THE LIFE CYCLE OF MALNUTRITION

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THE LIFE CYCLE

Malnutrition is not a disease that runs its course, bringing immunity. Rather it is a process, with consequences that may extend not only into later life, but also into future generations. The process of becoming malnourished often starts in utero and may last, particularly for girls and women, throughout the life cycle. It also spans generations. A stunted girl (that is, one whose height is significantly low for her age) is likely to become a stunted adolescent and later a stunted woman. Besides posing threats to her own health and productivity, poor nutrition that contributes to stunting and underweight in her adult life increases the chance that her children will be born malnourished. And so the cycle turns.

OF MALNUTRITION

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BIRTH AND INFANCY

This year some 30 million babies in the developing world—around 82,000 every day—will be born with impaired growth due to poor nutrition during fetal life. Two-thirds of these infants will be born in South and Central Asia. By any standard, this is a major global human development problem with profound short- and long-term consequences for individuals, households, communities, and nations.

In developing countries the main direct causes of intrauterine growth retardation (IUGR) are nutritional. IUGR occurs when women suffer from low weight and short stature before pregnancy—largely because of their own childhood malnutrition—and then gain too little weight during pregnancy, primarily because they do not consume enough food or because infection compromises the absorption or utilization of the food they do eat. Other factors underlie these direct causes, including household food insecurity, poor caring practices, and inadequate health and environmental conditions.

The consequences of being born malnourished are grave. IUGR infants suffer from impairment of most immune functions and face an increased risk of diarrhea and pneumonia. The risk of neonatal death is 10 times higher for infants weighing 2–2.5 kilograms than it is for those weighing 3–3.5 kilograms. IUGR also significantly reduces body size, changes body composition, and lowers muscle strength in the long term. Recent research has linked IUGR to neurological dysfunction, associated with attention deficits, hyperactivity, clumsiness, and poor school performance.

Beyond childhood, there is growing evidence that IUGR increases the risk of acquiring high blood pressure, non-insulin-dependent diabetes, coronary heart disease, and cancer in adult life. The "fetal origins of disease" hypothesis posits that poor nutrition during critical periods of gestation and early infancy, followed by relative affluence, increases the risks of chronic diseases in adulthood. Urbanization and rapid economic development are changing people's dietary patterns and lifestyles in ways that make such consequences more likely to emerge.

Pregnant women and their fetuses not only need to consume adequate amounts of food but also need to get access to adequate micronutrients—the vitamins and minerals that help the body function. Apart from the direct effects on the woman herself, micronutrient malnutrition during pregnancy has serious implications for the developing fetus. Iodine deficiency can cause fetal brain damage or stillbirth, folate deficiency may result in neural tube defects, and iron deficiency anemia and vitamin A deficiency can raise the future infant's risk of illness and death and impair vision and cognitive development.

CHILDHOOD

IUGR infants are more likely to become stunted children. In addition, conditions during infancy and early childhood, like frequent or prolonged infections and inadequate consumption of nutrients—particularly energy, protein, vitamin A, zinc, and iron—can contribute to underweight and stunting among preschool children. Inadequate food, health, and care in the household or community again underlie these immediate causes.

The recently released *Fourth Report on the World Nutrition Situation* prepared by the United Nations Sub-Committee on Nutrition and IFPRI states that currently about one in three children under five years old in the developing world is stunted, with Eastern Africa (48 percent) and South Central Asia (44 percent) having the highest levels. This translates into some 182 million stunted children, 70 percent of whom live in Asia and 26 percent in Africa.

Almost 27 percent of all under-five children are currently underweight (of low weight for their age), a prevalence that dropped during the 1990s but not very rapidly. Most countries failed to achieve the ambitious goal set at the 1990 World Summit for Children of halving childhood underweight prevalence by the year 2000.

Childhood malnutrition has immediate consequences. Underweight children tend to have more severe episodes of diarrhea and a higher risk of pneumonia. They are also more likely to die. Over 50 percent of the nearly 12 million child deaths that occurred in 1995 were associated with low weight for age, the majority of which derived from the effects of mild to moderate undernutrition.

Can these children catch up? Can malnutrition be reversed if children are adequately nourished later? The answer is yes, to a point. The potential for catch-up growth among stunted children is limited after age two years, particularly when such children remain in poor environments. A recent study in the Philippines, however, has shown that some catch-up between the ages of two and eight and a half years is feasible for children who were not born with low birthweight or severely stunted in infancy. Children who were stunted at age two years, however, whether or not they later achieved catch-up growth, were found to suffer significantly from later deficits in cognitive ability, a finding that further emphasizes the need to prevent early stunting.

Data on the nutritional status of school-age children are increasingly being collected, as evidence mounts linking malnutrition or hunger with poor school attendance, performance, and learning.

ADOLESCENCE

Adolescence, which covers most of the second decade of life, is a transition phase when children become adults. During this time, growth in stature or height accelerates, driven by hormonal changes, and is faster than at any other time in the individual's postnatal life except the first year.

