Causes of Hidden Hunger

3

Even Hunger Needs Quality: Not Just Quantity!

Quality of Food

When we talk about high quality food in rich countries, we tend to think of products that are meticulously prepared, are particularly delightful to eat, or have special ingredients that we consider to be of a higher quality in comparison to those in similar products. This definition of quality is of mostly no interest to people living in countries with mass nutritional problems, although it is precisely here that this issue is of life and death importance. Quality in this case means, first and foremost, that food contains the essential micronutrients (i.e., vitamins, trace elements) and amino acids (protein building blocks).

Food quality can be calculated by means of the ratio of essential components (i.e., the percentage of the RDA) versus the number of calories (i.e., percentage of the recommended amount). This ratio, which is referred to as 'nutrient density', tells us how well adapted a particular food is for supplying micronutrients. The daily diet of individual persons or entire groups can be assessed using this ratio as a basis.

Food quality, or to put it another way, nutritiousness, is a fundamental part of food security and, as such, the basis for each person's nutritional requirements.

Food Security

If we define healthy food as that which has everything our body needs to maintain a good state of health, then the flip side, unhealthy food, are products which lack

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these vital nutrients (micronutrients, amino acids). Thus, when choosing what we eat, it is necessary that we have a variety of foods in our diet to ensure that we get all of the necessary amounts of micronutrients and amino acids.

Therefore, it is necessary for us to know what food we buy and eat contains and balance our diet to make sure that we receive enough calories, but that the RDAs for the different nutrients are met. The former involves nutrient density, the latter diet diversity. Provided that a wide variety of foodstuffs is available, a person must be in a position to first identify the nutrients contained in products (through proper education) and second to purchase them (by having enough money). Together, nutrient density and diet diversity make up food security.

Food security describes a situation in which all people have access to and the financial means to purchase safe, nutritious food that meets their own individual needs and tastes and ensures them an active and healthy life on a constant basis (FAO 2002).

This definition rests upon four fundamental pillars, the fourth of which was only added recently:

- availability of food,
- access to food,
- food quality (nutritiousness),
- stability of food prices.

The FAO's definition of food security includes the goal and hopeful vision of providing food to all hungry people on the one hand and the inherent dilemma contained within this vision, including many hurdles on the other hand. Food security for the entire world population is an ambitious goal, if not a completely utopic vision. Depending upon how this definition is applied to specific countries or population groups, one or more of the pillars will be missing. The causes of hidden hunger are closely tied to this four pillars.

The Four Pillars of Food Security

First Pillar: Availability of Food

The availability of food first and foremost means that a particular foodstuff is on hand to be purchased. It is dependent upon a variety of factors which are barely influenced by those who purchase the products. One such influencing factor is whether it is grown or produced locally or imported from another location. This is especially relevant in African countries where high transportation costs and especially challenging transport routes (i.e., poor road conditions, reduced technical possibilities, legitimate, and arbitrarily drawn borders) greatly affect

availability. The question of whether a particular foodstuff could be transported or locally grown is in turn dependent on the climate, the season, the quality of soil, and the technical possibilities available. One reason that certain products are not sold is because they cannot be supplied to the markets of local communities. Many markets have a limited assortment of produce because the potential buys cannot afford to purchase such products and there is thus no demand for them. In addition, the produce of local farmers cannot compete with cheaper imports—cheaper because of subsidized farming and pressure to keep import taxes low. Local farmers also have nothing left after they have provided food for their own families. Such a limited variety means that the assortment of food necessary for maintaining a balanced diet, one which contains sufficient amounts of vital micronutrients, is not available.

In short, availability of food simply means that various foodstuffs are able to be purchased by consumers. This conforms to the right of individuals to food, but falls short of fulfilling their right to nutrition. Whether or not the right to a balanced diet can be fulfilled or not depend on the second pillar: access to food.

Second Pillar: Access to Food

Access to a particular foodstuff means that it is both available and can be acquired by a person, for example by paying cash, bartering, or performing a service. The easiest way to accomplish gain access to a particular foodstuff is to successfully produce it yourself. The same is of course true with regard to availability. The best produced and most varied assortment are of no use to hungry persons who are hampered from purchasing the items because either war or transport issues prevent them from making it to market or due to the fact that they simply cannot afford to purchase the products.

