

# Nutrition and Health



Malnutrition comes in a number of forms that not only affect a person's health and well-being, but also place heavy burdens on families, communities and states (FAO and WHO, 2014). Ending hunger, achieving food security and improving nutrition are all key steps toward sustainable development (UN, 2016). Food safety is also a key concern, as unsafe food remains

a major cause of disease and death (WHO, 2015). Meanwhile, changes in dietary patterns around the world have consequences for public health and sustainable development.

As production systems become increasingly interconnected and the climate changes, the threat of food-borne, vector-borne, and transmissible zoonotic diseases increases.

## 'TRIPLE BURDEN' OF MALNUTRITION REMAINS A GLOBAL HEALTH EMERGENCY

The 'triple burden' of malnutrition weighing on most countries consists of undernutrition, micronutrient deficiencies, and overweight and obesity.

Different forms of malnutrition can co-exist within the same country, the same household and even the same individual.

**Undernutrition** is declining globally. Between 2000 and 2015, the prevalence of stunting (low height for age) among children under five years declined from 32.7 to 23.2 percent, and the number of stunted children fell from 198 million to 156 million (UNICEF, WHO and World Bank, 2016). However, around 800 million people, or almost 11 percent of the world's population, still go hungry (FAO, IFAD and WFP, 2015b), and the rate of stunting is not declining fast enough, particularly in Africa, to reach the World Health Assembly target of a 40 percent reduction by 2025 (WHO, 2014). Childhood stunting is a largely irreversible outcome of inadequate nutrition and repeated bouts of infection during the first years of a child's life. Stunting before the age of two results in poorer cognitive and educational outcomes in later childhood and adolescence. In 2015, 7.4 percent of children under five were moderately or severely wasted (low weight for height) and, in 2013, an estimated 16 percent of all newborns globally had low birth weight (UNICEF, 2016). Nearly half of all deaths among children under five are attributable to undernutrition (UNICEF, WHO, World Bank and UN, 2014).

**Micronutrient deficiencies** affect more than 2 billion people worldwide (Micronutrient Initiative, 2015). In 2011, for example, more than half a billion women between the ages of 15 and 49 suffered from iron deficiency anaemia. Anaemia contributes to 20 percent of all maternal deaths (WHO, 2016c), with about 50 000 women dying in childbirth each year due to

a lack of iron. Vitamin A deficiency is a public health problem in more than 100 countries. It causes an estimated 250 000 to 500 000 children to go blind every year, and half of them die within a year of losing their sight (WHO, 2016d). An estimated 38 million babies are born with iodine deficiency, which is the most common cause of preventable brain damage (WHO, 2016b). Zinc deficiency affects about 30 percent of the world's population (Micronutrient Initiative, 2015).

**Overweight and obesity** are increasing worldwide, in all population groups, owing to increased consumption of foods that are high in energy, fats, added sugars or salt, and an inadequate intake of fruits, vegetables and dietary fibre. This 'nutrition transition' reflects rapid urbanization, the increased production of processed food, and more sedentary lifestyles. In 2014, some 40 percent of people aged 18 and over were overweight and, of these, 13 percent were obese (WHO, 2016e). Globally, 44 percent of adult diabetes cases, 23 percent of ischaemic heart disease and 7 to 41 percent of certain cancers are attributable to overweight and obesity (WHO, 2009). Almost two-thirds of the world's population live in countries where overweight and obesity kill more people than underweight (WHO, 2016e).

Between 2000 and 2015, the prevalence of overweight among children under 5 years rose from 5.1 to 6.2 percent (UNICEF, WHO and World Bank, 2016). If this trend continues, by 2025 the percentage of overweight, including obese, children under five will reach 11 percent, or 70 million (WHO, 2014). Childhood obesity increases the risk of early onset of obesity-related health complications, which were once thought to be only problems for adults. The early occurrence of these diseases can have serious consequences on children's future risk of non-communicable diseases (Park et al., 2012). The economic price of malnutrition is billions of dollars in lost productivity and health care costs (FAO, 2013b). By improving nutrition, particularly during a child's first 1 000 days, many public health

problems can be prevented and many obstacles to sustainable development overcome (1,000 Days, 2016).

## CHANGES IN DIETARY PATTERNS ARE AFFECTING PUBLIC HEALTH

Dietary patterns are not only a reflection of what people eat; they reflect complex social behaviours. This makes assessment of what constitutes a healthy diet inherently difficult. Many factors need to be considered when undertaking interventions to encourage behavioural changes that can lead to healthier diets. For example, excess consumption of processed meat and red meat are linked to increased risk of death from heart disease, diabetes or other illnesses. At the same time, meat provides high-quality protein and a variety of micronutrients, such as iron, vitamin A, iodine and zinc, many of which are difficult to obtain in adequate quantities from foods of plant origin. Vitamin B12 is only found in animal source foods (WHO, 2016a). These nutrients are essential for a healthy immune system, which is needed to fight off infections. When addressing dietary patterns, the health risks and benefits of animal-source foods need to be balanced.

