

Hidden Hunger in the Developed World



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“The food you eat can be either the safest and most powerful form of medicine or the slowest form of poison.”

Ann Wigmore, Lithuanian holistic health practitioner, nutritionist and health educator.

Key messages

Solutions are available: Many countries have implemented mandatory or voluntary fortification of folic acid, vitamin D or iodine. The experience of many countries indicates that the fortification of staple or processed foods may be an efficient way to provide an adequate intake of micronutrients.

The term “hidden hunger” has gained significant currency among nutrition scientists and policy-makers in recent years. In its broadest sense, it denotes a chronic lack of micronutrients – vitamins and minerals – whose effects may not be immediately apparent and whose consequences may be long-term and profound.

While much groundbreaking research into the subject of hidden hunger has been conducted in the last two decades, many questions remain regarding the extent and implications of this phenomenon and the best means of tackling it. From today’s perspective, however, it is clear that hidden hunger is a growing threat to public health, both in the developing and the developed worlds.

The following chapter provides a short introduction and examples to this topic, which is complex, ramified, and the subject of considerable scientific attention and controversy as this book goes to press.



A child with rickets in India in 2006. This non-communicable disease is associated with vitamin D deficiency and results in irreversible malformation of the skeleton

Source: Dr Tobias Vogt



A 1960 photo of a Kings checkout worker is among the items at the New Jersey Supermarket Archives at Rutgers University. Allen Bildner, whose parents founded Kings in the 1930s, donated memorabilia from the chain's early days.

Source: Special Collections and University Archives, Rutgers University Libraries

Hidden hunger in the developed world

Hidden hunger, also known as chronic micronutrient malnutrition, is experienced by more than one in three of the world's total population. This term refers to a chronic lack of vitamins and minerals, which is not immediately apparent and which can exist for a long time before clinical signs of malnutrition become obvious.

It is a popular perception that most people who live in the developed countries of the world enjoy a nutritionally sound diet and are not prey to hidden hunger. The reality is, however, different. Micronutrient inadequacies are to be found in the developed world as well as in the developing world, and their current rate of growth in the developed world gives cause for concern. Growing evidence from

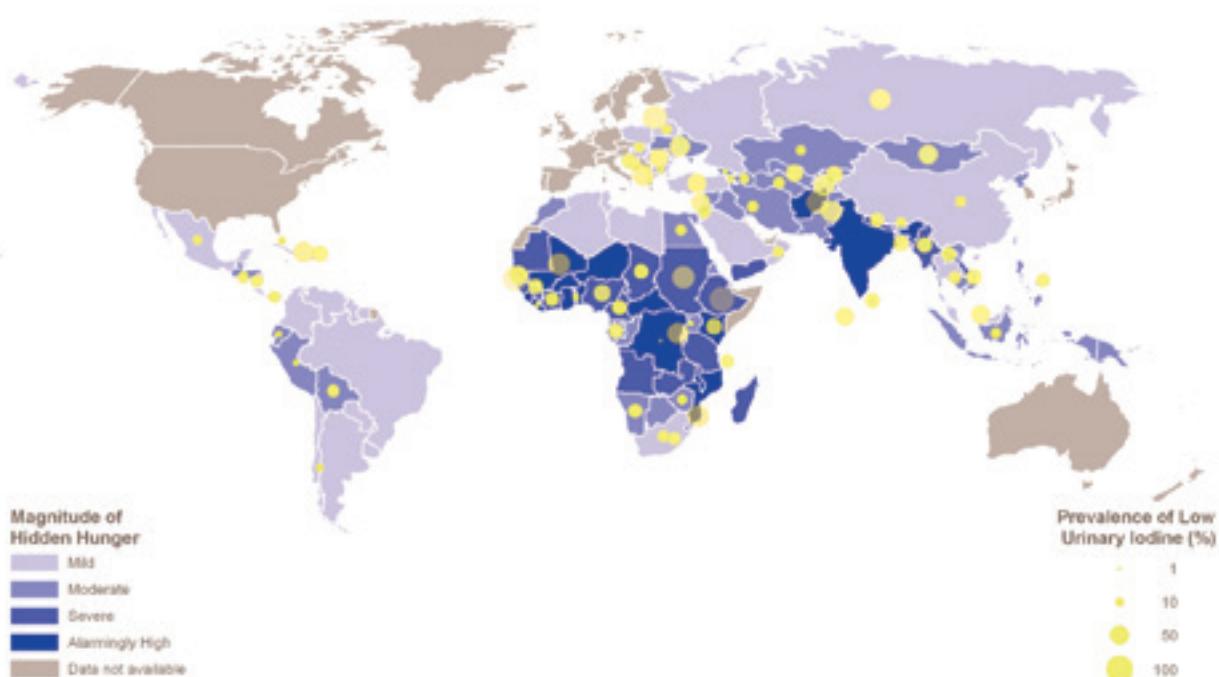
intake surveys in Western countries such as the USA, Canada, Germany, France, Great Britain and many others indicates that a sufficient intake is not being achieved in the case of some micronutrients, according to recommendations using RDAs as reference. This is especially the case for folic acid, vitamin D, vitamin E, iron and iodine.

