

Chapter 2

Eat Well, Eat Better

For millions of years, man's primary preoccupation was having food to eat. Today, eating is an act that goes far beyond fulfilling biological needs, touching upon the social, hedonistic, cultural and symbolic aspects of life. Malnutrition includes illnesses related to overeating, undereating, or dietary imbalances in terms of food quality. These imbalances, most often linked to lifestyle, are on the rise throughout the world. Eating habits depend on much more than just individual preferences or consumer purchasing power, as was pointed out in the collective scientific expert report on eating habits coordinated by INRA in 2010. They are a determining factor not only for personal health but also for the diversity of the world's food systems.

Throughout history, human societies have experienced changes in lifestyle and quality of life as well as in the availability and nature of food. When the changes involved are particularly profound, these are known as "food transitions". An example would be the changeover in Neolithic times from hunting and gathering to farming and animal husbandry, or the passage from times of famine to times of relative prosperity such as developed countries are experiencing today. The food transition that developed countries have been experiencing for the past 100 years is characterised by a growing imbalance between the abundance of food products, their relatively easy access, and an increasingly sedentary lifestyle leading to a decreased need for calories. This imbalance in turn triggers a slew of health problems, from obesity to chronic diet-related illness such as diabetes, cardiovascular disease or articular disease. These food transitions also go hand in hand with epidemiological changes.

Today, some population segments in many developing countries are experiencing similar food transitions, combining excessive calorie intake and an increasingly sedentary lifestyle. What is more, this transition is taking place in relatively short time spans. Even if the issue of hunger stubbornly persists, especially in developing countries, increasingly urbanised populations in emerging economies, and even in poor countries, are no stranger to illnesses linked to overeating. In fact, analyses on a country-by-country basis are of little interest: just as there are people who go hungry in rich nations, there is a growing number of people who suffer from dietary imbalances in all countries around the world. The key public health challenge of the future will no longer be infectious diseases, but so-called degenerative diseases. To redress these imbalances, which depend on multiple and complex factors,

well-thought-out action must be taken at all stages of the supply chain (agricultural products, industrial processing, distribution, catering services, etc.), as well as at demand-side (final consumers, consumer preferences and habits, constraints, ability to make choices, etc.). Regulatory strategies must also be taken into account (industry regulations, informing consumers and raising awareness, tax programmes or subsidies, etc.). This chapter presents a series of actions pertaining to different stages of the food system that come into play once the produce leaves the farm. Particular attention will be paid to consumers, distributors, players in the food industry, and the authorities entrusted with public health issues. If sustainable solutions are to be found, the perspective taken must be a global one, acknowledging the role lifestyle plays. This is the new food transition nutritionists are calling for.

Changes at the Root of Nutritional Imbalances

Food transitions that have long been underway in wealthy nations, and more recently but also more rapidly in emerging economies and well-to-do households of poor nations, are most often characterised by a rise in calorie consumption despite a decline in calorie requirements. This imbalance results in a surge of health issues such as overweight and obesity, and qualitative nutritional imbalances.

Changing Food Consumption Habits in the Developed World: France, a Case in Point

Contents of the Consumer Shopping Basket have Changed

In terms of food availability, the twentieth century is marked by profound changes. Energy rations reached a plateau and then gave way to a phase of qualitative changes and diversification of diets [1]. Figure 2.1 illustrates this trend in France. Graph A shows the evolution of total available calories per person per day between the end of the eighteenth century and 1960, as well as changes in the principal food sources of these calories (plant vs animal origin). Graph B provides a breakdown of total calorie intake by macronutrients (carbohydrates, lipids and proteins) between 1780 and 2000.

Trends in apparent food availability are related to documented trends in food consumption. The share of cereals (bread, pasta) in the food ration has been seen to decrease, followed by a drop in starches (potatoes), while simultaneously more meat products, fruits and vegetables, fatty foods and sugar are consumed. This phase continues up until the 1980s before levelling off, with a slight drop in calorie intake. Such a trend is not unique to France but has been observed in all countries of the Mediterranean basin, where a significant rise in available calories and animal-based lipids, and a drop in carbohydrates, have been recorded. The same phenomena are currently being observed in Northern and Eastern Europe [2]. When

