

Introduction

Food and nutrition occupy the daily thoughts of most people around the world including children who are preoccupied with their next meal and scientists studying the effects of that meal on health and functioning. Because more is not necessarily better when talking about food, it is important to know what foods, in what quantities, and at what ages produce healthy and productive children and adults. Of course, most people don't have health and productivity in mind when they eat. They may be motivated by the sensory pleasures of eating, the desire for energy, the feeling of being full, or the sociability of eating with others--or they may eat simply out of habit. However, the food preferences of adolescents are very similar to their parents, indicating that family eating influences what we think and like about food. Moreover, there are commonly held beliefs in all cultures about the good and bad effects of certain foods. Consequently, there are many personal, familial, and cultural influences on the food we eat. But what is the cost of a poor diet and how easy is it to change one's diet?

Cost of a Poor Diet

The cost of a poor diet is immense. While the interactive effect of malnutrition and infection is responsible for over half of child deaths in developing countries (Pelletier, Frongillo, Schroeder, & Habicht, 1995), overweight has been declared the number one health problem in the United States. Surprisingly, the overweight problem is starting to appear among urban women in developing countries such as India and Chile that are making the transition to better economies. Obesity, whether experienced in Washington, Calcutta, Santiago or Samoa, is bad for one's health because it can lead to heart disease, diabetes, and premature death. In poor countries, many women are short because of poor diets in youth and they are anemic because their diets lack iron; consequently many die while giving birth to a normal sized baby. However, the most pressing moral dilemma of our times is the wasted human potential in the millions of children who are malnourished either at birth or throughout their first five years. They are more likely than well-nourished children to become ill and to die. More information on these infectious diseases can be found at the World Health Organization's website (<http://www.who.int/infectious-disease-report>). If malnourished children survive the first five years, their quality of life will be impaired: they will be less able to learn at school, more fearful of unfamiliar people and new experiences, less persistent at solving daily problems, and less sociable. Simply increasing food intake is not a sufficient or even a wise solution--too much food eaten during pregnancy may have little or detrimental effects, too much iron may be toxic, and too much bulk destroys a child's appetite. Specific nutrients along with psychosocial stimulation may be the best mix. This will be discussed in subsequent sections.

Childhood Malnutrition

Almost 30% of children under 5 years of age in the world are underweight; most live in developing countries in Africa and South Asia. Typical malnourished children are not thin or wasted looking, but is short for their age or stunted. They are usually malnourished at moderate rather than severe levels. Even mild and moderate malnutrition lead to physical health, learning and social problems. Most mothers would be surprised if they were told that their child was malnourished because there is no obvious wasting or change in behavior if the child has been this way for months. However, when the child's weight and height are compared with other well-nourished children from the same region, the discrepancy is striking. For example, if well-nourished children of 4 years of age weigh on average 16 kg or 35.2 pounds, a child of 12.5 kg or 27.5 pounds will be considered underweight and therefore malnourished. This is based on a rough definition of moderate malnutrition as less than 80% of the expected weight, though the World Health Organization now uses a more accurate formula based on standard deviations from the average. Likewise, if well-nourished children of 4 years of age measures 102 cm or 40 inches in height, a child of 90 cm or 35 inches will be considered moderately stunted, using a rough calculation of less than 90% of expected height. Adults can calculate their own body mass index (BMI) as the quotient of weight (kg) / height² (m²). Somewhere between 19 and 23 is considered healthy; over 25 is overweight, 30 obese, and 17 underweight. The new standards published in 2000 by the Centers for Disease Control are available (<http://www.cdc.gov/growthcharts>).

Close to 170 million children are malnourished if we use weight as our indicator of malnutrition. Across all developing countries, 28% of children under 5 years of age are malnourished. For example, according to UNICEF (2001) who collects and publishes this information, the figures are 56% in Bangladesh, 53% in India, 47% in Ethiopia, 34% in Indonesia, 31% in Nigeria, 28% in the Philippines, and 5% in Costa Rica. Most of them were not born with low birth weight -- approximately 16% of newborns in developing countries are low birth weight (less than 2500 gm) even though they are full term (37-40 weeks). If breastfed, as most rural children are, they probably thrived in the first 6 months on breast milk alone. However, most of these children probably did not gain enough weight after that point both because of infections such as diarrhea and pneumonia and because the food offered was of insufficient quantity and quality for growth and illness recovery. As a result, their weight and height did not rise as it should, and they did not have enough reserves to cope with the next episode of diarrhea or respiratory infection. In addition to suffering poor health, underweight children suffer long-term problems in their ability to learn and solve problems, and in their emotional and social life.

