Chapter 1.4

Towards a Balanced “Healthy Diet” for the 21st Century

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“Let food be thy medicine and medicine be thy food.”

Hippocrates, (c. 460 – c. 370 BC), known as “the Father of Western Medicine.”

Key messages

• Changes in diet and physical activity levels are chiefly responsible for the recent increase in nutrition-related chronic diseases.

• The problems of diet-related diseases cannot be addressed by the traditional model of single-nutrient deficiency or excess.

• Consumers will make healthier dietary choices if they have a practical option to do so.

• Diets must return to ones based predominantly on plant foods, with limited processing and a limited proportion of refined carbohydrates (need to limit intake of sugar[s]).

• An adequate diet may be obtained from many different combinations of foods, but no individual combination has universal applicability.

Writing from the perspective of 1957, the British nutritionist Anne Wilbraham reflected on the precariousness of the concept of the “balanced diet.” She observed: “Much was accomplished during the Second World War when, owing to rationing and control, it was difficult to obtain an ill-balanced diet [in the United Kingdom]. In the doubts that at present assail us as to the subtle dangers to health of too much of the wrong kinds of foods the lessons of wartime nutrition should not be forgotten. For it remains true that the foundations of good health are laid in the early years of life and that if boys and girls are properly nourished until maturity is reached they will be the better fitted to withstand hardship and privation in later life. It remains for us to be certain as to the nature of ‘proper nourishment’, a necessity which points to the need for more research on the problems of human nutrition.”

Almost 60 years later, and on the other side of the Atlantic, the sustainable food systems activist Ellen Gustafson meditated on the process of collective amnesia that has led to a crisis in public health around the world since Wilbraham penned the above lines. She commented: “Roughly 30 years ago (about the time I was born), a series of shifts – some well-intentioned – led to the current global food system and modern American diet. During the 1950s, farming and food production, patterns of food delivery and consumption, even the way we thought about food careered off the tracks. The food systems we live with today were formed by innovation, technology and abundance. But they were also formed by food science that forgot what food is, and why we eat it. They were formed from farm subsidies and food aid that were intended to save farmers and save lives, but ended up destroying both. They were formed from farm consolidation that resulted from well-intentioned, misunderstood legislation. They were formed by the genetics of hunger – and the genetics of profit. The system operated confidently under this principle: By producing cheaper, more shelf-stable food, it meant we could feed “more” hungry people. That sounded like a solution. In fact, it sounded like the perfect solution. Yet it was a misguided measure that created an even bigger problem that has been three decades in the making. As a result, today America’s largest exports aren’t civilian aircraft and semiconductors, intellectual property or even corn. America’s largest exports are bad food, bad food policy, crippling hunger, and escalating obesity.”
To assess the requirements of a balanced diet that will meet the needs of a rapidly expanding global population in the 21st century, it is first necessary to consider the evolution of human eating habits, in order to outline the drivers which, in today’s global village, still inform so many of our eating choices.

**Human nutritional needs and foods available to meet them**

The foods produced since the advent of agriculture have evolved depending on prevailing environmental conditions that affect the climate, solar radiation, soil characteristics and water resources. These conditions, fundamental for the development of agriculture in prehistoric times, continue to play an important role in defining modern agriculture. Human diets have similarly changed from ones based on a predominantly gatherer-hunter or scavenger mode of existence to the present agriculture-based model.

Humans in pre-agricultural times depended on foraging for plant foods such as seeds, fruits and nuts, as well as hunting small animals; if they inhabited the land/water interface, they were able to collect mollusks and algae, and to catch fish. They were also likely to have been scavengers of meat and fat protected by bone (such as brain and marrow) left over from the hunt by predators larger and stronger than humans. Agriculture evolved in very specific ecological settings that facilitated the domestication and selection of the four main crops upon which we still rely for our food supply: wheat, rice, corn and potatoes. In these settings, these crops became the key foods to support the expansion of human populations to the current level of over 7 billion individuals.

