - 1995 and 1996 - 2005 among countries in Asia^[7]

Countries	% of population living on less than USD1 per day	
	1990 - 1995	1996 - 2005
Pakistan	47.8	17.0
India	42.3	36.0
Bangladesh	35.9	36.0
China	33.0	16.6
Turkmenistan	20.7	12.1
Philippines	19.8	15.5
Indonesia	17.4	7.5
Vietnam	14.6	2.2
Mongolia	13.9	27.0
Azerbaijan	10.9	3.7
Lao PDR	7.8	27.0
Sri Lanka	3.8	5.6
Malaysia	2.0	2.0

hunger between 1990 and 2015 (Table 1). While about 43 countries with more than 60% of the world's people have already met or are on track to meet the MDG 1 by 2015, 1.2 billion people still live in extreme poverty. In Asia, more than 600 million people subsist on an income of USD1 per day or less.^[4] Table 2 shows that several Asian countries have high proportions of their populations living in extreme poverty, despite overall significant economic progress being made in the region over the past decade.

People in poverty suffer from the fundamental problem of lack of access to adequate food and housing, health care, safe water and a clean living environment. The lack of

Table 3. Prevalence of undernutrition in Asia^[8, 9]

Countries	Children under 5 moderately or severely underweight (%)	Undernourished people as percentage of total population
	1996 - 2005	1996 - 2005
Bangladesh	48	30
Nepal	48	17
India	47	20
Timor-Leste	46	8
Cambodia	45	33
Laos PDR	40	21
Pakistan	38	23
Myanmar	32	5
Maldives	30	11
Philippines	28	19
Vietnam	27	17
Korea (DPR)	23	35
Thailand	18	21
Malaysia	11	3
China	8	12

resources to such basic living needs aggravate the vulnerability of the poor to food insecurity, infections and diseases. Poverty breeds ill-health and ill-health perpetuates poverty. In order to lift people out of the poverty cycle, investments in health and nutrition as part of pro-poor strategies are imperative.

It is thus appropriate that nutrition-related indicators are used for monitoring the targets of MDG 1. These indicators include decreasing the prevalence of underweight among young children, and reducing the prevalence of people subsisting below the minimum energy requirements. The vast majority of underweight children live in developing regions, mainly in Africa and Asia. In Africa, the number of underweight children is forecasted to increase from 25.8 million in 1990 to 43.3 million in 2015, a change of 68%.^[5] Asia, however, has the largest number of underweight children but substantial decreases are predicted for the region, owing to a large extent the rapid economic development in China. The number is estimated to decrease from 131.9 to 67.6 million between 1990 and 2015, a change of minus 49%, with the largest decline projected for Eastern Asia (minus 87%) followed by South-east Asia (minus 52%).^[5] Nonetheless, several countries in Asia particularly South Asia rank high for proportions of underweight children below 5 years of age, and proportions of the population living on insufficient food energy (Table 3).

Poor nutritional status in childhood and adolescence can lead to impaired health during pregnancy thereby bringing about an inter-generational effect on human capital. "Improved nutrition is central to improved income generation, poverty reduction, and more rapid development. Better-nourished individuals constitute the bedrock of a nation that respects human rights and strives for high labour productivity. Well-nourished mothers

are more likely to give birth to well-nourished children who will attend school earlier, learn more, postpone leaving school, marry and have children later, give birth to fewer but healthier babies, earn more in their jobs, manage risk better, and be less likely to fall prey to diet-related chronic diseases in midlife."^[6] It is therefore crucial to break this vicious cycle of serious deleterious consequences on human development that is perpetuated by poor nutrition. Nutrition is an important human capital that deserves investments by both the public and private sectors.

Millennium Development Goal 2

Education is a crucial factor in ending global poverty. Education equips a person with knowledge, skills and attitudes to earn a living and have consumption choices in life. It is estimated that currently, there are more than 100 million children around the world of primary school age who are not in school.^[10] The majority of these children are in the regions of sub-Saharan Africa and South Asia.

Table 4. MDG 2: Achieve universal primary education

Target	Indicators
Target 3: Ensure that, by 2015, children everywhere, boys and girls alike will be able to complete a full course of primary schooling	i. Net enrollment ratio in primary education ii. Proportion of pupils starting grade 1 who reach grade 5 iii. Literacy rate of 15 to 24-year-olds

Poor health and nutrition is a leading cause for millions of children in developing countries to miss out on essential education. Malnourished children are less likely to enroll in school, or enroll later than other children, and are more likely to experience a disruption in their schooling. Undernourished children are at high risk of poor cognitive development and subsequent school failure. Hunger and malnutrition reduces concentration span, memory capacity and academic performance.^[10]

Besides access to food *per se*, intake of specific micronutrients is also paramount to cognitive functioning in infants and young children. Among the micronutrients commonly studied in this respect are iodine, iron and zinc. Iodine is an essential component of thyroid hormones that are necessary for skeletal growth and neurological development. Iodine deficiency disorders (IDD) has long been known to be associated with reduced intelligence and psychomotor retardation, affecting visual-perception organisation, visual-motor coordination and speed of information-processing.^[11] Nonetheless, the impact of iodine supplementation on the cognitive performance of children requires further investigation as results have not been consistent.^[12] In any case, IDD is highly preventable through universal salt iodisation and other public health measures.

