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How Serious Is Malnutrition and Why Does It Happen?

Chapter 1 outlined the economic and other reasons for investing in nutrition. This chapter details the enormous size and scope of the nutrition problem (both underweight and overweight) at global, regional, and country levels to further strengthen the case for investing in nutrition.

Nearly one-third of the world's children are either underweight or stunted, and micronutrient deficiencies affect more than 30 percent of the developing world's population. The poor are the most affected. The malnutrition divide between the developed and the developing world is very wide, and inequities are increasing. Asia continues to have both the highest rates and the largest numbers of malnourished children in the world. Africa is the only continent seeing an increasing rate of undernutrition. The epidemic of obesity and diet-related noncommunicable diseases (NCDs) is emerging in the same countries and often in the same households where undernutrition is already a serious problem.

Evidence shows that malnutrition is not simply a result of household food insecurity: many children in food-secure households are still underweight or stunted because of inappropriate infant feeding and care practices, poor access to health services, or poor sanitation, except under famine conditions. Malnutrition is often linked to gender issues such as women's lack of time. Though malnutrition is higher among the income poor, it also affects the better off—suggesting that behavior is often an underlying cause of malnutrition.

The worst damage from malnutrition takes place from conception through the first two years of life, and most of this early damage is irreversible. Initial evidence suggests that the origins of obesity and diet-related NCDs may also lie in early childhood. Therefore, the best window of opportunity for addressing malnutrition is very small, from before conception through the first two years of age. Later investments and actions are unlikely to be able to reverse the damage from early years.

Over one-fourth of all children in developing countries are either underweight or stunted. One-third of the world's population (almost 2 billion people) suffers from various forms of iodine deficiency disorders (IDD). The same numbers have iron deficiency, which leads to anemia. About a quarter of the children under age five (127 million) suffer from vitamin A deficiency, which increases the risk of early death.¹ Simultaneously, the proportion of people who are overweight or obese is growing, often in the same countries where undernutrition and micronutrient malnutrition are concentrated, leading to what is often referred to as the “double burden of malnutrition.” Some 1.1 billion adults are overweight, and 300 million are obese.²

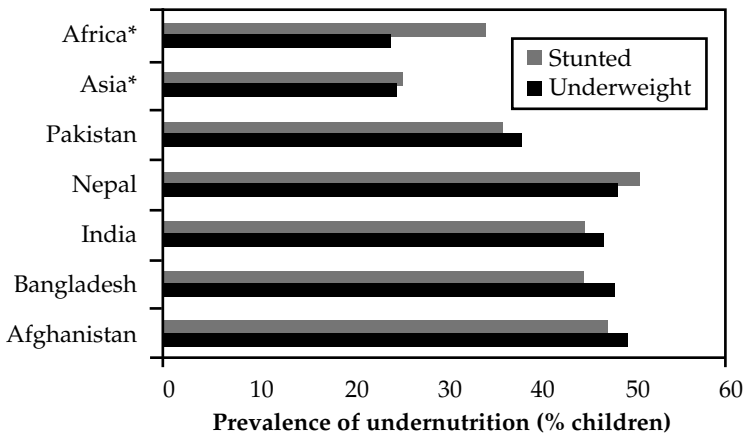
Undernutrition

The “malnutrition divide” between the developed and the developing countries is huge. Twenty-seven percent (more than 147 million) of children under age five are stunted and 23 percent (more than 126 million) are underweight in developing countries. Comparable figures for the developed world are 2.6 percent for stunting and 1.1 percent for underweight. In Africa, about 24 percent of children are underweight and 35 percent are stunted; between 35 million and 50 million children under age five are affected. Less well known is that in Asia, average underweight rates are somewhat higher than in Africa (26 percent), and in several large South Asian countries, both underweight and stunting rates are nearly double those in Africa (38 to 51 percent). Undernutrition is therefore worst in Asia, which has 92 million stunted and 89 million underweight children (box 2.1).³

In a recent World Health Organization (WHO) study, underweight prevalence in developing countries was forecast to decline by 36 percent (from 30 percent in 1990 to 19 percent in 2015)—significantly below the 50 percent required to meet the MDG over the same time frame.⁴ These global data mask interregional differences that are widening disturbingly. Much of the forecast global improvement derives from a projected prevalence decline from 35 to 18 percent in Asia—driven primarily by the improvements in China. By contrast, in Africa, the prevalence is projected to increase from 24 to 27 percent. And the situation in Eastern Africa—a region blighted by HIV/AIDS, which has major interactions with malnutrition—is critical. Here underweight prevalences are forecast to be 25 percent higher in 2015 than they were in 1990.

Even in East Asia, Latin America, and Eastern Europe, many countries continue to carry heavy burdens of undernutrition and micronutrient malnutrition (Cambodia, Indonesia, Lao PDR, the Philippines, and Vietnam; Guatemala, Haiti, and Honduras; and Uzbekistan, to name only a few). In many, such as Guatemala and the Republic of Yemen, the undernutrition

Box 2.1 Undernutrition prevalence in South Asian countries is much higher than in Africa



Source: De Onis and others (2004a); SCN (2004).

*Estimates are based on WHO regions.