The availability of food, as well as access to it, provides no guarantee whatsoever that the food itself fulfills its purpose, i.e., that it is sufficiently nutritious. That brings us to the third pillar.

Third Pillar: Quality of Food—Nutritiousness

The nutritiousness of food is the most important pillar in the concept of food security. Without it, a healthy, balanced diet is unthinkable. In this context, nutritiousness means that food has a high enough nutrient density, meaning that it contains sufficient amount of essential micronutrients, which can also be absorbed by the body (bioavailability). Since there is hardly any one single foodstuff that can supply a person with all of the essential nutrients that he or she needs, a person's diet needs to be balanced in order to ensure nutritiousness. This is what is meant by diet diversity.

Micronutrient-Rich Foods

If we classify food into different groups based upon how many micronutrients it can potentially supply and how much of it should be consumed daily, it quickly becomes clear that animal-based foods are of particular significance.

The foods listed in Table 3.1 only need to be consumed in small portions (<100 g) to fulfill the recommended daily allowance for specific micronutrients. Naturally, other foods also contain the respective micronutrients, but these must be eaten in larger quantities to provide a sufficient amount of micronutrients. Concerning the micronutrients which are essentially responsible for hidden hunger, there are only a very few sources which supply a sufficient amount. The most important source of vitamin A is liver, followed by fatty fish, such as eel and egg yolk. A good source of zinc is again liver, and, to a certain degree, meat and various types of cheese. It is more or less the same situation with iron. Liver once again tops the list of sources. Iodine comes primarily from fish and algae, which also are a good source of fatty acids and vitamin D. The list goes on and on. Yet, it does not take an enormous amount of imagination to realize that the foods just mentioned rarely find their way onto the tables of poorer families, if they make it there at all.

Worldwide 75 % of all calories (kcal) consumed come from wheat, corn and rice. More than 50 % of the protein eaten comes from foods with low nutritional

Table 3.1 The best sources (100 % RDA <100–150 g) of vitamins, as well as minerals and trace elements

Water-soluble vitamins	
Vitamin B1	Pork
Vitamin B2	Liver, milk
Vitamin B6	Germ buds
Niacin	Calf's liver, grain
Biotin	Liver, soybeans
Panthotenic acid	Liver
Folic acid	Liver, eggs
Fat-soluble vitamins	
Vitamin A	Liver
Vitamin E	Oils
Vitamin D	Fish
Vitamin K	Germ buds, Brussels sprouts, chives
Minerals and trace elements	
Iron	Meat, liver
Selenium	Meat
Magnesium	Germ buds, wheat bran
Zinc	Germ buds, animal-based food

value: wheat, corn, rice, millet, rye, oats, and barley. This kind of diet has very little in common with our evolutionary roots. 15,000 years ago, and prior to that as well, cereals were more of a secondary source of nourishment. People had a diet based on fish, meat and, depending on availability, sweet fruits, leaves, and roots. This apparently provided prehistoric peoples all of the daily amounts of micronutrients they needed over a very long time period. The switch to eating more grain which took place roughly 12,000 years ago was a move that prevented starvation since grain can be stored, yet it also reduced the amounts of micronutrients that people were getting in their daily diets. Studies of skeletons and teeth that date from around this time have revealed signs of the degenerative effects of this change for the very first time. At the same time, this was also a period when food began to be traded as a commodity between those who had rich stores of it and those who were dependent on acquiring it.

Even today grains supply 80 % of the energy and 60 % of the protein which people consume, particularly in poorer parts of the world. If 80 % of the calories one should consume come from grain, then there is only a little room left for high quality, micronutrient-rich food. Ironically, the end result is that people are 'full', yet suffer from undernourishment since their micronutrient reserves are empty. Part of this has also to do with the fact that the few micronutrients which grain does supply are poorly absorbed by the body.