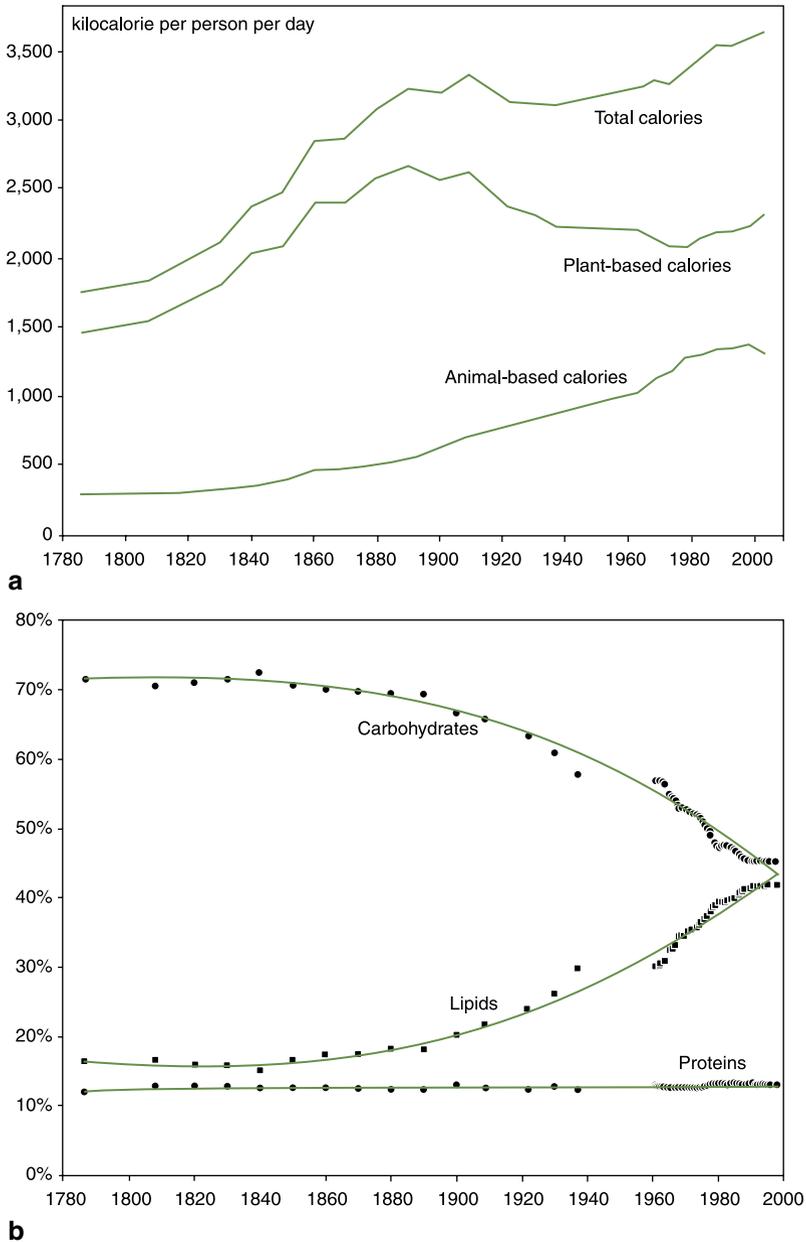


Fig. 2.1 Level of apparent food availability in France. (Source: P. Combris, based on J. C. Toutain, FAO Stat, reproduced with the permission of F. Bourin Publishers)

it comes to meat products, the trend is less linear. It can nevertheless be described as an overall drop in consumption from the 1980s onward, a shift from butcher meats to poultry, steady pork consumption, and an increase in fish intake. Some foods

formerly in low demand have witnessed an exponential rise in consumption: dairy products (cheese and yogurt), fruit and vegetable juices, and frozen or processed foods [3].

Other products are also characterised by less linear change: fresh fruits and vegetables remain stable in terms of volume [4] while processed fruits and vegetables are clearly on the rise [5]. One of the major trends in the past decades has indeed been a shift in consumption toward ever-more processed food [6]. Among industrial food products, those in highest demand are those that are the most accessible from an economic point of view, thanks to economies of scale, with large-volume production and the development of wide-scale distribution [7]. The relative stability of the share of industrial food products¹ in household food budgets (80% in 1960 and 83% in 2006) goes alongside a rise in the volume of food consumed. This overall trend holds true for the most heavily processed food products [5] which require minimum preparation time. The boom in fresh dairy products (25-fold increase in volume consumed over 40 years) is the most telling example of the shift from basic products to more heavily processed products. Canned goods and ready meals also increased in popularity, on the supply- as well as demand-side: annual household spending went from 639 € in 1979 to 872 € in 2000 [8]. All of these trends taken together lead to an increase in the “calorie density” of food purchased and consumed.