Traditional dietary patterns have changed with time, and have withstood the test of human evolution. Indeed, most naturally occurring dietary patterns meet or exceed the nutritional needs of populations, although this is not the case where social or economic conditions limit access to food (purchasing capacity) or where cultural practices restrict the choice of foods consumed. However, within the framework of our present understanding of food-health relationships, it seems likely that a large variety of foods can be combined in varying amounts to provide healthy diets. Thus, it is difficult to determine a precise indispensable intake of individual foods that can, when combined with other foods, provide nutritionally adequate diets under all conditions. Perhaps the exception that proves this rule is human milk, now accepted as a source of complete nutrition (with the exception of iron) for the first 6 months of life, provided enough sun exposure is allowed to prevent vitamin D deficiency (in urban settings within temperate regions of the globe, levels of sunlight may not be sufficient, however, necessitating supplementation of the diet with vitamin D).

The prevailing view is that a large set of food combinations is compatible with nutritional adequacy, but that no given set of foods can be extrapolated as absolutely required or sufficient across different ecological settings. Recent trends in the globalization of food supplies provide clear evidence that dietary patterns, and even traditionally local foods, can move across geographical niches.

The modern approach in defining the nutritional adequacy of diets and dietary recommendations has progressed over the past two centuries in accordance with the scientific understanding of the biochemical and physiological basis of human nutritional requirements in health and disease. The definition of essential nutrients and nutrient requirements has provided the scientific underpinnings for nutrient-based dietary recommendations. However, there are obvious limitations to the reductionist nutrient-based approach, since people consume foods and not nutrients. Moreover, the effect of specific foods and dietary patterns on health goes well beyond the combination of essential nutrients the food may contain. For example, if we neglect to integrate bioavailability or nutrient interactions in defining trace element recommendations, we will not be able to assess the true nutritional value of foods.

In addition, factors unrelated to diet commonly exert a key influence on the health effect of diets; for example, parasitic infections rather than iron deficiency may be the cause of anemia in many parts of the world. Similarly, if we continue to ignore or undervalue the essential role of physical activity in achieving energy balance, dietary recommendations will fail to meet the goal of preventing obesity and other nutrition-related chronic diseases.
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The nutrition transition

Many parts of the world are currently undergoing the so-called “nutrition transition.” This is defined as changes in the food and nutrition profile of populations as a result of the interaction between economic, demographic, environmental, and cultural factors in society. Taking the Latin American region as an example, it can be seen that nutritional patterns have changed considerably, being now marked by an increase in the consumption of high-energy-density foods (high in fats and sugars) and a decrease in physical activity, with sedentary urban populations predominating.\(^7\)\(^8\)\(^9\)\(^10\)\(^11\)\(^12\)\(^13\) Social and economic progress has improved environmental sanitation, contributing to a decline in infectious diseases. At the same time, higher income has fostered the consumption of high-energy-density foods and reduced the consumption of grains, legumes, and other sources of fiber. The result has been a gradual increase in life expectancy at birth and a greater proportion of obesity and other nutrition-related chronic diseases (type 2 diabetes, cardiovascular disease, certain types of cancer, and osteoporosis) in the total burden of disease.

Until recently, it was commonly thought that these non-communicable diseases were associated with excess – that is, with a wealthy environment. Another theory is that differences between countries are due to differences in genetic susceptibility, which would lead to the conclusion that this is a problem for individuals and almost a necessary evil or – even worse – a sign of social and economic progress. The reality in Latin American cities is that nutritional problems associated with nutritional imbalances, especially the imbalance between energy intake and energy expenditure, are most frequently observed in poor urban populations. Changes in diet and physical activity, as well as the wider food environment, can explain most of the increase in nutrition-related chronic diseases, which have reached epidemic proportions in many countries in recent decades. Clearly, this is the result of environmental changes, since genetic drift occurs over longer periods. What is certain is that our current genes were selected over the past six million years of our species’ evolution in order to maximize the use of ingested energy and store as much of it as possible for when it would be needed. Today, in an environment that no longer demands physical labor to produce a little food, these same genes help to produce obesity, insulin resistance, and the associated metabolic consequences: diabetes, dyslipidemia, atherosclerosis, and hypertension.
Highly processed products

Highly processed products are made from processed substances extracted or refined from whole foods – e.g., oils, hydrogenated oils and fats, flours and starches, variants of sugar, and cheap parts or remnants of animal foods – with little or no whole foods. Products include burgers, frozen pizza and pasta dishes, nuggets and sticks, crisps, biscuits, confectionery, cereal bars, carbonated and other sugared drinks, and various snack products.