The most immediate, but not the only, cause of malnutrition is the lack of calories that provide energy and protein for building body cells (Waterlow, 1992). Both are needed to put weight and height on a child. Calories are present in many foods, particularly those high in sugars, starches, and fats. These include fruits such as bananas, tubers such as potatoes, animal or vegetable oil, grains and rice. Fatty acids from oils are particularly important in forming the myelin sheath that surrounds nerves, allowing for a rapid

response from the brain; researchers now realize that fatty acids are essential for maturation of the eye nerves and detection of light. Protein is found in certain foods such as meat, fish, eggs and legumes; only 15% of calories need be protein so this is not usually a problem. Recently we have come to realize that other nutrients required in smaller amounts are also necessary for physical and mental health. These include vitamin A, iron, iodine, and zinc (World Health Organization, <http://www.who.int/nut>).

Vitamin A was only recently discovered to have wide-ranging effects in strengthening a child's resistance to illness such as diarrhea and measles, in addition to its well-known effect on vision. Children and adults who lack vitamin A first notice the effects when they walk outside at dusk--they can't see anything. Over time, the eye disease known as xerophthalmia blinds the person as the membrane over the eye becomes dry, wrinkled and eventually opaque. Three million children develop xerophthalmia each year; up to half a million become blind. Children who lack even small amounts of vitamin A have a weaker immune system and so they suffer longer and more severe bouts of diarrhea, measles, and pneumonia. Vitamin A deficiency is so widespread in countries in Africa and Asia, that up to 70% of children are considered at risk. Orange fruits and vegetables are the most common source of vitamin A.

Iron deficiency leading to anemia curtails the oxygen-carrying capacity of hemoglobin and so prevents full vitality of the brain and its development. Both children and adults who are deficient in iron lack the energy, endurance and activity to remain actively engaged with their environment. Iron-deficient children are less involved and interested in their surroundings, unhappier and more fearful. Work and learning therefore suffer along with mood. Consequently, anemic children show poorer language, motor, and eye-hand coordination abilities than non-anemic children (Grantham-McGregor & Ani, 2001). In developing countries, particularly in Africa and South Asia, 21.5 million children under 5 years of age, or 40% of preschoolers, are anemic. Iron deficiency is caused not only by an iron-deficient diet but also by malaria and hookworm infections. Hookworms, which are prevalent in feces-contaminated soil, enter through the sole of unshod feet and then sap blood through the intestine wall. They and other geohelminths prevent full use of food intake of school-age children who pick up worms in their travels around the community.

Iodine deficiency is thought to be the main cause of reduced brain capacity through its effect on the thymus and thyroid gland. It is simply bad fortune to live in a region where this element is not naturally found in the soil and so is lacking in plant food. Before iodine-fortified salt became available for purchase several years ago, 15% of school children 6 to 11 years of age in developing countries had an enlarged goiter, the main sign of iodine deficiency. Even today many families do not have access to iodized salt. The most severe problems in psychological functioning are found in newborns of iodine-deficient mothers because iodine is essential for early brain development.

Zinc has newly entered the list of essential nutrients for health, particularly in the early years when children are vulnerable to infections. Zinc supplements in the first year, given in syrup form, were found to reduce the duration and severity of acute and persistent diarrhea and pneumonia, especially in malnourished children. Perhaps because of the

protection against infection, children on zinc supplements show better weight gains over the years.

Breast milk is universally acknowledged as the best nutrition for infants. Not only does it provide antibodies that protect the infant from early infections, but it contains all the nutrients listed above, such as fatty acids and protein, that infants may not get from commercially sold milks. Infants given breast milk alone for the first 4-6 months grow better, are healthier, and develop more mature mental abilities than children fed other commercial or cows' milks. Making sure that mothers offer their infants breast milk is a concern in all countries of the world.

Cultural Influences on Food Choices and Nutrition

It is not surprising that children and adolescents share food preferences with their parents rather than their friends. From birth, parents make most food choices for their children. Choices may be influenced by the foods that are available and the foods are appreciated or avoided by one's cultural group. However, because there is variability within a culture, most parents have some choice between what they learned to appreciate when growing up and what is available currently. The mother's food intake during pregnancy, while important for her health, does not appear to make much difference to her unborn child; rather her long-term nutritional status from well before conceiving determines whether the baby will have a low birth weight or a mental impairment.

