

Improving Nutrition through Food Quality, Access, Affordability, and Waste Reduction**

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Summary

In both the developing and developed world, the problem of undernutrition continues, yet overweight and obesity have become serious health threats. The answer to solving undernutrition is not increasing food production, but rather focusing on the quality of food and ensuring access to healthy food for all people. This will require collaborations across many disciplines, rigorous research to measure the impact of policies and programs, and leadership from national, regional, and local leaders. Partnerships among universities, public health officials, and policy makers are critical for success.

Current realities

Globally, the lack of sufficient food is the main nutrition-related health problem that has been focused on by policy makers for the last 50 years. Almost 800 million people in the world are hungry and growth of 200 million children under the age of 5 has been stunted due to undernutrition. In addition, 2 billion people experience poor physical and cognitive development due to insufficient consumption of energy and essential micronutrients (e.g., vitamin A, iron, iodine, and zinc).

Despite many attempts to increase consumption of these micronutrients, deficiencies persist. An estimated 250 million children are vitamin A deficient, causing up to 500,000 of them to become blind every year. In developing countries, billions of people are affected by iron deficiency, while half of pregnant women and 40% of preschool children are anemic. These conditions contribute to both poor pregnancy outcomes and maternal death and impaired physical and cognitive development. Iodine deficiency affects almost 800 million people worldwide and is a major cause of cognitive impairment in children, causing 20 million children per year to be born with cognitive disabilities. Zinc deficiency impairs growth and is responsible for the death of 800,000 children per year. Immune deficiencies caused by a lack of iron, vitamin A, and zinc rank among the top 10 leading causes of death through disease in the developing world.

Paradoxically, the number of overweight and obese people worldwide has increased during this same time period and is now estimated to be over 2 billion. For the first time in human history, the number of overweight and obese people globally is about equal to the number of undernourished people. In the United States, 69% of adults are overweight or obese, and the percentage of obesity in children is 8% for ages 2-5, 18% for ages 6-11, and 21% for ages 12-19. In Canada, 54% of adults are overweight or obese. Since the Canadian data are based on self-reported weight and height, the actual prevalence of obesity is likely to be 6%-9% higher.

In low- and middle-income countries, many of which still struggle with high rates of undernutrition, obesity-related chronic diseases such as diabetes and cardiovascular disease are becoming the fastest growing causes of death. In Mexico, undernutrition exists in up to 36% of the population in some states. Nationally, 18% and 11% of the population experiences moderate and severe food insecurity respectively. The greatest prevalence is among rural, indigenous people and the poor. A total of 18% of pregnant women and 23% of preschool children are anemic. Simultaneously, 33% of the population in Mexico experiences obesity. Mexico struggles with the “double burden” of an overweight and undernourished population, sometimes within the same family and even the same person. In India, 48% of children under the age of five experience stunted growth, while half of pregnant women and 74% of children under the age of five are anemic. Yet at the same time, 20% of adults and 11% of adolescents are overweight or obese.

In the U.S., where obesity is a serious problem, undernutrition also occurs, and it is generally associated with poverty. For example, in the state of Minnesota, which often ranks at the top of the most livable places in the U.S., poorer communities do not experience equal levels of health, access to healthy food, and economic success as the rest of the state. Minnesota has the fifth largest agricultural food economy of any state in the U.S., yet there are 3.5 million visits to food shelves per year and 20% of families with children face food insecurity. At the same time, two-thirds of all Minnesotans are overweight or obese, and \$2.8 billion are spent each year on obesity-related health care. Many of these overweight people are living in poverty, and in some cases are malnourished as well as overweight.

Scientific opportunities and challenges

The Green Revolution of the 1960s increased production of corn, wheat, and rice, and it is credited with reducing the occurrence of famine. Yet the Green Revolution has been criticized for having a negative impact on food quality, producing grain monocultures often used for export, animal feed, or biofuel, rather than the polycultures used for local consumption. The revolution caused agricultural biodiversity to decrease, and both pesticide use and soil nutrient depletion to increase, leading to lower levels of micronutrients in foods grown. With the increase in production and availability of grains, hunger and starvation decreased, but micronutrient deficiencies have continued and hunger has not been eradicated.

Many people maintain that a new “Green Revolution” is needed to feed the growing world population. Yet calculations of food production suggest that the world produces enough food to feed everyone. In 2011, food production resulted in availability of almost 2,900 kcal per day per person. This rose from 2,600 kcal per day per person in 1990, which is remarkable given that the world’s population grew by about 2 billion during that time. In developing countries, quantities of kcal per day per person produced increased from 1,850 in the early 1960s to more than 2,600 in 2008. These data suggest that when it comes to dietary energy, there is enough food on the planet to feed everyone. Some have estimated current food production can feed up to 10 billion people at this time.