According to the United Nations Food and Agriculture Organization (FAO), micronutrient inadequacies may, in the long term, lead to a wide number of health problems, including impaired cognitive development, lower resistance to disease, and increased risks during childbirth for both mothers and children. A particular issue in the developed world is the inadequate folic acid intake and vitamin D status.



Food bank in Hérault, France: The growth of food banks in the developed world is a sign that nutrition insecurity is by no means confined to the developing world.

Source: Anne-Catherine Frey



Global map presenting hidden hunger index based on the prevalence estimates (HHI-PD) in 149 countries and prevalence of low urinary iodine concentration in 90 countries with 2007 Human Development Index <0.9.

The hidden hunger index HHI-PD was estimated based on national estimates of the prevalence of stunting, anemia due to iron deficiency, and low serum retinol concentration.

Source: doi:10.1371/journal.pone.0067860.g002

Key definitions

Macronutrient deficiency

This type of malnutrition, known as Protein Energy Malnutrition (PEM), involves a lack of protein and food containing enough calories. This term is applied when hunger is defined in terms of an insufficient intake of calories.

Micronutrient deficiency

Unlike PEM, persons suffering from this type of deficiency may display no outward signs or symptoms. As long as no significant clinical symptoms appear, no consideration is given to the possibility of a micronutrient deficiency. This begs the question of whether a shortfall of the recommended dietary allowances (RDA) is pathologically significant and, if so, how a diagnosis can be made.

Common micronutrient deficiencies

The most common micronutrient deficiencies among women and children are lack of iodine, which is essential for bodily and mental development; iron, a lack of which causes anemia and hampers the cognitive development of children; and vitamin A, which is needed for healthy eyesight and a healthy immune system.

It is often overlooked that behind each of the deficiencies attributed by UNICEF to an unbalanced diet there exist further deficiencies that are not yet visible, yet which exert a negative impact on a child's development. Likewise, a lack of other micronutrients than the above-mentioned three can hamper development long before symptoms are apparent.

The fact that both the FAO and the WHO define hunger in purely quantitative terms – i.e., the result of too few calories – misses the mark. Even if the subjective aspect of hunger, the empty feeling in one's stomach, is addressed by this definition, there is another aspect of hunger which is left out: the body's craving for essential nutritional components. This is what is meant by 'hidden hunger'.

Dimensions of hidden hunger

The human body extracts 51 different essential compounds from food which it cannot produce itself through metabolism. Among these, as far as we currently know, are amino acids, as well as so-called micronutrients (vitamins, trace elements and minerals), which exert a direct influence on physical and mental development and the immune system, and are vital to the body's metabolic processes. To date, it is only known what effects the lack of a certain few micronutrients have on the body in the form of clinical symptoms, such as scurvy (due to a lack of vitamin C), rickets (caused by a vitamin D deficiency), beriberi (triggered by too little vitamin B) and pellagra (resulting from niacin deficiency). This naturally does not exclude the possibility that the micronutrients which have hitherto been the object of less analysis also have an impact on our susceptibility to certain illnesses or the onset of such ailments later in life.