Bioavailability of Iron and Zinc from Plant-Derived Food

How nutritious food is provided that it is at all, essentially depends on whether or not the micronutrients it contains can be absorbed by the intestines. The best example to illustrate this fact is pro-vitamin A found in carrots. If a carrot is eaten raw, the body is less able to absorb the β-carotene, which then results in a very low amount being absorbed due to the cellulose capsules which surround it. The β-carotene only becomes bioavailable once the carrot has been cooked or pressed to extract the juice.

The same situation applies to a variety of other micronutrients, particularly the ones which are vital to the body. Various types of grain and beans contain rather high concentrations of iron and zinc compared to other plant-based foodstuffs. Studies have shown, however, that iron absorption from soybeans, black beans, and peas is very low. Only about 0.5–4 % of the iron contained in them is able to be absorbed by the body. The figures for zinc are slightly higher. Here the absorption rate from grain is between 10–20 % (Gibson 1994). As a result, the staple foods eaten by children, especially in developing countries, provide hardly any of these two micronutrients which the body can absorb in adequate amounts.

Iron coming from plant-based food is particularly tricky to absorb. Such iron is nonheme, meaning that it is not attached to hemoglobin, and it is 10–20 times more difficult for the body to absorb than heme–iron from animal-based products.

An important factor in the poor absorption rate of the both elements is phytic acid, which is found in grain and binds itself to both minerals in the intestines. Tests conducted with a type of enzyme known as phytase, which neutralizes phytic

acid or reduces its level of activity, showed that it can actually be used to increase bioavailability (Ael-M et al. 2011; Sandberg 1991). Phenolate compounds which bind with iron and are found in millet inhibit the absorption of plant-based iron. Studies using various models have concluded that the bioavailability of iron from millet and grain lies somewhere between 3–15 % (Lestienne et al. 2005).

Studies that examined the iron content of food eaten by children in Uganda showed that fish and meat could very well be utilized as good sources (Tidemann-Andersen and Acham 2011), with concentrations varying between 1–12 mg/100 g for iron and 0.5–2 mg/100 g from zinc. Sorghum, a type of millet used to make bread, may contain up to 70 mg of iron per 100 g, depending upon the variety. Yet despite this high concentration of zinc, the authors of the study come to the conclusion that the primarily vegan diet of most Ugandans makes it very difficult for them to meet the RDA for iron and impossible to meet that of zinc.

Millet is an important staple food for many African populations. The most common variety is pearl millet, also known as finger millet in East and South Africa. Pearl millet contains a high concentration of iron (100 mg/100 g) and an adequate concentration of zinc (2 mg/100 g). In comparison, wheat has more zinc (3.5 mg/100 g), but contains very little iron (4 mg/100 g). Studies conducted in different African countries showed that, despite the high concentration it contains, millet is a poor source of iron. In Burkina Faso, millet supplies 20 % of the average person's daily calories (30 g), however nearly 80 % of children and 50 % of women are anemic (Micronutrient Initiative and UNICEF 2004).

Ultimately, food with the highest concentrations of iron and zinc are poorly suited to fulfilling people's RDA from these micronutrients. Only by including foods that contain iron in a bioavailable form, as well as preformed vitamin A into one's diet can a person improve their level of nutrition. An essential component of this is diet diversity. Combining food from different food groups is the key to preventing hidden hunger and chronic malnutrition. Some examples will illustrate the difficulty faced by many of maintaining a healthy diet by means of nutritious foods. Below is an overview of the typical daily diet of children in two different African countries (see Table 3.2). One can quickly see that these diets are a far cry from being able to provide children with the three essential micronutrients (vitamin A, zinc, and iron).

