



Obesity and malnutrition:
the paradox of food
for our children



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Obesity and malnutrition: the paradox of food for our children
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Dear Reader,
After analyzing the relationship between diet, lifestyle and health, with insights concerning the world of children, we have found ourselves facing a paradox of global dimensions.

There are 155 million overweight or obese school-age children in the world, i.e., one in ten; and there are 148 million underweight children under 5 years of age, equal to 25% of the undernourished world population.

Despite the interventions made so far, these two extreme situations continue to co-exist and do not show any significant signs of reversal. For these reasons, we felt the obligation and the urgency to focus on this paradox, which everybody seems to ignore.

We asked ourselves some questions: if the adoption of healthy lifestyles and a healthy diet have a positive effect on health, how can these instructions be made actionable and practical? Are we aware that such plans should have a medium-long time horizon and involve a plurality of actors? As for malnutrition, what must be done to promote genuine autonomy of the countries involved? What are the measures and checks to be activated to encourage such an approach?

These are just some of the questions which we have tried to answer in order to address the current situation urgently and decisively.

In the hope that the findings and proposals can be translated into policy and concrete actions toward a better world.

Enjoy the read,

Guido Bazile



THE VISION OF THE BARILLA CENTER FOR FOOD & NUTRITION

TO OFFER A VARIETY OF HIGHLY SCIENTIFIC CONTRIBUTIONS
AND BECOME A VALUABLE SERVICE TO THE INSTITUTIONS,
THE SCIENTIFIC COMMUNITY, THE MEDIA AND CIVIL SOCIETY
OVER TIME; A MEETING POINT FOR ANYONE WHO CARES
ABOUT FOOD, THE ENVIRONMENT, SUSTAINABLE DEVELOPMENT
AND ITS IMPLICATIONS ON PEOPLE'S LIVES.

THE FUTURE OF FOOD IS GROWING WITH US



THE BARILLA CENTER FOR FOOD & NUTRITION

The Barilla Center for Food & Nutrition (BCFN) is a center of multidisciplinary analysis and proposals which aims to explore the major issues related to food and nutrition on a global scale.

Created in 2009, BCFN intends to listen to the demands emerging from society today by gathering experience and qualified expertise on a worldwide level and promoting a continuous and open dialogue. The complexity of the phenomena under investigation has made it necessary to adopt a methodology that goes beyond the boundaries of different disciplines.

These topics under study are broken down into four areas: *Sustainable Growth for Food*, *Food for Health*, *Food for All* and *Food for Culture*. The areas of analysis involve science, the environment, culture and the economy; within these areas, BCFN explores topics of interest, suggesting proposals to meet the food challenges of the future.

FOOD FOR SUSTAINABLE GROWTH

In the field of *Food for Sustainable Growth*, the Barilla Center for Food & Nutrition focuses on the issue of the optimization of natural resources within the framework of the food and agricultural sector. More specifically, the studies conducted so far have identified some critical issues and have evaluated the environmental impact of food production and consumption, putting forward a series of proposals and recommendations for individual and collective lifestyles which may have a positive effect on the environment and on natural resources.



FOOD FOR HEALTH

In the field of *Food for Health*, Barilla Center for Food & Nutrition has decided to start its research work by analyzing the existing relationship between nutrition and health. It has studied in depth the recommendations provided by the most distinguished nutrition institutes in the world and the results of ad hoc panel discussions with some of the most accredited scientists at the international level. As a result, it has been able to provide civil society with a clear set of concrete proposals for more easily adopting a correct lifestyle and a healthy diet.





FOOD FOR ALL

In the field of *Food for All*, the Barilla Center for Food & Nutrition deals with the issue of food accessibility and malnutrition with the aim to reflect how to promote better governance of the food and agricultural sector on a global scale, in order to have a more equitable distribution of food and a better impact on social well-being, health and the environment.



FOOD FOR CULTURE

In the *Food for Culture* area, the Barilla Center for Food & Nutrition aims the relationship between man and food. In particular, BCFN has traced the most significant stages in the evolution of the man-food relationship, refocusing on the fundamental role of the Mediterranean diet.

In line with this approach, the activities of BCFN are guided by the Advisory Board, a body composed of experts from different but complementary sectors, which makes proposals, analyzes and develops the themes, and then drafts concrete recommendations.

One or more advisors have been individuated for each specific area: Barbara Buchner (expert on energy, climate change and the environment) and John Reilly (economist and expert on environmental issues) for the area *Food for Sustainable Growth*; Mario Monti (economist) for the area *Food For All*; Umberto Veronesi (oncologist), Gabriele Riccardi (nutritionist) and Camillo Ricordi (immunologist) for the area *Food for Health* and Claude Fischler (sociologist) for the area *Food for Culture*.

The position paper *Obesity and malnutrition: the paradox of food for our children* addresses the issue of the large imbalances in the world between developing countries and Western countries, with reference to the eating habits adopted by the younger age groups and the diseases that are directly and indirectly related to them.

After devoting all of 2009 to an analysis of the overall relationship between diet and health, in 2010, the BCFN concentrated its efforts on investigating the link between nutrition and healthy growth in the different phases of the life of the child, from pre-school and school age, through adolescence. In 2011, it became clear – in the field of infant nutrition – that there are striking contrasts occurring on a global level: on the one hand, the increase of overweight conditions and obesity, on the other, the presence of chronic malnutrition and undernourishment; and finally, the simultaneous presence of these extremes in emerging countries that are difficult to reconcile with their rapid economic and social growth.

The aim of the paper, therefore, is to examine the factual evidence of this global nutritional imbalance, suggesting some key approaches to bring infant nutrition back onto a track of stability and the virtuous promotion of health, starting from the two extremes manifest in today's world.

This paper – which has benefited from contributions made by UNICEF specifically for the BCFN – examines both the principles for a proper childhood diet in the Western world and guidelines for reducing malnutrition in developing countries.


In light of these findings, the BCFN proposes six key actions in the medium to long term that would generate beneficial effects on the health of children and adolescents as well as to address an imbalance as baffling as it is unsustainable for all of mankind.





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A photograph of two young children sitting outdoors, eating chocolate cake. The child on the left is a boy with blonde hair, wearing a red and blue plaid cap and a purple polo shirt. He has chocolate smeared on his chin and is holding a piece of cake in his right hand. The child on the right is a girl with blonde hair, wearing a wide-brimmed straw hat and a pink t-shirt with the word 'LADY' and floral embroidery. She has chocolate smeared on her chin and is holding a piece of cake in her left hand, with her right hand raised towards her face. The background shows a wooden fence and some greenery.

OBESITY AND MALNUTRITION: THE PARADOX OF FOOD FOR OUR CHILDREN

EXECUTIVE SUMMARY

In higher income countries, a large number of deaths in adulthood are linked to problems that result from overeating and bad eating habits, and the consequent lifestyle, in many cases, stems from an early age.

In developing countries, in contrast, there is child malnutrition and undernourishment, which can have a significant impact throughout adulthood. In emerging countries such as China and Brazil, there is the troubling spread of extreme events, because on the one hand, food patterns that lead to obesity are being followed by part of the population, while, on the other hand, situations of undernourishment/malnutrition continue. It is therefore important to pay attention – from early childhood, in Western countries, as well as in all the developing/emerging countries – to the adoption of appropriate eating behavior in terms of healthy daily eating habits and lifestyles.

In this context, all Western countries are showing an exponential growth of obesity and overweight conditions in children. According to data collected by the International Obesity Task Force,¹ there are 155 million school-age children aged from 5 to 17 who are overweight or obese, or 1 in 10. Of these, 30-45 million are classified as obese, or 2-3% of the world's children. In the U.S., 17% of children from 2 to 19 years of age, about 12.5 million, are obese. Almost one third of American children and adolescents are overweight or obese.

The rapid spreading of this phenomenon, has been affecting all major advanced countries over the past 20 years. Even in Europe, the problem of child obesity is becoming increasingly widespread: each year in the EU member states, around 400,000 children are considered overweight and more than 85,000 are obese.² With regard to childhood obesity alone, its prevalence in Europe appears to be 10 times greater today than in the Seventies.³

The European Association for the Study of Diabetes (EASD) acknowledges that the prevention and treatment of obesity is “the most serious public health problem around the world.” In addition to serious problems of over-eating found in the diets of children and adolescents in Western countries, a situation of the persistence of hunger and malnutrition simultaneously exists in a large part of the world's child population, concentrated mainly in developing/emerging countries.

There are 148 million underweight children under 5 years of age,⁴ mostly in developing countries⁵ (25% of the total undernourished world population), while the 155 million school-age children who are overweight or obese live mainly in developed countries. This is one of the greatest and most jarring paradoxes our world faces today.

What is emerging from many areas is that the sustained and prolonged economic growth in these countries (India, China, Brazil, etc.) has not been able to respond effectively to the undernourishment and malnutrition that affected the population even before their eco-

omic expansion. For example, in the case of India, a recent article⁶ stated that the rapid economic growth is not translating to a higher quality of life at similar speeds: today, more than 40% of Indian children under 5 years of age are underweight, due to malnutrition.

In 2010, the FAO estimated that there were about 925 million undernourished people in the world, while in the 1995-97 period, there were 825 million undernourished people. The trend has been growing since the mid-Nineties and it is also clear that the economic growth of developing countries, primarily India and China, has not translated into a reduction of the problem of malnutrition/undernutrition.

In addition, a further paradox is seen when one analyzes the dynamics and internal numbers of developing countries with reference to the diets adopted. Obesity, seen as a major problem in the Western world, is also emerging as a serious problem in developing countries where, the coexistence of obesity and malnutrition are increasingly observed.

It therefore seems clear that the relationship between diet and health affects all parts of the world, with differing reflections, critical problems and characteristics. If, for developing countries, the relationship between food security and health is primarily through having access to adequate food and small amounts of micronutrients, especially for children, for the advanced countries, the crux of the matter turns out to be adherence to a healthy and proper diet.

On the one hand, in Western contexts, it appears necessary to promote healthy lifestyles at an early age of life. If the trends of eating habits and lifestyles that occurred in recent decades with dramatic speed are not reversed, the future generations will be condemned to worse health than those who preceded them.

This means the establishment and sharing of strategies and initiatives – of a medium- to long-term time horizon – that are able to combine immediate and effective results in the near future. We need to spread the principles of healthy eating based on a correct overall caloric intake, an adequate range of the diet and regular physical activity, starting from childhood and in adolescence.

On the other hand, it is possible to emphasize how much progress has been made in the fight against malnutrition in developing contexts, especially in regions such as South Asia (India, Pakistan, Bangladesh), but the volatility of food prices now threatens many of the results achieved. Moreover, the increasingly frequent crises of drought in Africa and floods in Southeast Asia have produced devastating effects. The effectiveness of new integrated strategies to combat malnutrition has been demonstrated, but to achieve substantial and sustainable results, these need to be extended to national policies, with massive and long-term investments.

In light of these reflections, there are some potential strategies and concrete actions to be taken, both in the short-term and the medium-long term.

At the basis of everything, across the board, is the central role of prevention with regard to diet and lifestyle, both in Western countries and in developing countries: on the one hand, prevention in terms of spreading the correct kinds of behavior that are able to slow down the onset of an overweight and obesity in youth; on the other hand, prevention of the deterioration of food and the lives of children and adolescents in conditions of extreme fragility in the least developed countries.

In light of these reflections of the premise, we believe in Western contexts that it is more necessary than ever to:

- 1 Promote the further deepening of scientific knowledge.
- 2 Properly structure the interventions, according to the best international practices.
- 3 Encourage the spreading of accurate food information and promote the culture of prevention.

In the final analysis, with a transversal view toward all the reflections and proposals, the



assurance for proper eating habits for children and adolescents must necessarily occur through the implementation of a collective effort, the outcome of the contribution of many players (schools, family members, health care providers.) who take care of the child at different times of the day.

Alongside the other major players that make up the core of the work of food information/orientation/prevention, in recent years – with increasing awareness – there has been the agri-food industry's role in contributing actively to the creation of proposals and offers that are consistent with the accurate information on food and lifestyles and in actively promoting their adoption. The food industry appears to have a primary role in providing appropriate responses to the different lifestyles of people, both through appropriately profiled product offerings and through coherent and responsible communication.

In relation to developing countries, we believe – in parallel – that it is necessary to:

- ① Promote economic development related to agriculture so as to reduce hunger and malnutrition and to ensure an improvement in access to food by the poor.
- ② Establish stable and long-lasting actions against undernourishment and malnutrition in the world.
- ③ Implement initiatives to enhance the social role of women and their economic independence, in order to combat malnutrition.



1. THE PARADOX OF CHILDHOOD DIET IN THE WORLD

1. THE PARADOX OF CHILDHOOD DIET IN THE WORLD

After spending all of 2009 analyzing the complex relationship between diet and health, in 2010 the Barilla Center for Food & Nutrition concentrated its efforts on surveying the link between nutrition and healthy growth in the different phases of childhood, from preschool to adolescence. In 2011, the importance of the large imbalances between developing countries and Western countries became clear, as they relate to the eating patterns adopted by the younger age groups and the diseases directly and indirectly related to those patterns.

On the one hand, we know that childhood obesity is a serious risk factor for obesity in adulthood, especially in Western countries. On the other hand, in a more general sense, the lifestyle and behavior that are learned in childhood – such as food preferences, diet composition, distribution of food intake throughout the day, portion size, food consumption patterns, as well as an active or sedentary lifestyles – can influence an overall appropriate or inappropriate eating behavior in adulthood because of the “memory effect” related to acquired habits.

In Western countries, a large number of deaths in adulthood are linked to problems resulting from overeating, poor eating habits and lifestyles that, in many cases, develop at an early age. In developing countries, what emerges is child malnutrition, with significant negative impacts on health in adulthood. Moreover, in emerging countries such as China and Brazil, the situation has even led to an alarming spread of extreme eating patterns, leading part of the population to be malnourished and another part of the population to be obese.

Therefore, it is important to pay attention – in early childhood, especially in Western countries, and in all developing/emerging countries – of the need to adopt proper eating behavior, in terms of healthy daily eating habits and lifestyles.

Preventive actions aimed at changing certain lifestyle, nutritional, and physical habits are possible, but such interventions must begin at the earliest stages of life in order to be as effective and durable as possible.

As noted by Claudio Maffei at the Second International Forum on Food and Nutrition, “The first years of life are a very important window of time in the development of the organism. [...] Eating well during the developmental age is very useful, not only because it guarantees [healthy] growth and development in children, but because it also provides a defense against metabolic disease and other diseases that we might encounter in later life.”

The way we eat and behave, in fact, is able to significantly influence the emergence of many chronic diseases (obesity, type 2 diabetes, cardiovascular disease, and certain kinds of cancer). The acquisition and maintenance of nutritional and physical exercise habits adapted to changing social and environmental requirements are necessary for the welfare of the present and future generations.

All Western countries are experiencing an exponential growth in numbers of obese and overweight children. According to data collected by the International Obesity Task Force,¹ there are 155 million school-age children worldwide who are overweight or obese (1 in 10). Of these, 30 to 45 million or 2% to 3% are classified as obese.

Although not an isolated case, the United States is certainly a prime example of the trend of the spread of overweight and obesity conditions among the younger population groups (as well as among adults).² Recent nationally representative data indicate that 17% of American children between 2 and 19 years of age, or about 12.5 million, are obese. Rates are higher in racial and ethnic minority groups across childhood ages.

The rapid spread of childhood obesity is not limited to the United States, all major advanced countries over the past 20 years are experiencing similar trends.

The problem of childhood obesity is becoming more widespread in Europe as well: every year, in the EU Member States, around 400,000 children are considered overweight and over 85,000 obese.³ The rate of childhood obesity in Europe is 10 times greater today than in the seventies.⁴

In Italy, this issue has become increasingly important due to an increase in the number of children and adolescents who are overweight or obese. Out of every 100 children in the third grade, almost one quarter are overweight (23.6%) and more than 12 are obese (12.3%). Overall, it is estimated that there are more than one million children between 6 and 11 years of age who are overweight or obese: that is more than 1 child out of every 3. The data collected on physical activity are not very encouraging either: only 1 in 10 children engaged in physical activity appropriate for their age, and 1 in 4 did perform physical activity on the day preceding the survey. Additionally, half of the children in the study had a television in their bedroom.

Finally, the perception of the problem by parents appears to be inversely proportional to the statistical frequency of excess weight: 4 out of 10 mothers of overweight children did not feel that their child weighed too much for his or her height.

As you can imagine, overweight conditions and obesity in childhood and adolescence have a high impact, both in terms of health care costs and in terms of proper physical and cognitive development of children and adolescents.

The European Association for the Study of Diabetes (EASD) supports the prevention and treatment of obesity because it believes that it is “the most important public health problem throughout the world.”

Although the health consequences of obesity and overweight children are well documented in the literature, up to now only a small number of studies and publications have been devoted to the economic impacts on health and social systems. Among these, particularly interesting are the results of a recent study⁵ that was conducted on young Americans between the ages of 6 and 19, which shows that the subjects considered obese have generated incremental health care costs of \$194 for office visits, \$114 for prescription drugs, and \$12 for emergency services, compared to children of normal weight. By extending this data to the entire nation, you can see how overweight conditions and obesity among young people have incremental costs for the U.S. health care system of \$14.1 billion a year.

Alongside the serious problems encountered in the diet of children and adolescents in Western countries, there exists the problem of persistent hunger and malnutrition in a large part of the worldwide child population, concentrated mainly in developing/emerging countries.

One of the main problems facing developing countries, in fact, is that of malnutrition. Malnutrition is considered to be a scarcity of food compared to the overall needs of the individ-

IN WESTERN COUNTRIES, A LARGE NUMBER OF DEATHS IN ADULTHOOD IS LINKED TO PROBLEMS RESULTING FROM OVEREATING AND FROM BAD EATING HABITS AND LIFESTYLES. IN DEVELOPING COUNTRIES, HOWEVER, THERE IS EVIDENCE OF CHILD UNDERNOURISHMENT AND MALNUTRITION WITH SIGNIFICANT NEGATIVE IMPACTS ON HEALTH IN ADULTHOOD

THE CHILDHOOD OBESITY IN EUROPE ALONE TURNS OUT TO BE 10 TIMES GREATER TODAY THAN IN THE SEVENTIES

THE FAO HAS ESTIMATED THAT THERE ARE ABOUT 925 MILLION UNDERNOURISHED PEOPLE IN THE WORLD, WHILE IN THE 1995-1997 PERIOD, THERE WERE 825 MILLION UNDERNOURISHED PEOPLE

ual: both as undernourishment – that is, inadequate intake of all the necessary nutrients for healthy and proper development in children – and for maintaining of a healthy life in adults. Data indicates that the sustained and prolonged economic growth in these countries (India, China, Brazil, etc.) was unable to respond appropriately to the starvation and malnutrition of the population even before their economic expansion. For example, a recent article⁶ stated that India's meteoric economic growth is not resulting in a higher quality of life at similar speeds: Today, more than 40% of Indian children under 5 years of age are underweight due to malnutrition.

In 2010, the Food and Agriculture Organization of the United Nations estimated that there were about 925 million undernourished people in the world, while in 1995 to 1997, there were 825 million undernourished people. The trend has been growing since the mid-nineties; it is clear that the economic growth of developing countries has not succeeded in reducing the number of malnourished people.

As you can see from the FAO map of undernourished populations worldwide, published in 2010, the areas most affected are Asia, Africa, and Latin America. (Note also that Mexico, despite having a high percentage of overweight and obese people also has a large undernourished population.)

Specifically, the countries most affected are those in Sub-Saharan Africa, followed by India (where 20% of the population and 44% of the children are malnourished), East Asian countries, and Latin America.⁷

In other words, the majority of the world's undernourished people live in countries in the developing world, distributed as follows:

- about 580 million in Asia;
- about 230 million in Sub-Saharan Africa;
- about 60 million in Latin America and the Caribbean;
- about 40 million in Africa and the Middle East.

In addition, a further paradox can be seen by analyzing the diets adopted in developing countries. In fact, obesity, a major problem in the Western world, is becoming an important issue even in developing countries, where, more and more often, obesity exists alongside malnutrition.

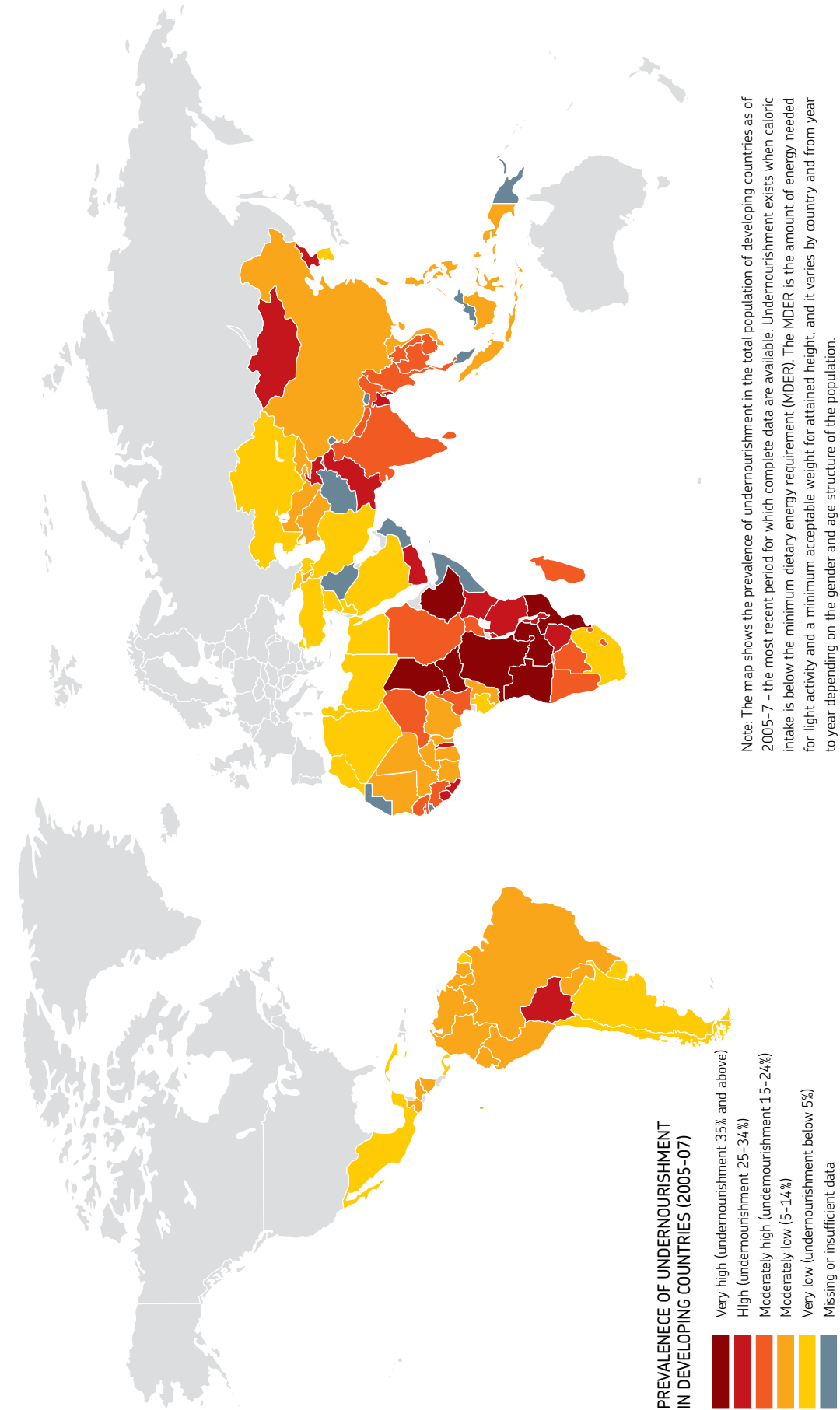
In general, the differences that were initially registered between developed/Western countries and developing countries tend to emerge simultaneously within the same developing countries, like China and Brazil. For example: In the last 15 years, the percentage of China's population that is overweight has nearly doubled, from 13.5% to 26.7% of the population, while in Brazil it has almost tripled in men and doubled in women. Another example is that of Mexico: In early 2011, the OECD showed that this country has the highest percentage of obese or overweight people in the world, 69.5%.