The consequences of a micronutrient deficiency

Both sides of the coin – the causes and adverse effects of the above-mentioned micronutrient deficiencies – are nothing new and have been researched at length. It is therefore quite astounding that they are not considered when assessing the food situation in the world. Moreover, the 'hidden' deficits of micronutrient deficiencies are known, and recommendations are given to avoid a deficiency, for instance by means of supplements or food fortification. However, it is often overlooked that the underlying cause of such deficiencies is a diet which does not meet the nutritional needs of most people, not to mention children and pregnant women. It is also not enough to push for a diet which contains all micronutrients, except in cases of acute, life-saving intervention. Hidden hunger must first and foremost be uncovered and then avoided by all means. The negative, in fact devastating, effects of hidden hunger, cannot be reversed once the damage is done.

Source: Hans Konrad Biesalski, Hidden Hunger, Springer-Verlag, Berlin Heidelberg 2013

The return of rickets

Leading doctors [in the UK] are calling for vitamin D supplements to be made more widely available to children to beat the returning scourge of rickets.

Cases of rickets have gone up four-fold in the past 15 years because many pregnant women and young children are not getting enough of the sunshine vitamin.

Says Professor Mitch Blair of the Royal College of Pediatrics and Child Health (RCPCH): “We know vitamin D deficiency is a growing problem, and localized research reveals startlingly high levels of vitamin deficiency among certain groups including children. People can only get a fraction – just 10 percent – of their recommended daily amount of vitamin D through food, and very little from sunlight. So getting out in the sun more or eating more oily fish isn’t going to solve the problem.”

Lack of vitamin D is related to a plethora of serious illnesses in children and adults that could be prevented through relatively simple steps such as taking supplements.

Diabetes, asthma, multiple sclerosis, tuberculosis, and life-threatening heart disease have been linked to low levels of vitamin D in early life. The RCPCH estimates at least half of the UK’s white population, up to 90 percent of the multi-ethnic population and a quarter of children have vitamin D deficiency.

Many people thought rickets had virtually been eliminated after the war, but there has been a recent rise in numbers of children with the disease. Cases went up from 183 in 1995/96 to 762 last year.

Source: Abridged from Return of rickets: Cases up four-fold in the last 15 years as pregnant women and children fail to get enough Vitamin D. Jenny Hope, Mail Online, December 14 2012.

An increase in poverty and poor nutrition in the developed world

An increase in poverty in industrialized countries, with children primarily affected, is an issue that is often overlooked. Being poor means having a poor diet and little dietary diversity in many cases, which means that children who live in the land of plenty may also suffer from malnutrition. Sadly, this fact seems to interest only a very few people.

In a recent article in the Financial Times magazine, Where austerity really hits home, Gillian Tett raises the issue of hunger in the United Kingdom, with an example from a deprived area of Liverpool:

“There’s a lot of little kids going hungry round here,” explained one friend, who works in a local community center. Indeed, just the other day she had spoken to a family where the child had been chewing wallpaper at night. “He didn’t want to tell his mum because he knew she didn’t have the money for supper,” she explained. “We hear more and more stories like this.”

Gillian Tett’s anecdotal evidence of poverty and hunger as a growing problem is backed by figures from the Trussell Trust, providers of a network of food banks around the UK, who state:

“In 2011–12 food banks fed 128,687 people nationwide, in 2012–13 we anticipate this number will rise to over 290,000. Rising costs of food and fuel combined with static income, high unemployment and changes to benefits are causing more and more people to come to food banks for help.”

The UK is not alone. In Germany, Nanette Ströbele-Benschop and Peter Tinnemann in their paper *Health Inequalities in Berlin, Germany – analysis of local efforts to support socio-economically disadvantaged people* cite a project supported by the Berliner Tafel e.V. to distribute fresh produce on a weekly basis to the most socioeconomically disadvantaged people, which found that the daily number of people served increased by 9% from May 2006 to May 2010.

Source: The Financial Times, March 8, 2013; <http://www.ft.com/cms/s/2/7de158e8-86bd-11e2-b907-00144feabdc0.html#axzz2Z7CZFGe8>

Child poverty and malnutrition in the US

Child poverty in the US has reached record levels, with almost 17 million children now affected. A growing number are also going hungry on a daily basis.

Currently, 47 million Americans are thought to depend on food banks. One in five children receives food aid. For some families, cheap and easy to prepare food can mean unhealthy choices like pizza – increasing the likelihood of obesity and health problems later in life.

In many areas schools take part in a “backpack” program, set up to deliver food parcels to the most vulnerable on a Friday – so that they have enough to eat over the weekend. In eastern Iowa and western Illinois, the River Bend Foodbank now helps 1,500 children in 30 schools through one such scheme. It has seen the numbers needing help rise sharply.