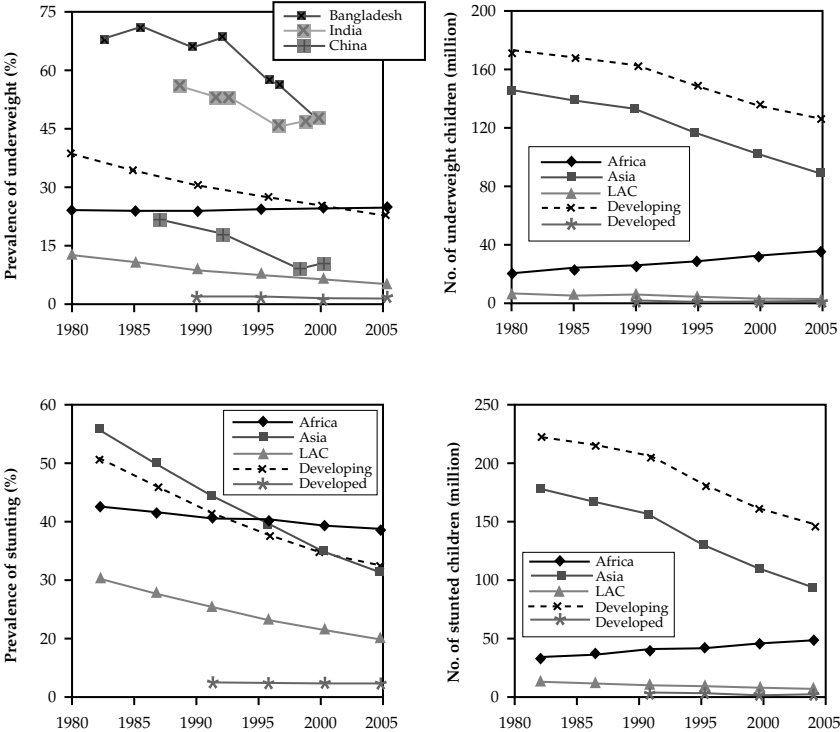
Note: India, Bangladesh, Nepal, and Afghanistan have underweight rates that are similar to that of Ethiopia (see figure 2.12).

- The numbers as well as the rates of underweight and stunted children are extremely high, especially in South Asia.
- Underweight rates in several large countries in South Asia are nearly double those in Africa as a whole.
- While numbers are projected to drop everywhere except in Africa, Asia will continue to have the majority of the malnourished even in 2015.

Contrary to common perception, undernutrition is at much higher rates (and numbers) in Asia than in Africa. Yet most development partners continue to invest in Africa and much less in Asia.

rates are well above those in that region as a whole. Chances are that these high undernutrition rates will escape the attention of the international development partners unless special efforts are made to highlight this issue within regions that are doing well at an aggregate level (figure 2.1).

Figure 2.1 Prevalence of and trends in malnutrition among children under age five, 1980–2005



Source: De Onis (2004a); SCN (2004).

Note: Estimates are based on WHO regions. Prevalence and numbers also appear in technical annex 2.1.

Regional and subregional data also mask other inequalities, as evident from the very high rates of underweight in Bangladesh and India (see box 2.1) and the very high rates of undernutrition in countries in Latin America (such as Guatemala), the Middle East and North Africa (such as the Republic of Yemen), and Eastern Europe and Central Asia (such as Uzbekistan) (figure 2.12). Although current trends suggest that Asia may approach the MDG target, wide disparities are likely to remain among Asian countries, with some of the largest countries lagging behind. Inequities are likely to be much larger within these countries—with rural areas, the poorest, and in

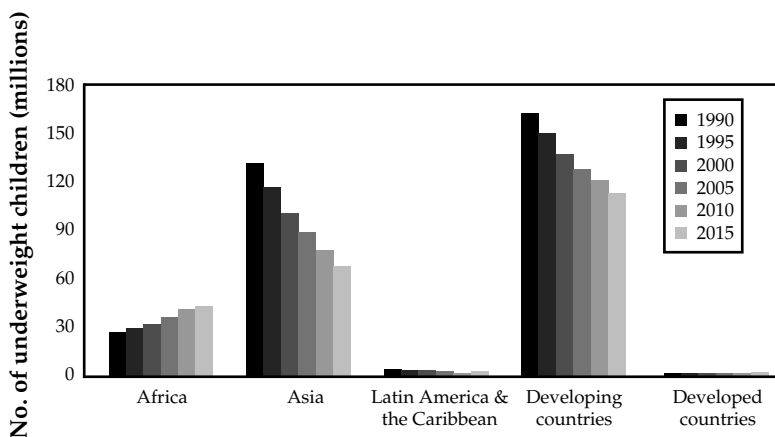
some cases girls, lagging furthest behind. In absolute numbers, the global total of underweight children is projected to decline by nearly one-third, from 164 million in 1990 to 113 million in 2015.⁵ Although numbers are projected to drop everywhere except in Africa, Asia will continue to house the majority of the malnourished in 2015 (figure 2.2).

Inequities in nutrition, including urban-rural differences and income and gender inequities, not only will persist, but often will become larger. Data from India illustrate these inequities across income quintiles for both underweight and anemia rates (see table 1.5). Underweight rates are much higher among the poorest quintile and the rate of decline is much lower, so that over time these inequities between the rich and the poor are widening. Regional and country-specific data on child underweight and stunting prevalence show wide disparities, even across countries in the same regions (figure 2.12 and technical annex 5.6).