Iron deficiency is the most common nutritional deficiency in the world. Globally, almost half of pre-school aged children and pregnant women, and close to one-third of non-pregnant women suffer from anaemia.^[13] Approximately half of anaemia cases is caused by

iron deficiency. Other causes include malaria, worm infestation, and deficiencies of vitamin B₁₂, vitamin A and folate. Iron has multiple roles in neuro-transmitter systems and may affect behaviour through its effects on dopamine metabolism, which is known to affect attention, perception, memory, motivation and motor control.^[14]

As for zinc, given its multiple roles in DNA replication, RNA transcription, endocrine functions and metabolic pathways, it is not surprising that zinc intake affects growth and development.^[15] It is postulated that children become more alert and active with zinc supplementation and would be more able to benefit from stimulation. Another benefit of zinc supplementation is that it reduces significantly the frequency and severity of diarrhoea and respiratory illnesses and the duration of diarrheal morbidity.^[16] Children with frequent bouts of infections are likely to have high absenteeism from school resulting in poor academic performance. Improving dietary intake including micronutrients of school children is important in strengthening their academic performance.

Millennium Development Goal 3

There have been steady improvements in most of the world's poor countries in women's and girls' education levels, according to the World Bank.^[17] Over 37 million girls in low-income countries have been enrolled in primary school since 1995, improving girls' enrollment rate from 80% of the boys' rate in 1995 to 88% in 2005. Also by 2004, the gap between girls and boys completing primary school had narrowed to 5.4%, from 14.8% in 1991.

Table 5. MDG 3: Empower women and promote equality between women and men

	Target	Indicators
Target 4:	Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015	i. Ratio of girls to boys in primary, secondary, and tertiary education ii. Ratio of literate females to males among 15- to 24-year-olds iii. Share of women in wage employment in the non-agricultural sector iv. Proportion of seats held by women in national parliament

Nonetheless, worldwide gender disparities still prevail in education, as well as in employment and other fields. Gender bias and discrimination pose serious constraints to women's capabilities and opportunities. In countries with such practices, girls are less likely to be enrolled in school and drop out earlier than boys. For example, girls in Sub-Saharan Africa and South Asia face cultural and economic barriers to education at the primary school age. They are married when young and may have several children by early adulthood. The nutritional status of their children and their own are likely to suffer in the face of inadequate diet and health care.

Hence, despite many international agreements affirming their human rights, women are still much more likely than men to be poor, malnourished and illiterate. Two-thirds of the world's illiterate population are women and 80% of its refugees are women and children. Women are recognised to represent a tremendous reservoir of human potential, but in many instances, they lack power and lack voice. When women are empowered with economic resources and lead productive lives, their children and families stand to benefit and enjoy a better quality of life. Gender equality is said to bring about a 'double dividend' in benefiting children and women themselves.^[8] There is ample evidence of the multiplier effects of investing in gender equality and women's empowerment.^[18] On the other hand, women suffering from poor diet and ill-health constitute a substantial erosion in terms of human capital.^[19]

"Empowered women contribute to the health and productivity of whole families and communities and to improved prospects for the next generation. Discrimination against women and girls, including gender-based violence, economic discrimination, reproductive health inequities, and harmful traditional practices, remains the most pervasive and persistent form of inequality."^[20]

Millennium Development Goal 4

By definition, the under-five mortality rate is the probability (expressed as a rate per 1,000 live births) of a child, born in a specified year, dying before reaching the age of five, if subject to current age-specific mortality rates. The under-five mortality rate is a strong measure of child survival globally, as death occurring in this age group forms more than 90% of the mortality cases among children under the age of 18. Worldwide, the mortality rate of children below five has been on a decline in recent decades, for example, from 13 million in 1990 to 9.7 million in 2005-2006.^[21] However, the numbers involved remain large, for example, in Asia alone more than 4 million children under age five die each year, mostly from preventable diseases.^[4] Table 7 shows that while significant declines have been attained generally, there are countries, including those in Asia such as Cambodia, Myanmar and Pakistan, that continue to have high levels of mortality rates for children under five years old.

The mortality rate of young children is an important indicator of the social, economic and environmental conditions in which children live, including their nutritional and health care. In fact, child mortality in developing countries decreased in the 1990s due to improvements in (i) fertility behaviour; (ii) nutritional status, breastfeeding, and infant

Table 6. MDG 4: Reduce under-five mortality by two-thirds

	Target	Indicators
Target 5:	Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	i. Under-five mortality rate ii. Infant mortality rate iii. Proportion of one-year-old children immunised against measles

Table 7. Under-five mortality rate in Asia (per 1,000 live births)^[26, 27]

Countries	Under-five mortality rate		Infant mortality rate
	1970*	2004	2006
Japan	21	4	3
Singapore	27	3	3
Republic of Korea	54	6	4
Brunei Darussalam	78	9	6
Malaysia	70	12	9
Thailand	102	21	11
China	120	31	23
Philippines	90	34	23
Indonesia	172	38	27
Vietnam	87	23	20
India	202	85	55
Cambodia	..	141	63
Myanmar	179	106	66
Lao PDR	218	83	52
Pakistan	181	101	71
Bangladesh	239	79	53

feeding; (iii) the use of health services for children by mothers; (iv) environmental health conditions; and (v) socio-economic status.^[22] The actual causes of the majority of deaths are attributable to six causes: diarrhoea, malaria, neonatal infection, pneumonia, pre-term delivery, or lack of oxygen at birth.^[18] Hence, child mortality is largely preventable through the adoption of basic health interventions such as early and exclusive breast-feeding, measles immunisation, vitamin A supplementation, and the use of insecticide-treated bed nets to prevent malaria.