Large Supermarket Chains Now Play a Key Role in Household Food Supply

Although homegrown consumption is still widespread in France (25% of households have a vegetable garden and 15% an orchard), this is nevertheless limited to certain products (fruits and vegetables, rabbits and poultry, etc.). Today, household food supply still depends on where food is obtained, which in turn depends on consumer profile (income, age, etc.), place of residence, proximity to a supermarket or hypermarket, etc. This notwithstanding, the size and predominance of markets, small retail outlets and large supermarket chains have been changing considerably over the past 40 years. Hypermarkets, which have long held around 5% of market share, accounted for a third of the share at the close of the twentieth century. Since then, that figure has remained stable or dipped slightly. Supermarkets have witnessed similar margins of growth, today accounting for 70% of spending on food (compared with less than 5% in 1970). Simultaneously, the market share of small retail outlets went from 20% in 1970 to less than 10% in the early 2000s. Among specialised small food businesses, bakeries have held up best [9–11]. According to surveys on health and nutrition carried out in 2002 and 2008, there seems to be a trend in French households toward diversifying where and how food is obtained. More food is being purchased over the Internet or by telephone, or delivered to the home [12, 13], and direct sales from producer to consumer are on the rise, although still rare [14].

¹ Products from the meat, dairy, beverage and grain industries, as well as “diversified” food industries, as opposed to products directly obtained from agricultural activity (unprocessed fish products, fresh fruit and vegetables, eggs, honey, unprocessed rabbit and game).

Eating In: A Tradition that is Alive and Well

Mealtimes are, without a doubt, an important part of family and community life, revealing the value placed on celebration and pleasure. The fairly widespread notion that this tradition is losing ground in France is difficult to prove. To be sure, profound changes since the 1950s and 1960s have significantly modified traditional mealtime practices in France, due in part to an increasingly urbanised population. Nevertheless, the debate about the breakdown of the traditional French mealtime model, largely under the influence of marketing professionals, continues. French sociologist Nicolas Herpin [15] associates this breakdown with a certain dissolution of meals (simplification of main meals and shift to smaller or side meals), temporal dislocation (imprecise mealtimes), de-synchronising (family members no longer eat together), relocation (multiplication of places where meals are eaten), and a certain de-ritualising (blurring of boundaries between ordinary and festive meals). According to his research, these trends are not equally representative of all strata of French society. More recent studies on inter-generational relations reveal a deregulation of family life, increasingly individualistic lifestyles among family members, and a growing tendency among adolescents to adopt independent lifestyles at a much earlier age [16]. These trends taken together foster greater autonomy when it comes to food and eating habits as well. The relative loss of the importance of family meals combined with the increasing popularity of ready meals, consumed in front of the television or in the living room, sometimes even with guests, bears witness to this.

Nevertheless, the vast majority of the French still have their meals at home. In 1997, four out of five French people had their midday meal during the working week at home, a figure that rises to 90% for the evening meal [17]. The most recent studies have shown a slight drop in the first statistic while the second remains stable. Today, however, three quarters of the adult population still eat at home at midday, albeit with strong variations depending on social class and place of residence. The budget share of food consumed outside the home among French households stands practically unchanged for the past 50 years, at around 5%. Of that 5%, the share spent in restaurants has doubled, from 30% in 1960 to 60% in 2005, to the detriment primarily of cafés. The total share spent in public eating establishments has remained stable, at around 23%.

Growing Similarities Between Food Consumption Models Around the World

Data used to analyse food consumption trends vary from country to country. Studies based on individual habits are the most representative of actual consumer behaviour, but unfortunately, their methodology varies in time and space, making accurate comparisons between countries difficult. In order to evaluate apparent food availability, statistics from the FAO, which include figures for food production and food exports and imports, are most often used. The advantage of this method is

that it is homogeneous in time and space, making it possible to compare different countries on a given date and to track trends in each of them. The disadvantage, aside from the varying quality of data collected from different countries, is that the calculation of food quantities actually consumed is far from accurate (see Insert, Chap. 1). Nevertheless, clear trends have been detected.

A rapid food transition has clearly been underway in China for the past 30 years [18]. Great strides have been made in tackling undernutrition and poverty, with annual economic growth rates of 10%, which have led to greater calorie availability. For the wealthiest Chinese, especially those living in cities, traditional diets characterised by a very small calorie share from lipids, have undergone drastic change. The contribution of calories from meat rose 349% in the past 40 years, (from 90 to 644 kcal per day per person), that from vegetable-based oils 680% (from 35 to 273) and that from sugar 305% (from 18 to 73). In contrast, the contribution of calories from rice only rose 24%, and that from tubers and dried pulses dropped 31 and 88% respectively [19].