Low Birthweight

South Asia has the highest rate of babies born with low birthweight (28 percent), followed by the Middle East and North Africa and the rest of the Africa region. Low birthweight is much less of a problem in Latin America and the Caribbean, East Asia and the Pacific, and Europe and

Figure 2.2 Projected trends in numbers of underweight children under age five, 1990–2015

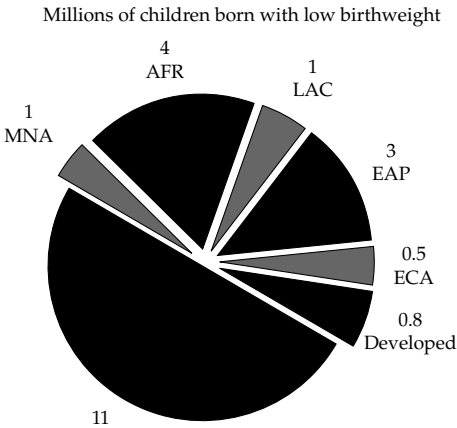
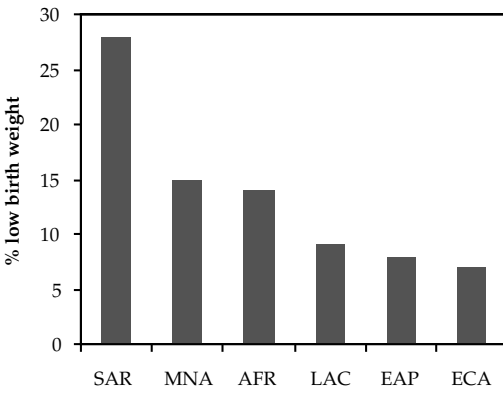


Source: De Onis and others (2004a, 2004b).

Note: Estimates are based on WHO regions.

Central Asia. High rates of low birthweight contribute to the high rates of underweight and stunting, especially in South Asia. The large population in South Asia means that this rate is multiplied several times over—so that South Asia has the highest number of babies born with low weights, setting the stage for having the largest numbers of undernourished children. Birthweight is an issue in Africa as well, but on a smaller scale.

Figure 2.3 Prevalence and number of low-birthweight infants



Source: UNICEF and WHO (2004).
Note: Estimates are based on UNICEF regions.

Low-birthweight children are disadvantaged even before they are born, and evidence suggests that these children rarely catch up in growth.⁶ Furthermore, data suggest that the major causes of low birthweight are poor maternal nutrition, anemia, malaria, diarrhea, sexually transmitted diseases, and diseases, such as schistosomiasis, where they are endemic. In more industrial countries, cigarette smoking during pregnancy is the leading cause of low birthweight.⁷

Recent research has shown that babies born with low birthweight are much more prone to abdominal obesity and noncommunicable diseases in adult life. This phenomenon, referred to as the “Barker hypothesis” or “the fetal origins of adult disease,” is still being debated, primarily because most evidence supporting the hypothesis comes from observational rather than experimental settings.⁸ We do not aim to review the entire literature here, simply to note that evidence to support this hypothesis has been documented in varied observational settings in the developed and developing world (the Netherlands, Sweden, India, China, and several other countries).⁹ In Japan, results from one study suggest that lower birthweight and lower rate of height increase during childhood are independently associated with increases in blood pressure and serum cholesterol in adult life.¹⁰ In Finland, low birthweights for height have been shown to be associated with increased risk of coronary heart disease, and low height and weight at age one year also increased the risk.¹¹

Data from longitudinal studies on 300,000 19-year-old conscripts exposed to the Dutch famine of 1944–45 show that maternal malnutrition during early pregnancy was associated with higher body mass index (BMI, weight for height) and waist circumference in 50-year-old women, but not in men. The analyses also showed that the rate of obesity was higher in women who had been exposed to famine in early pregnancy, as compared with those exposed to famine in the last trimester.¹² The timing of the food deprivation (early or later in pregnancy) also determined susceptibility to diabetes and high blood pressure.¹³

Many of these observational studies conclude that improvements in fetal, infant, and child growth could substantially reduce the incidence of NCDs in adulthood. This link could explain why the same developing countries that have high numbers of low-birthweight and underweight children are now experiencing the double burden of increasing numbers of adults who are overweight or have NCDs, as documented in the following sections.

Obesity and Diet-Related Noncommunicable Diseases

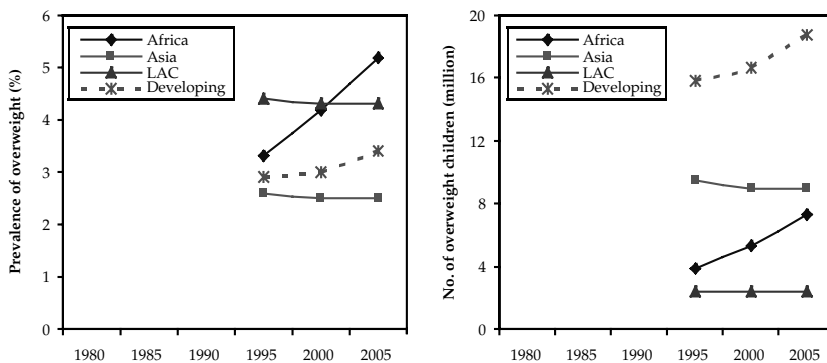
The International Obesity Task Force estimates that about 1.1 billion adults are overweight, including more than 300 million who are obese.¹⁴ Childhood overweight affects about 155 million school-age children, including about 40 million who are obese. Overweight and NCDs account for about 46 percent of the global burden of disease and about 60 percent of total global deaths, 79 percent of which occur in developing countries.¹⁵ The attributable mortality and burden of disease are expected to grow to 73 percent and 60 percent by 2020. Trends in overnutrition rates—observed as obesity or as an excess of added sugar and saturated or trans-fatty acids in the diet—are alarming. Take three examples from three continents: In Mexico, rates of adult male obesity have tripled since 1988; in China, more than 200 million adults are affected—a 2002 survey revealed national adult overweight at 23 percent, obesity at 7 percent, and childhood obesity at more than 8 percent; in South Africa in 1998, 29 percent of men and 56 percent of women were overweight or obese.¹⁶ High rates of overweight increasingly coexist with high rates of underweight—a 1999 national survey in China found one in five overweight children under age 9 had suffered from stunting because of chronic undernutrition early in life.