Between 1990 and 2013, the consumption of more nutritious foods increased worldwide. Trends differ, however, in the types of food consumed and across regions. For example, fruit consumption increased in all regions, but vegetable consumption increased only in some (Master, 2016). Typically, fruit consumption, in terms of grams per person per day, tends to rise with average income levels, whereas vegetable consumption declines. In sub-Saharan Africa, per capita fruit consumption was 16 percent below the global average level in 1990; by 2013, it had slipped to 23 percent below. In East Asia, instead, fruit consumption grew closer to world average levels - in 1990, it was 46 percent below; by 2013, it was 39 percent below. Seafood consumption in grams per person per day declined in three out of seven regions. It remains highest in Southeast Asia,

which also saw the largest increase in whole grain consumption. Dairy product consumption is highest in North America and Europe.

These different patterns are partly due to differences in individual purchasing power and the income elasticities of food demand. They also depend on other factors, such as refrigeration options and access to convenience food, which tend to improve with levels of economic development. Cultural preferences also explain the different patterns across regions for meat, milk and fruit consumption.

In most regions, however, the consumption of highly processed foods increased more than the consumption of fresh foods. Middle-income countries show the greatest shift toward dietary patterns based on highly processed foods (Imamura et al., 2015). There was an increase in the consumption of sugar-sweetened beverages in four out of seven regions, with the largest increase in North America. In all regions, consumption of processed meat has increased. In East Asia, red meat consumption has increased substantially, but it has declined in every other region. Levels of red meat consumption are similar in East Asia, Latin America, North America and Western Europe.

Data availability only allows for a systematic examination of long-term trends in dietary patterns using FAO's food balance sheets (FBSs), which provide evidence of apparent food intake through estimates of dietary energy supply (DES) and the per capita supply of protein. FBSs offer a comprehensive picture of long-term trends for key categories of food and provide globally comparable indicators of per capita daily food supply at the country level.

An analysis by food groups reveals that in the last 50 years, per capita caloric availability and the diversity of foods consumed have increased. Between 1961 and 2011, the share of calories from the apparent daily per capita consumption of cereals dropped from 35 to 29 percent in high-income countries and from 56 to 50 percent in low- and middle-income countries. During the same period, the share of calories from fruits and vegetables rose

from 4.9 to 5.4 percent in high-income countries and from 3.9 to 6.9 percent in low- and middle-income countries (FAO, 2016b). FAO projects these trends to continue towards 2050, but with slower growth in the consumption of fruits and vegetables in low- and middle-income countries compared with that in high-income countries. The divergence in dietary transition towards more consumption of these nutritious foods is largely explained by the projected strong increase in demand for meat and dairy products in low- and middle-income countries.

Overall, the average dietary energy supply in low- and middle-income countries remains well below that of high-income countries, but the gap is closing gradually. In 1961, the DES of low- and middle-income countries was only 68 percent of that in high-income countries, but rose to 81 percent in 2011. By 2050, it is projected to be 86 percent. Across all groups of food items, dietary patterns in the two groups of countries tend to converge (FAO, 2016b).

In the last 50 years, the daily intake of protein has increased in high-income countries, particularly from meat, eggs, milk and dairy products, which rose from 39 g per capita in 1961 to 52 g in 2011, a 33 percent increase for an annual growth rate of around 0.6 percent. Most of this increase occurred in the 1960s and 1970s. Since the 1980s, protein intake from animal sources has remained almost constant. FAO projections for 2030 and 2050 show daily protein intakes of 54 g and 57 g per person respectively. Between 1961 and 2011, in low- and middle-income countries, the daily per capita availability of protein from animal products rose from 9 to 20 g, an increase of 116 percent. The daily per capita protein intake from animal products in low- and middle-income countries is projected to reach 22 g by 2030 and 25 g by 2050.

Globally, fish contribute around 18 percent of the total animal protein intake, but in some coastal communities and small island states the percentage can reach as high as 60 percent (FAO, 2009). Global per capita consumption of seafood has

been increasing and currently exceeds 20 kg per year. This trend is expected to continue as incomes rise and consumers become more aware that fish and fishery products can be a healthy alternative to meat from farm animals.

With the increases in food supply in recent decades, the world now produces more than enough food to satisfy the dietary needs of the entire global population. The average DES per person per day in low- and middle-income countries is around 2 750 kilocalories and in high-income countries it is around 3350 kilocalories.

However, adequate food availability does not automatically imply adequate food intake by all. First, inequality in incomes and other means of subsistence explain large differences in access to food and why still hundreds of millions of people are undernourished. Second, poorer households tend to face impediments to the adequate utilization of food owing to lack of access to facilities, such as food storage, cooking equipment and clean water, and to services, such as health care and basic nutrition education. Third, the dietary transition is partially reflected in improved access to more nutritious foods, including meat, dairy products, fruits and vegetables, but not necessary in the right balance. Analyses based on household surveys, as well as the trends shown above based on the FAO food balance sheets, suggest accelerated growth in consumption of meat and slower growth in consumption of fruits and vegetables.