Out of approximately 10 million children below five who die each year, 4 million die during the first 4 weeks (neonatal deaths), and another 3.3 million are stillborn.^[23] The MDG 4 has rightfully included infant mortality rate as one of its monitoring indicators. The infant mortality rate is defined as the number of infants who are born alive, but die before one year of age. The infant mortality rate reflects the quality of a country's health care delivery services. Among Asian countries, high infant mortality rates prevail in South Asia, Cambodia, Myanmar and Laos (Table 7).

Maternal health and nutrition are important for neonatal health. High neonatal deaths occur as a result of untreated or poorly treated maternal complications, inadequate neonatal care, harmful home care practices including discarding of colostrum. Colostrum, the yellowish, sticky breast milk produced at the end of pregnancy is the ideal food for the newborn, and breastfeeding should be initiated within the first hour after birth. Exclusive breastfeeding up to 6 months of age is the ideal way of providing young infants with the nutrients required for healthy growth and development.

Breast milk is known to contain not only nutrients required by the newborn, but also non-nutritional components that promote infant growth and development, such as

antimicrobial factors, digestive enzymes, hormones and growth modulators. Through breastfeeding, the child derives protection against infections and thus experiences less frequent bouts of diarrhoea, respiratory infections, and allergies. Dehydration from diarrhoea used to be the most common cause of infant mortality worldwide, but the use of oral rehydration solution has helped to reduce drastically the rate of children dying from dehydration. Diarrhoea could be avoided in the first place by ensuring exclusive breastfeeding.

After six months on exclusive breast milk, infants require appropriate complementary foods that provide adequate amounts of macro- and micro-nutrients to meet their rapid growth and development. In West Java, Indonesia, use of inadequate complementary foods led to faltering of growth at age 6-7 months resulting in 24% stunting and 32% underweight at 12 months of age.^[24] The complementary foods given included honey, water with or without sugar, coffee, biscuits and bananas. In a study of 505 infants aged 6-12 months in South Africa, micro-nutrient deficiencies were reported, including low serum levels of retinol (20%), ferritin (67%) and zinc (32%), as well as a high prevalence of anaemia (49%).^[25] These were consequences of inappropriate feeding practices that included the use of diluted formula feeds and maize porridge.

Millennium Development Goal 5

Maternal mortality is defined as “the death of a woman while pregnant or within 42 days of termination of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental causes.”^[28] The international measure of maternal mortality is maternal mortality ratio, which depicts the risk of maternal death relative to the number of live births. Thus, maternal mortality ratio is the number of maternal deaths in a population during a given time period per 100,000 live births during the same time period.

Improving maternal health has been an important concern of international and national agencies as well as non-government organisations for several decades. Reducing maternal mortality has been an intractable challenge especially in the developing world. Out of the estimated 536,000 maternal deaths worldwide in 2005, 99% of these deaths occurred in developing countries.^[28] Among the developing regions, sub-Saharan Africa has the highest maternal mortality ratio (900 per 100,000 live births), followed by South Asia (490), Oceania (430), South-Eastern Asia (300) and West Asia (160) (Table 9).

Poor nutrition reduces the mother's resistance to infection, while deficiencies of iron, vitamin A, folate, iodine and calcium are associated with pregnancy complications, posing a major risk factor for maternal mortality. About half of all pregnant women in developing

Table 8. MDG 5: Reduce maternal mortality by three-quarters

Target	Indicators
Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	i. Maternal mortality ratio ii. Proportion of births attended by skilled health personnel

Table 9. Comparison of 1990 and 2005 maternal mortality ratios (MMR)⁽²⁸⁾

Region	1990		2005		% change in MMR between 1990 & 2005
	MMR	Maternal deaths (thousand)	MMR	Maternal deaths (thousand)	
World Total	430	576	400	536	- 5.4
Developed	11	1.3	9	0.96	- 23.6
Developing	480	572	450	533	- 6.6
Africa	830	221	820	276	- 0.6
Asia	410	329	330	241	- 19.7
Eastern	95	24	50	9.2	- 47.1
South	620	241	490	188	- 21.1
South-East	450	56	300	35	- 32.8
Western	190	8.5	160	8.3	- 16.2
Latin America	180	21	130	15	- 26.3
Oceania	550	1	430	0.89	- 22.2

countries are anaemic and underweight.^[29] About a half of anaemia in pregnancy is due to iron deficiency, and iron deficiency anaemia in turn is associated with one-tenth of maternal mortality in developing countries. Besides anaemia, women who are underweight are also more likely to have unsuccessful pregnancies. More than a third of women of reproductive age are underweight in sub-Saharan Africa, while more than half of the women in South Asian countries are underweight.^[17]

It has been estimated that delaying marriage and first birth, preventing an unwanted pregnancy and eliminating unsafe abortion would avert up to one-third of maternal deaths. Wider birth spacing and prevention of pregnancies in very young women could also reduce low birth weight rates, improve child growth and reduce child mortality by half.^[17] Around 15 million young women aged 15 to 19 give birth each year, accounting for more than 10% of all babies born worldwide. Girls aged 10 to 14 are five times more likely to die in pregnancy or childbirth than women aged 20 to 24, while girls aged 15 to 19 are twice as likely to die.