Trends in overweight among children under age five, though based on data from a limited number of countries, are alarming (figure 2.4)—for all developing countries and particularly for those in Africa, where rates seem to be increasing at a far greater rate (58 percent increase) than in the developing world as a whole (17 percent increase). The lack of data prevents definitive answers for why Africa is experiencing this exaggerated trend; however, the correlation between maternal overweight and child overweight suggests that one of the answers may lie therein (figure 2.5).

Comparable data for overweight and obesity rates among mothers show similar alarming trends. Countries in the Middle East and North Africa have the highest maternal overweight rates, followed by those in Latin America and the Caribbean. However, several African countries have more than 20 percent maternal overweight rates—in Mauritania, more than 40 percent of mothers are overweight.

Also evident is that overweight coexists in the same countries where both child and maternal undernutrition are very widespread and in many countries with low per capita GNP (figures 2.6 and 2.7). Furthermore, as many as 60 percent of households with an underweight person also had an overweight person, demonstrating that underweight and overweight coexist not only in the same countries, but also in the same households.¹⁷ Again, these data support the premise that access to and availability of food at the household level are not the major causes of undernutrition.

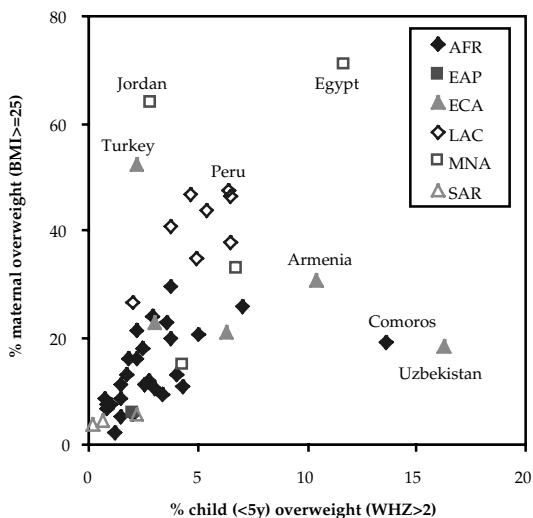
Figure 2.4 Trends in obesity among children under age five



Source: SCN (2004).

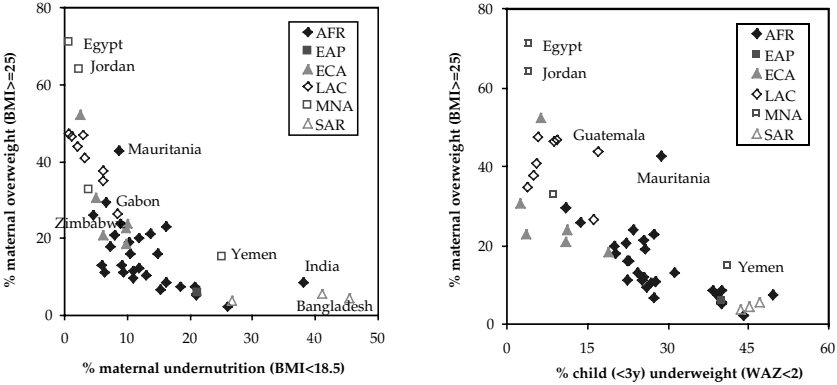
Note: Estimates are based on WHO regions.

Figure 2.5 Maternal and child overweight



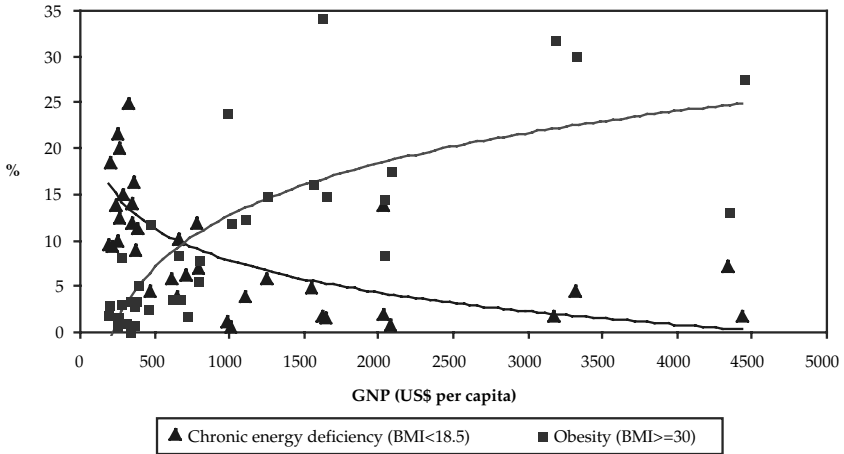
Source: Author's calculations using data from measuredhs.com.