So why is there still hunger and undernutrition in the world if there is enough food? Poverty is the primary reason, as it results in insufficient income to purchase food and a lack of land to grow food. Poverty is most often caused by lack of resources, unequal income distribution, and political and social instability. The World Bank estimates that there are more than 1 billion people worldwide who live on less than U.S. \$1.25/day and 2.2 billion people who live on less than U.S. \$2/day. Poverty is also caused by hunger, which reduces a person’s ability to learn, work, and be productive. In addition to poverty, hunger is caused by food and agricultural policies, climate change, and food waste (i.e., 33% of all food produced is wasted).

In the developing world, the increase in obesity is due to increased availability of cheap, energy-dense foods, as well as a lack of physical activity that accompanies economic growth and affluence. During a 15-year period, having developed and moved away from a traditional diet of corn and beans, the average Mexican has eaten 29% less fruits and vegetables and 6% more carbohydrates, while consuming 37% more soft drinks. Mexicans are the world’s second largest consumers of soft drinks, at 150 liters per person per year. White bread is replacing tortillas, and fast food is replacing home cooking. Mexico now has the highest rate of diabetes in the world.

Policy issues

This global shift from undernutrition to simultaneous undernutrition and obesity has occurred in virtually every country as it has developed economically. There are no examples in which increases in an overweight/obese populace has been avoided. It is critical that while combatting undernutrition, policy makers consider the unintended consequences of overnutrition and set policies in place to

avoid its development. The solutions to these problems will likely be country-dependent. In some cases they will require policy changes at the national, regional, or local level.

In the developed world, much of this work will take place at the local and regional levels. For example, the Minnesota Department of Health, Blue Cross and Blue Shield of Minnesota, and the University of Minnesota Healthy Food, Healthy Lives Institute led the effort to develop a plan to address its state's nutrition problems. The Minnesota Food Charter (<http://www.mnfoodcharter.com>), launched in 2014, is a roadmap describing 99 actionable policy and systems changes that will create a healthier state. Its purpose is to lay a foundation for research and policy that will reduce both undernutrition and overnutrition in the state. The Minnesota Food Charter recommendations are applicable at all levels:

- *Improve food and nutrition knowledge and skills:* Knowledge of nutrition and how food is produced must be provided in the schools as well as to the public through Extension programming, clear nutrient labeling on foods, and required menu labeling. The loss of knowledge of food preparation is a public health problem, and providing food skills education (i.e., cooking) in schools and to adults will improve food consumption and nutrition-related health.
- *Make healthy food more affordable:* Government subsidies can be used to lower the price of healthy foods, such as fruits and vegetables. Governments can also restrict marketing of and increase prices of high sugar/high fat foods (e.g., Mexico bans TV advertising of and imposes taxes on energy-rich food and beverages). Reducing poverty through economic development will provide people with the resources needed to purchase healthy foods.
- *Increase food availability and accessibility:* Many people buy much of their food at convenience stores that generally do not stock much fresh, nutrient-dense food. City ordinances can be passed (e.g., in Minneapolis) that require and support convenience stores to provide these foods. Healthy food financing initiatives can be used to support the development of grocery stores that stock healthy foods in areas that do not have sufficient source of healthy foods. Cultural food requirements must be considered, as well as the food sovereignty of indigenous peoples.
- *Institute necessary changes in food infrastructure:* Globally, there needs to be (i) increased diversification of crops and agricultural practices that increase production of nutrient-dense foods (via governmental incentives/subsidies, biofortification by private industry, etc.); (ii) improved gender equity and empowering of women who do most of the agricultural work, lead the families, and raise the children in much of the world; (iii) decreased food waste at home, throughout the food chain (e.g., manufacturing, transportation, storage), and in food service settings (e.g., restaurants, schools, institutions); (iv) improved access to markets for small farmers; and (v) the incorporation of nutrition objectives into agricultural programs and policies.
- *Support collaborations among nutritional scientists, public health workers, farmers, food manufacturers, economists, sanitation experts, civil engineers, policy makers, etc.:* One of the barriers to effective collaboration is that these disciplines are generally isolated from each other within universities and governments (e.g., the agricultural sector focuses on production and not consumption and human health; the nutrition sector focuses on nutrients and not foods or agriculture). These groups must work together to improve nutrition and health (e.g., the U.S. Dietary Guidelines need to consider impacts on food production when making recommendations for consumption of specific foods; there needs to be national discussions on genetic modification of foods). Rigorous research will be needed to determine the impact of agricultural, policy, educational, social, cultural, and economic programs and policies, either in research universities, or government-supported research institutes.

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