Most are made, advertised, and sold by large or transnational corporations and are very durable, palatable, and ready to consume, which is an enormous commercial advantage over fresh and perishable whole or minimally processed foods. Consequently, their production and consumption is rising quickly worldwide. In the global north – i.e., North America and Europe – highly processed products have largely replaced food systems and dietary patterns based on fresh and minimally processed food and culinary ingredients that have less fat, sugar, and salt. In the global south – i.e., Asia, Africa, and Latin America – highly processed products are displacing established dietary patterns, which are more suitable socially and environmentally.

Highly processed products are typically energy-dense; have a high glycemic load; are low in dietary fiber, micronutrients, and phytochemicals; and are high in unhealthy types of dietary fat, free sugars, and sodium. When consumed in small amounts and with other healthy sources of calories, highly processed products are harmless; however, intense palatability (achieved by high levels of fat, sugar, salt, and cosmetic and other additives), omnipresence, and sophisticated and aggressive marketing strategies (such as reduced price for super-size servings), all make modest consumption of highly processed products unlikely and displacement of fresh or minimally processed foods very likely. These factors also make highly processed products liable to harm endogenous satiety mechanisms and so promote energy overconsumption and thus obesity.

What drives food choices?

It is normally believed that food choices depend essentially on the law of supply and demand. Thus, the consumer’s preference is the basis of the demand and determines the supply. This model posits consumers as the principal driver of supply, with industry merely meeting their needs. In this case, the factors that usually determine food purchases and consumption patterns are the consumer’s income, the prices, and the intrinsic and perceived quality of the products.

A more in-depth analysis of what drives consumption reveals that nowadays supply does not passively wait to respond to demand but has a life of its own and actively influences the choice of goods for purchase and consumption. That is, we buy and consume what is offered to us, not what we need to live a healthy life. What drives supply, and hence consumption, today is largely dominated by the factors that determine the productivity of the food-production chain. In this model, demand and consumption are determined by the ways we produce, process, distribute, trade, market, and advertise food. All these factors are beyond the consumer’s control, and they operate mainly on the maximization of profit. The food production chain responds to the need to produce progressively cheaper food and to promote the highest possible consumption. As evidenced daily in the press, the eagerness to maximize profits creates both advantages and risks. The possibility of producing safe and less expensive food is no doubt the greatest advantage. However, the risk of ignoring concerns about a safe and healthy diet is also inherent in a model that puts commercial interests above consumer health. Some say that the responsibility for resolving this dilemma lies with the consumer, and that it is enough to provide information through nutritional labeling, public service announcements about healthy eating, or nutritional guidelines that promote healthy eating. What is certain is that the food production chain and the engines that drive the food supply are very powerful, and that they do not have a real counterpart in the efforts to educate, guide, and facilitate the selection and consumption of safe, wholesome food by the consumer.

Table 1 | Annual growth rate (%) of volume consumption per person in low- and middle-income countries, and high-income countries

<table>
<thead>
<tr>
<th>Food Category</th>
<th>Low- and middle-income countries</th>
<th>High-income countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged food</td>
<td>1.9%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>5.2%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Processed food</td>
<td>2.0%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Oil and fats</td>
<td>1.6%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Snacks and snack bars</td>
<td>2.4%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Alcohol</td>
<td>2.8%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Tobacco*</td>
<td>2.0%</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

*Tobacco data are in retail sales per person.