Figure 2.6 Maternal overweight versus maternal and child undernutrition



Source: Author's calculations using data from measuredhs.com.

Figure 2.7 Coexistence of energy deficiency and obesity in low- and middle-income countries

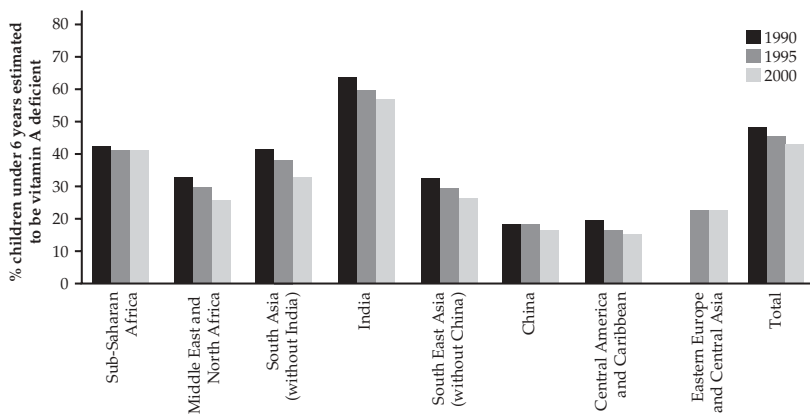


Source: Monteiro and others (2004).

Micronutrient Malnutrition

Deficiencies of key vitamins and minerals continue to be pervasive and they overlap considerably with problems of general undernutrition (underweight and stunting). A recent global progress report states that 35 percent of people in the world lack adequate iodine, 40 percent of people in the developing world suffer from iron deficiency, and more than 40 percent of children are vitamin A deficient (figures 2.8 and 2.9).¹⁸ In summary, the scale of the malnutrition problem is very large and, given its consequences for economic development, calls for immediate and large-scale action.

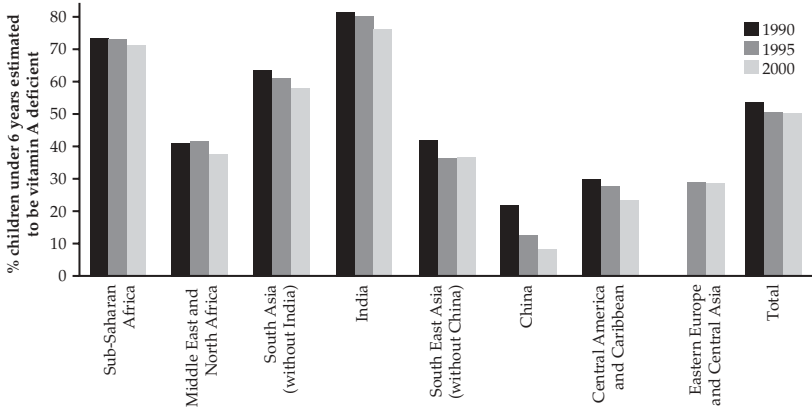
Figure 2.8 Prevalence of subclinical vitamin A deficiency in children age 0–72 months, by region, 1990–2000



Source: UNICEF and MI (2004b).

Note: Estimates are based on UNICEF regions.

Figure 2.9 Prevalence of iron deficiency in preschool children, by region, 1990–2000



Source: UNICEF and MI (2004).

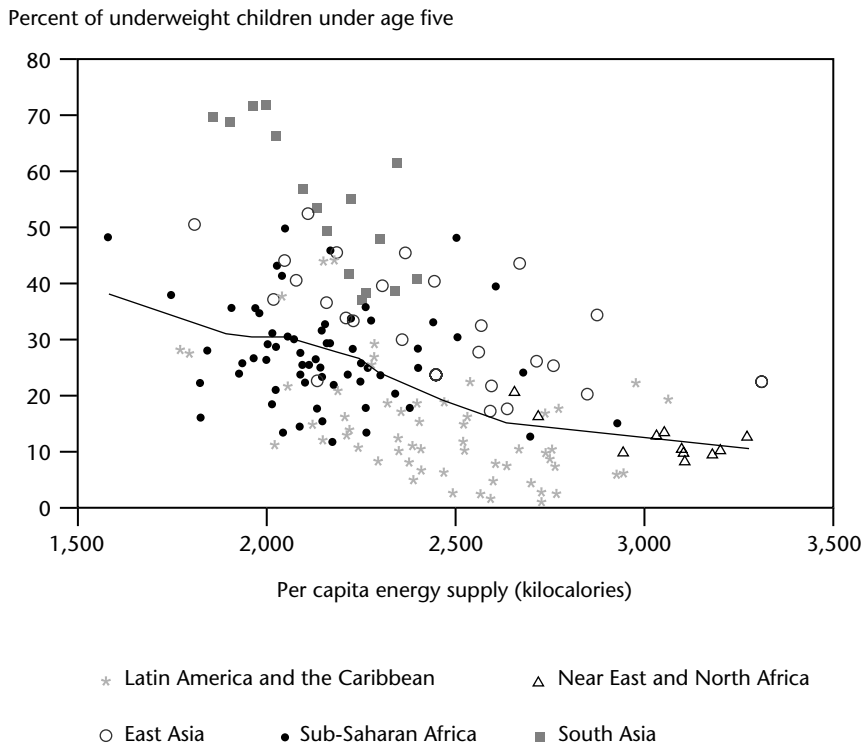
Note: Estimates are based on UNICEF regions.