The same paradox is also found by analyzing the world's children: There are 148 million children under 5 years of age who are underweight,⁸ most of whom live in developing countries⁹ (25% of the world's entire undernourished population), while more than 155 million school-age children are overweight or obese live in developed countries.

With reference to the developing countries, it is evident that:¹⁰

- 17 million babies are born underweight each year;
- 50% of pregnant women recorded an iron deficiency, with the consequent risk of hemorrhage during childbirth;
- 47.4% of preschool-age children are anemic;
- the deficiencies of vitamin A and zinc are thought to be the reason of, respectively, 0,6 and 0,4 millions of deaths per year;
- the cost of malnutrition to developing countries is estimated at about \$30 billion a year.

Figure 1.1. FAO Hunger Map (2010)



Source: The Millennium Development Goals Report, UN 2008.

THE UNITED NATIONS HAS ESTIMATED THAT 2.1 MILLION INDIAN CHILDREN DIE EACH YEAR BEFORE REACHING 5 YEARS OF AGE, EQUAL TO 4 CHILDREN EVERY MINUTE

THE PARADOX IS THAT, NEXT TO THE 1 BILLION UNDERNOURISHED PEOPLE IN THE WORLD, THERE ARE APPROXIMATELY 1.4 BILLION PEOPLE WHO ARE OVERWEIGHT OR OBESE

AN ISSUE THAT IS CENTRAL TODAY, AND WHICH WILL BE EVEN MORE SO IN THE FUTURE, IS THE SO-CALLED "HIDDEN HUNGER" WHICH AFFECTS MORE THAN 2 BILLION PEOPLE, ACCORDING TO ESTIMATES MADE BY THE WORLD FOOD PROGRAM

The extraordinary and recent economic development has not yet translated into widespread improvement in the quality of life and the indices of well-being in the population. This is the case in Asia, the continent with the greatest incidence of hunger and malnutrition and where 578 million people are starved/malnourished, more than double those in Africa (275 million). In India, there has been an increase in malnutrition: out of the 578 million people, mostly young people, living with starvation/malnutrition, about 340 million ingest a sufficient level of calories, but not of nutrients,¹¹ which means they consume more fat than they should for a proper diet.

Southeast Asia in general, and the Indian subcontinent in particular, are the world's regions with the greatest number of underweight children. The United Nations has estimated that 2.1 million Indian children die each year before reaching 5 years of age, equal to 4 children each minute, and about half of the children born in India are underweight.¹² Among the Indian children who survive the first years of life, a significant share have malnutrition: India has about 60 million malnourished children.

In India, the prevalence of malnutrition is 50% in rural areas and 38% in urban areas, and is slightly higher in females (49%) than in males (45%). The lack of specific individual nutrients represent another nutrition concern in India: 75% of children suffer or have suffered from anemia, 57% of children of preschool age from a lack of vitamin A, and the lack of sufficient levels of iodine can reach 15% of children in certain geographical area. Alongside the 1 billion undernourished people in the world, there are approximately 1.4 billion with overweight or obese conditions: this translates into 36 million deaths per year (including 5.6 million children under 5 years of age) due to food shortages and malnutrition, and 29.2 million deaths a year from overeating (of which 17.5 million are due to cardiovascular disease, 3.8 million to diabetes, and 7.9 million to cancer).

In this context, a discussion about the longevity of the population is also relevant. In Europe and the United States, in fact, longevity is seriously threatened by bad eating habits – that is to say, diets high in fats and sugars, which, combined with reduced physical activity, are factors that lead to the increase of obesity and to the increased possibility of developing chronic diseases such as diabetes, cardiovascular disease, and cancer. The longevity of individuals is also threatened in developing countries, but by the opposite factors from those of developed countries: from a lack of food and the scarcity of essential nutrients for maintaining health in adults and for children's healthy development. Widespread malnutrition of children in these countries increases their susceptibility to diseases. This suggests approaches that consider of the "lifecycle," and encompass the entire lifespan of a generation (or even two) with respect to the problem of the hunger/disease spiral. In fact, the nutrition and health of future generations strictly depend on those of the present generation and the actions that will be implemented in the near future.

In this sense, a central issue that will become more evident in the future is the so-called "hidden hunger," which the World Food Programme estimates affects more than 2 billion people.

Unlike hunger, that reflects a lack of food, hidden hunger is a chronic lack of vitamins and minerals that often has no visible warning signs, so that people who suffer from it may not even be aware of it. These deficiencies, which represent *mal-* (poor) nutrition than as *under-nutrition* interfere with basic physiologic function at the organ level, as well as growth problems and, in some cases, serious psychiatric illnesses, especially in younger individuals. (It should be noted that both malnutrition and undernutrition may and often do appear together). According to the World Food Programme, hidden hunger is a major cause of severe social and economic hardship in developing countries, and has led to the rise of numerous civil conflicts in these countries over recent decades.

Malnutrition and infant mortality: Some key findings by UNICEF

About 200 million children in developing countries between the ages 0 and 5 suffer from some form of malnutrition: nearly 1 in 3.

Maternal and child malnutrition, in its various forms, contributes to 3.5 million deaths a year. It is associated with about 35% of deaths of children under 5 years of age and represents 11% of the total impact of diseases (in terms of global DALYs – "disability-adjusted life years"). Malnutrition is, therefore, the main risk factor for mortality and disease for children in this age group and, in any case, generally plays a role in over half of child deaths.¹³

Stunting, severe wasting and intrauterine growth restriction are responsible for 2.2 million deaths annually of children under 5 years of age, and 21% of DALYs (R.E. Black *et al.*, *Lancet series on maternal and child undernutrition*, January 2008, paper 1).

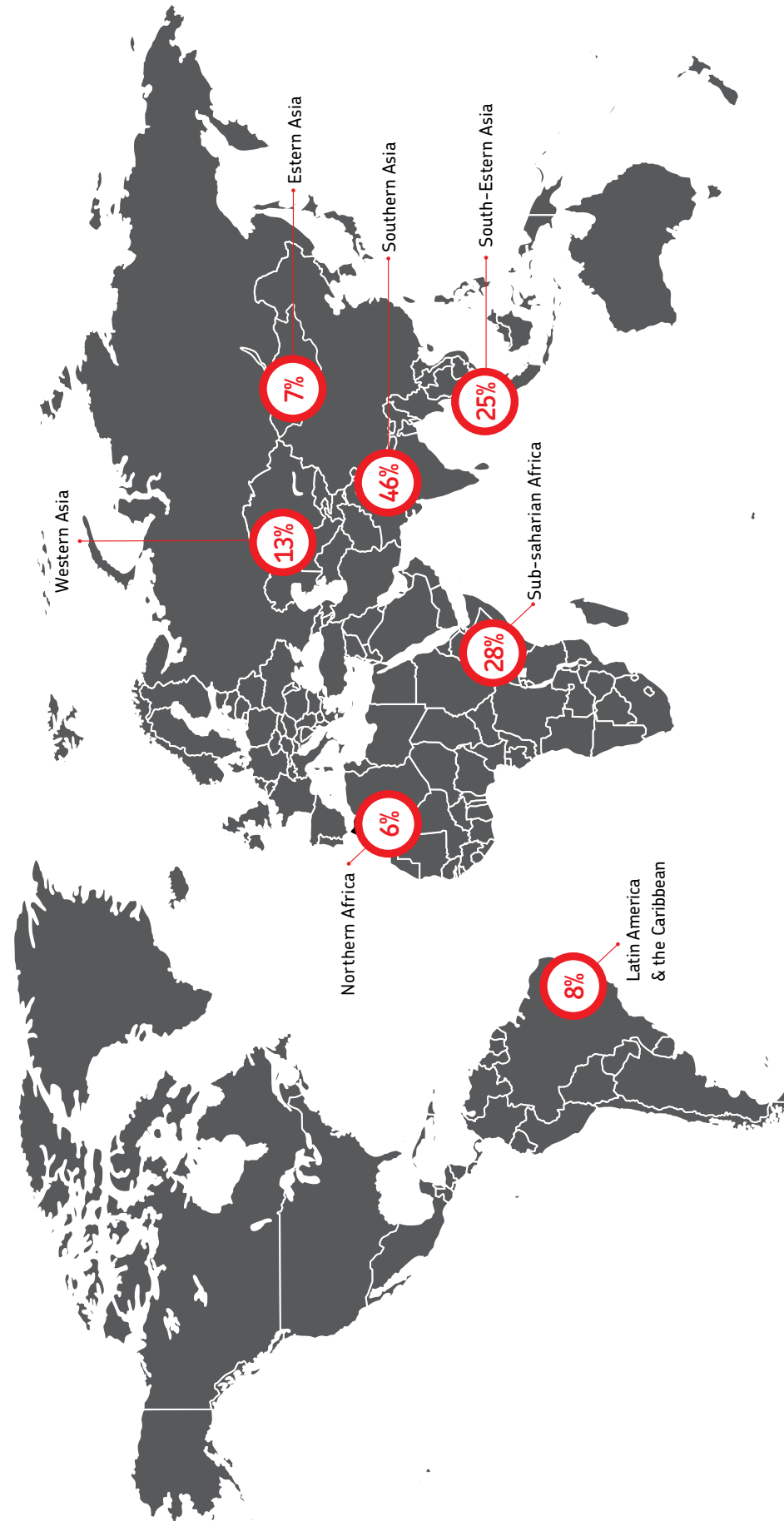
Of the 26% of children from 0 to 5 years of age in developing countries, 1 in 4 are underweight ("acute malnutrition"), 10% severely so. In addition, severely underweight children are 9 times more likely to die than those who are well fed. Again, in developing countries, children are twice as likely to be underweight if they were born or grew up in rural areas rather than urban areas. In terms of wealth, the children from the poorest 20% of households are more likely to be underweight than those who belong to the richest 20%.

Progress in reducing the prevalence of underweight children is often unequal between the rich and the poor: While in India, for example, there has been no significant improvement among children from the poorer families, the prevalence of underweight children in the richest 20% of households, however, has decreased by about a third from 1990 to 2008.



Justin Guariglia/National Geographic Stock

Figure 1.2. Children under 5 years of age in malnourished conditions (in % of the total children per region)



Source: The Millennium Development Goals Report, UN 2008.

For example, vitamin A deficiency causes 0,6 million deaths per year; the vitamin is essential because it helps regulate several fundamental biological processes, such as growth, vision, reproductive capacity, and cell differentiation. The FAO periodically calculates the availability of vitamin A for human consumption in several countries around the world, through the conversion of estimates of food available for consumption into micrograms (mcg) of retinol equivalents (RE). The currently available data (2003-2005) shows that vitamin A deficiency is particularly significant in most developing countries (figure 1.3.).

Finally, most of the studies of food security and human health carried out worldwide focus on the study of the determinants of the dramatic hunger and disease conditions that are prevalent in developing countries, especially in the younger population. Certainly, in terms of emergency and timeliness, these aspects are of fundamental importance and priority for the international community.

If we refer to the definition of food security given by the World Food Summit in 1996, which said that food security is a “situation where all people have physical and economic access to a quantity of healthy and nutritious food that is sufficient to meet their dietary needs and food preferences for an active and healthy life,” in analyzing this definition, one can see that the problem of the relationship between the access to food and health cannot be resolved only (as mentioned earlier regarding “hidden hunger”) by whether or not there is physical access to something to eat.

Food safety, proper nutrition and health, even and especially in childhood, represent a highly complex problem.

In light of these considerations, it is evident that the relationship between diet and health is a problem that affects all areas of the planet and all ages, with differing levels of urgency. If for developing countries the relationship between food security and health is primarily through access to adequate food and an adequate minimum amount of micronutrients (especially for children), for advanced countries, the main problem is adherence to a healthy and proper diet. The current food paradoxes not only threaten to undermine the economic, social and health sustainability of the planet today, but will lead – very quickly – in the near future to where starvation and disease, in every form, will once again be the keywords.

FOOD SECURITY IS A
“SITUATION WHERE ALL
PEOPLE HAVE PHYSICAL
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AND NUTRITIOUS FOOD,
ENOUGH TO MEET THEIR
DIETARY NEEDS AND FOOD
PREFERENCES FOR AN
ACTIVE AND HEALTHY LIFE”

Figure 1.3. Availability of Vitamin A for human consumption in 2003 to 2005

| | | | | | | | |
|-------------------------|---|-----------------------|---|------------------------|---|--------------------------|---|
| Bangladesh | 1 | Indonesia | 2 | Belarus | 3 | Malta | 3 |
| Burkina Faso | 1 | Iran | 2 | Belgium | 3 | Mexico | 3 |
| Cambodia | 1 | Ivory Coast | 2 | Belize | 3 | Morocco | 3 |
| Central Africa Republic | 1 | Jordan | 2 | Bermuda | 3 | Namibia | 3 |
| Ciudad | 1 | Kenya | 2 | Bosnia and Herzegovina | 3 | Netherlands | 3 |
| Dem. Rep. Congo | 1 | Liberia | 2 | Brunei | 3 | Netherlands Antilles | 3 |
| Djibouti | 1 | Libya | 2 | Burundi | 3 | New Caledonia | 3 |
| Eritrea | 1 | Macedonia | 2 | Canada | 3 | New Zealand | 3 |
| Gambia | 1 | Madagascar | 2 | Cape Verde | 3 | Norway | 3 |
| Guinea-Bissau | 1 | Mauritius | 2 | Chile | 3 | Pakistan | 3 |
| Lesotho | 1 | Moldavia | 2 | China | 3 | Paraguay | 3 |
| Malawi | 1 | Mongolia | 2 | Cyprus | 3 | Peru | 3 |
| Mozambique | 1 | Myanmar | 2 | Czech Republic | 3 | Poland | 3 |
| Nicaragua | 1 | Nepal | 2 | Denmark | 3 | Portugal | 3 |
| Togo | 1 | Nigeria | 2 | Estonia | 3 | Romania | 3 |
| Yemen | 1 | Palestine | 2 | Fiji Islands | 3 | Russian Federation | 3 |
| Zambia | 1 | Panama | 2 | Finland | 3 | Rwanda | 3 |
| Zimbabwe | 1 | Samoa | 2 | French Polynesia | 3 | Saint Kitts and Nevis | 3 |
| Algeria | 2 | Sao Tome and Principe | 2 | Gabon | 3 | Saint Lucia | 3 |
| Armenia | 2 | Senegal | 2 | Germany | 3 | Saint Vincent/Grenadines | 3 |
| Azerbaijan | 2 | Serbia and Montenegro | 2 | Ghana | 3 | Saudi Arabia | 3 |
| Benin | 2 | Sierra Leone | 2 | Greece | 3 | Seychelles | 3 |
| Botswana | 2 | Siria | 2 | Grenada | 3 | Slovakia | 3 |
| Brazil | 2 | South Africa | 2 | Guyana | 3 | Slovenia | 3 |
| Bulgaria | 2 | Sri Lanka | 2 | Hungary | 3 | Solomon Islands | 3 |
| Cameroon | 2 | Sudan | 2 | Iceland | 3 | Spain | 3 |
| Colombia | 2 | Suriname | 2 | Israel | 3 | Sweden | 3 |
| Comoros | 2 | Swaziland | 2 | Italy | 3 | Switzerland | 3 |
| Congo | 2 | Tagikistan | 2 | Jamaica | 3 | Timor Est | 3 |
| Costa Rica | 2 | Thailand | 2 | Japan | 3 | Tunisie | 3 |
| Dem. P. Rep. of Korea | 2 | Trinidad and Tobago | 2 | Kazakhstan | 3 | Turkey | 3 |
| Dominican Republic | 2 | Turkmenistan | 2 | Kiribati | 3 | Ukraine | 3 |
| Ecuador | 2 | Tanzania | 2 | Korea | 3 | United Arab Emirates | 3 |
| Egypt | 2 | Vietnam | 2 | Kuwait | 3 | United Kingdom | 3 |
| El Salvador | 2 | Albania | 3 | Kyrgyzstan | 3 | United States | 3 |
| Ethiopia | 2 | Angola | 3 | Laos | 3 | Uruguay | 3 |
| Georgia | 2 | Antigua and Barbuda | 3 | Latvia | 3 | Uzbekistan | 3 |
| Guatemala | 2 | Argentina | 3 | Lebanon | 3 | Vanuatu | 3 |
| Guinea | 2 | Australia | 3 | Lithuania | 3 | Venezuela | 3 |
| Haiti | 2 | Austria | 3 | Luxembourg | 3 | | |
| Honduras | 2 | Bahamas | 3 | Malaysia | 3 | | |
| India | 2 | Barbados | 3 | Maldives | 3 | | |

1 Availability of less than 300 mcg of RE per person per day

2 Availability of 300 to 600 mcg of RE per person per day

3 Availability of more than 600 mcg of RE per person per day

Source: elaboration by The European House-Ambrosetti of data from the FAO Statistics Division, 2009.



2. PROPER DIET FOR HEALTHY GROWTH: BASIC PRINCIPLES AND HABITS



2.1 THE RELATIONSHIP BETWEEN DIET AND HEALTH IN CHILDHOOD

Growth is a continuous process that begins at conception and ends with the attainment of sexual maturity. Somatic growth is accompanied by neural-psychic development. This long process can be schematically divided into three phases, depending on the particular anatomical, physiological, and psychological changes occurring in the child: childhood, adolescence, and youth. Each phase is associated with specific food requirements, consumption of nutrients, and recommended lifestyle choices for the healthy development of the individual.

The first stage, childhood, can in turn be divided into early infancy, from birth to the first 2 years – including the so-called periods of the newborn (first month of life), infant, and young weaned child (first dentition) – “later infancy” or the “age of play,” which includes the pre-school period from ages 3 to 5; and finally the “third childhood,” also known as the “school age,” which includes the period between 6 and 11 years of age.

The second stage is adolescence (or puberty), and includes the period between 11 and 18 years of age in males and between 11 and 16 in females.

The third and final stage is youth, ranging from 18 to 25 years in males and from 16 to 20 years in females. In this last phase, nutritional directions and lifestyles are almost identical to those of adults.

Infancy

During the period of early infancy—characterized by rapid growth—it is particularly necessary that the child be given an adequate amount of energy. Macronutrients in food can provide energy to the child by way of the fats, carbohydrates, and proteins. To understand the importance of energy intake—especially in the early years of life—you can see that (per gram of macronutrient assumptions and per unit of body weight), the amount of protein intake in the first years of a child’s life is almost the same as that of an adult, whereas the carbohydrates are almost twice as much as that consumed by an adult on average, and the amount of fat is almost four times that of an adult.

Energy is necessary for the maintenance of vital phenomena (respiration, cardiovascular activity, renal and brain function) at rest (basal metabolic rate), to ensure the processes of digestion, metabolism, storage of nutrients, and thermogenesis, deposition of new tissue (growth), and physical activity. In the first year of life the energy requirement for growth is significant, but it decreases rapidly, from 35% in the first month of life to 5% at 1 year of age. After the first year and up to age 9 or 10, of the total daily energy expenditure, 50% to 60% is needed for the basal metabolic rate, 30% to 40% for physical activity, 5% to 8% for thermogenesis, and only 2% for further growth. A report of the World Health Organization (WHO)¹ shows how the recommendations

from different countries/organizations compare to each other with respect to energy requirement for preschool-age children. It shows a considerable range of values that, on the whole, are reliable, derived from the product of the estimated amount of energy required per kilogram of body weight and the average weight of the child within several age groups.

When energy intake falls below the minimum level required, the child may experience delayed growth and/or be limited in the ability to perform normal physical activity, especially in preschool-age children, because they are growing so rapidly. In addition, prolonged shortages in energy ingestion can create conditions of true malnutrition and/or lead to a state of reduced protein stores, linked to body metabolizing protein to generate energy. In contrast, an excessive intake of energy compared to energy requirement promotes deposition of fat.

Therefore, especially following an increase in the incidence of obesity among children and adolescents, the WHO advises limiting the excessive intake of fats and sugars from an early age.

The main macronutrients required for the proper energy intake in children of pre-school and school age (and for all individuals) are proteins, fats, and carbohydrates. Proteins are an essential component of human cells that are vital to adequate protein intake, especially in preschool and school age—that is, when the body is growing and requires the presence of amino acids needed for tissue generation (especially of the organs and muscles).