A number of unusual feeding practices greet the newborns at birth if they are delivered outside a clinic or hospital. For example, before giving breast milk, Ethiopian newborns might be given a spoonful of soft rancid butter or warm water with sugar to oil the pipes and sweeten the vocal cords. Even hospitals in urban settings were found to interfere with early breastfeeding by supplying commercial milk in bottles. Now, mothers delivering their babies in Nairobi, Bogata, Bangkok and other cities with baby-friendly Hospitals are receiving the message that only breast milk should be given to infants under 4 months of age. Unfortunately, many new urban mothers have the misguided belief that they do not have enough milk and their baby needs more to grow. Consequently, they regularly supplement breastfeeding with other foods and liquids such as cereal, fruit, cow's milk, and tea in the first few months; the supplements in turn impair a mother's milk flow. Others know that breast milk by itself provides everything infants need. So for these and other reasons, the number of mothers giving only breast milk in the first 3 months varies from 9% in Turkey to 50% in India and 84% in Ethiopia.

While breast milk alone suffices for the first 4-6 months, infants after this age need weaning foods, namely semi-solid foods such as fruits, vegetables, oil, cereals, and eggs in addition to breast milk. Many mothers in Africa and Asia, however, believe that one can wait until children have teeth at one year before feeding them adult food. Others believe that a special kind of traditional porridge with lots of mass but few calories will satisfy children's hunger. Both of these diets lead to malnutrition. Weaning foods therefore vary considerably depending on whether the culture and the family support early or late solids. Beliefs about infants' appetites also play a role as some mothers are guided by their

children's interests or disinterests in the food while others force-feed children who are lying down or feed children who sit on the lap facing away from their mothers. Although it is known that infants have appetites and broad taste preferences, parents may believe that infants are passive and unmotivated until programmed by their parents. Another common belief is that because children do not work, they do not need as much food as adults. Thus, children may receive only two meals a day rather than the five smaller meals that they need up to 3 years of age.

Given that malnutrition and diarrhea are so common in developing countries, it is interesting to note how mothers of young children respond to these illnesses. Both require food and fluid. However, many mothers do not recognize the malnourished state of their own children and do not attribute thinness of their own or others' children to lack of food. Illiterate mothers in particular may believe that some social behavior on their part or an animistic spirit in nature caused the children to grow thin. Likewise many mothers believe that children with diarrhea need less, not more, food and fluids. Others believe children who have diarrhea need certain foods to restore a hot-cold balance to the body. Fortunately, in some cultures, rice and bananas are cool foods--good to reduce the heat of diarrhea and good to restore nutrients. However, vegetable soups are thought to be too hot, although they would add needed water to children who are losing too much. Many writers have portrayed traditional beliefs as if they were taboos--firm rules that bring disease and death if broken. However, in most places there seems to be a sufficient mix of traditional and modern beliefs for people to consider and choose.

The most common foods missing from children's diets worldwide are fruits and vegetables, and in some cases, milk. Even in warm tropical climates where fruits and vegetables are plentiful, there is the belief that fruits and vegetables give children diarrhea. Of course, loose stools for one day are not the same as watery stools for three days straight. Furthermore, once breast feeding ceases, children in rural developing areas rarely drink cows' milk. Even in industrialized countries, children and adults eat much less than the daily 5-9 fruit and vegetable servings they should. In the U.S., the Gimme 5! school intervention program promoted consumption of 5 fruit/vegetable servings by targeting school cafeterias, family snacks, and community shops. However, it was a multi-year challenge simply to add one fruit to each child's daily diet. Children are more likely to enjoy fruits and vegetables if they have had fresh ones throughout childhood, perhaps as a result of residing close to orchards and gardens. Adolescents in industrialized countries typically eat more high-fat and high-sugar foods and less fruits, vegetables and dairy products than they need. In fact, U.S. adolescents' emphasis on taste and convenience, rather than health and family meals, has been blamed for their low "healthy eating" index: 20% had a poor diet and 74% had a diet in need of improvement. As a result of urbanization, most industrialized countries are finding that their citizens lack a diverse diet and need to be encouraged through advertising campaigns and school cafeterias.

New Directions on Solutions

Many ideas for enhancing nutrition and health have been tried and evaluated around the world. In addition to improving agricultural yields, governments have helped hospitals promote breastfeeding and banned the use of bottles with infant formula. These have been two very successful nutrition programs. Others include fortifying foods with iodine (iodized salt) and adding vitamin A and iron to children's drinks and snacks. An alternative is to provide vitamin A drops to children every 6 months in their first year or two when they need extra protection from illness. This has been found to reduce the duration and severity of diarrhea and measles, as well as to cut childhood deaths by up to 30%. It also reduces blindness. Likewise, anemic children given supplementary iron each day for several months show better appetites and more activity, without running the risk of getting malaria. Zinc supplementation in the first year or two not only reduces the duration and severity of diarrhea and pneumonia, but it also helps children add weight. In addition to providing nutrients to supplement children's diet, many nutritionists are working with rural people to help them develop new and convenient weaning foods and cultivate their own vegetables. Because families are the place where food selections and preferences begin, it is important to have parents develop new recipes.