Today, fats account for more than 30% of calorie intake among almost half of all Chinese adults [18]. Data have also been collected regarding the calorie requirements of this population, which have dropped as the Chinese practice less physical activity, leisure activities become increasingly passive (e.g. television) and more people have their own cars. Simultaneously, food distribution has also undergone considerable changes, with the proliferation of large supermarket chains and substantial investments. Nevertheless, some distinguishing characteristics remain relatively unchanged, at least thus far: the consumption of non-alcoholic beverages and ready-made meals remains very marginal. As a direct consequence of these shifts, the number of overweight Chinese men and women tripled and doubled, respectively, between 1989 and 2000; between 1985 and 2000, the number of overweight youth rose by a factor of 28. Today, some 290 million Chinese people, i.e. one quarter of the adult population, are overweight, and the number is rising sharply. Over a period of 24 years, the mortality rate due to noncommunicable diseases related to diet has gone up considerably, particularly affecting the underprivileged classes of Chinese society [18].

Trends in food distribution that have been observed in China are also underway in many developing countries, to varying degrees depending on wealth and contact with the outside world. Traditional distribution channels, small and varied, have been replaced with large supermarket chains that are centralised and uniform. The changeover started with staple products (cereals, oil, sugar, etc.) before spreading to fresh produce, albeit with differences from region to region. Large “western-style” supermarket chains attract first and foremost the privileged classes, but quickly draw the urban masses as well, as they are more compatible with urban lifestyles, themselves “westernized”: ever-more urbanised societies, bolstered purchasing power, more women working outside of the home, growing number of private vehicles and refrigerators, demand for a wide range of food products, etc.

Practically speaking, this wave of transformations in food distribution swept the world in four phases: first in big cities of the richest nations of Latin America; followed by East and South-East Asia; followed by the poorest Latin American nations

and East and Southern Africa, as well as smaller cities of countries from the first phase; and lastly South Asia. The speed of this transformation is impressive. Take Brazil, for instance, where today 70% of food is distributed in large supermarkets, up from 10% only 30 years ago. China, Brazil, and many other developing countries have witnessed the same transformation that occurred over a period of 50 years in France and the US in a span of less than 20 years. Incidentally, this rapid development of wide-scale distribution affects the relationships between producers, the food processing industry and consumers. Access to the market becomes more difficult for small producers with limited negotiating clout, or due to stringent specifications in terms of quantity, quality and hygiene. The food purchasing departments of large supermarket chains exert tremendous pressure on producers and industrial players who initiate food processing procedures.

Getting to the Root of Profound Changes

Incomes and Prices that Foster Abundance, Availability and Access

Research carried out in economics and the history of economics has shown that changes in diets are rooted in economic and nutritional factors. Analysed from a broad, overall perspective, that is, based on macronutrients and food groups, these changes are similar from one country to the next, and depend directly on the level of economic development. In industrialised countries, and now in the vast majority of the world, the agricultural revolution, spurred on and followed by the industrial revolution, led to a considerable drop in the cost of food calories. The actual price of different food products changed dramatically, as did diets. The benefits of these changes are well known: biological capacity, aptitude for work, longevity and improved quality of life. The drawbacks, although analysed more recently, merit equal attention: issues related to overweight and obesity, diabetes, cardio-vascular disease, etc.

Research carried out based on FAO surveys allows us to identify and describe nutritional trends that accompany economic development. On the basis of studies carried out at the end of the 1930s in 70 countries, Cépède and Lengellé [20] have shown that people seek to satisfy nutritional requirements by turning first to inexpensive foods such as cereals and tubers, followed by fatty foods, then sugar, and finally meat and dairy products as their quality of life increases. These more expensive food products replace the aforementioned cheaper ones once food needs are met across the board, thus accelerating changes in overall diet.

Périsse, Sizaret and François [21] set out to establish correlations between calorie intake in terms of macronutrients, and per capita income, basing their research on observations made in the early 1960s in 85 countries. They found that as income increases, the share of lipids in diets sharply rises (despite a drop in plant-based

lipids); the share of carbohydrates decreases, with a drop in cereals left uncompensated by increased sugar consumption; and protein calories remain stable, as a rise in animal-based proteins compensates exactly for a drop in plant-based proteins. These changes in diet are directly related to the increased consumption of animal products that goes hand in hand with higher incomes.