Optimal sources of high-quality protein are represented by meat, fish, cheese, milk, eggs, and certain products of plant origin, such as soy products, beans, and legumes. Even products derived from wheat are a source of protein, while most of the vegetables and fruits contain it in limited quantities.

In addition to protein, the second macronutrient essential to ensure the proper and balanced intake of energy for the child is fat. Fats ingested from food are a source of energy and of essential fatty acids for the child—in particular, long-chain polyunsaturated fatty acids, because they have specific and important physiological functions.

The structural fats are an essential part of cell membranes, of neural tissue, and of cell architecture as a whole, while fat storage—especially present in adipose tissue—plays the role of long-term energy reserve for the body. In addition, fat intake with food enables an optimal absorption of fat-soluble vitamins (A, D, E, K).

The WHO recommends that, in the transition from weaning to preschool age, i.e., around 2 years of age, 30% to 40% of the energy intake comes from fats. The Nemours Foundation² stresses the important role that fat and cholesterol play an important role in the growth of the child, especially with regard to brain development, which is why it should not be reduced in the diet beyond certain limits. In particular, in a young child (2 to 3 years), the calories from fat should account for 30% to 35% of the total calorie intake, while in a child aged 4 years and up, calories from fat should be 25% to 35% of the total. Carbohydrates are the third and, in quantitative terms, the most important energy source. Carbohydrates in food—once converted into monosaccharides (glucose)—provide energy to all body tissues, especially the brain and red blood cells, which use only glucose as fuel for their cellular activities.

Carbohydrates not absorbed in the small intestine are converted into lactic acid in the colon and short-chain fatty acids. These metabolites, along with some oligosaccharides, also promote the acquisition and maintenance of an adequate movement of the intestinal mucosa through the prebiotic effect exerted on the intestinal microbial flora.

The three main categories of carbohydrates in foods are sugars, starches, and fiber. Sug-

IN THE EVENT WHEN THE ENERGY INTAKE IS LESS THAN THE MINIMUM LEVEL REQUIRED, SERIOUS PROBLEMS MAY BE EXPERIENCED CONCERNING THE DELAY IN THE CHILD’S GROWTH AND ABILITY TO PERFORM PHYSICAL ACTIVITY IN THE NORMAL WAY

IN THE FIRST YEAR OF LIFE, THE ENERGY REQUIREMENT FOR GROWTH IS SIGNIFICANT, BUT IT DECREASES RAPIDLY: FROM 35% IN THE FIRST MONTH OF LIFE TO 5% AT ONE YEAR OF AGE

FRUITS AND VEGETABLES ARE HIGHLY RECOMMENDED FOODS IN THE DIET FOR THE PRE-SCHOOL YEARS, AND - IF POSSIBLE, EVEN MORE SO - FOR SCHOOL-AGE CHILDREN

ars are a primary source of energy, but do not make other important nutritional contributions to the body. To establish a proper diet for the long term, including adolescence and adulthood, the WHO suggests excessively rich food and sugary drinks are not beneficial to preschool and school age children. Research suggests that when the proportion of total energy intake due to added sugar exceeds 30% it generates significant problems for the child's health—in particular, a significant increase in the levels of glucose, insulin, and blood lipids.³ Many countries/organizations recommend that the daily intake of added sugars should not exceed 10% of the total energy intake. In the case of preschool-age children, this translates into an average of no more than 25 grams of sugar per day.

Also according to the WHO, despite the fact that starches are easily digested and absorbed by the human body, a diet that is too rich in starch—mainly present in products derived from cereals, potatoes, and rice—may be unsuitable, especially during the pre-school? ages. An increase in the total intake of starch, however, is generally recommended as the child become school age. The research on the effect of diets rich in starch in preschool- and school-age children is limited, however.

The third main category of carbohydrates is represented by fibers, which appears to have many positive effects on child health from the earliest stages of life. In particular, fibers appear to have a beneficial effect on the rate of intestinal transit (regularizing the bowel), intestinal absorption (slowing down the rate of absorption of nutrients, including cholesterol and glucose), and the risk of being overweight (helping to give a lower energy density to the diet and increasing satiety). In fact, foods high in fiber are characterized by a low energy density,⁴ reducing the postprandial glycemic response and satisfying hunger extremely well, limiting the total ingestion of food and benefiting the digestive processes.

Fruits and vegetables, which are rich in fiber, are highly recommended foods in the diet of preschool-age children and, if possible, even more so at school age. Fruits and vegetables, in fact, are rich in fiber, but also contain high amounts of micronutrients that are especially important in periods of rapid growth. These appear to have an advantage compared to other foods rich in fiber—and therefore recommended in the diet of children, such as whole grains and legumes—because, unlike those foods, fruits and vegetables do not contain elements that may reduce the absorption of zinc and iron ingested with food. Alongside the main macronutrients, vitamins and minerals are essential to proper nutrition for children in their preschool and school years.

For example, in young children, adequate intake of vitamin A is necessary for the proper formation of sight, to ensure the integrity of epithelial tissues and the development and differentiation of tissues. This vitamin plays a central role in proper development of the immune system and is involved in the development of taste and hearing.

The main sources of vitamin A are: liver, dairy products, eggs, fish, margarine, and some fruits and vegetables (such as carrots and yellow-orange fruits).

Vitamin B, like vitamin A, plays a fundamental role in the growth and development of the child. It is found mainly in whole grains, legumes, peanuts, meat, green leafy vegetables, eggs, milk, and fish.

Vitamin C is essential for optimal functioning of the immune system and collagen synthesis. It also performs an important role in iron absorption (especially from plant sources). Vitamin C is found primarily in fruits and vegetables, particularly spinach, tomatoes, potatoes, broccoli, berries, and citrus fruits.

Vitamin D plays an essential role in calcium metabolism (stimulating intestinal absorption), in muscle function, in cell proliferation and maturation, and in the proper functioning of the immune system. The main dietary sources of vitamin D are repre-

sented by fatty fish (sardines, salmon, tuna, herring), fish oils (especially cod liver oil), margarine, dairy products, eggs, liver, and beef.

However, as already mentioned, other essential elements of the diet of preschool and schoolchildren are represented by the minerals: iron in hemoglobins present in meat and fish and non-hemoglobins present in cereals, legumes, beans, vegetables, and fruits. Calcium is found in milk and dairy products, peanuts, and fish; magnesium is present in roasted peanuts, dried fruit and nuts, raw spinach, and some varieties of green vegetables. Phosphorus is found in milk, cheese, shrimp, salmon, sardines, herring, and green leafy vegetables, sodium is present in bread, salumi, sauces, pickled foods, and salt; and zinc is present in red meat, liver, fish, milk and dairy products, wheat, and rice.

Along with all of the considerations concerning micro- and macronutrients, it is crucial – for children in the growth phase – that they partake in regular physical activity, mainly outdoor. This is an absolutely central issue in a process of proper development in the early years of the child, as advised by all the major international medical-scientific experts.

Adolescence

Adolescence is a period marked by intense metabolic activity⁵. At this time there is a strong acceleration of the growth rate in both males and females. Somatic growth is accompanied by rapid psychological development and behavior characterized by a progressively more intense need for independence and autonomy; this also significantly influences adolescent eating behavior.

During adolescence the daily intake of food should be rich enough to meet the increased demands of the processes of growth and, at the same time, the prevention of metabolic and degenerative diseases that are characteristic of adulthood (hypertension, diabetes, atherosclerosis, and cancer).

Nutrition and issues relating to the adoption of proper diet and lifestyle play a major role in adolescence. At this age, when the psychophysical development is being completed, the foundations of a healthy diet that will act as a preventive factor for many diseases later in life are consolidated.

Despite the fact that the diet of adolescents is a matter of great interest, few studies have analyzed the nutritional needs of this particular age group. Often, in fact, the data from studies published in various national and international associations has actually been extrapolated from studies on childhood and adulthood.

In the absence of in-depth and sufficiently broad studies on energy needs during adolescence (both in terms of the sample studied and the time reference), it is difficult to determine the needs of an individual with rapid fluctuations in the rate of growth from year to year, and with considerable differences between the sexes.

The following table shows the ranges of energy needs in adolescents.

Figure 2.1. Energy needs in adolescence for males and females

| | AGE | MALES | FEMALES |
|----------------------------|-------|-----------|-----------|
| ENERGY NEEDS (kcal/day) | 11-12 | 1993-2343 | 1739-2048 |
| | 13-14 | 2277-2794 | 1864-2297 |
| | 15-16 | 2393-2976 | 1898-2338 |
| | 17-22 | 2515-3215 | 1942-2411 |

Source: BCFN from various sources (Italian Human Nutrition Society, L.A.R.N., revision 1996; FAO Nutrition and Consumer Protection Division, Nutritional Requirements Reports; Food and Nutrition Board [Institute of Medicine of the National Academies], Dietary Reference Intakes, 2006).

REGULAR PHYSICAL ACTIVITY IS IMPORTANT - FOR CHILDREN IN THE GROWHT STAGE - MAINLY IN THE OPEN AIR

THE SYSTEM ACTS TO ENSURE THE INTAKE OF SUFFICIENT AMOUNTS OF ENERGY TO MEET METABOLIC NEEDS; ON THE CONTRARY, THE REGULATION AND INTAKE OF NUTRIENTS MAY BE SUBOPTIMAL, THEREBY LEADING TO POSSIBLE DEFICIENCIES OF CERTAIN ELEMENTS

These ranges are strongly influenced by factors such as weight, body composition, and physical activity level.

In most cases, where food access is not limited, energy needs are met efficiently through a fine and automatic regulation of appetite by the hypothalamus. Appetite promotes the ingestion of food that is responding both to energy needs and the needs for various nutrients. Although the system generally works to ensure the intake of sufficient amounts of energy to meet metabolic needs, on the contrary, regulation of the intake of individual nutrients may be suboptimal, thereby leading to possible deficiencies of certain elements.

The nutritional needs of adolescents are influenced primarily by the physical growth of the individual, which tends to peak between 11 and 15 years of age for girls and between 13 and 16 years of age for boys. In addition, the need for energy and nutrients varies from day to day even in the same subject.

The most common nutrient deficiencies at this age are those of iron and calcium. Anemia due to iron deficiency is one of the most common diseases associated with food deficiencies⁶. Teenagers may be subject to iron deficiency anemia due to increased tissue demand, particularly in muscle and red blood cells, which involves a significant increase in the need for iron to make hemoglobin (the protein that carries oxygen) and myoglobin (globular protein contained in muscles).

The increase in lean body mass,⁷ especially of the muscles, is more important in adolescent boys than in girls. In preadolescence, the lean mass is the same for both sexes; however, when adolescence starts, in the male there is a greater accumulation of LBM (Lean Body Mass) for each additional kilogram of body weight gained during growth, which causes him to have a final lean mass that is almost twice that of the female.

For females, however, a factor that contributes to increasing the demand of iron is the onset of the menstrual cycle. The loss of blood due to menstruation involves a constant depletion of this essential trace element, which must be replenished in the body by increasing intake. With the onset of menstruation, girls need to ingest 50% more iron than boys, equivalent to about 18 mg/day compared to 12 mg/day for males.

Thus, during adolescence it is important that there is an increase in the consumption of foods rich in iron,⁸ such as:

- lean meats and fish;
- legumes;
- dark green vegetables;
- nuts;
- iron-fortified cereals.

It is important to note that iron is absorbed at different rates from different foods. Iron of animal origin (also called “heme iron”) is absorbed better than that from non-animal sources (also called “non-heme iron”).

Therefore, teens that follow a vegetarian diet are at increased risk of iron deficiency. However, the intake of foods rich in vitamin C, found in citrus fruits, helps the absorption of iron from a plant sources when consumed together.

Calcium also plays an essential role in the body of the rapidly growing adolescent, given it is needed in the composition of bones and teeth.

The human skeleton contains approximately 99% of the body’s stores of calcium, and the increase of the skeleton and its weight reaches its peak during adolescence. About 45% of skeletal mass is formed during adolescence, even though skeletal growth continues up to almost 30 years of age. A lack of calcium during this period may cause damage to the proper growth of the individual. More specifically, calcium needs are

greatest during “early adolescence,” i.e., between the ages of 10 and 14 in females and between 12 and 15 in males, a period in which the average daily retention of calcium is 200 mg in females and 300 mg in males.

Since the efficiency of calcium absorption is only about 30%, it is essential that the adolescent diet provides an adequate intake of calcium for reaching the most bone density, since it is only during adolescence that the body can deposit the maximum amount of calcium required to achieve so-called peak bone mass, i.e., the maximum possible calcification. The maximum amount of calcium that can be deposited in the bones is genetically determined, but the peak bone mass can never be achieved if the individual does not acquire an adequate amount of calcium in the diet.

That makes it evident how important it is to eat foods rich in calcium, especially for girls—because with the onset of menopause, they are more at risk of osteoporosis. Indeed, as some studies have shown,⁹ reaching the peak bone mass in adolescence is crucial to reducing the risk of osteoporosis in later years.

THE HUMAN SKELETON CONTAINS APPROXIMATELY 99% OF THE TOTAL BODY STORES OF CALCIUM AND THE INCREASE OF THE SKELETON AND ITS WEIGHT REACHES ITS PEAK DURING ADOLESCENCE. ABOUT 45% OF THE SKELETAL MASS IS FORMED DURING ADOLESCENCE, EVEN THOUGH SKELETAL GROWTH CONTINUES ALMOST UP TO THIRTY YEARS OF AGE



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PHYSICAL INACTIVITY IS NOT ONLY ONE OF THE MAIN CAUSES RESPONSIBLE FOR OVERWEIGHT CONDITIONS AND OBESITY IN ADOLESCENTS, BUT ALSO FOR THE DEVELOPMENT IN THE LATER STAGES OF LIFE OF CHRONIC DISEASES SUCH AS HEART DISEASE, DIABETES, HYPERTENSION, CONSTIPATION AND BOWEL DIVERTICULOSIS, OSTEOPOROSIS AND SOME FORMS OF CANCER

All in all, it is common for adolescents to adopt eating patterns deficient in several nutrients, according to fashion or the desire to lose weight quickly and excessively. Osteoporosis, in fact, is one of the most serious and potentially irreversible consequences of anorexia nervosa and of rapid and excessive weight loss in adolescents, who often then do not achieve their peak bone mass.

The recommendation for adolescents of both sexes is an intake of 1,200 mg of calcium daily. The main dietary source of calcium is represented by dairy products, especially hard cheeses, which, having been subjected to a process that has led to a loss of water, contain higher concentrations of calcium. By eating several servings of dairy products like milk, yogurt, mozzarella, and cheese, one can easily reach the recommended level of calcium intake.

Dietary variety is an additional recommendation: a mixed diet that includes foods of plant origin (fruits, vegetables, legumes, grains, seeds, etc.), foods of animal origin (meat, cheese, dairy products, ham, etc.), as well as alternating kinds of foods consumed during the week. Eating behavior characterized by a single-food diet and the repeated and frequent consumption of lunches and dinners away from home significantly increases the risk of being overweight or obese in adolescence.

In addition to a healthy diet, health in adolescence is also associated with physical movement.

Physical activity helps to burn calories, tension, and stress, and improve moods and psychological well-being. Physical activity and sports bring great benefits to the cardiovascular and skeletal system, as well as the metabolism, while supporting the maintenance of proper body weight and an optimal body composition. This makes adolescents stronger and gets them used to adopting a lifestyle that will enable them to face the years to come in good health. Demonstrating this, the lack of physical activity in adolescents plays an important role in the development, progression, and perpetuation of certain diseases such as obesity. Based on the current recommendations,¹⁰ adolescents should be physically active for at least 60 minutes a day, including both physical sports activity and when at play. Some studies in Europe and the United States have found that the majority of adolescents are not very physically active or adopt a lifestyle that does not provide adequate physical activity—a lifestyle that, in other words, is sedentary.

Physical inactivity is not only one of the main causes of overweight conditions and obesity in adolescents, but also of developing, in later life, chronic diseases such as heart disease, diabetes, hypertension, constipation and bowel diverticulosis, osteoporosis, and some forms of cancer.

Sports and physical activities such as swimming, gymnastics, cycling, recreational bike riding, skating, ball sports, dance, and weight training, especially when led by an instructor for about 60 minutes a day, three to five times a week, can help increase bone mass and density. Again, adequate physical activity leads to improvements in body flexibility, balance, agility and coordination, and strengthening bones or improved bone density.

In conclusion, for healthy and proper growth of adolescents, in addition to adequate physical activity, they need to eat properly. Specifically, eating properly means considering the amount of food ingested, the quality of food in the diet, and the distribution of food throughout the day.

Eating behavior characterized by a single-food diet and the repeated and frequent consumption of lunches and dinners away from home significantly increases the risk of being overweight or obese in adolescents.¹¹

Variety requires a mixed diet that includes foods of plant origin (fruits, vegetables, legumes, grains, seeds, etc.), foods of animal origin (meat, cheese, dairy products, ham, etc.), as well as alternating kinds of foods consumed during the week.



2.2 DIETARY GUIDELINES AND RECOMMENDATIONS FOR CHILDREN AND ADOLESCENTS

Given the importance of nutrition during adolescence, especially for the role it plays in the prevention of major chronic diseases, governments and international organizations have spoken out on health issues and formulated guidelines for the definition of a balanced diet at different stages of life, focusing specifically on adolescence.¹²



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In general, in terms of distribution of the different meals of the day, nutritional science indicates the optimal number of times for the child to eat food each day is 5.

A suitable weekly composition might be as follows:

- cereals (bread and pasta) each day;
- fruit and vegetables each day;
- milk and dairy products each day;
- meat: 2 to 3 times a week;
- fish: at least 3 times a week;
- cheese: 2 times a week;
- eggs: 1 to 2 times a week;
- legumes: at least 2 times a week.

As mentioned earlier, one of the fundamental characteristics of a healthy diet is variety. In fact, it is from a varied diet that adolescents and children can easily get the nutrients they need for growth.

As a conclusion of its detailed work on the issues of nutrition and growth of children, the BCFN has made a synthesis of macro-guidelines that should be followed to adopt a diet and lifestyle that encourage the healthy development of children and adolescents.

SUMMARY OF THE MACRO-GUIDELINES FOR HEALTHY GROWTH

- 1 Adopt a healthy and balanced diet, alternating daily all the main foods, supplying all the nutrients and micronutrients (calcium, iron, vitamins, etc.) that adolescents need.
- 2 Avoid excessive calorie intake caused by consuming high-calorie foods or those with high concentrations of fat.
- 3 Start afresh to balance nutrients during the day, ensuring that there is a balance between the intake of animal protein and vegetables (which must be one to one), of simple and complex sugars (less consumption of sweets, more bread, potatoes, pasta, or rice), of animal and vegetable fats (using less lard and butter and more olive oil).
- 4 Minimize the intake of extra salt in order to reduce risk factors for developing hypertension, especially in adulthood.
- 5 Distribute food intake over 5 times during the day: breakfast, morning snack, lunch, afternoon snack, and dinner.
- 6 Avoid eating food outside the 5 times previously identified.
- 7 Engage in physical activity for at least an hour a day, including both sports and play.
- 8 Minimize a sedentary lifestyle as much as possible, particularly the time spent in front of a screen (television and computers).

2.3 THE ENVIRONMENTAL DOUBLE PYRAMID. PREVENTIVE TOOL AND GUIDELINES

In 2010, the Barilla Center for Food & Nutrition published the Food and Environment Double Pyramid for the first time, a communication tool developed to relate the nutritional and environmental impacts of the foods consumed. In 2011, after carrying out further analysis, the Double Pyramid has been updated and is represented as follows (Figure 2.2.). The underlying concept of the Food Pyramid is as follows:

As one rises toward the summit, the frequency of consumption of different categories of food should gradually decrease—without excluding specific foods—to ensure the necessary variety of foods in the appropriate relative amounts. The nutritional part of the Double Pyramid was developed using the Mediterranean diet as the reference. This dietary pattern is the nutritional approach traditionally adopted in Mediterranean countries such as Italy, Spain, Portugal, Greece, and southern France. The Mediterranean diet is characterized by its completeness and nutritional balance, and is recognized to be one of the best for physical well-being and the prevention of chronic diseases, particularly those of the cardiovascular system.

The environmental pyramid was produced by reclassifying the same foods in the food pyramid with respect to their impact on the environment: at the base are those with a higher impact; rising toward the summit the food are more eco-friendly ones. By completing this exercise, it was discovered that the sequence of the foods was roughly the same, though reversed. This correlation is evident if one turns the environmental pyramid upside down. Combining the two pyramids (one upright and the other upside down), the Food and Environmental Double Pyramid is obtained. You can easily notice that the foods that are more frequently recommended for consumption are also those that cause minor environmental impact; conversely, the foods for which a reduced consumption is recommended are those that have the most impact on the environment.

In practice, what emerges is the apparent coincidence in a single dietary pattern of two different but equally important objectives: people's health and environmental protection.

The Food Pyramid

The Food Pyramid as an educational tool

In recent years, the number of those who can choose what and how much to eat has greatly increased. However, without an adequate culture or widespread, illustrated, and applicable nutritional guidelines, people are likely to acquire unbalanced eating habits.

Evidence of this is the recent and rampant spread of chronic disease caused by overconsumption and a poorly balanced diet, as well as the reduction of physical activity in all age



Figure 2.2. The Food and Environmental Double Pyramid model, developed by the BCFN and now updated

A SINGLE FOOD MODEL
RESPONDS TO TWO
DIFFERENT BUT EQUALLY
IMPORTANT OBJECTIVES:
THE HEALTH OF PEOPLE
AND PROTECTION OF THE
ENVIRONMENT

groups. The American physiologist Ancel Keys, author of *Eat Well and Stay Well*, published in 1963, explored why the population in some regions of the world lived longer: The secret of longevity lay in a balanced consumption of all the foods, among which are favored fruit, vegetables, and cereal derivatives, while simultaneously reducing the consumption of foods rich in saturated fats and simple sugars (meat, and sweets). In particular, Keys discovered that this diet, which he called “Mediterranean,” produced mortality from heart disease in the countries of Southern Europe and North Africa that was lower than what was found in Anglo-Saxon and Northern countries, where the food was higher in saturated fat. Unfortunately, since then, even in Italy, the Mediterranean diet has come into competition with other less healthy food patterns (especially the American diet).