If the benefits of the dietary transition observed in low- and middle-income countries are to continue in the future and bring about the achievement of the 2030 Agenda's nutrition objectives, some conditions may need to be fulfilled. While food production must keep the pace with increasing demand, equitable food access and adequate food utilization have to be ensured. In addition, consumer education is needed to promote healthier food consumption patterns and ensure that the food abundance experienced in high-income countries does not translate into poor nutritional outcomes.

## HEALTHY DIETS CONTRIBUTE TO A HEALTHY ENVIRONMENT

There is growing recognition that changes in nutrition are critical to achieving several of the Sustainable Development Goals. Dietary patterns should be scrutinized not only for their impact on health, but also for their impacts on the environment and particularly their link to climate change.

Diets rich in meat, particularly that of ruminants such as cattle, are associated with higher environmental costs and higher emissions of greenhouse gases: methane, resulting from enteric fermentation; carbon dioxide, which is released from the clearing of forests for pasture; and nitrous oxide, which is generated in feed production (FAO, 2013a; FAO, 2016c). Diets with lower intake of meat have significantly lower emission intensity. Industrialized livestock systems tend to generate fewer GHG emissions per unit of product than other livestock systems, but they have other significant social and environmental impacts, including higher withdrawals of fresh-water, more pollution, greater use of antimicrobials with the associated risks of increased antimicrobial resistance, and potentially more outbreaks of zoonotic diseases.

In terms of GHGs emitted per unit of product, the aquaculture sector has significant advantages over other food production systems, especially livestock. Increasing evidence suggests that dietary patterns that have low environmental impacts can be consistent with good health (FAO and Food Climate Research Network, 2016). National dietary guidelines recommending lower red meat consumption, particularly among heavy consumers, could help reduce GHG emissions significantly (IFPRI, 2015).

Climate change is expected to also have direct impacts on food quality and nutrition. For example, the elevated levels of carbon dioxide in the atmosphere that are likely by 2050 are associated with substantial declines in the zinc, iron and protein

content of wheat, rice, field peas and soybeans (FAO, 2016c). In addition, the higher temperatures and more extreme weather events associated with climate change create favourable environments for food- and water-borne pathogens (IFPRI, 2015).

## UNSAFE FOOD REMAINS A MAJOR CAUSE OF DISEASE AND DEATH

Although comprehensive data on the extent of food-borne pathogens are lacking, factors that contribute to outbreaks of food-borne diseases include: unsafe water used in food cleaning and processing; poor production processes and handling, including inappropriate use of agricultural chemicals; the lack of storage infrastructure; and inadequate or poorly enforced regulatory standards (WHO, 2015). Recent estimates show that, in 2010, some 30 global hazards caused a total of 600 million food-borne illnesses and 420 000 deaths. The most frequent cause of food-borne illness, which led to 230 000 deaths, was diarrhoeal disease agents. The global burden of food-borne disease was estimated at 33 million 'disability adjusted life years'. Some 40 percent of the food-borne disease burden was among children under 5 years of age, and the highest per capita burden was in Africa, followed by Southeast Asia and the Eastern Mediterranean.

Food-borne diseases are caused by bacteria, viruses and parasites, as well as chemicals and toxins, such as aflatoxins, peanut allergens, dioxins and cyanide in inappropriately processed cassava. The burden of aflatoxins is especially high in Africa, Southeast Asia and Western Pacific. Aflatoxins, which can cause liver cancer, are produced by mould that grows on stored grains, such as maize, as well as on groundnuts, oilseeds and tree nuts. Aflatoxins have also been linked to stunting in children (PACA, 2014).

Food-borne pathogens weaken immune systems. The most vulnerable groups are infants and young children, pregnant women, the elderly and people whose immune system is already

compromised. In undernourished infants and children, food-borne diseases contribute to undernutrition by reducing the body's ability to absorb nutrients. Children who survive may suffer from delayed physical and mental development, which deprives them of the opportunity to reach their full potential in society (WHO, 2015).

As low-income countries adopt intensive animal husbandry to maximize production, the prevalence of pathogens in flocks and herds increases, as does the incidence of food-borne diseases. The warmer climate in tropical countries is also favours naturally occurring toxins and parasitic diseases.

Food-borne diseases slow economic development, and hinder the growth of the tourism, agriculture and food exports. Low-income countries' access to food export markets may be blocked if they are unable to meet the international regulatory requirements set by the Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organization. This, in turn, reduces the incomes of small-holder producers, which can impact their capacity to buy diversified and nutritious food.

Trade restrictions can also limit the availability of nutritious foods (Roesel and Grace, 2015). These food safety 'restrictions' on trade may come at a cost, in terms of market access for low-income countries, which may have more limited capacities to enforce food safety standards. Hence, the application of food safety standards in trade agreements may need to be supplemented by measures to assist low-income countries in strengthening national food control regulatory frameworks, enhancing food safety management along food chains, and developing online platforms for global networking and information sharing.

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