Adapted with permission from Stuckler D, Nestlé M. Big food, food systems, and global health. PLoS Med 2012; 9: e1001242

In this battle the consumer is David, since the forces that drive supply are largely invisible and unidentifiable, and have powerful resources that motivate and determine consumer behavior. Thus, we enter a restaurant or eatery, attracted by an environment that for a few minutes makes us feel like members of the “first world” and as good as anybody else – an environment with a little luxury that sparkles like the stars, where each piece of furniture, container, and product is an icon that in some way symbolizes our aspirations for success, where our ancestral hunger for sweet, salty, and fatty foods is whetted with tempting offers of more food for less money, a double portion for a few cents more, buy two and get one free, buy an A + B + C combination meal for a moderate price and experience bliss in this paradise of consumption for the sake of fun and instant gratification. The dilemma is between personal responsibility coupled with an environment that encourages healthy eating and an active life versus an environment that can discourage healthy food choices and promote a sedentary life. Certainly, we can help our consumers in the uphill battle against environmental influences, but we will be much more successful if at the same time we can make the hill less steep by promoting changes in the environment that will make the healthy choice the easy one.
### Table 2 | Potential supply- and demand-side interventions in the food production chain to modify food consumption – for example, in this case to reduce saturated fat intake

<table>
<thead>
<tr>
<th>Link in the food production chain</th>
<th>Food policy instruments with nutritional impact</th>
<th>Examples of impact on fat consumption affecting quantity or quality of fat intake</th>
<th>Effectiveness in reducing intake of saturated fat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food production</strong></td>
<td>Subsidies or price supports</td>
<td>Subsidies for feed production</td>
<td>Very negative</td>
</tr>
<tr>
<td></td>
<td>Support for dairy products; price guarantees for producers</td>
<td>Support for dairy products; price guarantees for producers</td>
<td>Very negative</td>
</tr>
<tr>
<td>Import and export quotas</td>
<td>Export incentives for vegetable oil</td>
<td>Export incentives for vegetable oil</td>
<td>Uncertain</td>
</tr>
<tr>
<td></td>
<td>Restrictions and/or tariffs on meat imports</td>
<td>Restrictions and/or tariffs on meat imports</td>
<td>Uncertain</td>
</tr>
<tr>
<td><strong>Food processing</strong></td>
<td>Quality grading</td>
<td>Definition of the level of quality (changes in the criteria for selecting quality, e.g., lean versus fatty)</td>
<td>Very positive</td>
</tr>
<tr>
<td>“Identity standards”</td>
<td>Identity standards — switch to low-fat milk and yogurt</td>
<td>Identity standards — switch to low-fat milk and yogurt</td>
<td>Positive</td>
</tr>
<tr>
<td>Nutrition labeling</td>
<td>Descriptors in nutrition labeling (e.g., low-fat milk, ice cream)</td>
<td>Descriptors in nutrition labeling (e.g., low-fat milk, ice cream)</td>
<td>Very positive</td>
</tr>
<tr>
<td><strong>Distribution, marketing, and advertising of food</strong></td>
<td>Advertising campaigns for dairy products</td>
<td>Changes in the demand of government programs for milk products (low-fat to replace full-fat milk)</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>Distribution, marketing, and advertising of food</strong></td>
<td>Nutrition labeling</td>
<td>Use % lean in the labeling of ground meat</td>
<td>Negative</td>
</tr>
<tr>
<td></td>
<td>Labeling in restaurant menus to indicate the quantity and quality of fat, low in saturated fat</td>
<td>Labeling in restaurant menus to indicate the quantity and quality of fat, low in saturated fat</td>
<td>Positive</td>
</tr>
<tr>
<td>Marketing standards</td>
<td>Need for standardization of the various sector descriptors: agricultural, health, trade</td>
<td>Need for standardization of the various sector descriptors: agricultural, health, trade</td>
<td>Uncertain</td>
</tr>
<tr>
<td><strong>Food choices and consumption</strong></td>
<td>Nutrition labeling</td>
<td>Label indicating the quantity and quality of fat</td>
<td>Very positive</td>
</tr>
<tr>
<td></td>
<td>Public information campaigns to promote good nutrition</td>
<td>Nutritional guidelines for consumer orientation</td>
<td>Very positive</td>
</tr>
<tr>
<td></td>
<td>Promotion groups for specific products</td>
<td>Promotion of cheese, milk, meat, ice cream, eggs</td>
<td>Very negative</td>
</tr>
</tbody>
</table>