More generally, the increasing standardization and processing of food has played an important role in providing food that is more easily accessible, but often at the expense of proper nutritional balance. Over the years, several research institutes have developed communication strategies for different population subgroups based on the concept of the Food Pyramid, placing the foods to be eaten more frequently at the base and those that should be eaten less at the top.

The value of the Food Pyramid as a communication tool is twofold. On the one hand, it is an excellent summary of the main knowledge gained from studies in medicine and nutrition. On the other, it is a powerful tool for consumer education thanks to its simple and intuitive graphics.

Components of the Food Pyramid

As noted above, the Food Pyramid has been developed in order to educate the population about a more balanced eating pattern (based on the Mediterranean diet).

Rising to the top of the pyramid, the relative frequency of the consumption of different food categories should decrease gradually, without any exclusion of any specific categories, and ensuring consumption of a diverse diet (one of the key principles of proper nutrition). More specifically, at the base of the pyramid are foods of plant origin, typical of the Mediterranean diet, rich in nutrients (vitamins, minerals, water) and protective compounds (fiber and bioactive compounds of plant origin). Going upward, there is a gradual increasing of the energy density of foods (many of which are found in the American diet), which should be consumed in smaller quantities.

The Environmental Pyramid

The environmental indicators

The Environmental Pyramid reflects a series of calculations, using the best available information. The estimated environmental impact for each single food item was calculated based on information and public data which was measured through a “Life Cycle Assessment” (LCA), an objective assessment methodology to establish energy and environmental loads in a process (either an activity or a service).

Figure 2.3. The LCA method of analysis is regulated by international standards ISO 14040 and 14044



This assessment includes the analysis of the whole value chain, starting from growing or extraction practices, raw material processing, manufacturing, packaging, transportation, distribution, use, reuse, recycling, and final disposal. On the one hand, the LCA approach has the advantage of offering a fairly objective and complete assessment of the system; on the other hand, the disadvantage lies in the difficulty of communicating the complex information that is generated.

Synthetic indicators are then used to fully understand this outcome. These indicators are meant to preserve the scientific basis of the analysis to the extent possible; they are selected according to the kind of system analyzed, and must be chosen to simply and completely represent the interactions with the main environmental categories.

By focusing on food production chains, analysis of the processes shows that the main environmental loads are represented by the emission of greenhouse gases, the use of water resources, and the ability to regenerate local resources. With this perspective, the Barilla Center for Food & Nutrition has selected the following key environmental indicators:

- “Carbon footprint,” which represents and identifies greenhouse gas emissions responsible for climate change and measured by the CO₂ equivalent;

Figure 2.4. The Carbon Footprint of foods

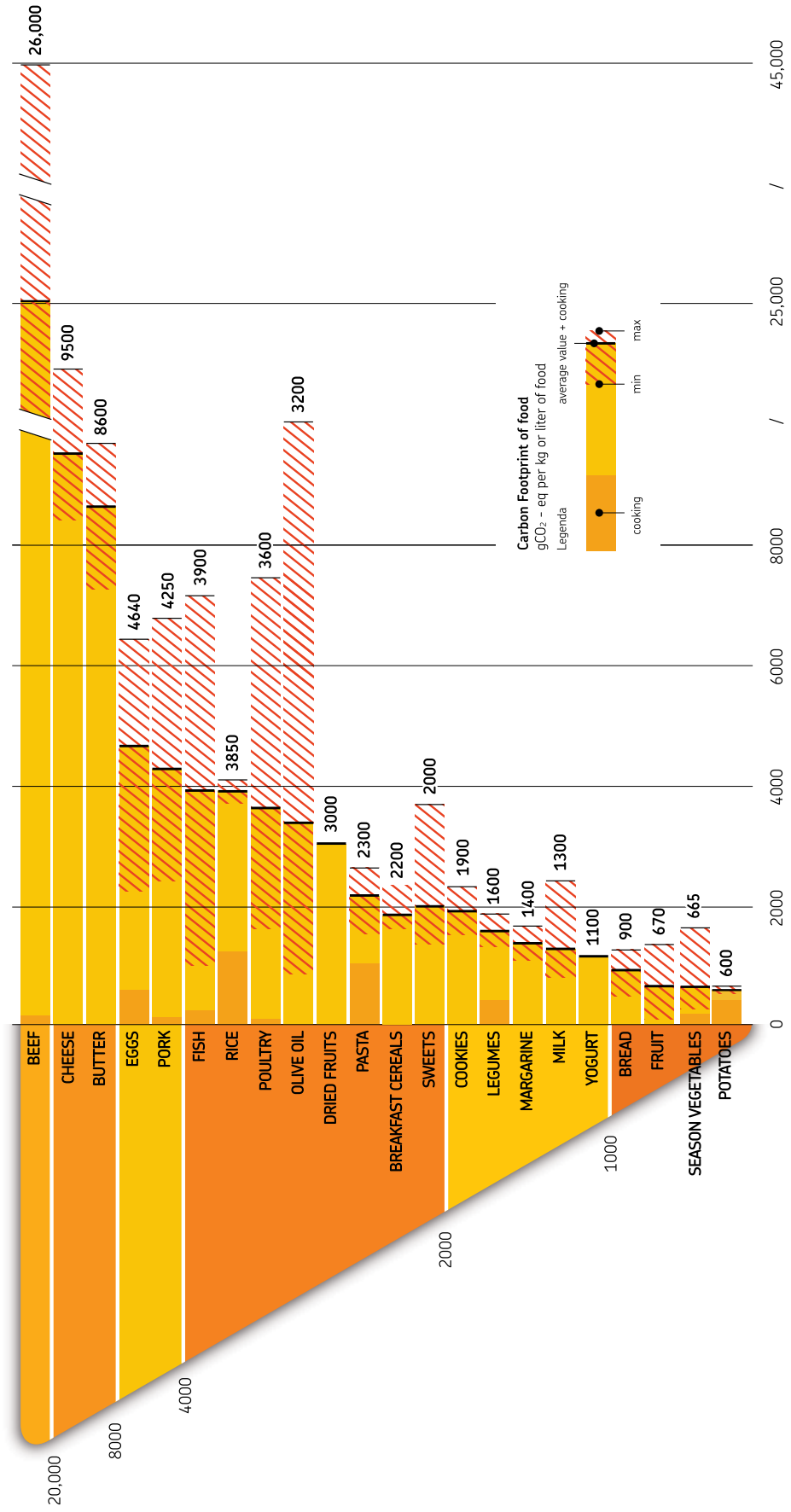


Figure 2.5. The Water Footprint of foods

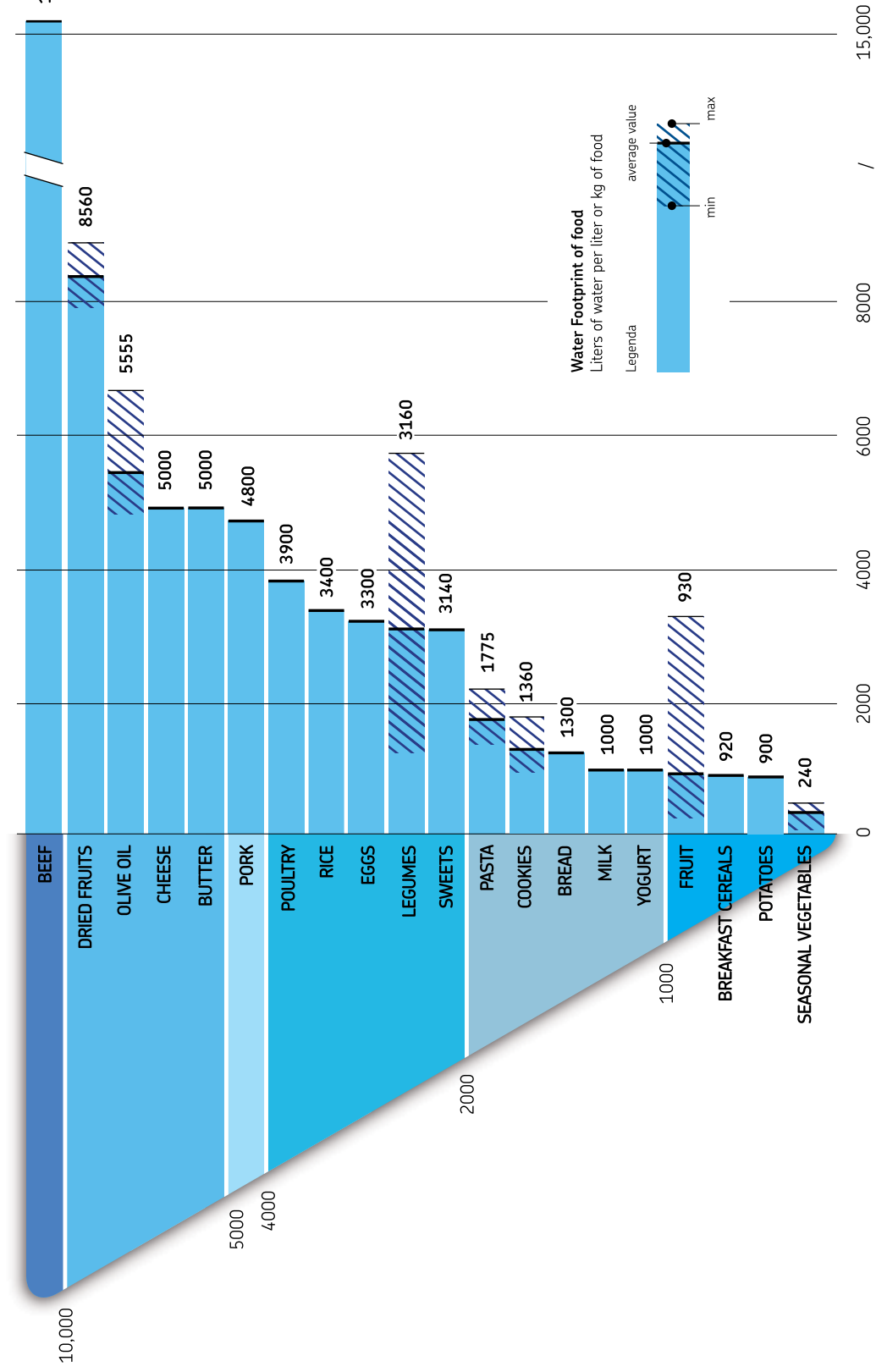
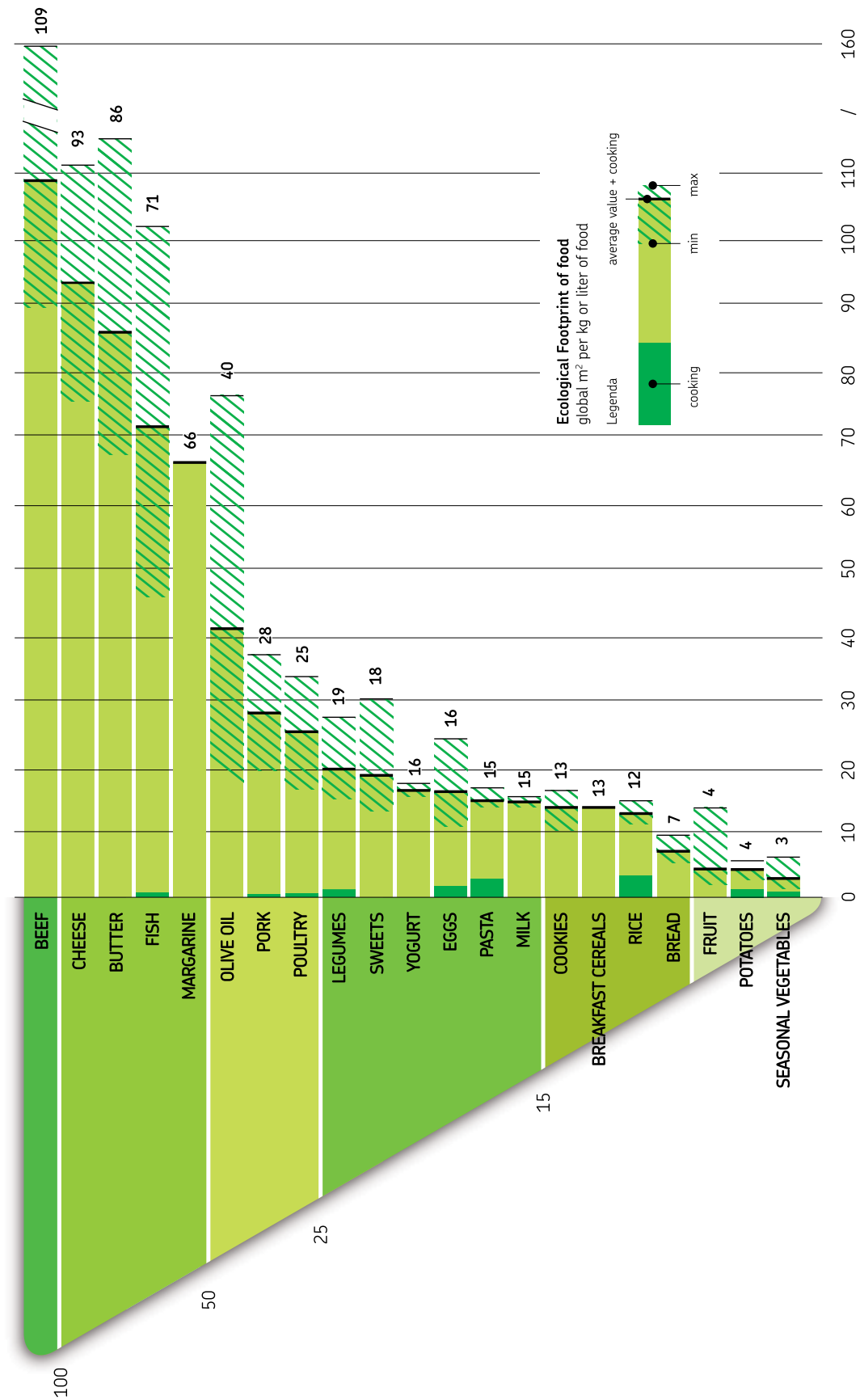
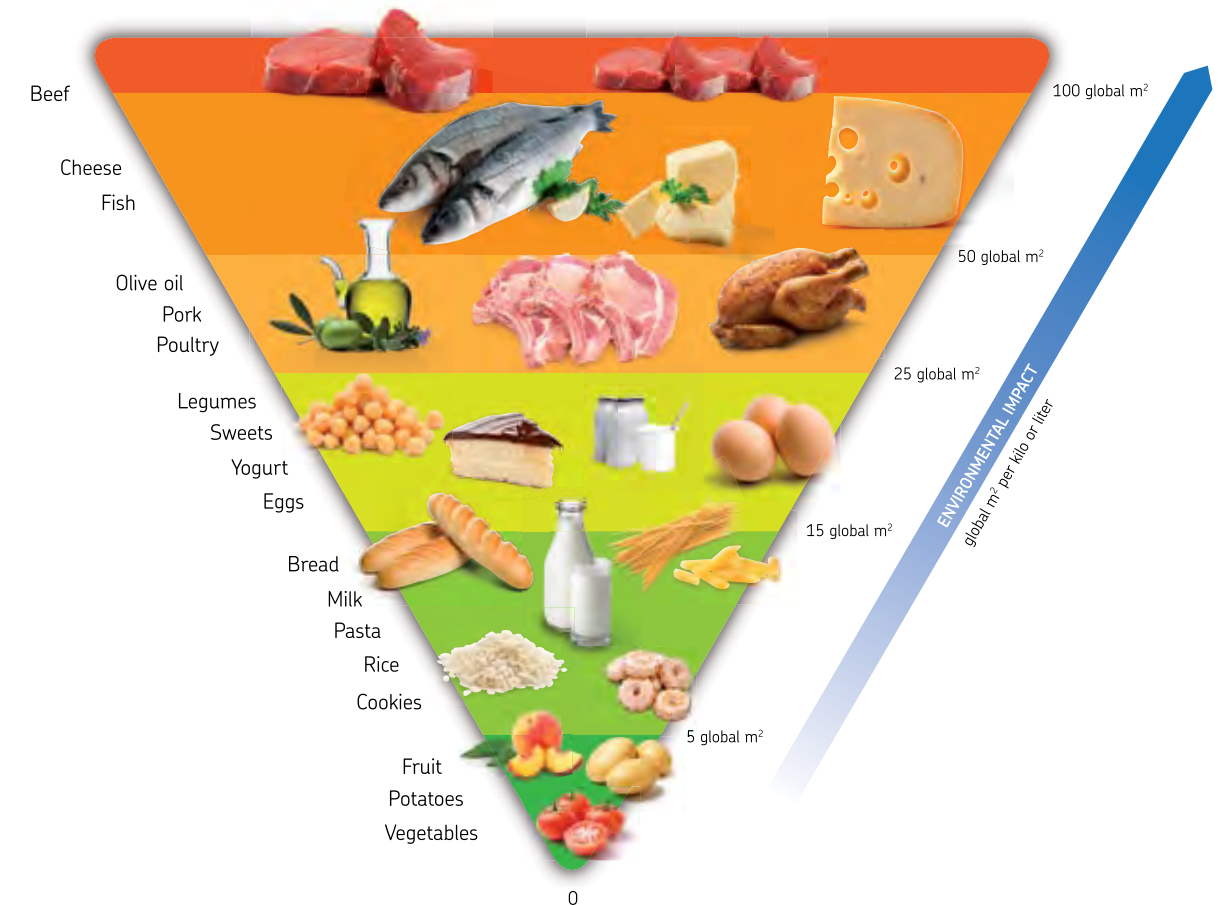


Figure 2.6. The Ecological Footprint of foods



- “Water footprint” or “virtual water content,” which quantifies consumption and how the water resources are used and measured in water volume (liters);
- “Ecological footprint,” which measures the quantity of biologically productive land (or sea) needed to provide resources and absorb the emissions produced by a manufacturing system, measured in m² or global hectares.

It is important to note the impacts taken into consideration by the Barilla Center for Food & Nutrition are not the only ones generated by the food production chain, although they are considered to be the most significant in terms both of real impact and communicability. Although we have chosen to represent the environmental pyramid footprint by using only the ecological footprint for synthetic reasons, the graphs show the environmental impacts of foods measured by their water and carbon footprint indicators, to avoid partial and sometimes misleading ideas of the impacts and to permit the reader to evaluate the indicators individually.

Figure 2.7. The BCFN's Environmental Pyramid, using the ecological footprint measure of global m² per kilogram or liter of food

The influence of food choices

In order to estimate the extent to which individuals' food choices affect the ecological footprint, two different daily menus were analyzed. Both are balanced from a nutritional point of view, both in terms of calories and nutrients (proteins, fats, and carbohydrates), but in the first one, the protein is of plant origin (“vegetarian” menu), while in the second, it is mainly of animal origin (“meat” menu).

The meat menu has an environmental impact that is two and a half times higher than the vegetarian one: 42 square global meters compared to 16, a difference of at least 26.

Based on this data, we can hypothesize what the reduction of an individual's environmental

THE ECOLOGICAL FOOTPRINT MEASURES THE AMOUNT OF BIOLOGICALLY PRODUCTIVE LAND (OR SEA) TO PROVIDE THE NECESSARY RESOURCES AND ABSORB THE EMISSIONS ASSOCIATED WITH A PRODUCTION SYSTEM, AND IS MEASURED IN GLOBAL M² OR HECTARES

IT IS POSSIBLE TO IMAGINE WHAT THE REDUCTION OF ENVIRONMENTAL IMPACTS OF AN INDIVIDUAL COULD BE, BY SIMPLY CHANGING THEIR EATING HABITS

Figure 2.8. How the ecological footprint varies according to food choices

| Weekly diet | WEEKLY IMPACT [global m²] | AVERAGE DAILY IMPACT [global m²] |
|---|---------------------------|----------------------------------|
| 7 TIMES "MEAT" MENU | 294 | 42 |
| 5 TIMES "VEGETARIAN" MENU + 2 TIMES "MEAT" MENU | 164 | 23 |
| 7 TIMES "VEGETARIAN" MENU | 116 | 16 |

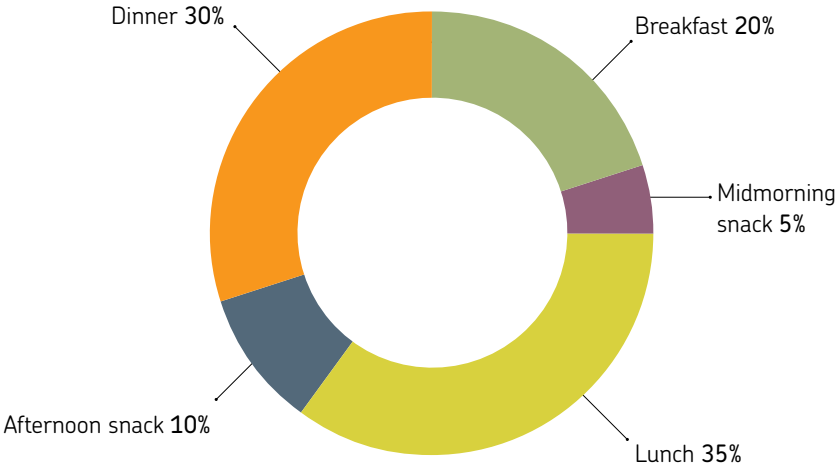
Sources: The BCFN, based on data from the Ecological Footprint Network

impact might be if he or she simply changed eating habits. Taking the example of a week's worth of food, we can hypothesize three diets that differ in how many times a vegetarian menu is eaten and how many times the menu is based on meat. Limiting meat to just twice a week, in line with the recommendations of nutritionists, you can "save" up to 20 global m² per day.

The Double Pyramid for those who are growing

Although until now we've talked about the Double Pyramid for adults, below we will deal with the concept of the Double Pyramid for those who are growing, starting with the nutritional aspects (synthesized in Chapter 1 of the present paper) and then combining them with environmental considerations.