In order to realise the MDG 5 of reducing maternal deaths by three-quarters the level in 1990, greater efforts towards improving health care for women are needed. These include prevention of unplanned pregnancies and unsafe abortions, provision of good pregnancy and delivery care.^[28]

Millennium Development Goal 6

Jeffrey Sachs, the Special Advisor to the previous United Nations Secretary General Kofi Annan, reported that "By the turn of the new millennium, sub-Saharan Africa's life expectancy stood at 47 years, more than two decades lower than in East Asia (69 years), and 31 years lower than the average age in developed countries (78 years)."^[30] The report described the devastating impact on health, food security and socio-economic development of two insidious diseases in Africa namely, AIDS and malaria. At the end of 2005, an estimated 38.6

Table 10. MDG 6: Reverse the spread of diseases, especially HIV/AIDS, malaria and other diseases

Target	Indicators
Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	i. HIV prevalence among 15- to 24 -year old pregnant women ii. Contraceptive prevalence rate iii. Number of children orphaned by HIV/AIDS

million people worldwide were living with HIV, and an estimated 2.8 million had lost their lives to AIDS.^[31] The overall HIV incidence rate is believed to have peaked in the late 1990s and to have stabilised subsequently. While Africa remains the global epicentre of the AIDS pandemic, several countries in Asia are experiencing increasing HIV prevalence notably China, Vietnam, and Indonesia.

HIV/AIDS can cause a patient to be severely malnourished as a result of (i) decreased intake of food, (ii) impaired nutrient absorption, and (iii) changes in metabolism.^[32] Decreased food consumption arises due to difficulty in chewing and swallowing because of mouth and throat sores, or the patient may suffer a loss of appetite, or experience side effects from medication or depression. The patient may be too poor to afford nutritious foods required to meet the increased requirements for energy and nutrients arising from the illness.

According to WHO^[33], energy requirements are likely to increase by 10% to maintain body weight in asymptomatic HIV-infected adults and growth in asymptomatic children. During symptomatic HIV, and subsequently during AIDS, energy requirement increases by 20 to 30% to maintain adult weight. In children experiencing weight loss, energy intake needs to be increased by 50 to 100%. The present recommendations for HIV-infected adults apply to pregnant and lactating HIV-infected women. No additional requirements for protein and fat are recommended by the WHO owing to insufficient data to support additional intake.

Recommendations for micronutrient supplementation are presently only for HIV-infected children and pregnant women. Children aged 5 to 59 months are recommended to receive vitamin A supplements every 4-6 months to avoid vitamin A deficiency, which is associated with diarrhoea morbidity and mortality. The standard iron-folate (60mg iron and 400 microgram folic acid) supplements are recommended daily during six months of pregnancy to prevent anemia, just as for non-HIV-infected women.^[33] While considerable understanding has been attained regarding nutrition care for people living with HIV/AIDS, it is realised that knowledge gaps exist and more evidence is essential before making further nutrition recommendations.

The vicious cycle of malnutrition and HIV (Figure 1) underscores the close links and interaction between nutrition and HIV infection. Malnutrition can have serious deleterious impact on HIV/AIDS in more than one way, including^[34]

- hastening the onset of AIDS among HIV-positive individuals,
- compromising efficacy and safety of anti-retroviral treatment,

- weakening resistance to opportunistic infections, and
- increasing oxidative stress leading to increased HIV replication.

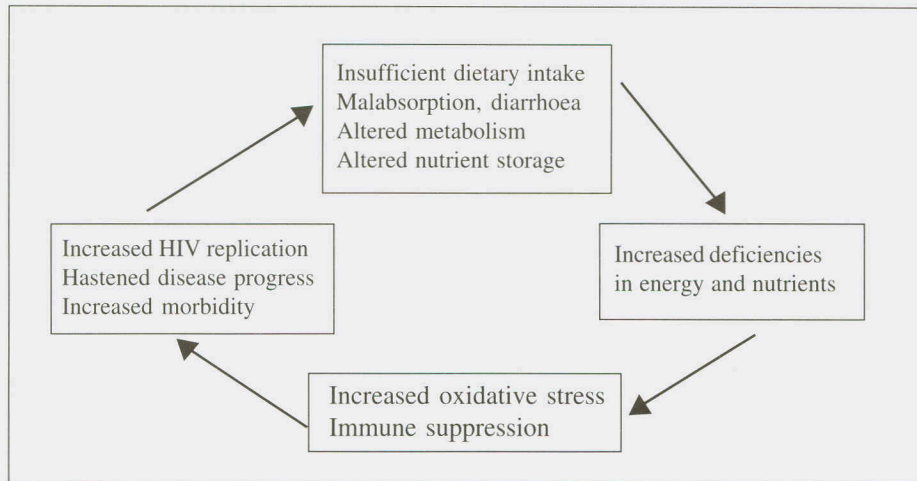


Figure 1: The vicious cycle of malnutrition and HIV/AIDS^[34]

In effect, the ability to resist HIV infection and opportunistic infections depends on the nutritional status of the patient.