### Reintroducing the balanced diet

The first order of business is to bring foods back as the source of nutrients, avoiding the concept of nutrients in isolation; vitamin and mineral deficits are still relevant, but by now we have a good idea how to solve these. Food, food preparations and patterns of food consumption need to be returned to the top of the list. This should include consideration of how crops are cultivated and processed, and how animals are husbanded and fed.

The problems of obesity and diet-related chronic diseases cannot be addressed using the traditional single-nutrient model. Entire diets need to be considered within the framework of the overarching food environment, not just specific nutrients. Furthermore, energy intake and output must be brought into balance. This is easier said than done: human beings are programmed to over-consume food energy and accumulate fat for energy reserves.

In terms of energy provision, a balanced diet is a problem for both poor and rich in today’s world, since the prices of sugars, refined carbohydrates and oils are relatively low at present; thus it is comparatively easy to consume more
energy than what a normal sedentary person expends. However, vegetables and other “healthy” foods such as legumes and fruits, as well as healthy fats, have become relatively more expensive and also less available within urban settings. Thus urban low-income populations are left with diets high in refined carbohydrates and unhealthy fats. If we then consider the high sodium content of industrially processed foods, we have the ideal mix of energy, fat and sodium to promote unhealthy weight gain and hypertension, which lead to cardiovascular diseases and cancer. After tobacco, obesity is the most prevalent cause of preventable cancer in the world today.\(^{14}\)

The only way to balance energy input and output is to expend energy and then eat according to what has already been expended. This is clearly hard to achieve, since appetite regulation in humans was established at a time when most individuals were on the verge of malnutrition. Our food-related behaviors and metabolic responses are therefore set to provide energy stores (mainly as fat) in preparation for leaner times. The foods we prefer to eat were defined at a time in our evolution when we needed to be active in order to get a meal. Over the past millennium, human beings have become progressively less active. Unless our existences become more physically active, we will always be on the side of excess intake. The attempt to curb the appetite is a lost battle – as has become all too clear over the past decades. We must change our diets and return to traditional diets based predominantly on plant foods, with minimal processing and a limited proportion of refined carbohydrates. As pointed out by Michael Pollan, we must grow our food and hunt the animal we expect to get on our plate.\(^{15}\) “To each according to his needs” is the law of thermodynamics that we must observe.

Fats and carbohydrates are perfectly healthy energy sources if we burn them off by being physically active. The residual adverse effects of fats, if consumed within the constraints of energy balance, are minimal and only observed in the case of trans-fats (which are produced by industrial processing in order to prevent rancidity); traditional human foods, except for dairy, are mostly cis-fats, and are thus generally healthy. Most cultures have based their diets on a mix of predominantly vegetable sources of foods, selecting a mixture of legumes and cereals that results in a balanced amino-acid mix very close to optimal in terms of human nutritional needs. Examples include beans and rice, corn and beans, wheat and lentils, and modern versions of these preparations; some additional small portions of meat or fish and dairy make these blends perfect for human requirements.

Most fats and carbohydrates are perfectly healthy as energy sources if we match our energy expenditure to our food intake; it is only when these sources exceed our expenditure that they become a potential health hazard. Thus if we are able to define our food intake as that necessary to match our energy expenditure, we will avoid most of the present diet/food-related health concerns.

What can public policies do?