Figura 2.9. Breakdown of recommended calorie intake throughout the day











Source: The European House-Ambrosetti, based on data from the Italian Human Nutrition Society

The Nutritional Pyramid for those who are growing

If the main connections are changed between macro-nutrient and micro-nutrient intake and proper development at different stages of growth in an average diet, it is possible to define the weekly composition of food eaten by children and adolescents that is correct and balanced, both in terms of the types of food ingested and the distribution of daily calories. A correct diet is characterized by variety—that is, a mixed diet that includes food from plants (fruits, vegetables, legumes, grains, seeds, etc.) and animals (meat, cheese, dairy products, ham, etc.) and alternation of food during the week. More specifically, the diet of children and adolescents should be composed as described in Figure 2.9., in terms of frequency of consumption. Despite these recommendations, many international studies have highlighted the prevalence among children ages 6 to 10 of eating habits that do not promote positive growth, and predispose them to weight gain. In fact, only 1% of children have food habits that are in line with the optimal weekly diet, and thus consume portions and a variety of food products in accordance with the

Figure 2.10. Optimal composition of the weekly diet

| | | |
|---|---|---|
| Consumption of cereals (bread, pasta, rice), especially whole-grain ones | Consumption of fruit and vegetables | Consumption of milk and dairy products |
|  |  |  |
| EVERY DAY | EVERY DAY | EVERY DAY |
| Consumption of meat | Consumption of fish | Consumption of cheese |
|  |  |  |
| 2/3 TIMES A WEEK | AT LEAST 3 TIMES A WEEK | 2 TIMES A WEEK |
| Consumption of eggs | Consumption of legumes | |
|  |  | |
| 1/2 TIMES A WEEK | AT LEAST 2 TIMES A WEEK | |

recommendations of a proper nutrition pyramid. The United States Department of Agriculture has also chosen to support the recommendations for the childhood diet contained in My Pyramid for Kids

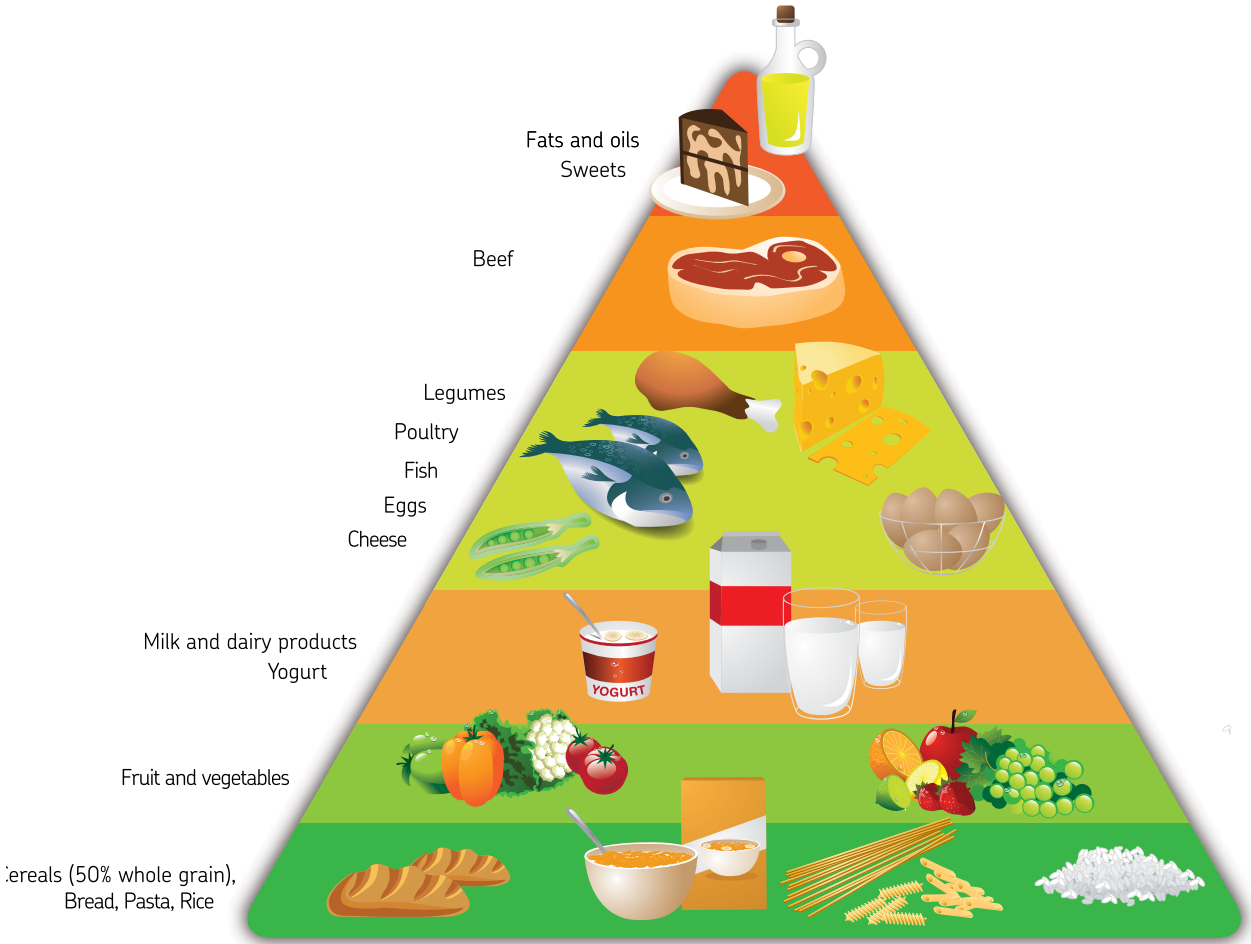
The Food Pyramid for those who are growing

Based on the specifications in these pages and with reference to childhood (in particular, from 2 years of age and up) and adolescence, the BCFN has developed a Food Pyramid that is used to achieve the same effects as the Double Pyramid. (The successive period, that of youth, is comparable to that of adults in terms of the frequency of eating.) As in the case of adults, the diet of children and adolescents should also be based mainly on plants, particularly the various cereals, especially whole grains, which are very important for their protective components and fiber content, and fruits and vegetables.

Going upward, we find milk and dairy products, preferably nonfat versions, as well as meat and fish. Then we get up to products with higher fat and sugar content, which we recommend be eaten less frequently.

The necessary intake of unsaturated fats should be covered by eating fish and nuts, and preferably using vegetable oils for seasoning.

Likewise, the BCFN has juxtaposed the food pyramid for those who are growing with the environmental impacts of the products contained therein, thus defining the double pyramid for those who are growing.



FOOD PYRAMID FOR THOSE WHO ARE GROWING

My Pyramid and My Plate

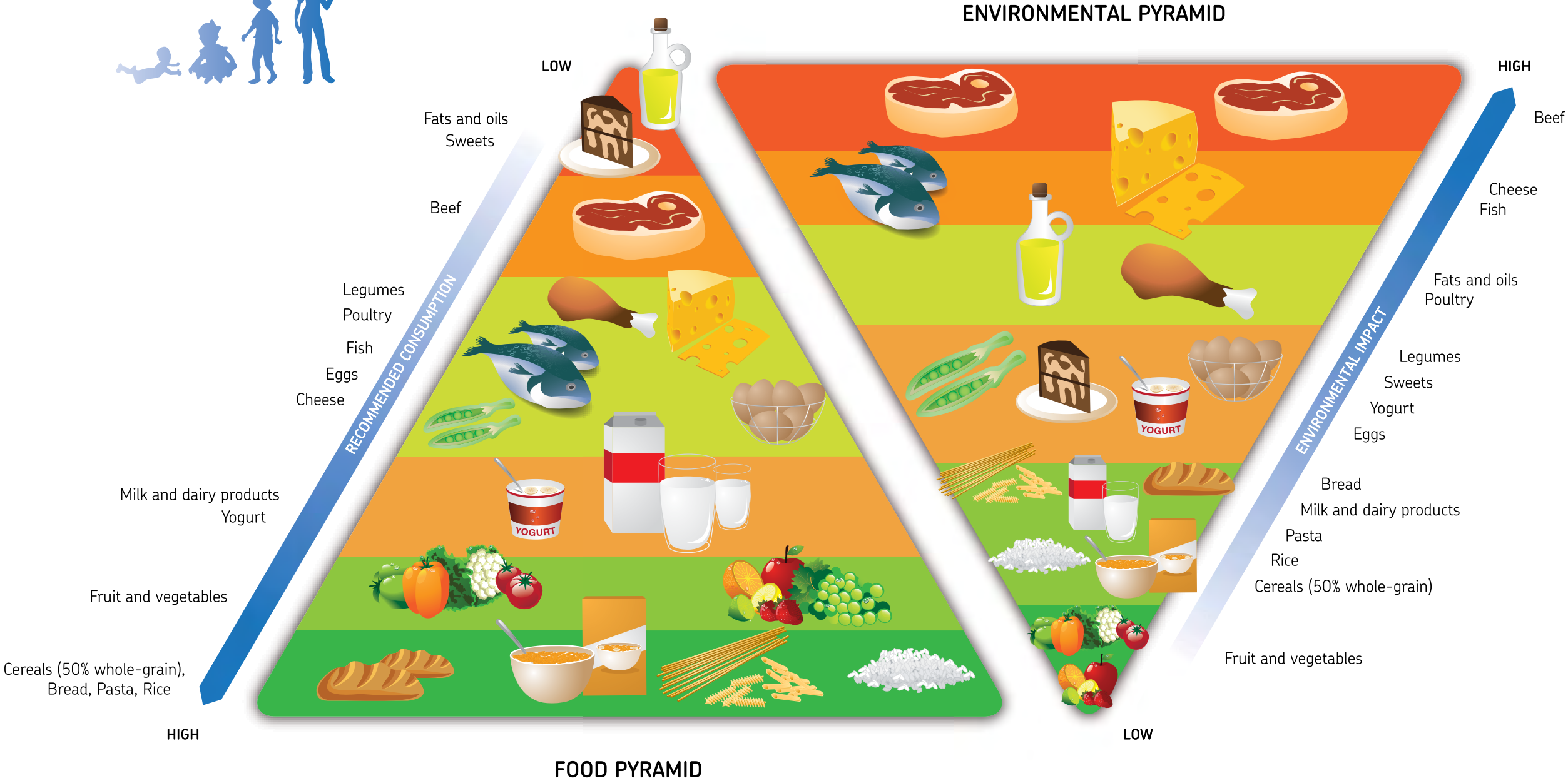
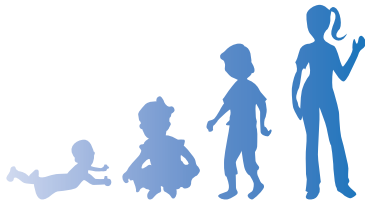
The Center for Nutrition Policy and Promotion, an organization of the United States Department of Agriculture (USDA), was established in 1994 to improve the nutrition and welfare of Americans. Its activities, which are designed to guide consumers toward healthy eating habits, led to the development of programs and recommendations on the introduction and frequency of consumption of foods in a balanced diet. These programs are carried out according to age and are based on the recommendations of the *Dietary Guidelines for Americans*, published and updated every five years by the USDA and the Department of Health and Human Services (HHS).

Among these, some years ago a Food Pyramid has been defined for children (aged 6 to 11 years), *My Pyramid for Kids*, in which the different types of food that should be consumed every day are highlighted in a colorful and fun way. The messages addressed to the children are accompanied by suggestions for the family, encouraging the proper distribution of food during the day and highlighting the vital role of physical activity for healthy growth. Today the USDA has developed a different way of communicating the concept of Healthy eating, with the MyPlate concept; for more details, please visit www.myplate.gov.



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THE DOUBLE PYRAMID FOR THOSE WHO ARE GROWING



3. CHILD MALNUTRITION IN DEVELOPING COUNTRIES



“Now the global community has begun to recognize that nutrition is and must be more than a footnote in the food security debate.

Nutrition security should be an essential element of every national development plan of the Less Developed Countries (LDC), as critical as clean water, as indispensable as education. We need to focus investments on areas that provide the highest return and the most sustainable results, ensuring not only more money for development, but also more development for the money that is invested.”

Anthony Lake, UNICEF Executive Director,
at the Fourth UN Conference on Less Developed
Countries, Istanbul, May 10, 2011.



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3.1 CAUSES OF MALNUTRITION AND THE PROBLEM OF FOOD SECURITY

Addressing malnutrition, especially that of children, is one of the health and development priorities worldwide. The human and economic costs of malnutrition are huge and fall primarily on the poorest households, and on women and children in particular. Its economic impact on developing countries, in terms of lost productivity and delayed economic development, is immense, but has so far been underestimated (*Scaling Up Nutrition: A Framework for Action*, 2010).

Malnutrition is caused by an insufficient intake of food, but there are other immediate causes of malnutrition, such as certain disease states. The underlying causes are due to poverty, lack of health services and care within families, and, most essentially, the fragility of government and international organizations in coping with possible and recurrent emergencies such as drought, floods, migration, conflicts.

The term “malnutrition” has many meanings, including “overnutrition” (due to excessive caloric intake), but it is commonly used as a synonym of “undernutrition.” A child is considered malnourished if their diet does not provide adequate calories, protein, and micronutrients for growth, or if their body is unable to absorb food properly because of illness.

Different types of malnutrition can be defined as:

- “Acute malnutrition,” also known as “wasting,” develops as a result of rapid weight loss or inability to gain weight. It is measured in children through a nutritional index using the ratio of weight-for-height (WFH) or the measurement of the brachial perimeter. It can be moderate (MAM) or severe (SAM; in these cases, the child’s life is at risk).
- “Chronic malnutrition,” also known as “stunting,” is indicated by a low height for age (HFA) ratio. It can be mild or severe, has a negative impact on the development of the person both physically and intellectually, and determines a lower resistance to disease. A low weight for age (WFA) ratio is used to discuss underweight children (“underweight malnutrition”).

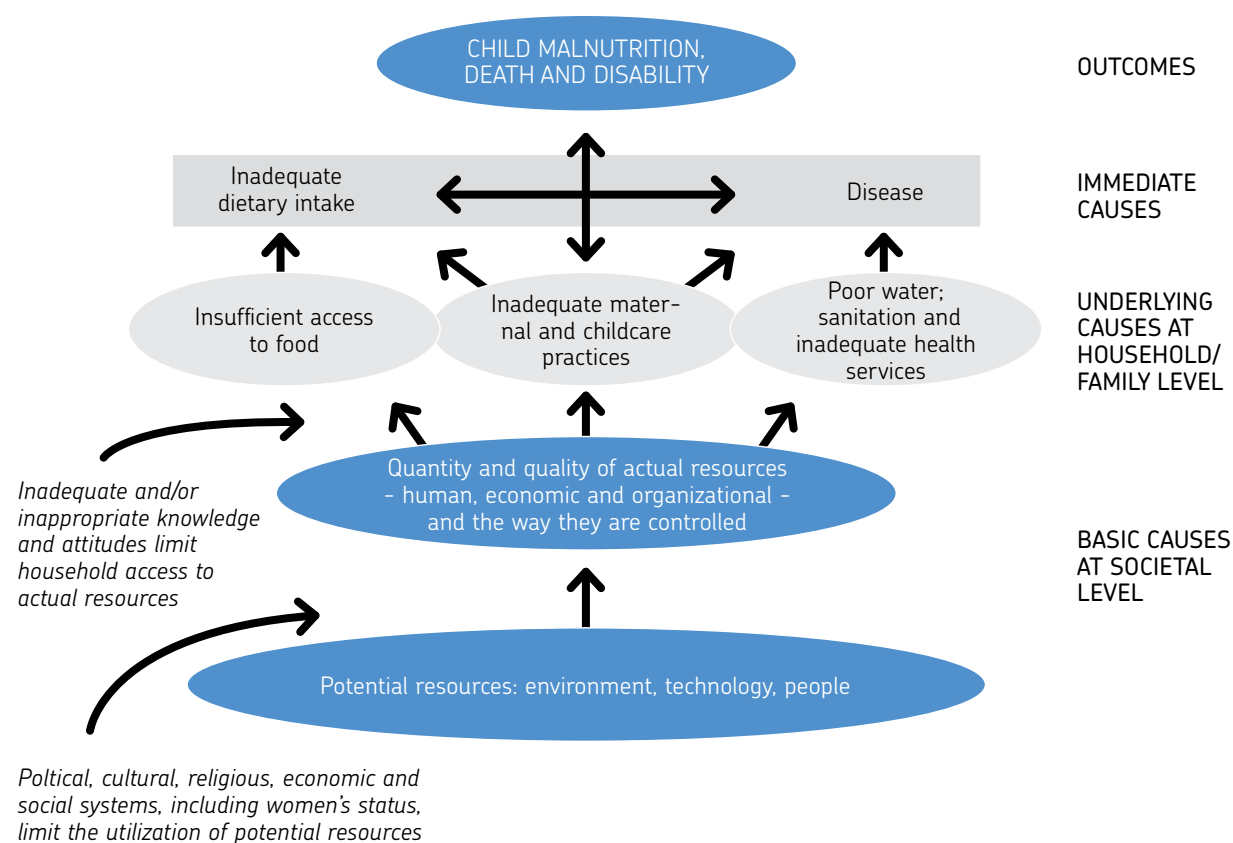
In addition to traditional forms of protein-energy malnutrition, also referred to as “structural,” i.e., type II (M.H.N. Golden, *The nature of nutritional deficiencies in relation to growth failure and poverty*, in “Acta. Pediatr. Scand.,” 374, 1991), there are many other specific forms of malnutrition referred to as “functional,” i.e. type I, related to specific micronutrient deficiencies (vitamins and minerals necessary to the human being, such as vitamin A, vitamin E, iodine, iron, calcium, etc.)

and that have consequences similar to those of chronic malnutrition, even though the growth parameters may look normal.

Since it plays a key role in the health and development of children, malnutrition has

A CHILD IS CONSIDERED MALNOURISHED IF THEIR DIET DOES NOT PROVIDE ADEQUATE CALORIES, PROTEIN AND MICRONUTRIENTS FOR THEIR GROWTH OR IF IT IS UNABLE TO ABSORB FOOD PROPERLY BECAUSE OF DISEASE

Figure 3.1. Causes of Child Malnutrition



Source: *The State of the World's Children*, 1998.

been selected as one of the indicators to measure progress toward the MDG (Millennium Development Goal): “Halve, between 1990 and 2015, the percentage of people who suffer from hunger.”

Given the prolonged negative effects of child malnutrition, the nutritional situation is considered important not only for the achievement of the MDG, but also in relation to child mortality (MDG 4: “Reduce by two-thirds, between 1990 and 2015, the infant mortality rate in children 0 to 5 years of age”), to infectious diseases, and to education and the equality of the sexes.

New Problems and Paradoxes

Much progress has been made in the fight against malnutrition, especially in regions like South Asia (India, Pakistan, Bangladesh). However, the increase in food prices in developing countries is now threatening many of the results that have been achieved. The negative effects, already evident in some of the countries that had made great progress, now must add the effects of climate change that are exacerbating the preexisting cyclical fluctuations of the rainfall and grain harvest. Crises related to drought in the Sahel in Madagascar (in 2010) and the Horn of Africa (in 2011), and the increasingly frequent flooding and salinization of the land in the Southeast Asia (Bangladesh, Myanmar) have had devastating effects. These crises were linked to increases in the price of imported food—which, paradoxically, because of their low prices in the past, had invaded the market, thereby creating dependence on imported food and, in many cases, destroying local agricultural production.

The effectiveness of new integrated strategies to combat malnutrition has been demonstrated, but for these to secure substantial and sustainable results, they should be implemented within the system of national policies, with massive long-term investments. Instead, the global economic crisis and budget cuts, particularly to development aid, primarily affect long-term programs: In times of crisis, donors (governments and private sector) tend to favor highly visible, short-term interventions. Emergency becomes the standard, and food aid is oriented to the availability/surplus of the donors. From a nutritional standpoint, this all has particularly serious effects in terms of the increasing dependency of the populations at risk on foodstuffs typical of emergency aid (rice, wheat, corn), at the expense of local crops that are often less productive, but also more resistant and sustainable in the long term.

THE GLOBAL ECONOMIC CRISIS AND BUDGET CUTS PRIMARILY AFFECT LONG-TERM PROGRAMS: IN TIMES OF CRISIS, DONORS (GOVERNMENTS AND PRIVATE PARTIES) TEND TO FAVOR HIGHLY VISIBLE, SHORT-TERM INTERVENTIONS



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Lessons learned from the experience

Work by UNICEF¹ and other agencies over the past two decades has shown that:

- Malnutrition is often invisible; therefore, nutritional monitoring and surveillance are critical;
- The combination of nutritional deficiencies and disease (malaria, diarrhea, etc.) results in an increase in malnutrition;
- Malnutrition is a vicious cycle between mother and child. It is therefore essential to intervene in support of nutrition for women during pregnancy and lactation;
- Iron-deficiency anemia, which increases the risk of maternal and neonatal mortality, is widespread among women in poor countries. The intake of micronutrients with iron and folate reduces anemia in children by as much as 45%;
- To reduce the risk of malnutrition throughout the life of an individual, the "window" in which action is essential is the first 1,000 days of life;
- Of all preventive interventions, that of

exclusive breastfeeding during the first 6 months, followed by complementary foods up to 2 years of age, is the most decisive action for the survival of children. This could reduce child mortality by 19% (Lancet, Child Survival Series, June 2003);

- All micronutrient deficiencies (iodine, iron, vitamins, etc.) have serious long-term consequences for the entire life of individuals (health, school performance, productivity);
- Cultural factors (food and/or gender taboos, customary uses) are essential, for example, in the nutrition of women during pregnancy and lactation, for correct feeding practices and weaning, and so on. This makes work concerning information and awareness at the community level crucial;
- Ultimately, what matters most are the strategies and programs to combat malnutrition adopted in each individual country. The best strategies must be adapted and adopted on a nation-by-nation basis.