Research has shown that better-nourished girls grow faster before menarche and reach menarche earlier than undernourished girls, who grow more slowly but for longer, as menarche is delayed. Ultimately, these two factors tend to balance out, and well-nourished and undernourished adolescents may achieve similar total height during adolescence. The adult height finally attained, however, may still differ as a result of pre-existing childhood stunting. Studies of several countries have shown little change in average height-for-age during the adolescent years, indicating little catch-up.

Because underweight adolescent girls are growing for longer, they may not finish growing before their first pregnancy. A still-growing adolescent is likely to give birth to a smaller baby than a mature woman of the same nutritional status, probably because of poor placental function in the adolescent and because the growing adolescent and the growing fetus are competing for nutrients. Calcium status is a particular concern, as the bones of adolescents still require calcium for growth at a time when fetal needs for bone growth are also high.

There remains little evidence to suggest that individuals who suffer from growth retardation in early childhood can significantly compensate for it in adolescence. Stunted children are thus likely to become stunted adults. Moreover, even if an intervention could lead to adolescent catch-up growth, which could reduce obstetric risk due to small maternal size, it would not necessarily reverse the effects of early childhood stunting on cognitive function.

ADULTHOOD

The economic livelihood of populations depends on the health and nutritional well-being of adults. In adults the main cause of a reduction in body weight is a decrease in food intake, often in combination with disease, but when energy intake exceeds energy expenditure, the excess is stored in fat mass. Both conditions, underweight and overweight, constitute adult malnutrition, and both represent common problems in the developing world. For example, in Bangladesh more than 50 percent of women are underweight, with just 4 percent overweight. In Egypt the opposite is true: over 50 percent are overweight and less than 2 percent are underweight.

Both underweight and overweight conditions have serious health effects. Underweight adults allocate fewer days to heavy labor and are more likely to fail to appear for work owing to illness or exhaustion.

At the other end of the spectrum, overweight conditions are associated with an increased prevalence of cardiovascular risk factors such as hypertension, unfavorable blood lipid concentrations, and diabetes mellitus. Overweight is also a major risk factor for the development of gallstones and endometrial cancer and is related to osteoarthritis in several joints. As already mentioned, adults who were malnourished as infants have a heightened risk of developing some of these conditions.

OLD AGE

Populations are aging. By 2025, the earth will house 1.2 billion elderly adults, of whom nearly 70 percent will live in developing countries. For most of these older people, retirement is not an option. Poverty, a lack of pensions, the deaths of younger adults from AIDS, and the migration of younger people from rural to urban areas are among the factors that will compel older people to continue working. Adequate nutrition, healthy aging, and the ability to function independently will be essential components of a good quality of life. Recent multicountry studies have shown significant malnutrition among older adults. In India, for example, two out of three over-70-year-olds are underweight. Research shows that the nutritional status of older adults is strongly related to functional ability, psychomotor speed and coordination, mobility, and the ability to carry out activities of daily living independently, even after controlling for age, sex, and disease.

WHAT CAN BE DONE?

The picture need not be so gray. Vicious circles—such as the life cycle of malnutrition—based as they are on mutually reinforcing processes, can be transformed into virtuous circles by more consistently and effectively applying our growing knowledge of what works, and where, in combating malnutrition.

The life cycle offers clear windows for preventive action. One such window comes in the first two years of life. Improving the environment in which the young child grows during this time could prevent and even reverse stunting and its consequences. Improvements in breastfeeding and complementary feeding practices increase both the survival prospects and the health and nutritional status of infants in the short and long term. A well-known study in Central America has shown that nutrition interventions in pregnancy and early childhood lead to improved body size and composition and better physical and intellectual performance in the adolescent and young adult.

Community-based nutrition programs—which may include activities such as communications for behavioral change, breastfeeding and complementary feeding promotion and support, micronutrient supplementation, and targeted supplementary feeding—are becoming more effective all the time, because we now know more about key factors in their success. Past experiences in Bangladesh, India, Indonesia, Tanzania, Thailand, and Zimbabwe have generated important lessons that are now being applied globally in a new generation of programs. We know that for programs to emerge, grow, and sustain themselves, the conditions in the community must be appropriate and communities must actively take part, not just as implementors but as decisionmakers. And we know more about the kinds of skills and resources that need to be strengthened in various groups in society to support such programs.

But more needs to be done. To improve decisions on policies and programs, we need more and better-quality data on nutritional status throughout the life cycle. Program experiences also need to be better documented and disseminated more effectively, so that others can benefit.

The potential gains are massive. Investing in maternal and childhood nutrition will have both short- and long-term benefits of huge economic and social significance, including reduced health care costs throughout the life cycle, increased educability and intellectual capacity, and increased adult productivity. No economic analysis can fully capture the benefits of such sustained mental, physical, and social development.

While preventing fetal and early childhood malnutrition deserves particular attention, the life cycle dynamics of cause and consequence demand a holistic, inclusive approach to malnutrition. Adequate nutrition is a human right for all people, and intervening at each point in the life cycle will accelerate and consolidate positive change.

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