What Causes Malnutrition, and Who Is Worst Affected?

At an immediate level, an individual becomes malnourished because of inadequate or inappropriate dietary intake, ill health, or both. These two factors often interact in a negative synergy. Illness reduces appetite and increases nutrient requirements, while inadequate intake of food (quantity or quality) makes the body more susceptible to illness. Underlying this vicious cycle are household or community deficits in food security, inadequate access to health and environmental services, and household child-care behaviors and practices. These three underlying factors—often summarized as “food, health, and care”—also interact, and they too are underpinned by more basic causes relating to the amount, control, and use of resources and capacity in societies.¹⁹

Undernutrition is often assumed to result primarily from food insecurity, but data from many countries suggest that food is not the only and often not even the main cause of undernutrition, except under famine conditions. Data show that at any given level of food availability, underweight rates can range from as low as 2 to 10 percent to as high as 40 to 70 percent

Figure 2.10 Prevalence of underweight children by per capita dietary energy supply, by region, 1970–96



Source: Haddad and Smith (1999).

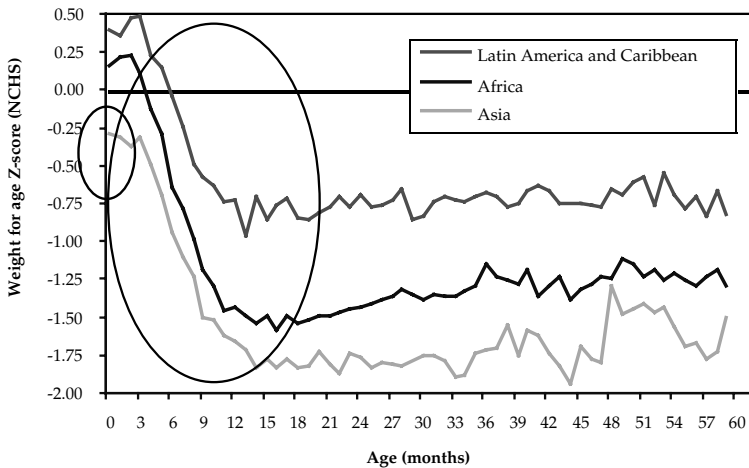
(figure 2.10). The conclusion, confirmed by many studies,²⁰ is not that food supplies are irrelevant, but that other factors, such as maternal knowledge, caring practices for young children, access to health services, and water and sanitation, have important roles to play. Data from many countries show high undernutrition rates in regions and households where food is plentiful: examples are the Arsi region in Ethiopia and the Iringa region in Tanzania, both of which have high food production rates yet also very high stunting rates—62 percent in Arsi and 66 percent in Iringa.²¹

Other data also show that higher agricultural production and higher income do not guarantee improved nutrition. Although the nutritional

status of children from the richest 20 percent of households is much better than that of children from the poorest 20 percent in many countries (for example, the Dominican Republic, Morocco, Nicaragua, Peru, and Turkey), the proportion of underweight children does not differ much by income level in many other countries (for example, Burkina Faso, Cambodia, Ethiopia, Kazakhstan, Madagascar, Niger, Tanzania, and Turkmenistan).²² In India (as in many other countries), even among the richest quintile, 26 percent of preschool children are underweight and 64 percent are anemic (see table 1.5), showing that food insecurity and poverty are not the only causes of undernutrition.

Box 2.2 The window of opportunity for addressing undernutrition

The window of opportunity for improving nutrition is small—from pre-pregnancy through the first two years of life. There is consensus that the damage to physical growth, brain development, and human capital formation that occurs during this period is extensive and largely irreversible. Therefore interventions must focus on this window of opportunity. Any investments after this critical period are much less likely to improve nutrition.



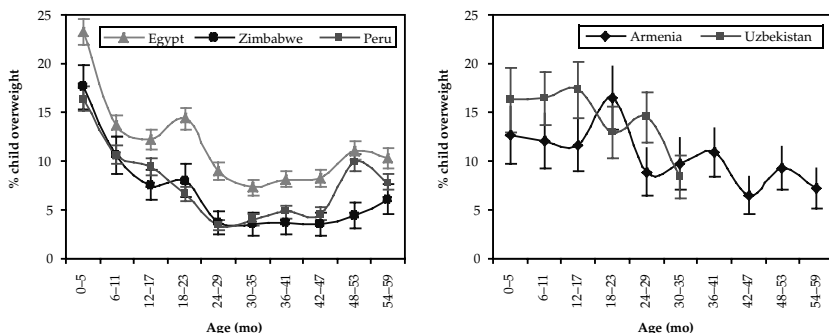
Source: Shrimpton and others (2001).
Note: Estimates are based on WHO regions.

Undernutrition is not just a state, but a process whose consequences often extend not only into later life, but also into future generations. The process often starts in the womb (especially in South Asia), and continues through at least the first two years of life (box 2.2). The critical periods of pregnancy and lactation and the first two years of life pose special nutritional challenges because these are when nutrition requirements are greatest and when these population subgroups, in many parts of the world, are most vulnerable to inadequate caring behaviors, inadequate access to health services, and inappropriate feeding practices.

