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## Introduction

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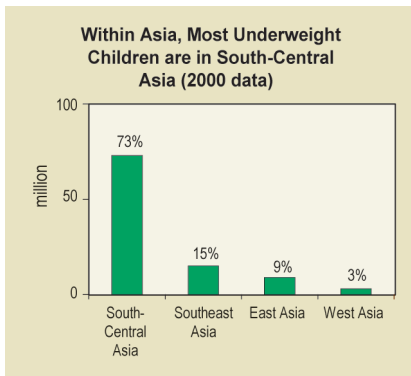
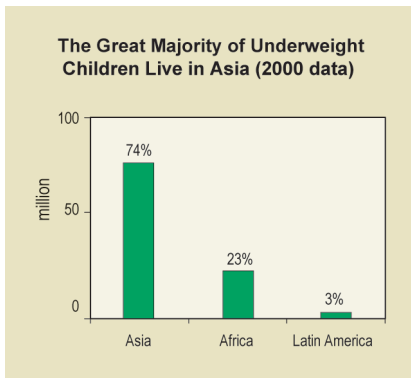


## Background

Nutrition is both the outcome and the process of providing nutrients needed for health, growth, development, and survival. Although food is an important part of this process, it is not by itself sufficient. Other supportive conditions that are essential include good caring practices, accessible good quality health services, reduced poverty, and adequate education levels. Nutrition is integral to the first Millennium Development Goal (MDG) on hunger and poverty. It is also instrumental in the efforts to achieve other MDGs, particularly those related to improvements in primary education enrollment and attainment, gender equity, child mortality, maternal health, and the ability to combat disease. The MDGs are presented in Appendix 1, and a summary of the role of improved nutrition in reaching the MDGs is shown in Appendix 2.

Malnutrition is a state of poor nutrition, which can result from insufficient, excessive, or unbalanced diet, or inability to absorb food. It is implicated in more than half of all child deaths worldwide. Malnourished children have lowered resistance to infection, and they are more likely to die from common childhood ailments such as diarrheal disease and respiratory infections. Those who survive are prone to frequent illnesses that worsen their nutrition status, trapping them in recurring sickness and faltering growth. Malnutrition is a multigenerational issue, as fetal development during gestation is influenced by maternal nutrition status, and women who were malnourished as infants are more likely to give birth to malnourished babies. Thus, infant malnutrition, especially for girls, perpetuates poverty and malnutrition across generations.

The prevalence of low birth weight is strongly associated with the undernutrition of mothers. Sixty percent of women in South Asia, and 40% of women in Southeast Asia, are underweight, and it is estimated that about 50% of all growth retardation during gestation in rural developing countries is attributable to small maternal size at conception. Low birth weight is one of the main reasons why children are underweight. The consequences include increased morbidity and mortality risks, poor neuro-developmental outcomes, reduced strength and work capacity, and increased risk of chronic diseases in adulthood. Reducing infant malnutrition, especially in girls, weakens one of the strongest links in the intergenerational transmission of poverty. In 1990, there were 162.2 million underweight children under 5-years old in developing countries, of whom 131.9 million (81%) live in Asia; of these 86 million



(53%) live in South-Central Asia.<sup>1</sup> After a decade, in 2000, the number decreased to 135.5 million, with 101.2 million (75%) living in Asia, and 73.4 million (54%) in South-Central Asia (see Appendix 3).

The major forms of malnutrition worldwide are protein-energy malnutrition such as marasmus and kwashiorkor,<sup>2</sup> and micronutrient malnutrition, such as iron deficiency anemia, vitamin A deficiency, and iodine deficiency disorder. According to current global statistics, more than 3 billion people in the world (about 50%) are malnourished, and among them, around 2 billion are micronutrient malnourished. An estimated 39% of preschool children are anemic as are 52% of pregnant women. Lack of quality foods, together with blood loss from hookworm transmitted through substandard sanitation, is the leading cause of iron deficiency anemia in most areas of the

world. Inadequate dietary intakes of iron are seen most often in premenopausal women, infants (particularly premature or low-birth-weight), children, and adolescents (especially girls).