Public policies can modify the way the supply of food influences consumption patterns and health. Possible interventions include:

- Optimizing the food production chain to offer healthier products at lower prices for poor consumers;
- Eliminating subsidies and economic incentives for the production of foods rich in saturated fats and facilitating the production of foods low in animal fat;
- Reviewing the regulations governing the international food trade from a nutritional and health perspective;
- Reviewing the regulations governing the institutional food offered in schools, public utilities, the armed forces, and the workplace;
- Facilitating the selection and consumption of healthful foods at lower prices; and
- Providing consumer information at the point of purchase (e.g., via improved labeling).
**Table 3 | Food classification based on the extent and purpose of industrial processing**

<table>
<thead>
<tr>
<th>Food group</th>
<th>Extent and purpose of processing</th>
<th>Examples*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1: Unprocessed or minimally processed foods</strong></td>
<td>No processing, or mostly physical processes used to make single whole foods more durable, accessible, convenient, palatable, or safe</td>
<td>Fresh, chilled, frozen, vacuum-packed fruits, vegetables, fungi, roots and tubers; grains (cereals) in general; fresh, frozen and dried beans and other pulses (legumes); dried fruits and 100% unsweetened fruit juices; unsalted nuts and seeds; fresh, dried, chilled, frozen meats, poultry and fish; fresh and pasteurized milk, fermented milk such as plain yoghurt; eggs; teas, coffee, herb infusions, tap water, bottled spring water</td>
</tr>
<tr>
<td><strong>Group 2: Processed culinary or food industry ingredients</strong></td>
<td>Extraction and purification of components of single whole foods, resulting in producing ingredients used in the preparation and cooking of dishes and meals made up from Group 1 foods in homes or traditional restaurants, or else in the formulation by manufacturers of Group 3 foods</td>
<td>Vegetable oils, margarine, butter, milk, cream, lard; sugar, sweeteners in general; salt; starches, flours, and “raw” pastas and noodles (made from flour with the addition only of water); and food industry ingredients usually not sold to consumers as such, including high fructose corn syrup, lactose, milk and soy proteins, gums, and preservatives and cosmetic additives</td>
</tr>
<tr>
<td><strong>Group 3: Highly processed food products</strong></td>
<td>Processing of a mix of Group 2 ingredients and Group 1 foodstuffs in order to create durable, accessible, convenient, and palatable ready-to-eat or to-heat food products liable to be consumed as snacks or desserts or to replace home-prepared dishes</td>
<td>Breads, biscuits (cookies), cakes and pastries; ice cream; jams (preserves); fruits canned in syrup; chocolates, confectionery (candies); cereal bars, breakfast cereals with added sugar; chips, crisps; sauces; savory and sweet snack products; cheeses; sugared fruit and milk drinks and sugared and “no-cal” cola, and other soft drinks; frozen pasta and pizza dishes; pre-prepared meat, poultry, fish, vegetable and other “recipe” dishes; processed meat including chicken nuggets, hot dogs, sausages, burgers, fish sticks; canned or dehydrated soups, stews and pot noodle, salted, pickled, smoked or cured meat and fish; vegetables bottled or canned in brine, fish canned in oil; infant formulas, follow-on milks, baby food</td>
</tr>
</tbody>
</table>

*These listings do not include alcoholic drinks. The examples given are not meant to be complete. Many others can be added, especially to group 3, using the general principles specified in the text and as indicated in the second column.


A healthy diet should contain high proportion of unprocessed fruits and vegetables. Source: Ricardo Uauy
My personal view

Ricardo Uauy

The world needs a food/nutrition-based perspective that examines the foods we need to preserve and augment our health and limits the production of foods that might compromise our health if consumed in excess. Thus food choices that support healthy consumption are promoted and choices that lead to unhealthy outcomes become less accessible as they exceed the “healthy limits.” At present the lowest-priced foods are those linked to adverse health outcomes, while healthier foods have become more expensive and less available.

Food processing as it stands today adds unhealthy components in order to preserve these foods and to promote their consumption; these additions are clearly linked to the chronic disease epidemic that we currently face. Returning to basic and minimally processed foods will improve our health and nutrition in multiple ways.

Further reading

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