Eating Habits: The Determining Factors

Sensorial Perceptions, Palatability and Food Intake

When it comes to the consumer, behaviours must be analysed during the food purchasing process and during mealtimes. Although eating is a codified activity governed by social and cultural norms, a certain physiological cycle still comes into play, dividing the process into three phases: a feeling of hunger, the act of eating and a feeling of satiety. Each phase is governed by complex physiological processes, which experts are constantly learning more about.

Experiments have shown that the sensorial properties of food come into play in each of the three phases mentioned above. Although this comes as no surprise, the mechanisms at work are more complex than the simple quantitative satisfaction of a physiological need. Behaviour prior to ingestion is associated with feelings of hunger (physiological need translated into internal signals) and a heightened appetite (desire to eat food that procures pleasure and satisfaction). The initiation of a meal depends, therefore, on factors other than internal hunger signals. Pre-ingestive behaviour involves seeking out, choosing, obtaining and preparing food, followed by the initiation of a meal. Behaviours that accompany the actual eating process are associated with the desire to eat and a feeling of fullness (choice, deciding on the size of a meal, ceasing intake). The feeling of fullness corresponds to the dynamic aspect of the state of satiety; it is characterised by a slower rate of ingestion and fewer mouthfuls in a given unit of time. Lastly, post-ingestive behaviour is associated with a feeling of satiety characterised by the absence of the desire to eat and a state of well-being and somnolence.

In each of these three phases of the ingestion process, appetite is regulated and a feeling of satiety conditioned on an ongoing basis. This is illustrated by the association between flavour and calorie density. In nature, sweet and fatty foods normally presuppose a certain calorie value, whereas salty foods presuppose mineral content [22]. Nevertheless, the relation between sensorial properties and the calorie or nutritive value of food is not so straightforward. It involves implicit, Pavlov-esque conditioning that takes place gradually throughout eating experiences and by way of post-ingestive metabolic effects. That is how experts have been able to shed light on how people acquire preferences and are conditioned to feel sated. Palatability is defined as the pleasure procured from the sensorial perception of food in standardised conditions. Research has shown that palatability is not solely a response to an internal physiological state (nutritional or energy needs), but part of a reward

system for sensorial stimulations. The pleasure derived from eating can be seen as the interaction between desire and appreciation. If one of the two is lacking, there is no reward [23].

As a general rule, the greater the palatability of a food, the greater the quantity consumed. Since foods that are sweet, fatty or salty tend to be much more palatable to consumers, sometimes to the point of creating addictions in the case of sweet and fatty foods, it is paradoxical that the higher the calorie content of a food, the greater the quantity consumed! In order to tackle obesity, exposure of the general population to sweet and fatty foods must be kept in check. This in turn would allow people to shape their preferences for and behaviour toward these kinds of foods.

Eating Habits and the Risk of Overnutrition

Beyond trends in macronutrients and large food groups, people have developed new eating habits which heighten the risk of overnutrition. Namely, this involves snacking, a habit often linked to eating outside of the home, ever-larger portions of food and the introduction of “new” foods. Snacking refers to eating more or less regularly between meals, a habit on the rise. The impact of snacking is difficult to assess. Nevertheless, some experts point to the fact that snacks are higher in calories and do not lend well to a balanced diet. Moreover, since snacking involves the intake of food in limited quantities, the feeling of satiety is never reached. Other studies show, however, that this is compensated by lighter main meals. Portion size, at the distribution and consumption stage, has a positive impact on the quantities of food actually ingested, as shown by the case of French fries [24].

Lastly, the introduction of “new” foods on the market, or the disproportionate rise in the consumption of certain nutrients, has caught the attention of scientists and public authorities concerned about public health. Sweetened beverages are a case in point, the consumption of which has been on the rise in many countries for the past few decades. In France, children (3–17 years of age) currently consume between 200 and 250 ml of sweetened drinks per day, accounting for slightly more than 20% of their total liquid intake. These sweetened beverages are full of simple sugars (saccharose, fructose, glucose syrup, glucose-fructose syrup), and lead to a significant increase in overall calorie intake.

The Effects of Environment on Eating Habits

The presence of food stimuli in an individual’s surrounding environment is an obvious factor in determining eating habits. Several other factors, which may have little to do with food or nutrition, may also affect food-related choices, e.g. frequency and size of meals [25]. The proliferation of easily accessible food sources is likely to stimulate consumption, especially between meals, and encourage people to choose foods that are easy to consume and require little preparation [26]. These food products, often dense in calories, are consumed quickly, anywhere and at any time [27].