“It’s changed dramatically since the recession. We’re up about 30% to 40% in terms of the number of people coming forward,” says Caren Laughlin, who has worked with food banks for 30 years. “That’s not only because so many people have lost their jobs, it’s also because the jobs that are replacing them are low paying. You cannot feed a family.”

The problems are reflected across America, says the nationwide charity Feeding America, which operates 200 food banks and feeds 37 million people each year, including 14 million children.

It says that, in total, nearly 17 million US children live in homes where getting enough healthy food is not something they can count on.

Source: Abridged from The children going hungry in America, Duncan Walker, BBC News, March 6, 2013

The history of the balanced diet

The pioneering biochemists of the first half of the 20th century revolutionized our understanding of the role that nutrients play in our health. Founders of the new science of nutrition such as Casimir Funk and Tadeusz Reichstein identified and isolated individual vitamins for the first time, and began to map out their complex functioning in the metabolism. A growing appreciation of the essential health-giving properties of these micronutrients led to the concept of the ‘balanced diet’ which provided adequate levels of proteins, fats and carbohydrates as well as sufficient amounts of vitamins and minerals. Public health policy – intensified by wartime food rationing and underpinned by educational propaganda – promoted the concept of the balanced diet. Despite the privations of war, the population of the United Kingdom, for instance, ate a healthier diet than at any time in history during World War II and the years immediately following. This generation has shown remarkable health and longevity, which are to a great extent traceable to good dietary habits over a long period of time.

The decline of the balanced diet

There is a polarization in dietary lifestyles in the developed world. While the more affluent and educated have the resources to support a healthier lifestyle and diet, those who are economically poor, who live in ‘food deserts’ and who do not possess a good knowledge of nutrition often do not have access to or cannot afford a healthy, balanced diet or do not have the means to make the right choices. Ironically, the polarization of diets in the developed world has been accompanied by a massive rise in the popularity of cult restaurants and TV chefs.

Sir Jack Cecil Drummond: A pioneer of nutrition science

Sir Jack Cecil Drummond was a Professor of Biochemistry who isolated pure vitamin A in the 1930s, but perhaps his greatest achievements were in translating original science into practical dietary programs. His obituary in the *British Journal of Nutrition* in 1954 praised these efforts:

"Perhaps Drummond's name is most closely associated with the provision of special foods for mothers and children. From the outset he pressed the claims of nutritionally vulnerable groups. The success of his efforts in this direction is seen in the schemes that were gradually evolved for the cheap supply and priority rationing of liquid milk, in the early experiments with blackcurrant syrup and rosehip syrup as sources of vitamins for expectant mothers and young children, in the subsequent provision of concentrated orange juice and cod-liver oil to these two groups, and in the generous allocation of rationed foods for school meals and the provision of national milk cocoa for adolescents."

Drummond developed a system of national rationing to ensure that everyone, whether rich or poor, had an adequate nutritional intake. As James Fergusson writes in his 2007 publication *The Vitamin Murders*:

"The health of the British nation, schoolchildren included, was not just maintained during the Second World War but improved...[T]he incidence of almost every diet-related illness was lower than it had ever been. Drummond was a genuine home-front hero."

As Tom Jaine writes in his introduction to the 1991 edition of Drummond's *The Englishman's Food: Five Centuries of English Diet*:

"Drummond was working during the heroic period of nutritional science when the constituents of food necessary to maintain, and then improve, the quality of life were finally defined. This... was the era when deficiency diseases received their full investigation. For centuries rickets, scurvy, pellagra, beri-beri, night blindness and hunger-oedema had been the scourge of various societies...but it needed the new nutrition to fully explain the treatment and to rapidly extend the benefits of cure to as many populations as possible."

Source: Abridged from Sir Jack Cecil Drummond DSc, FRIC, FRS: A hero of nutrition science and advocacy by Jonathan Steffen, Sight and Life 2/2012

'Food deserts' and the problem of limited access to balanced nutrition

The more varied one's diet is, the healthier it is. Normal body weight and growth can only be achieved if children take their food from several different sources.

Dietary diversity depends upon certain factors, for instance that different foods are available and also affordable. It is this lack of diversity that is responsible for malnutrition and all of its harmful consequences.