The overview in Table 3.2 depicts the diet of a child between the ages of two and five, which was determined by means of a questionnaire regarding types of food and the respective amounts over the course of one day, i.e., 24 h recall (Gegios et al. 2010). On average, 89 % of all children in Kenya and 31 % of children in Nigeria obtained 25 % of their daily calories from cassava. In purely arithmetic terms, 59 % of Kenyan children received enough vitamin A, 31 % enough zinc, and 22 % a sufficient amount of iron. In Nigeria, 17 % of children met the recommended daily allowance of vitamin A, 41 % got enough zinc, and 57 % enough iron. These figures are misleading. The problem of poor bioavailability discussed earlier means that the minerals contained in the grain-based foodstuffs which make up the largest part of these children's diets remain mostly unabsorbed. With the exception of sweet potatoes and a small variety of fruits,

Table 3.2 Daily diet of children in Nigeria and Kenya

Food	Nigeria % of energy	Kenya % of energy	Vitamin A (μg/kcal)	Zinc (μg/kcal)	Iron (μg/kcal)
Cassava	15	59	0	0.2	1.6
Corn	22	7	0	0.2	3.3
Rice	14	1	0	3.3	11.4
Sorghum	1	10	0.1	0.2	30
Wheat	8	1	0.2	1.8	3.2
Animal-based food	3	7	1.1	6.8	7.7
Legumes	9	3	0	9.4	22.3
Fruit	4	3	1.4	1.8	2.7
Green leafy vegetables	10	4	2.0	4.3	15.3
Yams	11	0	0	0.1	6.4
Bananas	2	1	0.2	1.7	3.3
Sweet potatoes	0	3	32.0	2.6	5.3

there are no foods which contain more than a negligible amount of pro-vitamin A. Only a small percentage of what the children eat comes from animals. We can hardly expect that the small quantities of sweet potatoes that are eaten in Kenya, not to be mentioned in Nigeria, supply children with a sufficient amount of vitamin A.

Nearly 40 % of children in Kenya and 50 % in Nigeria are affected by stunting. If one takes a look at the overview above, which represents the typical diet of people in most African countries, it is not surprising that half of the children are chronically malnourished. Data collected in five different countries in Asia and Africa indicate that this is no exception, but rather the rule regarding the state of food security among poorer population groups (Arimond et al. 2010).

In a more elaborately designed study in which interviews were conducted repeatedly (24 h recall), the diets of women in their child-bearing years were recorded, from which their respective micronutrient intake was then calculated. Table 3.3 shows the amount consumed as a percentage of the WHO's RDA. The WHO's recommendations are based upon the absolute minimum amount needed to prevent a deficiency, whereas the European suggestions reflect an optimal amount for maintaining a healthy population.

Table 3.3 clearly illustrates that nursing mothers (L) in particular are, to a large extent, not receiving enough micronutrients for themselves and their offspring. Women who are neither pregnant nor nursing (N) are lacking most of all folic acid, vitamin B2, vitamin B12, iron, and niacin. The WAP value shows that between 46–76 % of women in these countries are simply not getting enough of micronutrients they need. This is especially true for regions where the daily energy intake (E) is low, but also for countries such as Bangladesh (D), whose people get

Table 3.3 Place of residence and daily caloric intake including percentage of RDA for nursing mothers (L) and women who are not pregnant and not nursing (N)

Place of residence and daily caloric intake												
		A		B		C		D		E		
		City		City		Rural area		Rural area		City/slum		
kcal		2,078		2,024		2,086		2,083		1,211		
		1,692–2,791		1,613–2,513		1,620–2,547		1,761–2,445		875–1,664		
Percentage of women with an adequate supply of micronutrients												
Country	Th	B2	Nia	B6	Fol	B12	VC	VA	Ca	Fe	Zn	MAP
A	49	16	19	70	15	6	70	73	30	15	70	0.39
B	59	28	31	67	0	17	88	50	27	54	96	0.47
C/L	35	6	23	47	12	20	78	67	17	7	65	0.34
C/N	68	45	49	90	45	26	90	86	18	1	76	0.54
D/L	0	2	21	28	0	18	23	38	26	26	94	0.25
D/N	9	15	30	82	2	20	52	53	21	10	92	0.35
E/L	3	3	39	13	29	71	7	12	17	28	38	0.24
E/N	12	11	60	45	47	78	13	38	15	12	48	0.34

The number of women is given in brackets. (A) Burkina Faso (N178), (B) Mali (N102), (C) Mozambique (L306/N103), (D) Bangladesh (L113/N299), (E) Philippines (L247/N1798)
Abbreviations Th: Thiamine, Nia: Niacin, Fol: Folic acid, MAP: Mean Probability of Adequacy

enough energy each day (2,086 kcal/person) according to the FAO. When a woman in one of these regions is pregnant, a balanced diet is a serious burden for mother and child.