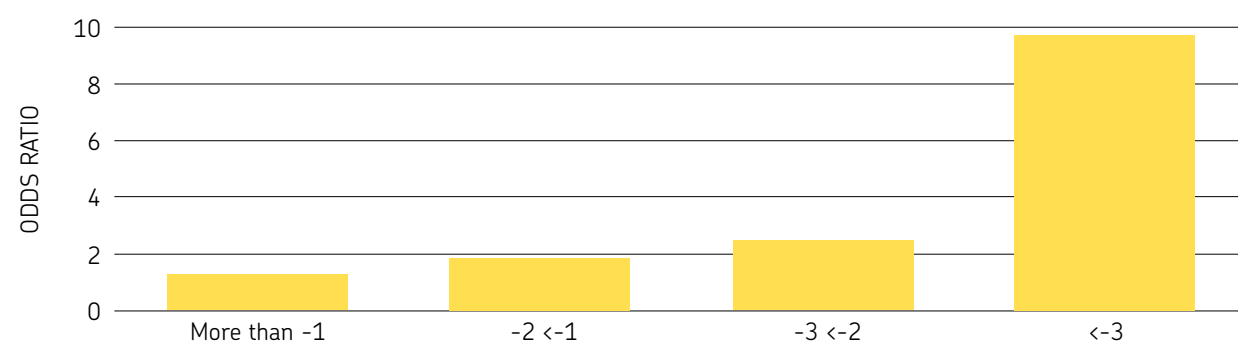
3.2 ACUTE MALNUTRITION

When speaking of children who are “starving,” we’re speaking of acute malnutrition. But this is only the tip of the iceberg that attracts attention; the problem goes for deeper. Often, acute malnutrition in its most severe forms (MAS or SAM, “severe acute malnutrition”), is the result of crises and emergencies. At other times, it represents a peak of recurring, “invisible” problems that emerge acutely only occasionally, but are always at the base of a chronic malnutrition and/or micronutrient deficiency. Acute malnutrition is defined as “severe” when the weight-for-height ratio (WHR) is -3 points (-3 Z-score) compared to the median value established by the WHO standards.² The diagnosis can be made on the basis of a visible severe wasting or the presence of edema. In children aged 6 to 59 months, a brachial circumference of less than 115 mm can also be a sign of severe acute malnutrition.

Epidemiological studies show that children with a weight/height ratio that is 3 points lower than the norm have a high risk of death, 9 times the risk of children with a weight/height ratio just 1 point lower than the norm. Similar studies, conducted using the brachial circumference (MUAC or “midupper arm circumference”) as a diagnostic criterion, showed that the risk of death is higher when the circumference is less than 115 mm. Severe acute malnutrition can be a direct cause of death or can act as an indirect cause, seriously aggravating the mortality rate due to diseases such as pneumonia or diarrhea.

More than 20 million children suffer from severe acute malnutrition, and most of them live in Sub-Saharan Africa and South Asia. It is estimated that over 1 million children die every year from this form of malnutrition. This intolerable burden persists, however, largely absent from the international health agenda. Very few countries, even in areas with a high prevalence of acute malnutrition, have any national plans and policies concerning it.³

Figure 3.2. Odds ratio for mortality by weight-for-height



Source: WHO-UNICEF, *WHO Growth Standards and the Identification of Severe Acute Malnutrition on Infants and Children*, A Joint Statement, 2009.

New criteria for “normal” growth standards (These apply to all countries and expand the number of cases to be cured)⁴

In 2006, WHO published child growth standards for attained weight and height to replace the previously recommended 1977 NCHS/WHO child growth reference. These new standards are based on breastfed infants and appropriately fed children of different ethnic origins raised in optimal conditions and measured in a standardized way. The same cohort was used to produce standards of mid-upper arm circumference (MUAC) in relation to age. The new WHO growth standards confirm earlier observations that the effect of ethnic differences on the growth of infants and young children in individual populations is small compared to the effects of the environment. Studies have shown that there may be some ethnic differences among groups, just as there are genetic differences among individuals, but for practical purposes they are not considered large enough to invalidate the general use of the WHO population growth standards as a standard in all populations. These new standards have been endorsed by international bodies such as the United Nations Standing Committee on Nutrition, the International Union of Nutritional Sciences, and the International Pediatric Association, and have been adopted in more than 90 countries.

Using weight-for-height: WHO and UNICEF recommend the use of a cutoff for weight-for-height of below -3 standard deviations (SD) of the WHO standards, to identify infants and children as having SAM. The commonly used cutoff is the same for both the 2006 WHO child growth standards (WHO standards) and the earlier National Center for Health Statistics (NCHS reference).

The reasons for the choice of this cutoff are as follows:

- 1) Children below this cutoff have a highly elevated risk of death compared to those who are above;
- 2) These children have a higher weight gain when receiving a therapeutic diet compared to other diets, which results in faster recovery;
- 3) In a well-nourished population there are virtually no children below -3 SD. There are no known risks or negative effects associated with therapeutic feeding of these children, applying recommended protocols and appropriate therapeutic foods.

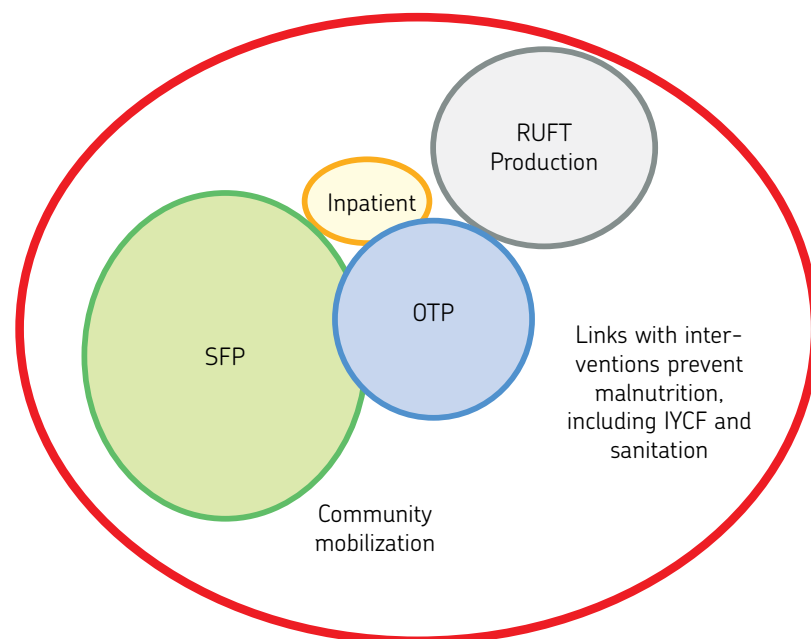
Using MUAC: WHO standards for mid-upper arm circumference (MUAC) by age show that in a well-nourished population, there are very few children aged 6 to 60 months with a MUAC of less than 115 mm. Children with a MUAC of less than 115 mm have a highly elevated risk of death compared to those who are above. Thus, it is recommended to increase the cutoff point from 110 to 115 mm to define SAM with MUAC.

When using the WHO child growth standards to identify the severely malnourished among 6- to 60-month-old children, the below -3 SD cutoff for weight-for-height classifies 2 to 4 times as many children compared with the NCHS reference. The prevalence of SAM, i.e., numbers of children with SAM, based on weight-for-height below -3 SD of the WHO standards and those based on a MUAC cutoff of 115 mm, are very similar. The shift from NCHS to WHO child growth standards or the adoption of the new cutoff for MUAC will therefore sharply increase caseloads. This has programmatic implications.

Lifesaving interventions without hospitalization: Community therapy for MAS

In the past, the treatment of severe acute malnutrition was hospitalization or admission to “therapeutic nutrition centers,” with standard therapy based on F75 and F100 therapeutic milk (see Figure 3.4. and box at page 71), then proceeding with the follow-up, once the child was discharged, through the “additional nutrition centers.” This, however, greatly limited the possibility of therapy, especially in the poorest and most isolated rural communities, where the problem was greater. Recent research has demonstrated the effectiveness of approaches, experimented on for over a decade, of providing treatment at home for severe acute malnutrition with the use of RUTF—therapeutic foods—of which the best known example is Plumpy’nut.

Figure 3.3. Components of acute malnutrition treatment



SFP: Supplementary Feeding Programme
OTP: Outpatient Therapeutic Programme
IYCF: Infant and Young Child Feeding

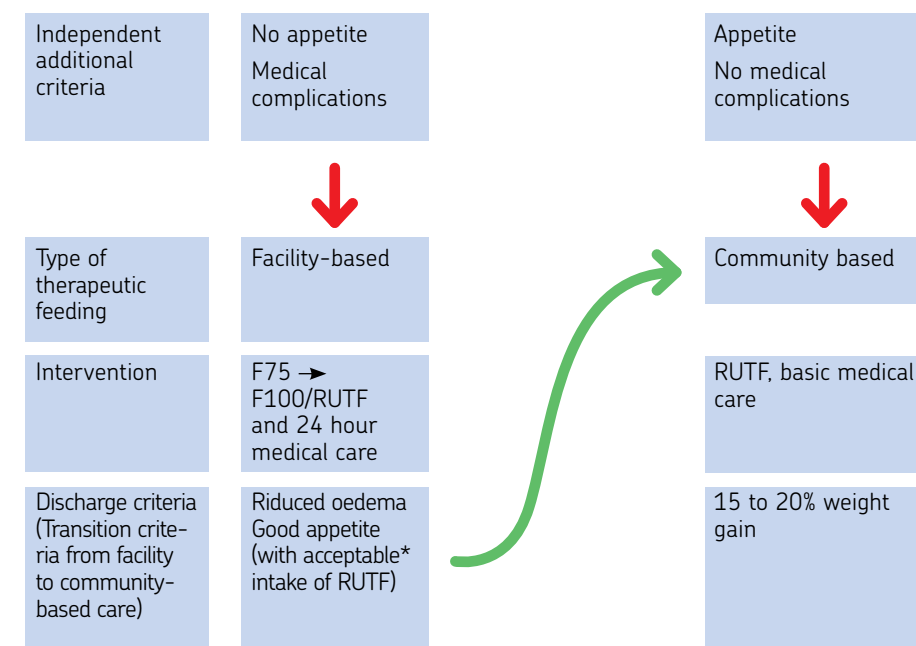
Source: UNICEF Programme Guidance, *Management of Severe Acute Malnutrition in Children*, febbraio 2008.

CHILDREN WITH SEVERE ACUTE MALNUTRITION NEED SAFE, PALATABLE, HIGH- ENERGY FOOD WITH ADEQUATE AMOUNTS OF VITAMINS AND MINERALS

Children with severe acute malnutrition need safe, palatable, high-energy food with adequate amounts of vitamins and minerals. The therapeutic foods (RUTF, the best known of which is the aforementioned Plumpy’nut) are generally soft, pasty foodstuffs that can be easily consumed by children under 5 years of age, without the necessary addition of water. At least half of the proteins in these foods should be derived from milk. Their composition is similar to the nutritional value of F100 milk (used as the standard for therapeutic diets in hospitals), but unlike the latter, the RUTFs should not be prepared with water, so as not to host and develop bacteria. This allows for their use at home, without refrigeration and even in poor hygiene conditions. When there are no medical complications, a malnourished child from 6 months onward, if hungry, may receive a dose of RUTF that is appropriate for their weight and consume it directly from the container, at home and at any time. The technology needed to produce RUTFs is simple and easily transferable, even in countries with minimal infrastructures. If produced locally, the cost is about \$3 per kg. For the treatment of a child with severe acute malnutrition, between 10 and 15 kg of RUTF are needed, distributed over a span of 6 to 8 weeks.

The integration of these innovative approaches with the use of residential care facilities in cases with medical complications has been shown to achieve very positive results, but

Figure 3.4. Treatment of severe acute malnutrition



* child eat at least 75% of their calculated RUTF ration for the day.

Source: WHO-UNICEF, *WHO Growth Standards and the Identification of Severe Acute Malnutrition on Infants and Children*, A Joint Statement, 2009.

requires the training of local community and health workers and the construction of an effective system for early diagnosis, screening, and referrals. If applied on a large scale and integrated with the possibility of hospitalization for cases with medical complications, this approach—based on the therapy of severe acute malnutrition at a community level—could save the lives of hundreds of thousands of children.

Furthermore, if interventions at the community level were added to the current hospital-based procedures, it could greatly reduce this leading cause of infant mortality.⁵

In fact, basic health-care workers or trained volunteers can easily identify children suffering from severe acute malnutrition, using simple strips of colored plastic specially made to measure the upper arm circumference, which must be greater than 115 mm. Volunteers can be trained to recognize the signs of nutritional edema in the legs.

Once identified, the children who suffer from severe acute malnutrition should be seen by a health professional who can evaluate their condition. This person must determine whether the child can be cared for at home, with regular visits to the health center, or, instead, needs to be admitted to a health facility. Early diagnosis, coupled with decentralized health care, makes it possible to start treatment of severe acute malnutrition before the onset of life-threatening complications.

In many poor countries, in fact, a child is rarely brought to health facilities, and often, only when it is too late. The long distances, transport costs, and the difficulty of leaving the other children and work in the fields, lead to procrastinating about traveling to the few existing health structures.

Therefore, it is in cases like these that a strong component of community-level management can often be the only solution to ensure timely and appropriate treatment.

It has been shown that 80% of children with severe acute malnutrition, identified at the local level, can be treated at home by using ready-to-use therapeutic food (RUTF) until he/she has regained sufficient weight. In some situations it is also possible to use an adequate diet with local foods of high nutritional value, with the addition of micronutrients, but this

IT HAS BEEN SHOWN THAT 80% OF CHILDREN WITH SEVERE ACUTE MALNUTRITION, IDENTIFIED AT THE LOCAL LEVEL, CAN BE TREATED AT HOME USING READY-TO-USE THERAPEUTIC FOOD – RUTF

requires particularly careful monitoring because, in cases of severe acute malnutrition, the dosage is highly sensitive.

Monitoring visits by a trained health worker, at the home or at the nearest medical facility (with the provision of subsequent doses of RUTF), should be weekly or biweekly.

This type of intervention, initially used in emergency situations and then extended on a large scale to “normal” situations, can reduce the mortality rate to below 5%, thus saving the lives of hundreds of thousands of children.⁶

SAM is found especially in poor families that have a low availability of nutritious foods and live in unsanitary conditions, which increases the risk of recurrent infections. Every preventive program must deal, first of all, with widespread poverty. However, the EU’s integrated approach to treatment of malnutrition can give new impetus to programs, obtaining lifesaving results on a large scale.⁷



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Therapeutic foods for severe acute malnutrition

- *Therapeutic milk*: Administered only in health centers and under the supervision of medical staff. For the first 2 to 3 days, the baby is fed F75 formula, which is lighter and easier to digest, then goes for several days to the more nutritious F100 milk. Then the baby is given pabulum (or sometimes even the Plumpy’nut) and a highly nutritious diet to follow at home for about 2 to 3 months, with periodic checkups.
- *Plumpy’nut*: Marketed with other brand names, but always with the same formula, it is made up of peanut flour, sugar, vegetable fat, and powdered milk, with added minerals and vitamins. It facilitates quick weight gain and does not need to be diluted, thus eliminating the risk of illness due to impure water. Children can suck it straight from the pack, avoiding touching it with dirty hands, and mothers can administer it at home without having to stay with their child for days in therapeutic feeding centers. Currently it is produced both in France and by 11 international companies, 8 of which are based in Africa.
- *ReSoMal (Rehydration Solution for Malnourished)*: A rehydration solution to be administered under medical supervision, orally or by nasogastric tube. This is a powder mixture to be diluted in 2 liters of drinking water and to be administered in case of dehydration (mainly due to diarrhea). One packet contains glucose, sodium, potassium, magnesium, zinc, and copper. The formulation is similar to that of ORS (oral rehydration salts, widely used to combat diarrhea at home or the community level), but adapted specifically for the treatment of children with SAM complicated by diarrhea.

What countries need to do to save children's lives

1 Adopt and promote national policies that:

- ensure that the national protocols for treatment of severe acute malnutrition (if necessary, based on the supply of RUTF), with an emphasis on activities at a community level;
- reach a high level of coverage of interventions designed to identify and treat children in all areas of the country and throughout the year, through effective community mobilization and *active case finding* of malnutrition;
- provide training and support for community health workers to identify children with severe acute malnutrition urgently needing treatment and to know how to recognize children with associated complications that require urgent hospital treatment;
- establish appropriate procedures for the referral of children with severe acute malnutrition with medical complications, so they can receive adequate treatment in health facilities;
- ensure training for better management of severe acute malnutrition at all levels (community and hospital).

2 Provide the necessary resources for the treatment of severe acute malnutrition, including:

- making RUTF available to families with children with severe acute malnutrition through a network of community health workers or decentralized health facilities;
- guaranteeing funds to provide free treatment of severe acute malnutrition, since the families affected are often the poorest ones;
- encouraging local production of high-energy therapeutic foods and fortified foods.

3 Integrate Treatment of SAM with other activities, such as:

- nutritional prevention initiatives, promotion of breastfeeding and proper weaning and feeding procedures, spreading of information, and education and communication campaigns;
- activities related to Integrated Management of Childhood Illness at the community level and with regard to health facilities.

The WHO, WFP, SCN, UNICEF and other partners are committed to supporting these interventions with the aid of training, supplies, technical consulting, and implementation of protocols for monitoring and verification, as well as promoting the local production of RUTF and other highly nutritional foods.

The work of UNICEF

UNICEF works with its partners in the areas of the world where child malnutrition is most severe and widespread (West and Central Africa, East Africa, South Asia) by promoting:

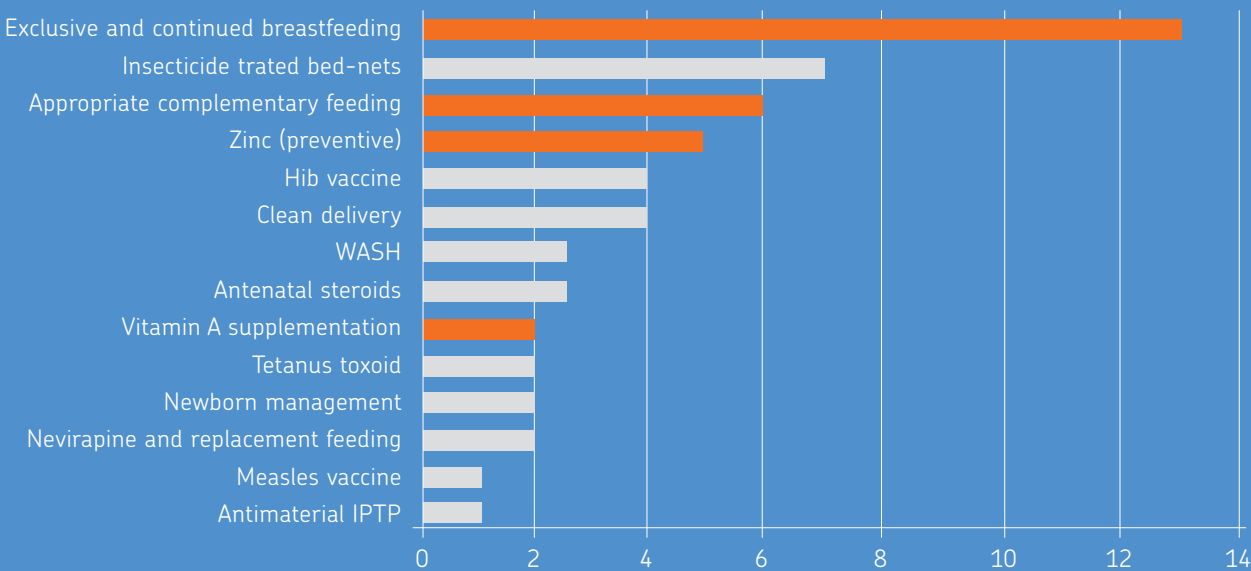
- The protection and promotion of exclusive breastfeeding for the first 6 months of life;
- The administration of micronutrients and supplements;
- The micronutrient fortification of staple foods such as flour, oil, and salt;
- Regular and accurate collection of data on nutrition to guide future action;
- Integrated management of acute malnutrition, with interventions at household and community levels (community nutrition centers run by the community) or admittance to medical facilities (therapeutic feeding centers) for the more serious cases;
- The regular supply of therapeutic food

(RUTF) and the training of health workers;

- The development of national policies that guide the activities of the ministries of health and nutrition as part of implementing the recommendations and standards developed at the international level;
- For the supply of therapeutic food, UNICEF has a mandate to deal with severe acute malnutrition and, therefore, therapeutic interventions (both at home and at in-patient treatment centers, with F75/F100 and other types of RUTF, such as Plumpy'nut). Together with WFP, UNICEF also intervenes on moderate acute malnutrition (MAM), on the family and community levels (via supplements, Plumpy'doz, Unimix).

In worldwide humanitarian response to emergencies, UNICEF is the leading agency in the nutrition cluster, meaning that it coordinates nutritional support for mothers and children.

Figure 3.5. The most effective interventions to reduce child mortality



Source: Lancet Series 2003 (interventions linked to nutrition are in orange).

3.3 MODERATE MALNUTRITION

Moderate acute malnutrition (MAM) is defined by a weight/height ratio of between -3 and -2 points of deviation from the reference value (-3/-2 Z scores with regard to the WHO standard values).

These measurements are normally carried out during visits with children by health workers. However, also for MAM, the brachial circumference can be used, indicating MAM if this measures between 115 and 125 mm. The latest estimates indicate that there are about 40 million children worldwide who suffer from moderate acute malnutrition. Most of them live in South Asia and Sub-Saharan Africa. The spreading of MAM in rural societies is often seasonal, linked to the performance of crops. It peaks during the time of the year marked by major food shortages (i.e., before the new crops). The relationship between prevalence and incidence (number of new cases per year) has not yet been sufficiently studied; add to this the fact that the brief episodes of MAM during food shortages continue to be overlooked by surveys focusing on MAM prevalence, conducted at other times of the year.

Children with MAM have an increased risk of death compared to well-fed children and, if untreated, may progress to severe acute malnutrition (SAM). There should be monitoring of their medical condition to see if they have illnesses that require special treatment. If they are well aside from malnutrition, they require a diet with all the nutrients necessary for optimal recovery. In this regard, breastfeeding support is crucial, since it provides many nutrients often lacking in the diet of poor families, and transfers antibodies from mother to child to protect him/ rher from disease. The WHO recommends the continuation of breastfeeding up to 2 years of age and beyond for children to be well fed, but this is even more important for children with MAM.

During a meeting at the WHO in October 2008, there was a revision of recommendations concerning the nutritional requirements of children with moderate acute malnutrition (MAM), which showed that children who suffer from MAM can gain weight at the rate of 5 g/kg/day, something that requires an additional intake of calories compared to an adequate “basic” diet, or 25 kcal/kg/day (*Proceedings of the WHO, UNICEF, WFP, UNHCR Consultation on the Dietary Management of MAM in Under-5 Children*, 2008).