Pregnancy and lactation substantially increase nutritional needs to support adequate fetal growth and breastfeeding, and the additional energy and nutrient demands easily place pregnant and lactating women at great nutritional risk. When pregnancies occur during the teenage years, the risk is even higher because of the competition for nutritional requirements between the mother's needs and the babies' needs—that is, between the mother's preparation for lactation and the fetal growth and development.²³ Children of adolescent mothers are also often at greater risk of poor nutritional care and feeding practices. Therefore women need access to appropriate health care and nutrition information as well as appropriate foods during pregnancy and lactation more than during any other period.

Very young children are the most susceptible to infections. They need the dietary inputs (through exclusive breastfeeding and timely complementary feeding) to support the fast rate of growth that typically occurs in the first two years of life. They are the least able to make their needs known

Figure 2.11 Prevalence of overweight among children under age five, by age group



Source: Data from measuredhs.com; authors' calculations.

and the most vulnerable to the effects of poor care practices. In fact, the main causes of the often precipitous decline in nutritional status immediately after birth (see box 2.2) are often inadequate feeding and caring practices rather than a lack of food in the household. Data also show that the damage done by undernutrition very early in life, to both physical growth and brain development, is largely irreversible.²⁴

Box 2.3 Three myths about nutrition

Poor nutrition is implicated in more than half of all child deaths worldwide—a proportion unmatched by any infectious disease since the Black Death. It is intimately linked with poor health and environmental factors. But planners, politicians, and economists often fail to recognize these connections. Serious misapprehensions include the following myths:

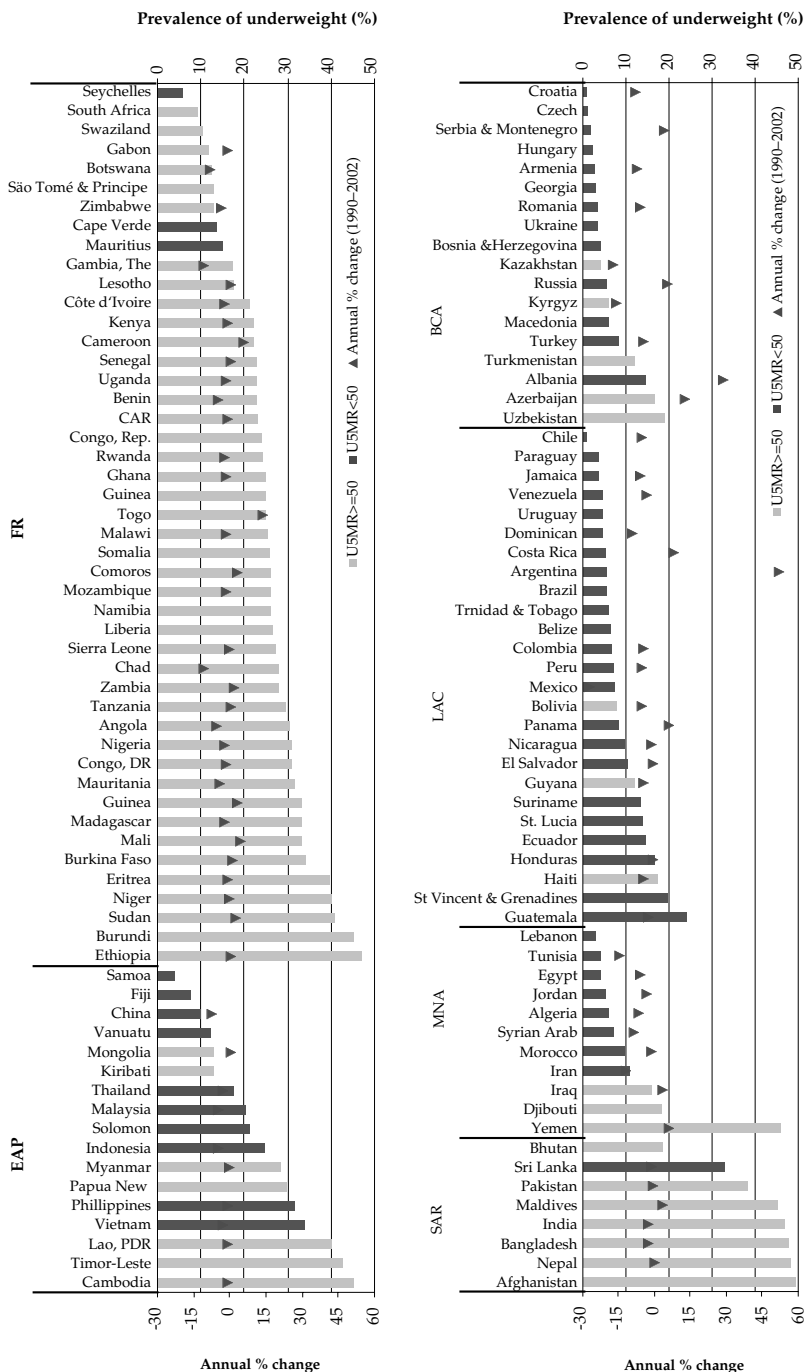
Myth 1: *Malnutrition is primarily a matter of inadequate food intake.* Not so. Food is of course important. But most serious malnutrition is caused by bad sanitation and disease, leading to diarrhea, especially among young children. Women's status and women's education play big parts in improving nutrition. Improving care of young children is vital.

Myth 2: *Improved nutrition is a by-product of other measures of poverty reduction and economic advance. It is not possible to jump-start the process.* Again, untrue. Improving nutrition requires focused action by parents and communities, backed by local and national action in health and public services, especially water and sanitation. Thailand has shown that moderate and severe malnutrition can be reduced by 75 percent or more in a decade by such means.