Several studies have proven that the availability of easily accessible foods alone stimulates consumption. What is not known, however, is whether this occasional rise in consumption is compensated elsewhere, or whether it affects an individual's calorie count in the long term. In a recent study, Story et al. [28] suggested that actions taken by public authorities to improve a population's food habits should also aim to create an environment conducive to healthy eating. Another documented example is that of the quality of attention paid to the act of eating: when distracted, people tend to eat more. Television is a key factor here.

Marketing and Food Consumption Behaviours

The approach developed by marketing experts is more comprehensive and inductive than that of traditional economics. By looking at the hypotheses and results of research carried out by economists, sociologists, psychologists and nutritionists, they focus on deciphering the logic behind the series of small decisions taken by consumers before and during the act of purchase, while managing food stocks, and at the moment of consumption. Particular attention is paid to consumer perception, the influence of environment, and consumer preferences that are in a constant state of flux. The normative implications of marketing research are clear: the lack of control consumers have on their food choices warrants intervention on the part of public authorities in order to protect consumers from themselves as well as from those who supply food.

This conclusion is supported by the most recent theoretical and empirical developments in economics, which call into question the traditional notion of “consumer as king”. In both cases, the consumer spends time and money in order to satisfy personal preferences in terms of pleasure, health and nutrition. The comparison between cost and benefit governs choices, which, in turn, influence future preferences. Economic studies are often based on the assumption that when it comes to pleasure, preferences are stable and unchanged by the context in which purchasing and consumption take place. Put simply, consumer tastes do not change. This hypothesis is too categorical. In reality, preferences are formed gradually by consumer experiences, generating habits that are relatively stable to be sure, but also malleable. Food marketing experts know how to exploit the associations consumers make between, on the one hand, the form, aroma and colour of foods, and, on the other hand, the pleasure of eating—associations that can trigger impulse buying or unplanned consumption.

Along similar lines, it would be logical to assume that proven risks related to overnutrition are a strong incentive to change behaviours. The notion of risk on the part of consumers is nevertheless highly complex, and how consumers deal with those food safety risks is subjective and personal. It depends on how likely the consumer perceives these risks and their potential consequences to be (generally underestimated), as well as the value placed on staying healthy in the long term—a factor that varies widely. In addition to sensorial and nutritional preferences and the amount of information available, two other factors come into play in consumer

choices: income and price. How do budgetary and price constraints affect consumer choices? Research provides some very clear answers: consumers are quick to react to price, and when the cost of a food product rises, consumption drops. Lastly, in societies where salaried employment is the norm, time spent on food and eating is restricted. Nowadays, it is less worthwhile for people to fix meals at home than to buy industrially produced meals near the workplace. Although food preparation still occupies first place among all domestic activities (approximately 50 min per day in France), it is definitely losing ground. What is more, accumulated gains in productivity in the food industry have led to a rapid drop in processed food prices. This is not the case for unrefined food products in their natural state. This trend of relative prices promotes the consumption of prepared foods, eating outside of the home and snacking.

Processed Foods and Calorie Excess

How are food processing technologies and consumer behaviour related? It is a known fact that the form and texture of food have an influence on how much of it is ingested. In particular, foods in liquid form are consumed in larger quantities, leading to greater calorie intake. The consumption of meals of equal calorie value but presented in different forms and textures lead to significant physiological variations, especially oxidative metabolism. The easier a food is to consume, the greater the quantity ingested, and therefore the greater the potential calorie intake. The structure of a food also has an impact on the availability of macronutrients and a feeling of fullness and satiety. Nowadays, it is widely accepted that foods with a low glycemic index curb hunger and are therefore ingested in lesser quantities.

Food structure has an impact on both the assimilation and digestibility of lipids and proteins, although how it affects fullness and satiety has yet to be explored in any depth. Fibre also comes into play, procuring a greater feeling of satiety while diminishing hunger and calorie intake. When it comes to additives, the use of flavouring, whether artificial or natural, even in small quantities, acts on the olfactory system to boost the acceptability of a food. The quest for maximal palatability can therefore contribute to detrimental habits such as overeating. To sum up, it seems that food technologies, especially during the secondary processing stage, have an impact on consumer food habits and the assimilation of nutrients via several channels, without the consumers being entirely aware of this. These mechanisms, because they are so complex, warrant further study to better understand the subtle interaction between texture and flavour and how they influence food consumption. While it is regrettable that industrially processed food products too often contribute to an increase in calorie intake, this also represents a major driver of change and an opportunity to improve the quality of food supply. This is key to changing food and eating habits for the better in terms of nutritional value.