There are districts in both urban environments and rural settings, where shops do not stock the range of fresh and nutritious foods necessary for a balanced diet. These areas are usually characterized by convenience stores that stock only processed foods and by fast-food restaurants.

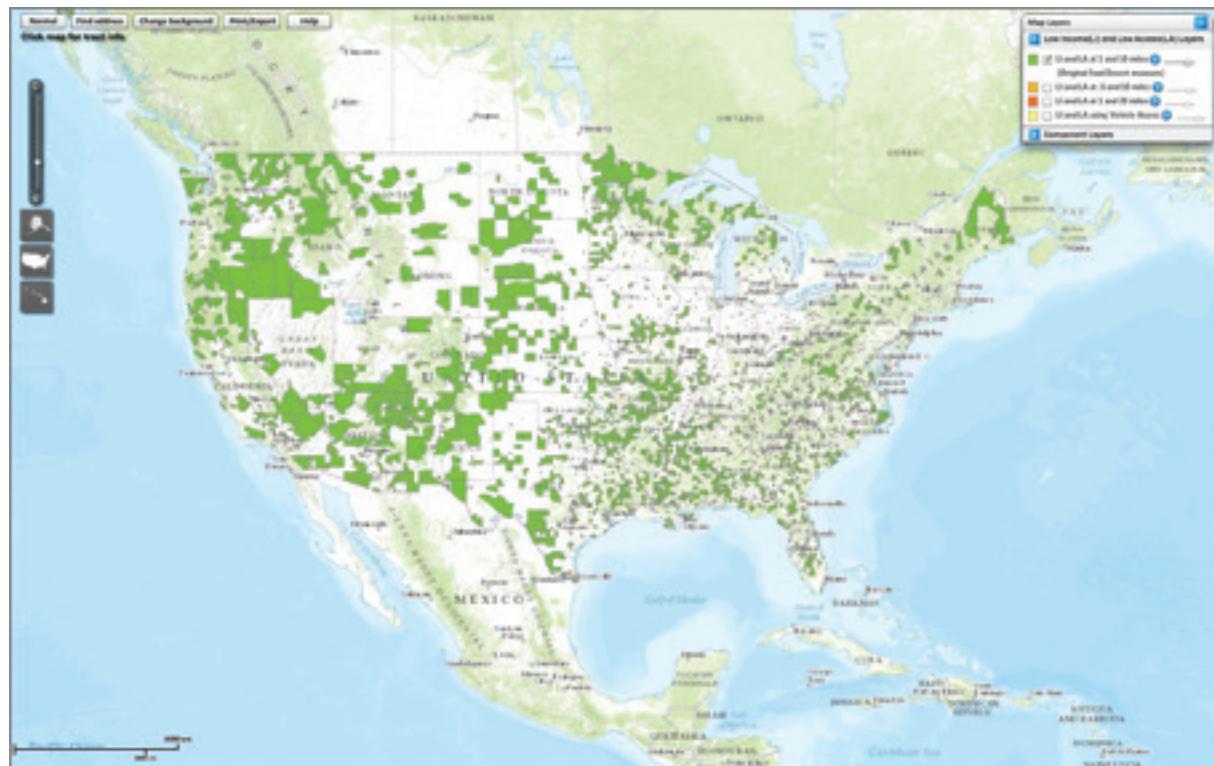
Residents who are unable, for whatever reason, to travel further afield in search of a better diet therefore find themselves in a situation where there is food to buy but the nutritional value of that food is inadequate.

In 2010 the United States Department of Agriculture defined what's considered a 'food desert' as follows: "To qualify as a 'low-access community,' at least 500 people and/or at least 33 percent of the census tract's population must reside more than one mile from a supermarket or large grocery store (for rural census tracts, the distance is more than 10 miles)."

Food deserts in the US and other barriers to a balanced diet

The United States Department of Agriculture (USDA) has replaced their original *Food Desert Locator* with the more detailed *Food Access Research Atlas*. This sophisticated mapping tool allows users to investigate multiple indicators of food store access, and highlights the areas of the US which can be classified as 'food deserts'

It should be pointed out that, in all cultural and geographical settings, the question of access to food has many dimensions, and that a variety of factors may combine to prevent an individual, or a group of individuals, from enjoying a balanced diet. These may include, for instance, lack of mobility (lack of transport or lack of physical mobility due to illness or infirmity), lack of purchasing power, and also a lack of understanding of basic nutritional principles. Within the world's most affluent societies, there are individuals – whether in hospitals, care homes or hospices, whether in substandard housing or sleeping rough in the street, who do not have access to that 'simplest' thing, a healthy, balanced diet.