Other programs are more ambitious. While simply providing supplementary food to children increases their weight and height somewhat and may, in turn, improve their intellectual and social abilities, much more needs to be added. To improve child health and nutrition in the long run, school meal programs are being implemented to provide children with two-thirds of their daily requirements of protein and energy in the form of a biscuit containing iron, iodine, vitamin A and fat (Consultative Group on Early Childhood Care and Development, 2002; Levinger, 1996; UNICEF, 2001; World Bank, 2002). Sometimes this is combined with de-worming activities to eliminate hookworm and other geohelminths that are ingested by children. The medication can be given to all children under the assumption that most have high worm loads. This is a good short-term goal, but children are likely to become quickly re-infected if ground and water are contaminated due to low latrine use. In regions where school enrollment is low, providing a nutritious breakfast or lunch may be an incentive to send children, especially girls, to school. Positive results have been found in raising children's weights, school attendance, and arithmetic. When combined with good quality schooling, these free meal programs have the advantage of not only adding energy, alertness, positive mood and receptiveness to learning, but also the acquisition of knowledge and problem-solving skills for the future. At the same time, noninvasive techniques are available to study how the brain uses various nutrients in the early years to process information.

The convergence of culture, food, and health has become a fascinating topic to scientists and practitioners from many disciplines. New ideas from around the world help contribute to our understanding of how to feed the growing world population for a better quality of life. It is not enough to know the food groups and provide the food. We need to know what the food does to our bodies and brains, and how people learn to adopt and change their food preferences and habits.

References

- Consultative Group on Early Childhood Care and Development (2002). *Early childhood care and development*. Retrieved from <http://www.ecdgroup.com>.
- Grantham-McGregor, S & Ani, C. (2001). A review of studies on the effect of iron deficiency on cognitive development in children. *Journal of Nutrition*, 131, 649-668. <http://www.nutrition.org>.
- Levinger, B. (1996). *Nutrition, health and education for all*. Retrieved from <http://www.edc.org/INT/NHEA>.
- Pelletier, D. L., Frongillo, E. A., Schroeder, D. G., & Habicht, J. P. (1995). The effects of malnutrition on child mortality in developing countries. *Bulletin of the World Health Organization*, 73, 443-448.
- Waterlow, J. C. (1992). *Protein energy malnutrition*. London: Edward Arnold.
- UNICEF (2001). *The state of the world's children*. Oxford: Oxford University Press.
- World Bank (2002). *Early child development*. Retrieved from <http://www.worldbank.org/children>.
- World Health Organization (2002). *WHO infectious disease report*. Retrieved from <http://www.who.int/infectious-disease-report/>.
- World Health Organization (2002). Nutrition. Retrieved from <http://www.who.int/nut>

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Questions for Discussion

1. Calculate your body mass index (BMI). Are you underweight, average or overweight? Is it related to your diet, illness, exercise routine or something else?
2. What nutrients do children and adolescents need and from which local foods do they get these nutrients?
3. Look at the Nutrition table in UNICEF's State of the World's Children. The site for the 2001 version is www.unicef.org/sowc01/tables/#, but you may find a more current one by changing the sowc01 term to the current year. For your country, find the % of

children with low birthweight, the % of children exclusively breastfed from 0-3 months, and the % of under-fives who are underweight and stunted. Then compare these figures with those of at least one other country of your choice from the regions of Africa, Latin America, and Asia.

4. Can you devise solutions for nutrition problems in your country? How would you put this solution into practice so that many children could benefit? How would you evaluate the outcome to see if children did indeed benefit? Some suggestions are offered in the reading with regard to iodine and fruits.
5. How are babies fed in your country from birth to 2 years of age? What problems do families encounter when trying to feed their babies--problems in acquiring food, preparing food, teaching babies to feed themselves, or overcoming fussiness about food? You might need to interview some families to seek answers to these questions.
6. Check the Riverdeep site for more student-friendly questions and projects concerning UNICEF's State of the World's Children information on nutrition. www.riverdeep.net/current/2001/12/123101t_children.jhtml.