Similar trends are being seen with other determining factors of food consumption behaviours. Taken together, they upset diets and lead to excessive calorie intake. The matter is exacerbated by two major and well-established trends: increasingly

sedentary lifestyles and pervasive consumerism. Awareness of these health hazards is growing and more and more people are paying attention to their weight, taking physical exercise and trying to improve their lifestyle. However, there is still a lack of documented statistics of the impact of this. Moreover, whole segments of the population are pro-active about finding new ways to obtain food (i.e. opting for local food products), and there is renewed interest in the nutritional quality of food.

Overnutrition and Health

Overweight and Obesity

Overweight and obesity result from an imbalance between calorie intake and expended energy. Because each situation is so different, with a variety of factors coming into play, it is not always possible to determine to what extent increasingly sedentary lifestyles and overnutrition affect matters. The blame is often put on factors such as increased use of motorised vehicles, urbanisation and a trend toward sedentary work and leisure activities. Other studies point the finger solely at increased intake to explain overweight and obesity. In reality, both trends must be taken into consideration together. According to the World Health Organisation (WHO), in 2005 there were 1.6 billion overweight adults in the world (body mass index or BMI² above 25), of which 400 million were obese (BMI above 30). Forecasts sounded the alarm bell, with an expected 2.3 billion overweight people and 700 million obese people by 2015. In France, the prevalence of reported cases of obesity rose from 8.5% in 1997 to 14.5% in 2009³. Nevertheless, France still has one of the lowest obesity rates in Europe (see Table 2.1).

Until the end of the 1960s, obesity among the adult population in the US was stable, at around 15%, rising to 35% in the early years of the new millennium [29]. Since then, it seems to have levelled off [30], proving the most pessimistic of forecasts wrong. This recent stabilisation must not, however, lead to an underestimation of the health risks that may well lie ahead for the US population. Indeed, there is a lag in the time between the onset of obesity and its consequences on health (metabolic, vascular, osteo-articular and neoplastic), indicating that a worsening of certain health indices can be expected [31]. Models have shown that the positive health effects linked to a decrease in certain risk factors, first and foremost smoking, are largely offset by overweight and obesity [32]. In the US, over two-thirds of the adult population is currently overweight (obese and non-obese people alike).

In the past, overweight and obesity were considered the hallmark of wealthy nations. Today, these health risks are on the rise at an alarming rate in developing

² BMI is calculated by an individual's body weight (in kilograms) divided by the square of his/her height (in metres).

³ Figures from the national survey ObEpi-Roche on the prevalence of overweight and obesity in France.

Table 2.1 Obesity and food consumption in the world. (Source: OECD, FAO and other data, compiled in Etil, 2010, Food Consumption and Health. In J. Lusk, J. Roosen and J. Shogren (editors), Oxford Handbook of the Economics of Food and Agricultural Policy, Oxford Univ. Press)

Country	Obese adults (prevalence in %)		Overweight non-obese adults (preva- lence in %)		Obese and/ or overweight chil- dren (7-11 years) (prevalence in %)	Calorie supply in kcal/capita/ day (% from fats)	
Year	1980	2006	1980	2006	2000	1980	2005
Australia	8.3	18.7	28.0	34.4	26.2	3,051 (33%)	3,084 (39.1%)
Canada	13.8	23.1	35.4	36.1	25.1	2,946 (37%)	3,552 (37.1%)
France	6.5	11.5	26.9	31.5	19.0	3,376 (39%)	3,603 (40.7%)
Germany	na	13.6	na	36.0	16.0	3,338 (37%)	3,510 (35.9%)
Greece	na	16.4	na	41.3	31.0	3,216 (35%)	3,700 (35.7%)
Italy	7.1	10.2	27.4	35.0	36.0	3,589 (32%)	3,685 (38.4%)
Japan	2.0	3.4	15.6	21.8	17.8	2,720 (23%)	2,743 (28.0%)
The Netherlands	5.1	11.3	28.2	35.2	12.0	3,071 (38%)	3,240 (38.2%)
Norway	na	9.0	na	34.0	18.5	3,350 (40%)	3,478 (37.4%)
United Kingdom	7.0	24.0	29.0	38.0	20.0	3,159 (39%)	3,421 (36.5%)
United States	15.0	34.3	32.4	33.0	15.2	3,155 (36%)	3,855 (39.4%)