Screenshot from the USDA's 'Food Access Research Atlas', showing food deserts in the US

Source: <http://www.ers.usda.gov/data-products/food-access-research-atlas.aspx#.UVBiGELd7dk>

The long-term consequences of inadequate nutrition

The long-term consequences of malnutrition and hidden hunger in the developed world are significant. For example inadequate and suboptimal vitamin D status alone is known to be a risk factor for some cancers such as breast cancer, prostate cancer, and several autoimmune diseases such as multiple sclerosis, rheumatoid arthritis and type-1 diabetes. An unhealthy, unbalanced diet rich in unsaturated fats, sugars and salts may contribute to a wide range of non-communicable diseases such as cardiovascular diseases, cancers, chronic respiratory diseases and diabetes.

In September 2011 the United Nations launched an effort to tackle non-communicable diseases (NCDs) such as cancer and diabetes with a summit meeting devoted to curbing the factors, such as tobacco and alcohol use behind the often-preventable scourge that causes 63 percent of all deaths. The two-day high-level General Assembly meeting adopted a declaration calling for a multi-pronged campaign by governments, industry and civil society to set up by 2013 the plans needed to curb the risk factors behind the four

groups of NCDs – cardiovascular diseases, cancers, chronic respiratory diseases and diabetes.

As well as steps to curb the use of tobacco and alcohol, the UN advocated steps to curb “the extensive marketing to children, particularly on television, of foods and beverages that are high in saturated fats, trans-fatty acids, sugars, or salt.”

Vitamin D has important benefits in lowering the risk of fractures, improving muscle strength, and reducing the risk of a number of conditions and diseases. The benefit regarding the reduction of fractures and the contribution to muscle strength is well reported, while other benefits are still emerging, covering areas such as type 2 diabetes, cardiovascular disease, some types of cancers, strengthening of the immune system, and autoimmune diseases such as multiple sclerosis.^{1,2}

Many people have a low level of serum vitamin D (measured as 25-hydroxy-vitamin D) owing to poor access to natural sources of vitamin D. This may be attributable, for instance, to factors such as an absence of cold-water

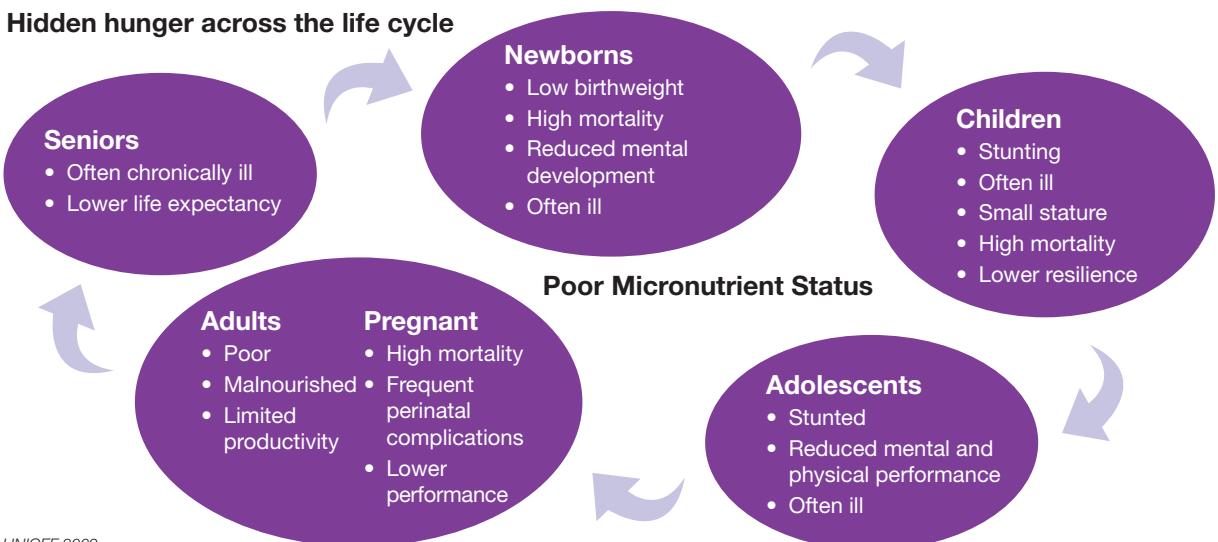
ocean fish from the diet, living largely indoors and therefore getting insufficient exposure to sunlight, and inhabiting the high latitudes of the world. The reduction of the direct and indirect costs associated with the above-mentioned diseases is based on randomized controlled trials using an intake of 200–800 IU vitamin D, which results in an adequate vitamin D status.