Dietary advice, in addition to breastfeeding, is essential to provide these children with the best use of locally available food resources, with the addition of supplements when needed. Therefore it is necessary to identify which foods of high nutritional value are available locally, and then to try a therapy based on these foods, to be supplemented later on if necessary. In many cases, poor families do not have access to animal protein, which leads to imbalances even in healthy and breastfed children.

In situations where there is a lack of food or availability and accessibility, it is necessary to resort to complementary foods. Among those most commonly used are mixtures of de-hulled soybean, corn, or wheat, dairy, sugar and vegetable oil. When there is a general

lack of food within a population, usually the distribution of the weight/height ratio shifts negatively for the whole population, especially children. Thus, this affects all of a population's children, not only those with a deviation of more than 2 points from the standard. Therefore, in such situations (such as emergencies, but also food crises), targeted interventions are aimed at the age groups at risk, regardless of the individuals' nutritional condition. Ideally, children with MAM should be visited every week or every two weeks to verify their response to treatment and possibly add food supplements, until they have achieved the correct standard of minimum weight/height. However, in areas with a high prevalence of malnutrition, the child should reach a weight that is slightly higher than the standard minimum, to prevent a rapid relapse.⁸



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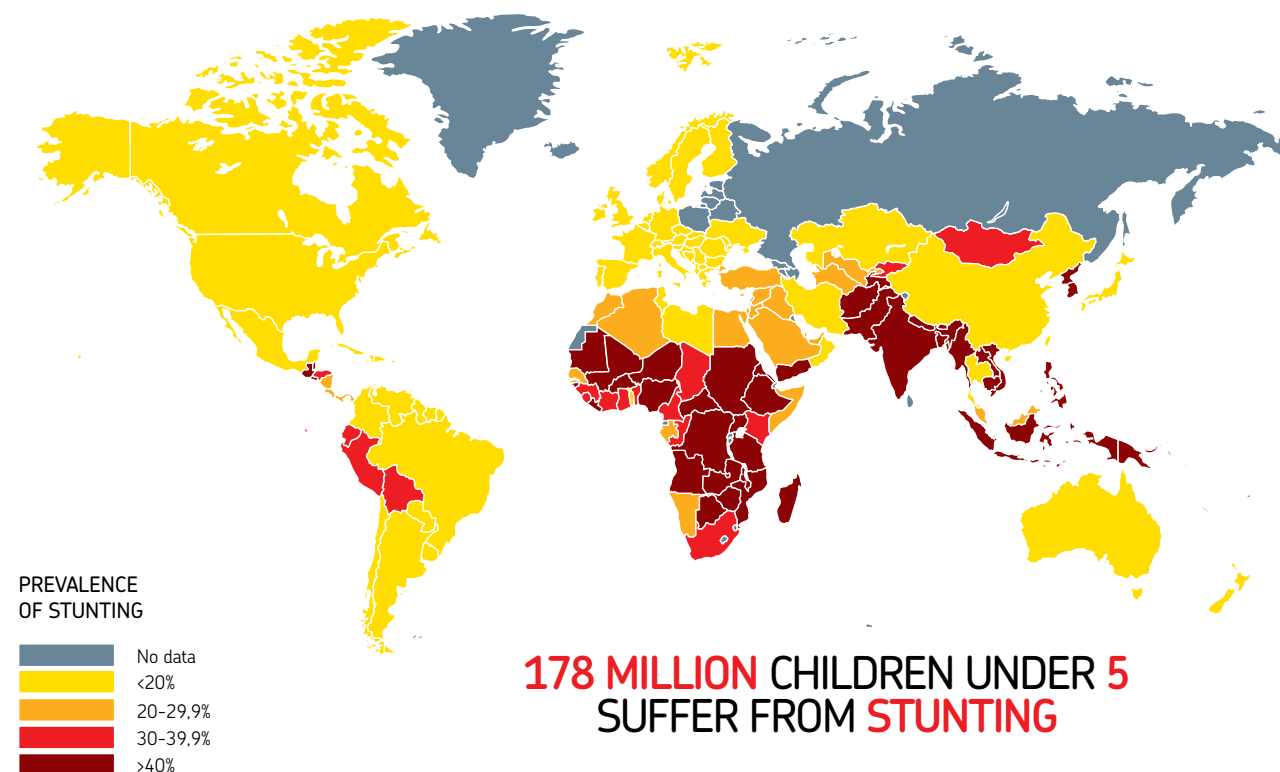
CHILDREN WITH MAM
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THEY MAY PROGRESS
TO SEVERE ACUTE
MALNUTRITION (SAM)

3.4 CHRONIC MALNUTRITION

THE CONDITION OF CHRONIC MALNUTRITION IS THE PRODUCT OF THE LACK OF BASIC NUTRIENTS DURING PREGNANCY AND THE FIRST 2 YEARS OF LIFE, AND HAS IRREVERSIBLE EFFECTS ON DEVELOPMENT, GROWTH AND THE PHYSICAL AND MENTAL HEALTH OF THE CHILD

The relationship between malnutrition and poverty is not constant, but it is recurrent: 80% of chronically malnourished children (178 million, according to 2008 estimates) live in 24 countries around the world. Of these, 14 are among the poorest (LDC, Less Developed Countries); and in 7 (Afghanistan, Ethiopia, Madagascar, Malawi, Rwanda, East Timor, and Yemen), 50% or more of the children aged 0 to 5 are chronically malnourished (UNICEF, *State of the World's Children Report 2011*, Statistical Annex). Chronic malnutrition is the product of a lack of basic nutrients during pregnancy and the first 2 years of life (undernourished mothers, or undernourished and/or ill-fed children). It has irreversible effects on the development, growth, and the physical and mental health of the child. In many cases, when there are adverse cycles (recurrent droughts, rising food

Figure 3.6. Where chronically malnourished children live



Source: Lancet Series on Maternal and Child Undernutrition, 2008.

prices, war, natural emergencies), the condition of chronic malnutrition in children rapidly evolves into forms of severe acute malnutrition, with very high risk to the lives of children. Even when this does not happen, chronic malnutrition can result in poor learning ability at school, which affects the ability to work and earn a living in adult life. Thus, this helps to perpetuate the vicious cycle of poverty in these countries. And this happens despite known interventions that are relatively simple, with an excellent cost/benefit ratio, that could substantially reduce these forms of malnutrition.

Countering the effects of chronic malnutrition, but also preventing it, is the focus of UNICEF's intervention in the medium and long term, because this requires no action spots. Instead, this requires the promotion and progressive adoption by governments and local communities of sustainable interventions in the context of a "continuum of care" that starts with the women of childbearing age and continues through pregnancy, childbirth, breastfeeding, and weaning up to the first 5 years of the child's life. These interventions must provide nutritional support during pregnancy, the fight against malaria and diarrhea (which aggravate malnutrition), attendance at birth, breastfeeding promotion, nutrition education at the level of families and communities, supplementation of micronutrients (especially vitamin A, iron and folate, zinc, and iodine), and the monitoring of infectious diseases.

The role of breastfeeding

In most developing countries, less than half of the newborn babies can enjoy exclusive breastfeeding from birth to 6 months, as recommended by UNICEF and WHO, since it is estimated that inadequate (suboptimal) breastfeeding practices are responsible for 1.4 million child deaths and 10% of the DALYs in children 0 to 5 years of age. Exclusive breastfeeding for the first 6 months of life, which is then continued with complementary foods, remains the single most effective measure for the survival of the child. (*Lancet Series on Child Survival*, June 2003).

However, in addition to the massive promotion of artificial feeding at the expense of breastfeeding, in many traditional cultures there are taboos or prohibitions preventing the child from receiving colostrum. Instead, the child is fed a substitute of water and sugar, which affects the success of breastfeeding because of water that is often polluted, and the deprivation of the essential elements contained in the colostrum. In many cultures, women who are pregnant or nursing do not consume animal protein, thus undermining the quality of nursing. The correct choice of foods for weaning is also central to the health of the child and in preventing malnutrition.

Micronutrient deficiencies

Micronutrient deficiencies are a global health problem. It is estimated that over 2 billion people worldwide are deficient in essential vitamins and minerals. The main deficiencies relate to vitamin A, iodine, iron, and zinc. Most of these deficiencies occur together and are concentrated in the poorest countries, with a map that largely overlaps (but not completely) that of chronic malnutrition. The deficiencies of vitamin A and zinc are estimated to respectively cause 0.6 million and 0.4 million deaths per year, and jointly more than 9% of global childhood DALYs. Instead, iron deficiencies weigh heavily on maternal mortality, causing 115,000 deaths per year and 0.4% of DALYs (*Lancet Series on Maternal and Child Undernutrition*, Jan. 2008).

COUNTERING THE EFFECTS OF CHRONIC MALNUTRITION, BUT ALSO PREVENTING THEM, DOES NOT REQUIRE SPOT INTERVENTIONS, BUT RATHER THE PROMOTION AND PROGRESSIVE ADOPTION BY GOVERNMENTS AND LOCAL COMMUNITIES OF SUSTAINABLE INTERVENTIONS IN THE CONTEXT OF A "CONTINUUM OF CARE"

Multi-micronutrients preparations/food supplements frequently used to address major deficiencies in micronutrients

- Plumpy'doz: Similar to Plumpy'nut, but not in a single-dose packaging, to be used for the integration of food at home or in the community.
- Nutributter: Food supplement of micronutrients, vitamins, and minerals that is spreadable and fatbased.
- Sprinkles/Vita Shakti: Marketed under various names and with different compositions, this is a mixed powder (MNP, or "multiple micronutrient powders") to be added to semiliquid foods, which contains a mix of supplements: B vitamins, vitamin A, iron and folate, iodine, and zinc. These are used with good results on mothers and children on a daily basis, under the control of local volunteers (e.g., in Southeast Asia), substituting the periodic administration of single tablets and syrups.
- Foodlet: Tablets made from milk powder enriched with micronutrients to be ground and mixed in the food, with vitamins, iron and folate, copper, zinc, and iodine.
- United: Mixture of corn flour and soy enriched with vitamins, calcium, zinc, iron, copper, and iodized salt. It should be cooked in water and can easily be produced on site. It was widely used in the past, but is now used mainly in food emergencies and for conditions of MAM.
- BP-5: Cookie-shaped food with high nutritional value, rich in protein, carbohydrates, fats, vitamins, and minerals, specifically designed to be distributed during emergencies.



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These are deficiencies resulting from the non-availability of micronutrient-rich foods such as fruits, vegetables, animal protein, and fortified foods, often too expensive or unavailable in the area.

These deficiencies can contribute to chronic malnutrition and/or cause specific diseases (gout, pellagra, beriberi, scurvy, rickets, etc.). The groups most vulnerable to micronutrient deficiency are pregnant women, lactating mothers, and young children, because they have a greater need for vitamins and minerals and are more vulnerable to the effects of the deficiencies. In practice, this means a greater risk of death for pregnant women and of giving birth to a newborn that is underweight or mentally handicapped; for breastfeeding women, their nutritional condition influences their ability to breastfeed and continue breastfeeding at least until the second year of life.

Their micro-nutritional condition determines the health and development of their child, especially in the first 6 months of life. In early childhood, micronutrient deficiencies increase the risk of contracting diseases such as measles, malaria, and pneumonia, and a decreased resistance to diarrhea in children, making them potentially fatal (WHO Health Report, 2011). These deficiencies can also cause permanent disabilities that threaten the development and learning ability of children.

The actions recommended by the scientific community and WHO, WFP, and UNICEF include vitamin A supplementation in infancy and early childhood, preventive supplementation with zinc, the distribution of iron and folate to pregnant women, and iodized salt universally (WHO, UNICEF, WFP, *Preventing and Controlling Micronutrient Deficiencies in Populations Affected by an Emergency*, March 2006).

A cohort study of mothers and children from 36 countries where 90% of the children had a delay in linear growth showed that this package of interventions can reduce the stunting at 36 months of age by 36%, mortality at ages 0 to 36 months by 25%, and about 25% of the DALYs associated with stunting, wasting, intrauterine growth restriction, and micronutrient deficiencies (*Lancet Series on Maternal and Child Undernutrition*, Jan. 2008, paper 3).

To eliminate the delay in long-term growth, these interventions will never be sufficient unless improvements concerning the basic causes of malnutrition are made, such as reducing poverty, improving education, reducing disease, improving health services, increased access to water, and the greater empowerment of women.

In the fight against micronutrient deficiencies, UNICEF operates on a large scale with various formulations of supplements, adapted to different social and cultural contexts: vitamin A tablets, iodized salt, iron and folate, zinc supplements, Sprinkles, and other multi-micronutrient fortified foods (especially for adult populations). Results of some recent research in Asia (*Workshop Report on Scaling Up the Use of Multiple Micronutrient Powders*, Bangkok, 28 April to 1 May 2009, UNICEF, cosponsored by U.S. CDCP) and in Latin America (*Workshop Report on Scaling Up the Use of Multiple Micronutrient Powders*, Mexico City, 1 to 4 June 2010, UNICEF, cosponsored by U.S. CDCP) demonstrate significant benefits arising from the use, in particular, of mixtures of multi-micronutrients (Sprinkles, etc.) for pregnant and nursing women and for children from 6 months to 5 years of age—which the WHO, WFP and UNICEF have been recommending for use in emergency situations since 2007.

Vitamin A deficiency

Vitamin A deficiency is a nutritional problem that is extremely widespread. Over the years, the percentage of children ages 6 to 59 months covered by the supplementation of vitamin A has more than doubled, to reach 77% (data does not include China). In the Less Developed Countries (LDC), coverage went from 41% to 88% between 2000 and 2008 (UNICEF,

TO ELIMINATE THE DELAY IN LONG-TERM GROWTH, THIS WILL NEVER BE SUFFICIENT UNLESS IMPROVEMENTS ARE MADE CONCERNING THE BASIC CAUSES OF MALNUTRITION, SUCH AS REDUCING POVERTY, IMPROVING EDUCATION, REDUCING DISEASE, IMPROVING HEALTH SERVICES, AN INCREASED ACCESS TO WATER AND GREATER EMPOWERMENT OF WOMEN

TODAY THE PERCENTAGE OF FAMILIES THAT CONSUME IODIZED SALT IN DEVELOPING COUNTRIES HAS RISEN FROM LESS THAN 20% (IN 1990) TO OVER 72%, BUT THERE IS STILL A 28% OF FAMILIES THAT DOES NOT CONSUME IT, INCLUDING AN ESTIMATED 41 MILLION CHILDREN EACH YEAR WHO ARE NOT COVERED FROM THE RISK OF INADEQUATE IODIZING OF SALT

Tracking Progress on Child Maternal Nutrition, 2009; UNICEF, State of the World Children Report 2011).

Severe forms of vitamin A deficiency can cause blindness and greatly increase the risk of infant mortality, because it decreases the resistance to infectious diseases such as measles, diarrhea, and acute respiratory infections. Numerous studies have confirmed the efficacy of vitamin A supplementation in the neonatal period, showing that it can reduce the mortality of children under 6 months by up to 20% (*Lancet Series on Maternal and Child Undernutrition*, Jan. 2008, paper 3), which confirms that it is one of the most effective interventions in reducing child mortality.

The fight to overcome this deficiency has made great progress, especially with the single-dose administration of supplements in capsules, at a cost of 2 cents each, in conjunction with childhood immunizations. But also the enrichment of flour and other basic foods, the diversification of the diet, and the promotion of breastfeeding are also important tools for the prevention of deficiency.

UNICEF currently provides 95% of the vitamin A capsules distributed to nursing women and children worldwide in conjunction with their vaccination campaigns.

Iodine deficiency

Iodine deficiency is the most emblematic example of possible, proven, and low-cost interventions. It is a fundamental cause of physical and mental retardation, permanent brain damage, gout, or thyroid gland malfunction. It can affect the fetus and children in the earliest years of life; it also contributes to an increased risk of prenatal and infant mortality and low birth weight. Often children born to women with iodine deficiency appear normal, but have actually suffered brain damage that will accompany them throughout their lives (such as cretinism).

A deficiency in iodine can be prevented by the equivalent of 1 teaspoon of iodine, which costs about 5 cents, consumed in micro quantities during the entire lifetime. Iodized salt, a solution also widely used in industrialized countries, was promoted by the World Summit on a global scale in 1990. Today the percentage of households consuming iodized salt in developing countries has risen from less than 20% (in 1990) to over 72%, but 28% of households still do not consume it, including an estimated 41 million children each year who are not protected from the risk of an inadequate intake of iodine suggested over iodized salt.

For over 40 years, UNICEF has been promoting the use of iodized salt, forming women's cooperatives and local groups for this purpose, to which it provides the simple equipment needed along with stocks of iodine, educating the community with information campaigns and putting pressure on governments to make it mandatory for all the salt on the market to be iodized. Other agencies and organizations participating in this effort: WHO, IC-CIDD (International Council for the Control of Iodine Deficiency Disorders), Micronutrient Initiative, World Bank, Kiwanis International, as well as many associations of teachers and consumers around the world. Iodine deficiency continues to be a major public health problem, even though there are many "success stories": In a single decade (1990 to 2000), China increased its use of iodized salt from 39% to 95%; Jordan from 5% to 90%, and Bangladesh from 20% to 70%. Peru and some Andean countries, Nigeria, and Kenya are other examples that have demonstrated the effectiveness of this approach.

Iron deficiency

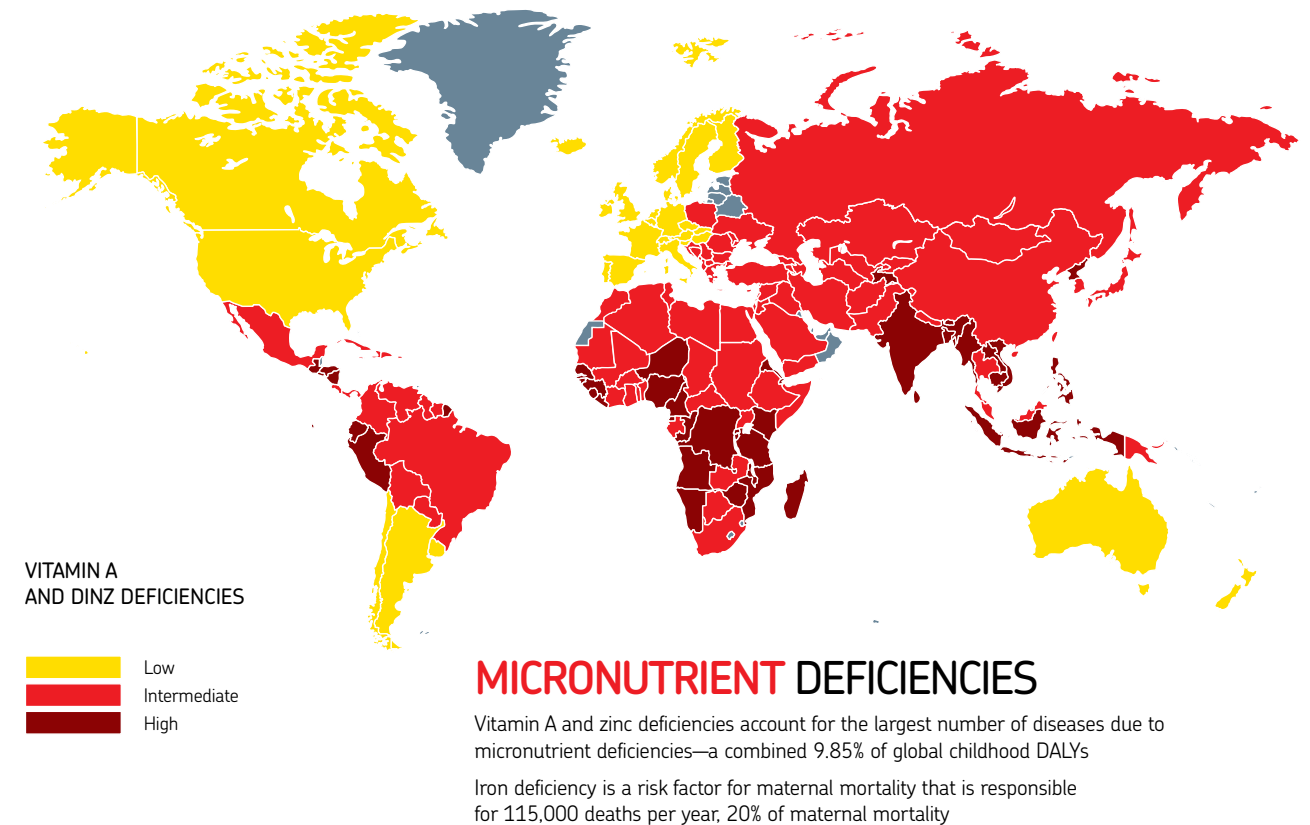
Iron deficiency is a major nutritional problem: 25% of the world's population suffers from it, most of which consists of preschool-age children and women. 42% of pregnant women and 47% of children ages 0 to 5 are deficient in iron. Progress in this area has been significantly lower than that reported on the lack of iodine and vitamin A (*Lancet Series on Maternal and Child Undernutrition*, Jan. 2008). Anemia increases the risk of hemorrhage and sepsis during pregnancy and is responsible for 115,000 deaths per year, equivalent to 20% of the mortality from pregnancy and childbirth (*Lancet Series on Maternal and Child Undernutrition*, Jan. 2008). In addition, anemic women can give birth to premature and/or underweight infants, who are more exposed to infection, with lower immunity and the risk of physical and mental retardation. Children are anemic when they have not received sufficient iron intake during pregnancy and lactation, due to the poor nutrition of the mother. Malaria in pregnancy and early childhood also worsens the state of anemia, raising the risk of mortality.

Interventions, therefore, focus on the administration of iron to pregnant and breastfeeding women, reducing the risk of maternal anemia and a low birth weight. Iron is typically administered with folic acid, which prevents serious damage to fetal neural tube defects such as spina bifida and anencephaly.

Given the interaction with malaria, UNICEF promotes the inclusion of the administration of iron and folate and antimalarial remedies together with the distribution of mosquito nets impregnated with insecticide. This is the standard protocol of prenatal visits at health facilities, especially at the community level, in all countries of Sub-Saharan Africa, where malaria and anemia are endemic and where integrated strategies to combat infant mortality have been implemented.