In the case of the infant born of a HIV-infected mother, the dilemma posed is whether to breastfeed or not. Studies have shown that infants who are exclusively breastfed face the same transmission rates as bottle fed babies.^[35] In populations where breastfeeding is the predominant form of infant feeding, not more than a third of the total mother to child transmission (MTCT) is thought to occur through breast milk with the rest occurring during the birthing process.^[2] With the use of short-course anti-retroviral therapy at birth, transmission rates can be cut by 51% in non-breastfeeding populations and by almost 40% in breastfeeding populations.^[36]

The WHO recommends replacement feeding instead of breastfeeding only if several conditions can be met. The replacement feeding must be acceptable, financially and physically possible, continued over a period of time and safe for both the mother and baby. If these conditions cannot be met, the WHO recommends that HIV-infected mothers give their babies only breast milk for the first 6 months of life.^[37] At 6 months, continuation of breastfeeding with additional complementary foods is recommended, if “replacement feeding is still not acceptable, feasible, affordable, sustainable, and safe”. All breastfeeding should cease once a nutritionally adequate and safe diet without breast milk can be provided.

The WHO made these recommendations in the face of estimations that up to 20% of infants born to HIV-infected mothers become infected through breastfeeding. However, stopping breastfeeding puts children at risk of other problems, including poor nutrition and increased risk of other life-threatening infections.

Millennium Development Goal 7

The environment provides resources that sustain human development and mankind in turn should ensure that development sustains the environment. Sustainable development encompasses appropriate management of natural resources in order to preserve them in their rich diversity and integrity.

Table 11. MDG 7: Ensure environmental sustainability

Target	Indicators
Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	
Target 10: Halve, by 2015, the proportion of people without access to safe drinking water urban and rural	i. Proportion of population with sustainable access to an improved water source, urban and rural ii. Proportion of population with access to improved sanitation,
Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	

While the MDG 7 focuses generally on the conservation of environmental resources and prevention of pollution, it also includes targets that are critically important to health. One of its targets is to halve the proportion of people without access to safe drinking water and basic sanitation by the year 2015. Access to safe water and living in a sanitary environment are necessary conditions for ensuring people do not run the risk of infections and disease arising from an unclean environment. It is estimated that more than 1.2 billion people gained access to improved drinking water, from 78% in 1990 to 83% in 2004.^[38] Unfortunately, more than one billion people worldwide were still without access to improved drinking water sources in 2004. Asia and the Pacific region have the most number of people (624 million) without access to safe drinking water.

As for access to improved sanitation, the global coverage increased from 49% in 1990 to 59% in 2004.^[38] Improved sanitation facilities refer to those that reduce the chances of people coming into contact with human excreta. The current pace of progress is believed to be too slow to meet the MDG target and coupled with population growth, there will be 2.4 billion people without basic sanitation in 2015.

Young children are particularly vulnerable to the ill effects of lack of access to safe drinking water, inadequate availability of water for hygiene, and lack of access to sanitation. These three factors together contribute to 88% of the 1.9 million children aged under five who die from diarrhoea diseases each year.^[38] Diarrhoea affects the child's nutritional status through reductions in appetite, dietary intake and intestinal absorption.^[39] Diarrhoea also increases catabolism and excretion of nutrients and electrolytes which are needed for

tissue synthesis and growth. On the other hand, malnutrition renders the child more vulnerable to infections such as malaria and measles, through weakening of the body's immune system.

Specific micronutrients are known to play key roles in increasing the risk or severity of diarrhoea.^[40] Studies have shown that vitamin A supplementation reduces mortality rate and severity of diarrhoea, while zinc supplementation shortens the duration and severity of the episode. It is important for care-givers to have sufficient nutrition and health knowledge on the prevention and management of diarrhoea, especially in areas that lack access to safe drinking water and improved sanitation. Dissemination of basic knowledge on nutrition and hygiene to care-givers can be integrated with other health promotion topics such as breastfeeding and measles vaccination.

Millennium Development Goal 8

The challenges embodied in the first seven MDGs require countries to work in partnership at regional and international levels. Towards this end, the eighth MDG provides a policy framework comprising targets and indicators for developed countries to increase their political, technical and financial resources in support of development initiatives of developing countries.^[41] Specifically, the industrialised countries have pledged to provide more official development assistance (ODA), measures to ensure debt sustainability in the long term, and an open multilateral trading system. In turn, developing countries would "take responsibility for their national development through the adoption of democratic governance mechanisms, policies and practices."