Assessments by various research groups indicate that the financial burden on direct and indirect healthcare costs arising from inadequate micronutrient status in the

developed world could be in the range of billions of euros.³

Economics aside it is, above all, a question of humanity. If we took the rights of every individual to an adequate diet as seriously as we take the issue of human rights, and if we proclaimed these as loudly and often as we rightly do with regard to human rights, then the first big step toward making a change would be taken.

Hidden hunger across the life cycle



UNICEF 2009

The economic impact of vitamin D deficiency

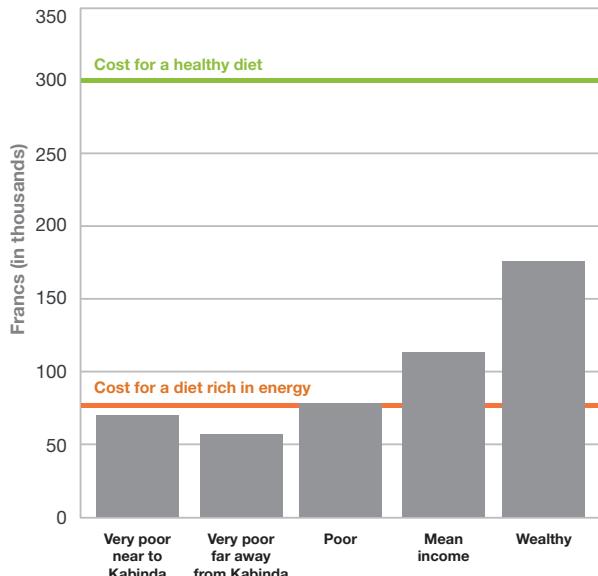
In developed countries, at least 10% of people in the general population and up to 70% and more of individuals in specific patient groups have blood vitamin D levels lying in the deficiency range (e.g. 25-hydroxy vitamin D levels <30 nmol/L). Vitamin D deficiency is probably the most frequent micronutrient deficiency in developed countries. In westernized societies, the economic burden of the healthcare system is high and will further increase in future due to demographic changes and the increasing proportion of elderly people.

In Europe, total expenditure on health varies between 6% (Eastern Europe) and more than 11% (Western Europe) of gross domestic product. Thus, an estimated annual amount of one trillion euros is spent on the healthcare system in Europe. A recent meta-analysis of pooled patient-level data from randomized controlled

trials provided convincing evidence that between 14% and 30% of nonvertebral fractures can be prevented by adequate vitamin D supply. Based on these data it can be calculated that in Europe alone, fracture prevention by supplementary vitamin D would result in cost savings of approximately five billion euros. There is some evidence from genetic studies, prospective cohort studies and randomized controlled trials that vitamin D may play a role in the prevention of type 1 diabetes, infections and cardiovascular-related deaths. Vitamin D may also reduce the risk of exacerbations in patients with chronic obstructive pulmonary disease and multiple sclerosis. Although there is much uncertainty about the cost savings potential of adequate vitamin D supply, the amount may reach the binary billions range.

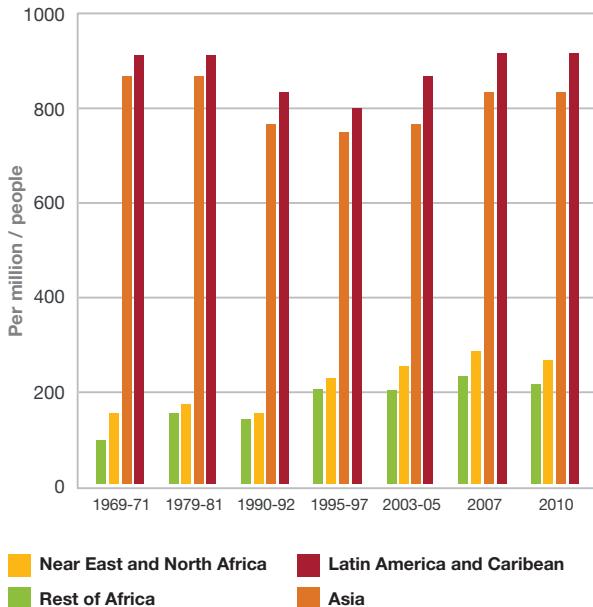
Source: Abridged from *Economic impact of undernutrition: Vitamin D by A. Zittermann, University Bochum and Bad Oeynhausen*