Micronutrients (all vitamins and most minerals) are substances that are needed by the body in very small amounts. They cannot be synthesized in the body, and need to be provided by the diet. They are essential to maintain normal body functions, and if these micronutrients are missing during phases of rapid growth, the development of basic biological functions can be

<sup>1</sup> Standing Committee on Nutrition (SCN). 2004. *5<sup>th</sup> Report on the World Nutrition Situation. Nutrition for Improved Development Outcomes*. March. United Nations, New York.

<sup>2</sup> Marasmus results from near starvation with deficiency of protein and nonprotein nutrients, while kwashiorkor usually shows more marked protein deficiency than energy deficiency, resulting in edema. The combined form of protein-energy malnutrition is marasmic kwashiorkor. Children with this form have some edema and more body fat than those with marasmus.

threatened. This is why young children and pregnant women are often among the risk groups for micronutrient malnutrition.<sup>5</sup> Micronutrient malnutrition is caused by poor-quality diets that are characterized by high intakes of staples but low consumption of animal and fish products, fruits, legumes, and vegetables, all of which are rich sources of bioavailable minerals and vitamins. Most of the micronutrient malnourished are those who cannot obtain these foods from their own production, and therefore supplementation or food fortification becomes necessary. These deficiencies negatively affect (i) child survival and growth, (ii) women's health and pregnancy outcomes, (iii) brain development and intelligence quotient (IQ), (iii) educational achievement, (iv) adult productivity/work capacity, and (v) resistance to illness.

The effect of nutrition status on the following are well researched: (i) iron status and anemia on productivity, (ii) vitamin A on reducing childhood mortality and cases of severe diarrhea, (iii) iodine supplementation on IQ as well as motor skills of children, and (iv) age of reaching developmental stages. However, most impact studies have used mortality, productivity, morbidity, and intelligence as outcome measures. Economic impact on family and community as an outcome indicator was not used, perhaps because of the long observation period needed (10–15 years) to measure this outcome. The impact on the health status and productivity of populations depends on the baseline prevalence of vitamin A deficiency, iron deficiency anemia, and iodine deficiency disorders. The negative impact on gross domestic product (GDP) rises proportionately with increasing iron deficiency anemia (lower productivity), vitamin A deficiency (lost person-years of productive contribution to society), and iodine deficiency disorders (low brain development) risks. Likewise the long-term negative impact will decrease as the prevalence of micronutrient malnutrition decreases. It is reasonable to assume that a program's impact might be slow in starting, but in Europe and North America, within a decade of the passage of laws and the introduction of the necessary enforcement mechanisms to increase iodine intake with salt, goiter (enlargement of the thyroid gland) disappeared.

Iodine deficiency disorders (IDD) can seriously damage the brain, slowing mental responses and impairing intelligence levels. Even moderate IDD can decrease the IQ level by 10 to 20 points; thus, children with IDD suffer most,

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<sup>5</sup> Micronutrient malnutrition usually refers to vitamin A deficiency, iodine deficiency disorders, iron deficiency anemia, zinc deficiency, folic acid deficiency (B9), other B vitamin deficiency, vitamin C deficiency, and vitamin D deficiency.

as they are slower and less intelligent, resulting in poor attainment in school. As adults they are weaker, less productive, and earn lower incomes.

The magnitude of health benefits used as illustration for reducing micronutrient malnutrition with fortification need to be reconsidered in developing member countries (DMCs) where very few of the foods that the poor consume are manufactured and can be fortified. In addition to the efficiency of fortification, there is also the issue of biological effectiveness and the appropriate dosage. Elemental iron is used in most premixes because of its low cost, but has very low absorption rates in the body, and its impact on anemia at the national level has not yet been clearly established.