Concerns related to health and nutrition are addressed in the MDG 8, whereby it is specified in Target 12 that developing countries should allocate 20% of the national budget to basic social services, which include basic education, primary health care, reproductive health, nutrition, safe water and sanitation. At the country level, the donor community would match that allocation by directing 20% of ODA in support of the same services (20/20 Initiative). In meeting the 20/20 Initiative, it is essential for both the recipient government and donor to ensure that "a substantial share of incremental expenditure goes to those health and nutrition interventions that really work, and that these reach the poor and underserved."^[42] To date, progress in achieving the 20/20 Initiative is reportedly slow. Only 12-14% of the national budgets of developing countries have been allocated to basic services in recent years, and this is matched by 10-12% of ODA.^[43]

Table 12. MDG 8: Create a global partnership for development, with targets for aid, trade and debt relief

Target	Indicator
Target 12: Develop further an open trading and financial system that includes a commitment to good governance, development and poverty reduction –nationally and internationally	Proportion of ODA to basic social services (basic education, primary health care, nutrition, safe water and sanitation)

Another important aspect of the MDG 8 is trade with the call for increased market access by developing countries, especially to the EU, Japan and North America, through reductions in subsidy in the developed countries. Trade that enables agricultural products to gain greater access to the international markets is particularly important to developing countries since the majority of the world's poor rely on agriculture for livelihood and employment. This would be one significant way of improving food security of the poor. Unfortunately, progress in this respect has been very slow and EU and North American countries continue to grant generous subsidies to their agricultural sector.

The assumptions of the MDG 8 are that trade liberalisation and liberal domestic policies can ameliorate the problems of poverty, poor health, unequal gender relations and environment degradation. These basic tenets have not been well received by some civil society organisations, who contend that "eradication of poverty, and efforts to address inequity in education, health care and sustainable environment, cannot be achieved without addressing the challenging issues of unsustainable debt, trade subsidies, and unequal power in global economic governance."^[44] Among the suggestions that have been proposed include the call for more resources to be given directly to non-government organisations, including organisations of grassroots women working on issues raised in the MDGs.

CONCLUSION

Worldwide, the scale of death and morbidity due to malnutrition directly or indirectly remains staggering. Undernutrition is responsible for at least one-fifth of the loss of years of life to death and disability. Over half a million women in developing countries die during pregnancy or childbirth annually, and a significant proportion of this could be avoided with adequate health and nutrition.

The Millennium Development Goals offer an opportunity for governments, international agencies and civil society organisations to work in partnership on improving human development as the key to sustaining social and economic progress. The MDGs are intended to focus attention on critical problems, and to maintain that focus by having clear indicators to monitor progress toward the achievement of specific goals. For example, performance indicators include coverage and quality of key child and maternal health, disease control services, as well as changes in mortality and disease incidence.^[45] Toward achieving these objectives, investments are needed to build and strengthen the capacity for monitoring and evaluation, in order to gauge short- and medium-term progress toward the MDGs.

Poverty reduction features prominently in the MDGs, and substantial investments in human capital especially health, nutrition and education are critical for the population to escape from the vicious poverty cycle. Economic progress is known to be a major determinant for improving childhood nutritional status, as exemplified by China and Vietnam, where recent economic reforms and growth have brought about commendable reductions in the prevalence of underweight and stunted children.

Non-income dimensions are equally important for achieving the MDG targets. These include health, nutrition, education, women's empowerment, and access to clean drinking water and sanitation. Improving maternal health and reducing mortality of young children are accorded due emphasis in the MDGs. The evidence that malnutrition is implicated in the etiology leading to maternal and childhood deaths underlines the critical roles and

contributions of adequate nutrition. It is thus important to incorporate nutrition considerations into government development policies and budgets towards enhancing the attainment of the Millennium Development Goals by 2015.

REFERENCES

- [1] IMF/OECD/UN/World Bank. A Better World For All: Progress Towards the International Development Goals. Report prepared by the staff of the International Monetary Fund, Organization for Economic Cooperation and Development, United Nations and World Bank. Washington, DC: World Bank, 2000.
- [2] Shrimpton R. Nutrition, the Millennium Development Goals and Poverty Reduction in ECOWAS Countries. Meeting of the Nutrition Focal Points of Countries of the Economic Community of West African States (ECOWAS) held in The Gambia 2-6 September 2002.
- [3] World Bank. The Millennium Development Goals. Washington DC: The World Bank, 2002.
- [4] Asian Development Bank. Fighting Poverty in Asia and the Pacific: The Poverty Reduction Strategy. ADB, Manila, Philippines, 2005
- [5] De Onis M, Blössner M, Borghi E, Frongillo EA, Morris R. Estimates of global prevalence of childhood underweight in 1990 and 2015. *J Am Med Assoc* 2004; 291: 2600-2606.
- [6] Díaz-Bonilla E, Robinson S. Shaping Globalization for Poverty Alleviation and Food Security. Washington DC: International Food Policy Research Institute, 2001.
- [7] ESCAP/UNDP/ADB. The Millennium Development Goals: Progress in Asia and the Pacific 2006. <http://mdgasiapacific.org> accessed on 26 June 2007.
- [8] UNICEF. The State of the World's Children. Women and Children: The Double Dividend of Gender Equality. New York: UNICEF, 2007.
- [9] UN/ACC/SCN. Nutrition and Agriculture. Geneva: United Nations Standing Committee on Nutrition, 2000.
- [10] Jukes M. Better education through improved health and nutrition: implications for early childhood development programs in developing countries. Basel: Birkhäuser, 2007.
- [11] Pollitt E. Malnutrition and Infection in the Classroom. Paris: UNESCO, 1990.
- [12] Black M. Micronutrient deficiencies and cognitive functioning. *J Nutr* 2003; 133: 3927S-3931S.
- [13] Mclean E, Egli I, de Benoist B, Wojdyla D, Cogswell M. Worldwide prevalence of anemia in preschool aged children, pregnant women and non-pregnant women of reproductive age. In: Kraemer K and Zimmerman MB (eds). Nutritional anaemia. Basel: Sight & Life Press, 2005.
- [14] Beard JL. Iron deficiency alters brains development and functioning. *J Nutr* 2003; 133: 1468S-1472S.