INTERVENTIONS, THEREFORE, FOCUS ON THE ADMINISTRATION OF IRON TO PREGNANT AND LACTATING WOMEN, REDUCING THE RISK OF MATERNAL ANEMIA AND LOW BIRTH WEIGHT; GENERALLY, IRON IS ADMINISTERED IN COMBINATION WITH FOLIC ACID, WHICH PREVENTS SERIOUS DAMAGE TO THE FETAL NEURAL TUBE

Figure 3.7. Micronutrient Deficiencies



Source: *Lancet Series on Maternal and Child Undernutrition*, 2008.



Chronic malnutrition and micronutrient deficiencies: West and Central Africa

In 2008, in West and Central Africa (24 countries), there were over 15.9 million malnourished children: 1 out of 4. Only 3 countries in the area (Congo, Ghana, and Guinea-Bissau) are on track to achieving MDG 1; these and other countries, such as Benin and Senegal, are in fact showing that a substantial improvement is possible even in the face of persistent poverty. In the region, only 22% of children under 6 months are exclusively breastfed. Although 70% of children between 6 and 9 months of age receive complementary foods, the quality of these and the frequency of intake is inadequate. UNICEF promotes an integrated approach that includes interventions of communication for development that is aimed at changing individual behavior and social norms, the optimum use

of locally available food resources and better access to quality food for poor families, the administration of micronutrients and fortified foods, and, when necessary, therapeutic food (RUTFs). Programs administering vitamin A twice a year, with a $\geq 80\%$ coverage (such as those carried out in many countries in 2009), are combined with other interventions such as vaccination, deworming, distribution of insecticide-treated nets, and the screening of acute malnutrition.

The most promising strategy to provide this integrated package of interventions through the health system in a sustainable way is by establishing Child Health Days or Weeks twice a year. In recent years, almost all of the countries have updated their national protocols for the management of acute malnutrition.

4. FINAL RECOMMENDATIONS



4.1 PROMOTE HEALTHY LIFESTYLES AND EATING HABITS IN WESTERN COUNTRIES

IF THE TRENDS IN EATING HABITS AND LIFESTYLES THAT HAVE BEEN IMPOSED IN THE WORLD WITH DRAMATIC SPEED IN RECENT DECADES ARE NOT REVERSED, FUTURE GENERATIONS WILL BE INEXORABLY CONDEMNED TO LIVE WORSE THAN THOSE THAT PRECEDED THEM

All the data – by now also for those geographic areas such as Italy, historically regarded as the homeland of correct food choices and healthy life – shows a rapid, inexorable deterioration of the current average health conditions and those expected in the future. If the trends of eating habits and lifestyles that have been imposed in the world in recent decades with dramatic speed are not reversed, future generations will be inexorably condemned to live in worse condition than those that came before them. Not many cases in modern history have registered such a marked reduction in the quality of life and in the average health conditions as that which – in light of the data – is expected within the next 10-30 years, when the current generations of children and adolescents will have reached adulthood and those who are now adults will become the new segments of the population aged over-65.

If we do not begin – right now – to change our habits regarding the lifestyle and diet of the present generations, starting from childhood, what will we be able to do when all the phenomena associated with the healthcare linked to them unfold their full potential of adverse effects?

This means that strategies and initiatives – with a medium- to long-term projection – must be defined and shared, and also combined with immediate results that have an impact in the near future. We need concrete steps to be enacted immediately.

In light of the evidence that has emerged during the analyses and the reflections that have been made, it is possible to highlight at all levels the importance of adopting healthy and balanced eating habits early in life (up until adolescence) for the purpose of maintaining good health in adulthood:

- a healthy diet and the adoption of an appropriate lifestyle allow the child and adolescent to achieve correct development (physical and mental) and to stay healthy;
- a proper process of growth and development related to a healthy diet provides positive effects for the prevention of risk factors of major chronic diseases in adulthood;
- it is likely, although difficult to test scientifically, that there is a beneficial “memory effect”- that through the acquisition of correct eating habits and lifestyle in childhood/youth, their maintenance is also facilitated in adulthood.

Moreover, in recent years, awareness has increased significantly, both scientifically and socially, of the important role played by the prevention of disease. With a key fact: prevention is even more important when dealing with issues of the health and growth of future generations.

The evidence in favor of the exceptional importance of healthy and balanced eating behavior from an early age is, from the perspective of prevention, in fact undeniable.

In light of these reflections on the premise, we believe more than ever that it is necessary to:

1 Promote the furthering of in-depth scientific knowledge

As anticipated, the nutritional problems related to growth have been investigated relatively little. In this regard, it is particularly important to:

- investigate the metabolic and endocrine effects that follow the eating of food and meals of different composition, with particular reference to those eating patterns that are consistent with the approved international indications and guidelines for a healthy diet, such as the Mediterranean model or Japanese style food. The anatomical-functional consequences of the different metabolic conditions that are established in the post-prandial phase are very important in the development of chronic degenerative diseases. The data available to date on this information concerning the child are very limited;
- investigate the short-, medium- and long-term effects of environmental pollutants on the metabolism, immunity and neuroendocrine systems. There is increasingly alarming data concerning the impact that the harmful substances in the environment, and also in food, have on the metabolic balance of children and young people;
- investigate the association between specific nutritional factors, the composition of meals and the diet, the distribution of nutrients within 24 hours, levels of physical activity, and the onset of major chronic diseases;
- investigate the role of physical exercise in the regulation of the quantity and quality of food intake in the child;
- investigate the relationships between particular gene structures (polymorphism), eating habits, postprandial metabolic responses and metabolic diseases in children.

2 Structure interventions according to the best international practices

Although the degree of scientific knowledge on the subject is still far from optimal, the wealth of experience accumulated in the formulation of concrete measures for improving the nutritional approach at a young age is nevertheless significant.

In particular, there are some principles that are well-established and generally accepted, though not always adequately considered/implemented when intervening in a growing child's diet and health:

- plans must be formulated with a long-term horizon. In fact, radical change (and in some cases, reversal) must be made with regard to the trends found in current lifestyles. This requires programs that must be defined with a very broad time horizon, and accompanied by adequate financial resources, with the certainty that the investments will also be able to provide substantial economic returns over time. Interventions that are too limited (in time and cost), oriented only to the present, do not seem capable of having a lasting impact on the eating habits of families;
- the issues related to nutrition and lifestyle should be addressed by an approach that combines information and experience (“active learning”). Experimentation is certainly the most effective way when dealing with children. The way to a healthy diet is also one step in an educational process that helps to create awareness through the formation of a taste that can appreciate foods traditionally considered “difficult” but which are essential to health (such as fruits and vegetables, for example). The introduction of these foods according to a good experiential approach thus becomes crucial for perceptions and preferences that can be maintained even in adulthood;
- it is essential that the information provided be practical and workable. All too often, the instructions are correct but difficult to implement or are contradicted by objective practices and habits, even institutionalized ones, that are very far from the principles indicated as optimal. In this latter regard, just consider that school buildings and pediatric hospitals

INVESTIGATE THE METABOLIC AND ENDOCRINE EFFECTS AFTER EATING FOOD AND MEALS OF DIFFERENT COMPOSITION, WITH PARTICULAR REFERENCE TO THOSE DIETARY MODELS THAT ARE CONSISTENT WITH THE APPROVED INDICATIONS AND GUIDELINES FOR HEALTHY EATING, SUCH AS THE MEDITERRANEAN MODEL

INTERVENTIONS THAT ARE TOO LIMITED (IN TIME AND COST), ORIENTED ONLY TO THE PRESENT, DO NOT SEEM CAPABLE OF HAVING A LASTING IMPACT ON THE EATING HABITS OF FAMILIES

THE GUARANTEE OF A CORRECT WAY OF EATING FOR CHILDREN AND ADOLESCENTS APPEARS NECESSARILY TO COME FROM THE IMPLEMENTATION OF A COLLECTIVE EFFORT, THE OUTCOME OF THE CONTRIBUTION OF MANY PLAYERS (SCHOOLS, FAMILIES, PEDIATRICIANS, ETC.) WHO TAKE CARE OF THE CHILD AT DIFFERENT TIMES IN THE DAY

have not yet completely removed vending machines containing only snacks/candy/sweets/soft drinks, and not any fruit, as would be desirable on the basis of information provided by the same medical-institutional sources that manage these places of public interest.

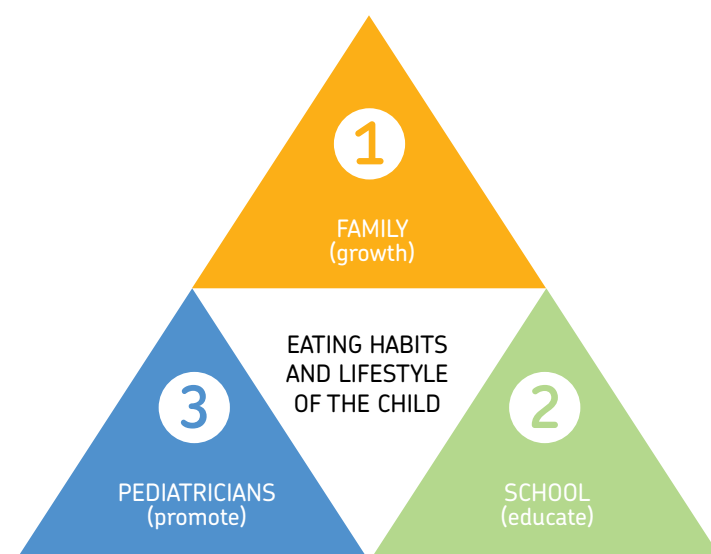
In general terms, it is hoped that interventions in the diet and health in the age of growth will have a national breath, with the necessary local variations, which – while differing in their form of execution – do not deviate in any way from the substance of the guidelines and principles set out at the national level and are continuously compared and exchanged internationally. It is noteworthy that there would be environmental benefits at the global level to the adoption of diets that emphasize fruits, vegetables and whole grains and restrict intakes of meat and energy dense highly processed foods.

3 Promote the spreading of correct information about food and promote a culture of prevention

It is necessary to further promote the importance of the role of nutrition in the early stages of growth for all healthcare providers and families, encouraging the active control of eating behavior (such as through widespread regular monitoring of the body mass index). In this context, pediatricians play a decisive role, having the possibility of more frequent visits made to the families as compared to family doctors, who then will take care of the adolescent at a more mature age. Health curricula in secondary schools represent an important avenue to reinforce those early messages.

Ultimately, with a transversal view concerning all the reflections and proposals, the guarantee for a correct way of eating for children and adolescents appears to necessarily pass through the implementation of a collective effort, the outcome of the contribution of many players (schools, families, pediatricians, etc.) who take care of the child at different times throughout the day.

If it is true that the behavior and choices regarding food and people's lives are crucial in order to obtain any positive change in the average level of health and well-being, it is also true – and this is the belief that the BCFN has matured in these years of work – that the individual, alone, cannot be the agent of the change in trends that arise from personal choices implemented over the past decades, but which have been influenced, encouraged or not adequately discouraged by a number of relevant actors on the stage of health and welfare.



The family and the school, for different reasons, appear to be the main operators of the effective work in forming a correct diet, addressed as much to the young – in perspective – as to the adults of tomorrow.

On the one hand, it is within the family that the child “learns” to eat food and internalize behaviors that he/she will be naturally led to adopt. On the other hand, it is the school – because of the growing importance of its presence with regard to food and its potential involvement with the families themselves – that must truly play an even more active role in promoting balanced eating habits, inviting the families to understand what the most appropriate food choices are and to “join forces” within a unified proposal for action.

Finally, a key player in the establishment of a virtuous food path and way of life is represented by the doctors, and in particular, pediatricians.

In particular, it is essential – especially in the future – for the role of family doctors and pediatricians to fully become – even more so than now – the first “gatekeepers” to emphasize the importance of proper nutrition and adequate physical activity for all the family members, in different stages of life (children, adolescents, adults, the elderly). Alongside the other major players that make up the core of the work of food information/address/prevention, emerging in recent years – with increasing awareness – is the role that the food industry has in contributing actively to the implementation of proposals and offers consistent with the indications for correct eating habits and lifestyles and in actively promoting their adoption.

The role of the agricultural-food industry is important in three areas: – in the promotion of healthy lifestyles and diet – from the earliest years of a person's life – through the definition and enactment of strategies of production and communications more in line with the indications emerging from the most reliable scientific studies on the relationship between diet, lifestyle and health, designed to respond appropriately to the diverse needs of people who, because of place and time, cannot easily follow proper eating habits;

- participation in and promotion of the improvement of the scientific knowledge available, through the promotion of investments in applied research and the creation of public-private initiatives which could lead to bridging the knowledge gap identified to date concerning the relationship between diet and health, especially in relation to the years of childhood and adolescence;
- improvement of communication processes in terms of the relationship between diet, lifestyle and health (with a particular focus on youth), easily and transparently disclosing the nutritional values of different foods and good diet rules through the various channels of communication available (the Internet, publicity, packaging, etc.).

If the role of the food industry is essential in relation to the emergence of a positive relationship between diet and health, at any age, its importance is even more evident when focusing on young people who are growing.

If childhood is characterized by a difficulty in real understanding by the child of the surrounding phenomena and the role food plays – which is entirely mediated and interpreted by the parents – the period of adolescence sees the gradual loosening of ties with the family practices learned early in life and the emergence of significant phenomena (both medical and social) in the life of the individual that are able to deeply influence lifestyles and eating habits.

In a context like this, the food industry is clearly one of the main actors for action regarding information and prevention aimed at children and adolescents that is truly comprehensive, integrated and effective. The food industry appears to have – in the

THE ROLE OF THE FOOD INDUSTRY IN ACTIVELY CONTRIBUTING TO THE DEVELOPMENT OF PROPOSALS AND OFFERS THAT ARE CONSISTENT WITH THE INFORMATION ON CORRECT DIET AND LIFE STYLES AND ACTIVELY PROMOTING THEIR ADOPTION

opinion of the BCFN – a primary role in providing appropriate responses to the different lifestyles of people, both through appropriately profiled product offerings and through consistent and responsible communication.

Finally, it is useful to highlight – in conclusion – that the BFCN has identified some concrete and active cases that have been successful in the practical translation of the information concerning the promotion of healthy lifestyles and food for growth. In particular, the “Epode” project in France appears to be a useful benchmark¹ and there is also the “Let’s Move” project launched by the Obama administration in the United States.²



4.2 EVALUATE THE EFFICACY OF INITIATIVES AND PROMOTE MEDIUM-LONG TERM STRUCTURAL INITIATIVES IN DEVELOPING COUNTRIES

1 Promote economic development related to agriculture to reduce hunger and malnutrition, and to improve access to food by the poor

It is undeniable that economic development plays a key role in the fight against hunger and malnutrition on a global scale.

Promoting initiatives that encourage economic development, in particular those relating to agriculture, is a necessary condition for supporting particular means of sustainable development. It is necessary to identify and disseminate practical tools and solutions – ones that are also credible and applicable in developing countries – with the goal of increasing agricultural productivity and access to food in those countries as well.

As discussed in the work carried out by the BCFN in 2010, in terms of agricultural productivity, the measures required in the next 40 years to support the growth of food consumption on a global scale is an essential factor in guaranteeing access to food all over the world and to all different age groups.

The challenge ahead is to innovate continuously toward the development of models of high agricultural productivity, higher quality and lower environmental impact.

In this sense, there are two useful lines of action:

- interventions of support should be promoted in developing countries that are aimed at achieving a state of food selfsufficiency and productivity in alignment with the level of the Western world through the transfer of scientific knowledge and best agricultural practices to these countries and through *ad hoc* programs which bridge the gap between today's knowledge in developed countries and in underdeveloped countries;
- the development and maintenance of “local systems” of production/distribution/consumption of food and agricultural goods must be encouraged through appropriate policies and incentives/disincentives, while preserving the quality of products and protecting their bio-sustainability. As well, taxes and commercial policies that are distorting world food markets, particularly to the detriment of developing countries, should be opposed.

These measures alone, combined with a more rational use of land, allow to obtain significant results.

One of the major issues currently being brought to the attention of the international community is that of the relationship, not always straightforward or well defined, between economic development and access to food, with the resulting impact on the reduction of hunger and malnutrition.

What is clear from a number of studies in developing countries is that the prolonged and sustained economic growth in these countries (India, China, Brazil, etc.) has not been able to respond appropriately to the undernourishment and malnutrition that affected the population even before their economic expansion.

PROMOTING INITIATIVES THAT ENCOURAGE ECONOMIC DEVELOPMENT, PARTICULARLY THOSE RELATED TO AGRICULTURE, IS A NECESSARY CONDITION TO SUPPORT REAL PATHS TO SUSTAINABLE DEVELOPMENT

THE DEVELOPMENT OF MICRO-CREDIT, AS DEMONSTRATED BY NUMEROUS STUDIES AND EMPIRICAL CASES, HAS A KEY ROLE IN REDUCING POVERTY IN RURAL AREAS. THE FINANCING OF SMALL FAMILY BUSINESSES IN RURAL AREAS OF DEVELOPING COUNTRIES CREATES ENORMOUS BENEFITS

One example is that of India, which in the last decade has impressed the world with its economic growth rates in a global context characterized by the conditions of stagnation and recession including that occurring in developed countries. The numbers are very clear: the average rate of growth in recent years was 9%, while this year, 2011, in the presence of the global crisis, it is nevertheless expected to be 8%. In this context of growth, it is becoming increasingly evident that the well-being of the population is not increasing at the same rate as the economic growth. Today, of about 1.2 billion people who live in India, approximately 700 million live on less than \$2 per day and 40% of the children are malnourished or underweight.

Some measures that should be expanded are:

- the introduction of fiscal and work schemes for the benefit of families living in rural areas of developing countries. In India, for example, programs have been implemented to promote employment of rural families, guaranteeing them a minimum of 100 working days per year;
- the expansion of initiatives such as the one organized by the International Business Leaders Forum,³ which arranged a “business call to action” by bringing together 35 general managers/CEOs of major Indian companies, with the aim of studying and implementing plans and business models in their own businesses that are more inclusive of the population;
- the development of microcredit, as demonstrated by numerous studies and empirical cases, has a key role in reducing poverty in rural areas. The financing of small family businesses in rural areas of developing countries creates enormous benefits. It has been shown that small loans on the order of U.S. \$100 to U.S. \$300 enable villages to irrigate fields more efficiently and significantly increase productivity, thus helping to reduce malnutrition and starvation in the rural population.

2 Establish stable and long-lasting interventions to fight against malnutrition in the world

Although in the past many programs for the development and promotion of health were mainly focused on the direct fight against disease, for the present and the future it is necessary to adopt an approach that shifts from the disease to the analysis and treatment of the disease’s direct and indirect causes. Among these, nutrition very often plays a prominent role.

The vicious cycle of lack of access to food and disease affects and, in turn, is influenced by many socioeconomic variables (education, living conditions, food prices, general health status, sociopolitical stability) that make the scenario of reference complex and multifaceted.

The list of variables directly or indirectly related to the hunger-disease relationship shows that there are some long-term phenomena and trends and some possible short-term events or shocks that are not entirely or not at all predictable and, therefore, are “unpreventable.” In no way comforting, the World Food Programme has estimated that in 100 cases of people defined as being “in conditions of undernourishment or malnutrition,” only 10% of them are tied to temporary shocks (civil wars, famines, epidemics, etc.), while 90% are linked to unresolved, long-term chronic situations.

This, in our opinion, is where the problem lies. International organizations, international agencies and private and public entities of different natures have gained significant experience in dealing with the temporary shocks related to earthquakes, epidemics, wars, etc. But once the acute phase of the crisis is over, the problems persist without a solution. In other words, time after time, a Band-Aid is applied to the most dramatic situations easing the public’s worry, but the phenomenon must be addressed in an organized manner and in terms of prevention, not just intervention in the most dramatic situations.

One of the problems is that, for example, when working with acute cases, cash donations to the countries in need are made so as to obligate the receiving country to buy, with those same resources, products and services from the donor country. In such a situation, it is self-evident that, in terms of resources, in the end nothing remains in the country that has suffered the shock, in terms of the ability to solve their problems independently in the future. The United Nations has underlined this problem⁴ and pointed out that this mechanism also damages the already weak local economy of developing countries. In fact, if there were not these constraints, the aid would give lymph to a local demand with induced labor, of know-how and prevention of new situations and similar shocks.

Consider, for example, that Eritrea was forced to spend its financial aid to buy goods and services from developed countries for constructing the railway network, even though there was already local expertise in place that could have been used at a much lower price.

3 Implement initiatives to enhance the social role and economic independence of women for the fight against malnutrition

The enhancement of women’s social role and their economic independence plays a key role in ensuring proper nutrition for children. This could help avoid situations like those that occur in developing countries where it is often impossible to emancipate women. It could also help women with personal needs and their desire for education, or assist the 50% of pregnant women who experience a shortage of iron, with the consequent risk of bleeding during childbirth.

The level of empowerment and emancipation of women is linked to the matter of equality between the sexes. Therefore, initiatives and actions aimed at reducing and/or eliminating discrimination between the sexes can help reduce the problem of malnutrition in developing countries, in that UNICEF has shown that women have a vital role in reducing malnutrition in children.⁵

The increase of female participation in the work world, stimulated by encouraging female entrepreneurship, actively contributes to economic growth and income distribution, especially among the younger female population.

Therefore, it is clear that women could play a fundamental role in reducing hunger and child mortality, since they are central to the task of raising children.

However, in order to be at the center of a significant change in the fight against hunger and death, women should be:

- put in the position to know the risks associated with the adoption of an inadequate or incorrect diet, especially for infants and children under 5 years of age;
- instructed in the techniques and basic operations that in a short time would significantly increase agricultural productivity;
- adequately informed regarding the practices of basic sanitation;
- endowed with a socioeconomic status, which too often is still denied to them in many developing countries.

The reality of women in developing countries, despite some efforts that have been made at the international level, is not perceived at present in an appropriate manner in all its centrality: much remains to be done to understand and exploit the full potential that policy aimed at the education and involvement of women could have in many difficult situations from a social and economic standpoint.

THE SOCIAL VALUE OF WOMEN’S ROLE AND THEIR ECONOMIC INDEPENDENCE PLAY A KEY ROLE TO ENSURE PROPER NUTRITION FOR CHILDREN

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CHAPTER 1

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