According to the FAO and the WHO, most women are well fed with 1,800 kcal a day, excluding the Philippines. This dangerous misconception stems are mainly from the fact that the top priority, and rightly so, is to stop undernourishment. Starchy grain-based foodstuffs build the backbone of this initiative. If we use the amount of bioavailable micronutrients in different foods as a basis for assessment, the picture would look quite different and undernourishment would quickly become obvious.

Fourth Pillar: Food Prices

The fourth pillar of food security is the most sensitive one and exerts a direct influence on each of the three other pillars. For families that already spend 80 % of their disposable income on food, there is not much a buffer zone when prices begin to fluctuate.

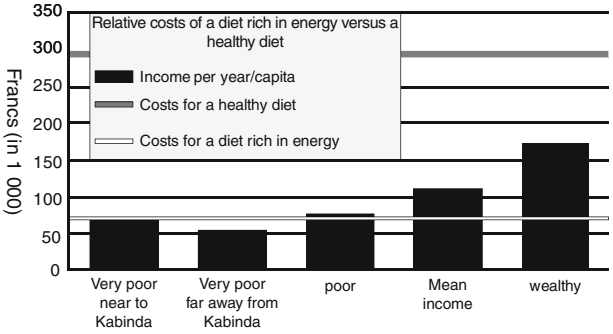

Fig. 3.1 Annual income, price of a diet containing enough calories and price of a balanced healthy diet (Save the Children 2010)

A healthy diet, meaning one which includes all of the essential components, is also impossible to achieve for those families with a healthier budget in poor countries. This is evident from Fig. 3.1, which shows the results of a study conducted in the Congo. Even those families who have a higher income would have to spend twice as much as they currently do in order to achieve a healthy diet. The poor, however not the very poor, are supplied with enough calories, at least in arithmetic terms. Hence, they are 'full' by means of fully inadequate food in nutritional terms.

Data compiled by the organization Save the Children (2010) illustrates the whole dilemma. Families with low income are still in a position to consume the recommended amount of calories and appear to be full, but in reality they are chronically undernourished. It is again the children who suffer from this situation most of all. In the DR Congo, nearly 80 % of their energy (1,651 kcal/person per day in 2007) comes from cassava and corn. Meat provides only 1 % (16 kcal) and oil 7 % (FAOSTAT.fao.org 2007). Since 1992, the number of calories consumed daily has dropped from 2,200 kcal/person to 1,650 kcal/person. As a result, every fourth child dies before the age of five.

Studies conducted in Kenya, Egypt, and Mexico clearly show that the vegetarian diets which prevail here lead to stunting and mental disorders among children (Dagnelie et al. 1991; Gibson 1994). In contrast, children whose diets included animal-based products showed a clearly healthier physical and psychological development (Allen et al. 1992). Adding even small portions of meat to a child's diet has been proven to have a direct influence on his or her intake of micronutrients and, consequently, his or her development (Murphy and Allen 2003). Diet diversity on a daily basis is of vital importance for fulfilling a child's nutritional needs. This variety in a child's diet ultimately depends upon which foods the family can actually afford to buy, an aspect which unites all four pillars of food security.

The Difference Is in the Mix

The more varied one's diet is, the healthier it is. That is what we understand in Europe by the term 'balanced diet'. Europeans hardly need to wonder whether or not they are getting enough micronutrients. Despite widespread skepticism, the industrialization of farming has had no impact on the essential micronutrients in our food for the past 50 years. We can select from a wide assortment of food which is so expansive that some cannot see the forest for the trees. Being spoilt for choice, or perhaps for personal or philosophical reasons, some people opt for diets which are quite lopsided, such as fast food, macrobiotics, and blood type diet.