- [15] IZiNCG Steering Committee. Assessment of the risk of zinc deficiency in populations and options for its control. In: Hotz C and Brown KH (eds). International Zinc Nutrition Consultative Group Technical Document #1. Reprinted from UNU Food Nutr Bull 2004; 25: S99-S129.
- [16] Aggarwal R, Sentz J, Miller MA. Role of zinc administration in prevention of childhood diarrhea and respiratory illnesses: a meta-analysis. *Pediatrics* 2007; 119:1120-1130.
- [17] World Bank. The World Bank and Gender Equality, 2007. <http://web.worldbank.org/gender> Accessed on 25 Oct 2007.
- [18] UNFPA. State of the World Population, 2005. New York: United Nations Population Fund. 38-49.
- [19] UN/ACC/SCN. 5th Report on the World Nutrition Situation. Nutrition for Improved Development Outcomes. Geneva: United Nations Standing Committee for Nutrition, 2004.
- [20] UNFPA. Promoting Gender Equality. 2006. <http://www.unfpa.org/gender> accessed 29 Oct 2007.
- [21] UNICEF. Press release "Child deaths fall below 10 million for first time" by UNICEF Executive Director Ann M. Veneman on 13 September 2007, New York; 2007.
- [22] Rutstein SO. Factors associated with trends in infant and child mortality in developing countries during the 1990s. *Bull WHO* 2000; 78:1256-1270.
- [23] Zupan J. Perinatal mortality in developing countries. *N Engl J Med* 2005; 352:2047-48.
- [24] Schmidt MK, Muslimatun S, West CE, Schultink W, Gross R, Hautvast GAJ. Nutritional status and linear growth of Indonesian infants in West Java are determined more by prenatal environment than by postnatal factors. *J Nutr* 2002; 132: 2202-2207.
- [25] Faber M, AJS Benade. Breastfeeding, complementary feeding and nutritional status of 6-12-month-old infants in rural KwaZulu-Natal. *South African J Clin Nutr* 2007; 20:16-24.
- [26] United Nations. Millennium Indicators Database. Department of Economic and Social Affairs, Statistics Division, New York.[<http://mdgs.un.org>]. Accessed Oct 2007.
- [27] United Nations. World Population Prospects: 2006 Revision. Population Division of the Department of Economic and Social Affairs at www.unpopulation.org, 2007.
- [28] WHO. Maternal Mortality in 2005. Estimation developed by WHO, UNICEF, UNFPA and The World Bank. Geneva: WHO, 2007.
- [29] Rush D. Nutrition and maternal mortality in the developing world. *Am J Clin Nutr* 2000; 72:212S-240S.
- [30] Sachs J. The end of poverty. How we can make it happen in our lifetime. London: The Penguin Press, 2005.

- [31] UNAIDS Joint United Nations Programme on AIDS. Report on the Global AIDS Epidemic. Geneva: UNAIDS, 2006.
- [32] Piwoz EG, Bentley ME. Women's voices, women's choices: the challenge of nutrition and HIV/AIDS. *J Nutr* 2005; 135:933-937.
- [33] WHO. Nutrient Requirements for People Living with HIV/AIDS. Geneva: WHO, 2003.
- [34] Semba RD, Tang AM. Micronutrients and the pathogenesis in human immunodeficiency virus infection. *Br J Nutr* 1999; 81: 181-189.
- [35] Coutoudis A. Breastfeeding and HIV transmission. *Nutr Res Rev* 2001; 14: 191-206.
- [36] Semba RD, Gray GE. Human immunodeficiency virus infection. In: *Nutrition and Health in Developing Countries*. In: Semba RD and Bloem MW (eds). New Jersey: Human Press Inc., 2001.
- [37] WHO. HIV and Infant Feeding Technical Consultation. Consensus Statement. October 25-27 2006. Geneva: WHO, 2006.
- [38] UNICEF. Progress For Children No. 5: A Report Card on Water and Sanitation. New York: UNICEF, 2006.
- [39] Brown KH. Diarrhea and Malnutrition. *J Nutr* 2003; 133: 328S-332S.
- [40] Christa L, Walker F, Black RE. Micronutrients and diarrheal disease. *Clin Infect Dis* 2007; 45:S73-S77.
- [41] Almeida I, Fard RF. Did we do what we said we would do? North Atlantic countries and global partnerships for development. Montreal: Rights & Democracy, 2005.
- [42] WHO/World Bank. High-Level Forum on the Health Millennium Development Goals Overview of Progress Towards Meeting the Health MDGs. Geneva: World Health Organization, 2003.
- [43] Vandemoortele J, Malhotra K, JA Lim. Is MDG 8 on track as a global deal for human development? Presented in "Mobilizing Partnerships and capacity for achieving MDGs" on June 3, New York, 2003.
- [44] Antrobus P. MDG 8. Presented at the United Nations General Assembly Informal Interactive Hearings, 23-24 June 2005, New York.
- [45] World Bank. The Millennium Development for Health: Rising to the Challenges. Washington DC: World Bank, 2004.