The Asia and Pacific region is currently facing a double burden of disease due to the nutrition transition, which accompanies development and urbanization. The nutrition transition is marked by a shift away from relatively monotonous diets of varying nutrition quality (based on indigenous staple grains or starchy roots, locally grown vegetables and fruits, and limited foods of animal origin) toward more varied diets that include more processed food, more foods of animal origin, more added sugar and fat, and often more alcohol. The transition usually accompanies reduced physical activity in work and leisure, leading to a rapid increase in the prevalence of overweight and obesity. Therefore, in addition to the old problems caused by malnutrition, new problems arise due to the epidemiological transition, from endemic deficiency and infectious diseases, toward diet-related chronic diseases, such as ischemic heart disease, diabetes, obesity, hypertension, stroke, and certain cancers. Although there is an increasing problem among the whole population of overweight, obesity, and diet-related chronic diseases, malnutrition takes its greatest toll in terms of illness, death, and disability on the poor, women, and young children.

Most nutrition interventions have been consistently evaluated as being cost effective, and many have very low unit cost, which can be borne almost entirely by the consumer. In ranking health investments using cost per disability-adjusted life year (DALY),<sup>4</sup> nutrition improvement compares favorably with other types of health and poverty interventions in most regions of the world. The World Bank's 1993 *World Development Report* stated that micronutrient programs are among the most cost effective of all health interventions. Most micronutrient programs cost less than \$50 per DALY

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<sup>4</sup> Murray, C.J.L. and A.D. Lopez. 1996. *The Global Burden of Disease*. Cambridge, Mass.: Harvard University Press.

gained. Deficiencies of just iron, iodine, and vitamin A could waste as much as 5% of GDP, but addressing them comprehensively and sustainably costs less than 0.3% of GDP. Since that time, published estimates using the Profiles model<sup>5</sup> have ranged from a modest 2–4% impact for iodine deficiency disorders and iron deficiency anemia in the People’s Republic of China (PRC), which has moderate levels of risk,<sup>6</sup> to 5% claimed by the World Bank for all micronutrients combined.<sup>7</sup> More recently, investigators have revised the estimates of impact of micronutrient malnutrition on GDP downward. While there is very little information on program efficiency, estimates linked to the impact of micronutrient malnutrition on health to find out how much micronutrient control activities can “reclaim” from lost GDP, are also unclear. From a policy point of view, it is important to know if, within the range of estimates, there is a point at which costs begin to exceed benefits.

Ongoing research<sup>8</sup> to refine the estimates of the economic impact of the consequences of micronutrient malnutrition using the Profiles model has shown more cautious results, and appears to be lowering from the earlier estimates of 5% to around 1% of GDP. Results from this research for various countries involved in the regional technical assistance (RETA) projects are shown in Table 1. The 1% estimate is also in line with recent 20-year projections on impact of social welfare improvement on GDP by the World Bank in Bangladesh.<sup>9</sup>

As the risk of malnutrition decreases, particularly micronutrient malnutrition, populations tend to be more productive. However, estimates on which bundle of nutrition activities is the most effective in relation to GDP are currently based on the results of pilot projects, and there is limited hard evidence at the national level.

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<sup>5</sup> To enhance and standardize estimates illustrating the impact of micronutrient malnutrition as a function of GDP, a computer program called the Profiles model was developed. This model was originally developed by the Academy for Educational Development (AED) in 1993, funded by the United States Agency for International Development (USAID) and the United Nations Children’s Fund (UNICEF). It has been used in 25 countries worldwide and continuously updated. Enhancement to and implementation of Profiles have been funded by a number of international agencies, including USAID, UNICEF, ADB, the World Bank, the Micronutrient Initiative (MI), and governments of implementing countries. Using PROFILES, the estimates of nutritional impact on GDP have been reduced by various researchers over the last few years.

<sup>6</sup> Ross, J., Chen C.M., He, W., Fu, F., Wang, Y.Y., Fu, Z.Y., and Chen, M.X. 2003. “Effects of Malnutrition on Economic Productivity in China as Estimated by Profiles.” *Biomedical and Environment Sciences* 16: 195-205.