Such imbalanced diets all have one thing in common: They are unhealthy in the long run. At least we have the freedom to choose how we wish to nourish ourselves. By means of education and knowledge of nutrition, we may choose to steer a particular nutritional course. The ability to plot their own dietary course is a luxury which poor populations do not have. Often the appropriate knowledge is missing, not to mention money, in order to select a diet which is not only filling, but is also healthy.

The price of food, especially staple foods, determines whether and for how long a child goes hungry with adverse effects. Dieticians in Europe are racking their brains to discover which of the so-called phytochemicals (bioactive compounds of which there are literally thousands and which have yet to proven as necessary for the body as micronutrients) or which herbs can serve to improve our health. The latest trend is called 'caloric restriction'. The underlying rationale is that what works for worms, spiders and laboratory animals can push the life expectancy of humans up over 100, as well. In light of the fact that the "age limit" for children living in developing countries is five, with such techniques as caloric restriction also playing a part, it would seem that our efforts to raise our life expectancy instead of trying to provide these children with an adequate diet is, to put it mildly, a decadent form of cynicism.

In Germany, there are more than 250,000 food products on offer. Children in developing countries often have no more than 15 to choose from. While we attempt to avoid the illnesses we cause ourselves due to our poor diets and lack of exercise by preaching such remedies as the '5 a day' concept or 'low carb diets', children living in poverty-stricken areas do not even enjoy what could be remotely referred to as a healthy diet. For them, this is a life and death issue! Only after a wider assortment of food becomes available can the basic nutritional needs of these children be met.

On the basis of the so-called Diet Diversity Score (DDS), it is possible to see the connection between food expenditure, diet diversity, and undernourishment/stunting. The DDS comprises up to nine food groups and also single foodstuffs, such as meat, fish, milk, eggs, vegetables, fruit, grains, cereal products, and oils, and it establishes a ratio of amount consumed to total calories or to the costs. The DDS can vary from country to country, depending upon whether a particular food is locally available or not. From this maximum number of nine essential foodstuffs,

the families are asked what they eat. A selection of five or less can easily contain 100 % of the energy and protein a person needs, as many studies have shown, but not supply all of the necessary micronutrients. As mentioned earlier, these include in particular vitamin A and vitamin E, but also folic acid, zinc, iron, as well as calcium and a range of other vitamins.

Limited dietary diversity usually means that one's diet comes mainly from grain-based food and cereal products and does not include animal-based food, as is often the case with families who have a lower income. A family's rise in income allows for more of an investment in food, especially in a variety of different foods, including meat, fish etc. So with prosperity comes more diet diversity. Only after six different types of food are consumed in sufficient portions on a regular basis (DDS 6 and higher) can children develop in step with other children in the same age group. If this score is not reached, height and weight will fall below the norm (see Fig. 3.2).

Normal body weight (WAZ) and growth (WAZ) can only be achieved if children take their food from at least six different sources. Since both indicators are simultaneously affected by undernourishment, the height-weight ratio remains constant and thus gives a distorted picture of the child's diet. Since up to 80 % of the calories these children consume come from cereals, there is very little room to add other foods to the diet without going over the limit for calories. This is precisely the reason why hidden hunger is, in fact, so hidden. The children are getting enough energy, but from only one or two types of food. The value of DDS as an indicator for a child's diet and, as well as a guideline for proper nutrition in poorer countries can be seen in the studies conducted by Mary Arimond and her staff (Arimond et al. 2010). The poor diets of the groups in Table 3.3 can be

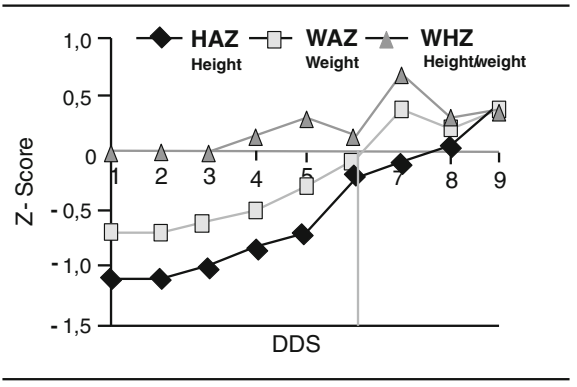

Fig. 3.2 Diet Diversity Score (DDS) and childhood development. The higher the diet diversity (DDS > 6), the more normal a child's physical development will progress. Weight-Age-Z (WAZ), Height-Age-Z (HAZ) and Weight-Height-Z (WHZ) are all calculations used to assess physical growth by benchmarking children against others who have a balanced diet in the same age group (Steyn et al. 2006)