Annual income and diet cost comparison



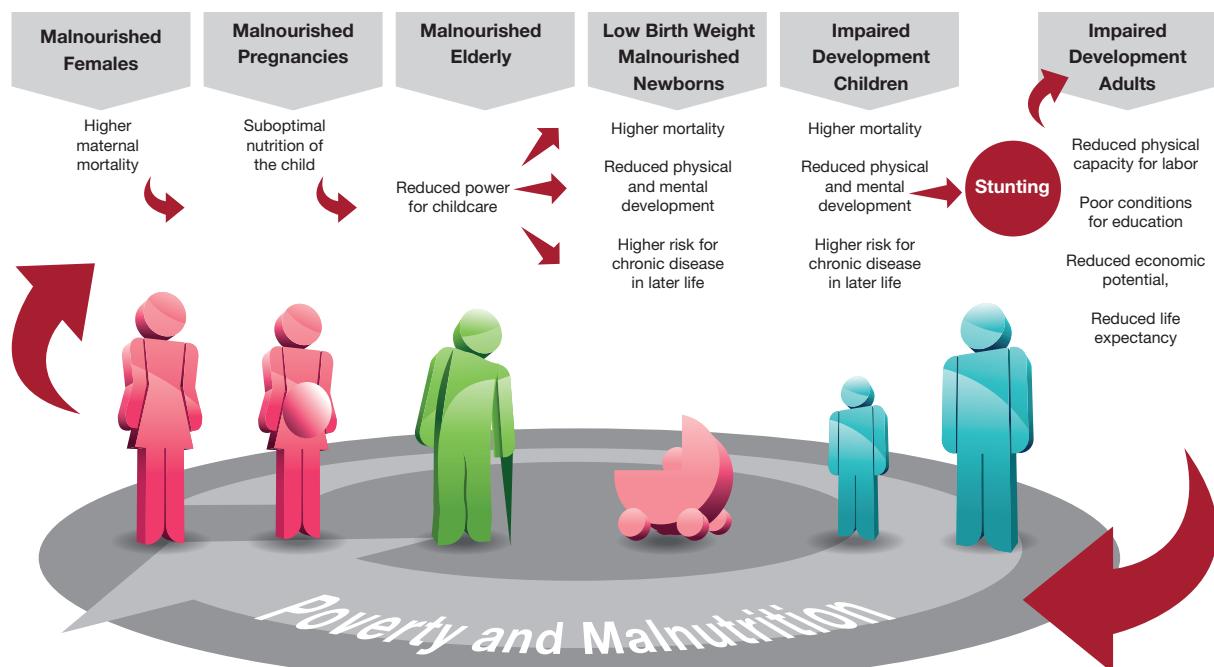
Save the Children 2010

Undernourished persons (in millions)



Fischer et al. 2008; input from FAOSTAT.fao.org 2011, 2012

Trapped in the cycle of hunger, generation after generation



Modified from: ACC/SCN 2000

My personal view

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We have clear evidence that income is related to food security, and we have a range of data showing that a balanced diet is related to higher income and higher education.

We need to evaluate food security, in particular in females and young children living in poverty, because inadequacy of micronutrient supply during the short time period of the 1,000-day window may also in developed countries have an impact on further development and consequently on the economic and health future of the child.

It may be that the magnitude of this problem is overestimated in the developed world. Nevertheless, as long as we lack data of sufficient quality on this subject, this problem should concern us. Nutrition science is based on molecular biology on the one hand and on research related to obesity on the other. Both have an excellent economically driven lobby. Malnutrition, however, is not in the focus of nutrition scientists, even though its impact is as serious as is that of overnutrition.

Further reading

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