<sup>7</sup> World Bank. 1994. *Enriching Lives*. Directions in Development Series. Washington, DC.

<sup>8</sup> The research is sponsored by UNICEF and the MI for use by UNICEF as an advocacy tool.

<sup>9</sup> World Bank. 2004. *Bangladesh 2020: A Long-Term Prospective Study*. Dhaka.

**TABLE 1**  
**Consequences of Micronutrient Malnutrition,**  
**Calculated Using the Profiles Model<sup>a</sup>**

<b>Country</b>	<b>Total Value of Lost Productivity Each Year (iodine + iron) (as % of GDP)</b>	<b>Total Value of Lost Productivity Each Year (vitamin A) (as % of GDP)</b>	<b>Total Impact on GDP (%)</b>
Azerbaijan	0.7	0.1	0.8
Bangladesh	0.8	0.1	1.0
Cambodia	1.2	0.3	1.6
China, People's Rep. of	0.5	0.0	0.5
India	1.0	0.2	1.2
Indonesia	0.8	0.1	0.9
Kyrgyz Republic	0.9	0.0	0.9
Mongolia	0.7	0.1	0.8
Pakistan	1.0	0.2	1.2
Philippines	0.6	0.04	0.7
Tajikistan	0.9	0.05	1.0
Thailand	0.5	0.01	0.5
Uzbekistan	1.1	0.08	1.2
Viet Nam	0.8	0.01	0.8

GDP = gross domestic product.

<sup>a</sup> The comparisons to previous (higher) estimates are tentative.

Source: See footnote 5.

Poverty reduction and strengthening of health care systems alone cannot solve micronutrient deficiency problems. Among other things, this condition is due to the hidden property of the micronutrient content of foods, and consumers do not automatically demand micronutrient-rich foods with increased income. Hence, food and agricultural policies need to watch over the quantity and quality of food supply, and promote the production, marketing, and consumption of micronutrient-rich foods. Safety-net programs, including refugee feeding, must also respond to the total nutrition needs of target groups, and not be limited to calorie needs only. Therefore, close collaboration between the public and private sector, as well as civil society, is essential.

## Methodology and Approach of the Special Evaluation Study

The special evaluation study (SES) reviewed and analyzed current and future nutrition and food fortification-related issues. It also explored whether the links with malnutrition are included and examined in the Asian Development Bank's (ADB's) poverty assessments conducted in 24 DMCs, as well as 33 of ADB's country strategy and program updates (CSPUs).

ADB has funded five RETAs that are directly linked to enhancing nutrition conditions, which have set the stage for ADB interventions in food fortification in 16 developing member countries (DMCs). The SES selected all of these RETAs for evaluation, including those ongoing, except the fifth RETA—technical assistance (TA) 9052-REG, as it was recently approved and not implemented during the SES. Basic data on the RETAs are given in Appendix 4. The RETAs were evaluated and analyzed against their goals and objectives, and against the assessments and ratings of TA completion reports (TCRs). The quality of outputs and impacts of these RETAs on the participating DMCs were also assessed. Due to resource and time constraints, only five participating DMCs covering different subregions were selected for detailed field assessments: Bangladesh, PRC, Indonesia, Kyrgyz Republic, and Viet Nam; desk reviews were carried out for others. In these five selected DMCs, consultations and interviews were conducted with policymakers and with other stakeholders related to health and nutrition, such as the public and private sector involved in nutrition and food fortification, nongovernment organizations (NGOs), nutrition institutions and academics, UNICEF, and other nutrition-related agencies. As much as possible, participants of the workshops sponsored by the RETAs and those involved in implementing the RETAs were traced and consulted. Appendix 5 provides the nutrition indicators and associated risk patterns of the DMCs participating in the selected RETAs. The strengths and weaknesses of RETAs as a modality in addressing nutrition issues and initiatives were explored and discussed in the SES. Key issues, lessons, inputs, and recommendations on strategic choices and priorities for future ADB operations in nutrition are also provided.