Table 3.4 Relationship between weekly expenditure for different foodstuffs and the risk of night blindness between the lowest (quintile 1) and the highest amount of consumption (quintile 5) among non-pregnant women (Jakarta, Indonesia)

Food	Quintile	Risk	p-Value
Vegetable-based	1	1.00	–
	5	0.47	<0.0001
Animal-based	1	1.00	–
	5	0.47	0.002
Eggs	1	1.00	–
	5	0.62	0.004
Non grain-based	1	1.00	–
	5	0.36	<0.0001
Grain-based	1	1.00	–
	5	2.80	<0.0001

improved from a 70 % to a mere 20 % inadequacy by increasing the diet diversity from 3 to 6 (with 15 g per food type).

An example of the adverse effects of low diet diversity is the onset of night blindness which is suffered by young women who have a vitamin A deficiency (see Table 3.4).

A diet based primarily on cereals (quintile 1) carries with it a three-fold higher risk of developing night blindness. However, a daily diet which contains ample portions of meat and plant-based products or eggs (quintile 5) helps to reduce the risk by more than 50 % (West and Mehra 2010). A clearly higher rate of night blindness exists among Asian families, who spend more money on rice than on fruits, vegetables, or animal-based products (Campbell et al. 2009).

By eating more grain-based products, the amount of vitamin A the body receives decreases. Women in their childbearing years who are affected by this will begin to show the clinical symptoms of a severe vitamin A deficiency. This is the beginning of a vicious circle. A vitamin A deficiency arises which is passed on to the newborn child, who, in turn, will suffer health disorders and have a lower life expectancy. If the mother also suffers from an iron deficiency, which is highly probable with such a diet, she is also at risk. This fact is attested to by the high number of deaths resulting from iron deficiency among mothers (Save the Children 2012).

The findings of a study exploring the relationship between DDS and one's personal situation in South Africa illustrate this fact, as well (Labadarios et al. 2011). In the study, 3,287 adults of different age groups and income brackets were interviewed. A DDS of < 4 was found to be insufficient for ensuring an adequate intake of micronutrients. Dark skin and a low standard of living were the typical characteristics of 70 % of the people who had a DDS under 4. A score of under 4

means that, in particular, vegetables containing pro-vitamin A are missing (less than 15 % of the interviews mentioned such vegetables), as well as dairy products and eggs. The poorest group had a DDS of below 3! Their main sources of calories came from cereals and roots. Since the DDS is a method for determining food security in individual households as a whole, it is safe to assume that the children living in these households have more or less the same poor dietary patterns.

Hidden hunger and chronic malnutrition are two terms for the same phenomenon, which causes widespread illness and death, especially among children. It is so easily overlooked unless there are pictures of absolute starvation, but also due to the fact that the statistics speak of an adequate supply of nourishment. Yet the malnutrition which these children suffer from leads to frequent cases of illness and, ultimately, an early death. Granted, success has indeed been achieved on numerous fronts: hygiene, medical care, and vaccines. Yet this must not tempt us to ignore the fact that malnourished children find themselves in a life-threatening situation. Deaths caused by the most common illnesses (diarrhea, malaria, measles, respiratory infection) are seldom attributed to the real underlying cause: chronic malnutrition.

Conclusion

Diet diversity is the safest method for ensuring that one's diet is healthy and nutritious. Yet diet diversity depends upon certain factors, for instance that different foods are available and also affordable. Poverty limits the variety of food people are able to obtain. It is this lack of diversity which is responsible for malnutrition and all of its harmful consequences.

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