Myth 3: *Given scarce resources, broad-based action on nutrition is hardly feasible on a mass scale, especially in poor countries.* Wrong again. In spite of severe economic setbacks, many developing countries have made impressive progress. More than two-thirds of the people in developing countries now eat iodized salt, combating the iodine deficiency and anemia that affect about 3.5 billion people, especially women and children in some 100 nations. About 450 million children a year now receive vitamin A capsules, tackling the deficiency that causes blindness and increases child mortality. New ways have been found to promote and support breastfeeding, and breastfeeding rates are being maintained in many countries and increased in some. Mass immunization and promotion of oral rehydration to reduce deaths from diarrhea have also done much to improve nutrition.

Source: Extracted from Jolly (1996).

Figure 2.12 Underweight prevalence and rates of decline in World Bank regions and countries



Source: WHO global database on child growth and malnutrition.

Note: U5MR = under age five mortality rate, per 1,000 live births. Prevalence of underweight is from the latest national survey available in each country. The coefficient of a regression that links the natural logarithm and underweight to the year of the survey serves as the average annual percentage change over the period for which data are available. All of the national data available between 1990 and 2002 were used for the estimation. Adjusted prevalence of underweight from national rural data (1990 and 1992) was used for India, as provided by WHO. No underweight data were available for these countries: AFR—Equatorial Guinea; EAP—Marshall Islands, Micronesia, Palau, Tonga; ECA—Belarus, Bulgaria, Estonia, Latvia, Lithuania, Moldova, Poland, the Slovak Republic, Tajikistan; LAC—Dominica, St. Kitts and Nevis; Industrial—Antigua and Barbuda, Republic of Korea, Slovenia.

Although data for the global or regional prevalence of overweight are much less readily available, we looked at data from five countries (figure 2.11) to track when obesity may have started to occur. In Egypt, Zimbabwe, and Peru, where mean overweight rates among children under age five are 12, 7, and 8 percent, respectively, a large proportion of children are already overweight at birth—suggesting again that the damage happens in pregnancy. Weights decline in the first two years of life and then seem to show an upward trend again. Data from Armenia and Uzbekistan are less clear—potentially because of the small sample sizes in the data we reviewed, as evidenced by the very large standard deviations around the means in figure 2.11. These results are consistent with physiological evidence that the origins of obesity start very early in life, often in the womb, though interventions to prevent obesity must likely continue in later life.

Malnutrition is perpetuated across generations. Where undernutrition levels are high, malnourished women or adolescent girls often give birth to babies who are born stunted and small. These children's growth seldom catches up fully in subsequent years. They are more likely to get sick and enter school late, do not learn well, and are less productive as adults. As adults, they are also more likely to suffer from the diet-related diseases such as diabetes, coronary heart disease, and hypertension, formerly thought to be associated only with increasing affluence. Babies born to underweight or stunted women are themselves likely to be underweight or stunted.²⁵ In this way, undernutrition passes from one generation to another as a grim inheritance.

The key implications for policy are these:

- The best window of opportunity for addressing malnutrition (both undernutrition and, to a large extent, overweight) lies before conception until two years of age (though in the case of overweight, additional interventions are needed in later years). Actions targeted to children older than age two, such as school feeding programs, are likely to have little effect on reversing the damage to brain development, the link with NCDs established in the early years, or on longer-term productivity and human capital formation.
- Access to food is often not the key issue because the food needs of children age 0 to 18 months are relatively small and because undernutrition seems to persist in many households and communities that also suffer from problems of overweight.
- Improving maternal knowledge, feeding, and time for care during pregnancy (to address low birthweight, especially in South Asia) and lactation and improving infant feeding and caring practices, such as exclusive

breastfeeding and adequate and timely complementary feeding, are critical to improving nutrition outcomes. These tasks are closely linked to issues of gender.

All countries with underweight rates greater than 20 percent should get priority for action in nutrition (figure 2.12). Countries with high rates of mortality in children under age five may need somewhat different actions than those with lower rates. Similarly, countries with lower rates of decline (annual percentage change) should be of greater concern, while in those where declines are good, the focus should be on sustaining and scaling up actions.

Notes

1. De Onis and others (2004a); SCN (2004).
2. WHO (2005b).
3. De Onis (2004a); SCN (2004).
4. De Onis and others (2004b).
5. De Onis and others (2004b).
6. Alderman and Behrman (2004).
7. UNICEF and WHO (2004).
8. Kimm (2004); Paneth and Susser (1995).
9. te Velde and others (2003); Illiadou, Cnattingius, Lichtenstein (2004); Bhargava and others (2004); Zhao and others (2002).
10. Miura and others (2001).
11. Eriksson and others (2001).
12. Ravelli and others (1999); Ravelli, Steing, and Susser (1976).
13. Roseboom and others (2000).
14. IASO (2004).
15. WHO (2002, 2001).
16. IASO (2004).
17. Doak and others (2005).
18. UNICEF and MI (2004b).
19. UNICEF (1990).
20. Pelletier and others (1995); Smith, Alderman, and Aduayom (2005); Haddad and others (1995); Haddad and Smith (1999).
21. Pelletier and others (1995); Smith, Alderman, and Aduayom (2005).
22. Gillespie (2002); Gwatkin and others (2003).
23. Delisle, Chandra-Mouli, and de Benoist (2000).
24. Martorell, Kahn, and Schroeder (1994).
25. Allen and Gillespie (2001).