Appendix 1. The Millennium Development Goals, Targets and Indicators

Goals and targets		Indicators ¹
GOAL 1 Eradicate extreme poverty and hunger		
Target 1:	Halve between 1990 and 2015 USD1 whose income is less than USD1 a day	1. Proportion of population below the proportion of people 2. Poverty gap 3. Share of poorest quintile in national consumption
Target 2:	Halve, between 1990 and 2015, the proportion of people who suffer from hunger	4. Prevalence of underweight children under five years of age 5. Proportion of population below minimum level of dietary energy consumption
GOAL 2 Achieve universal primary education		
Target 3:	Ensure that, by 2015, children everywhere, boys and girls alike will be able to complete a full course of primary schooling	6. Net enrollment ratio in primary education 7. Proportion of pupils starting grade 1 who reach grade 5 8. Literacy rate of 15 to 24-year-olds
GOAL 3 Promote gender equality and empower women		
Target 4:	Eliminate gender disparity in primary and secondary education preferably by 2005 and in all levels of education no later than 2015	9. Ratio of girls to boys in primary, secondary, and tertiary education 10. Ratio of literate females to males among 15- to 24-year-olds 11. Share of women in wage employment in the nonagricultural sector 12. Proportion of seats held by women in national parliament
GOAL 4 Reduce child mortality		
Target 5:	Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	13. Under-five mortality rate 14. Infant mortality rate 15. Proportion of one-year-old children immunised against measles
GOAL 5 Improve maternal health		
Target 6:	Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	16. Maternal mortality ratio 17. Proportion of births attended by skilled health personnel

GOAL 6 Combat HIV/AIDS, malaria, and other diseases	
Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	18. HIV prevalence among 15- to 24-year old pregnant women 19. Contraceptive prevalence rate 20. Number of children orphaned by HIV/AIDS
Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	21. Prevalence and death rates associated with malaria 22. Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures 23. Prevalence and death rates associated with tuberculosis(TB) 24. Proportion of TB cases detected and cured under DOTS
<hr/>	
GOAL 7 Ensure environmental sustainability	
Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	25. Change in land area covered by forest 26. Land area protected to maintain biological diversity 27. GDP per unit of energy use 28. Carbon dioxide emissions (per capita) 29. Proportion of population using solid fuels
Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	30. Proportion of population with sustainable access to an improved water source, urban and rural 31. Proportion of population with access to improved sanitation, urban and rural
Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	32. Proportion of households with access to secure tenure
<hr/>	
GOAL 8 Develop a global partnership for development	
Target 12: Develop further an open trading and financial system that includes a commitment to good governance, development and poverty reduction – nationally and internationally	Official development assistance (ODA): 33. Net ODA as percentage of OECD/ DAC donors' gross national product (targets of 0.7% in total and 0.15% for LDCs) 34. Proportion of ODA to basic social services (basic education, primary health care, nutrition, safe water and sanitation)

Target 13: Address the least developed countries' special needs, and the special needs of landlocked and small island developing states	35. Proportion of ODA that is untied 36. Proportion of ODA for environment in small island developing States. Proportion of ODA for transport sector in landlocked countries
Target 14: Address the special needs of landlocked and small island developing States	Market access 37. Proportion of exports (by value and excluding arms) admitted free of duties and quotas 38. Average tariffs and quotas on agricultural products and textiles and clothing 39. Domestic and export agricultural subsidies in OECD countries 40. Proportion of ODA provided to help build trade capacity
Target 15: Deal comprehensively with developing countries' debt problems through national and international measures to make debt sustainable in the long term	Debt sustainability 41. Proportion of official bilateral heavily indebted poor countries (HIPC) debts cancelled 42. Total Number of Countries that Have Reached their HIPC Decision Points and Number that Have Reached their Completion Points (Cumulative) (HIPC) (World Bank-IMF) 43. Debt Service as a Percentage of Exports of Goods and Services (World Bank) 44. Debt Relief Committed Under HIPC Initiative (HIPC) (World Bank-IMF)
Target 16: In cooperation with the developing countries, develop decent and productive work for youth	45. Unemployment of 15-24 year-olds, Each Sex and Total (ILO)
Target 17: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	46. Proportion of Population with Access to Affordable, Essential Drugs on a Sustainable Basis (WHO)
Target 18: In cooperation with the private sector, make available the benefits of new technologies- especially information and communications technologies	47. Telephone Lines and Cellular Subscribers per 100 Population (ITU) 48. Personal Computers in Use and Internet Users per 100 Population (ITU)