na not available

countries, especially in urban settings where the food transitions discussed earlier are gaining pace. Emerging economies are the first to feel the effects of this, but poor nations are not spared either. According to the OECD, seven Mexicans out of ten are overweight. The figure stands at 50% in Brazil, Russia and South Africa, approximately 28% in China and slightly less than 15% in India. In South America, North Africa, India, China and elsewhere, with the exception of sub-Saharan Africa, malnutrition due to overeating is more common than undernutrition. Mexico, the country in the world where overweight and obesity are most prevalent after the US, ranks first for childhood obesity, and diabetes is now the second cause of mortality after hypertension. In China, 200 million people are believed to be overweight, of which 90 million are obese, an increase of 39% and 97% respectively since 1992⁴.

Overweight, Obesity and Related Illnesses

Research on eating habits and health indicators poses a methodological problem since correlations between variables do not always imply a causal relationship. Analyses are based on a multitude of factors, both diet- and health-related. When an entire population is taken into consideration, the annual incidence of most illnesses is relatively low, calling accuracy into question when it comes to determining

⁴ Le Monde 12 July 2010.

the relationship between diet and health. Moreover, a number of factors influence health indicators, for example improved screening practices, disease prevention or therapeutic innovations, all of which make it more difficult to determine the role diet plays.

The sheer diversity of eating habits, the inherent difficulty in assessing them, and ever-changing trends—not to mention how those factors affect health across an entire population—make conducting research on food-related behaviour a genuine challenge. To remedy this, mass numbers of people must be monitored and their eating habits well documented, ensuring that analyses are accurate and reliable. Nevertheless, the overall findings could not be clearer: the food transitions underway in wealthy and poor nations alike are detrimental to health. More specifically, excessive calorie intake has a definite influence on a number of degenerative diseases such as type-2 diabetes, cardio-vascular disease, certain types of cancer and articular disease.

Diabetes

Obesity results from an excess of fat cells in the body which produce free fatty acids. These cells hinder the performance of insulin, the hormone that keeps blood sugar levels in check, gradually compromising its effectiveness. Uncontrolled sugar levels lead to the onset of type-2 diabetes, also known as sugar diabetes or insulin-resistant diabetes, which accounts for 90% of all diabetes cases today. Epidemic diabetes and obesity follow the same course, which has led to the coining of a new term: “diabesity”. Determining a causal relationship is, however, a more complex matter. Other variables come into play, such as old age, sedentary lifestyles, stress, genetic predisposition, etc. Nevertheless, diabetes and overweight do have this in common: they both share two of the four causes of insulin resistance which are eating disorders and a lack of physical exercise.

Cardiovascular Disease

Resistance to insulin is also at the root of many cardiovascular complications associated with obesity. It can lead to the production of a particular type of lipoprotein in the liver that produces “bad” cholesterol in the form of fatty deposits, called atheroma, in the arteries. Excessive amounts of “bad” cholesterol is a proven high-risk factor of cardio-vascular disease. In addition, obesity also triggers hypertension, which in turn exacerbates cardio-vascular risk.

Cancer

Numerous studies have confirmed the link between excessive weight and cancer risk, but once again it is difficult to assess the degree to which overweight and obesity play a role since many other factors come into play, the first among which

are a lack of physical exercise and poor eating habits. It is more accurate to speak of associations, and experts concur: there is indeed an association between the frequency of some types of cancer (oesophagus, thyroid, colon, rectum, pancreas, etc.) and overweight and obesity [33]. For every 5 kg/m² of BMI, the risk of cancer of the oesophagus increases by 52 % for men and 51 % for women. Likewise, the risk of thyroid cancer increases 33 % for men and 14 % for women.

The “double burden” of Disease in Developing Countries

Developing countries are witnessing a surge in chronic diseases linked to excessive calorie intake, overweight and obesity. Practically speaking, many low- and middle-income countries are currently struggling with what WHO calls a “double burden” of disease, the prevalence of which is defined as the number of persons afflicted by a given disease at a given time. While undernutrition, malnutrition and infectious diseases continue to take their toll, risk factors of noncommunicable diseases increase under the combined influence of factors such as overeating or imbalanced diets, overweight or obesity, a lack of physical activity, and more generally a shift toward westernized habits and lifestyles, especially in urban settings. Increasingly, situations of undernutrition/malnutrition and overnutrition/overweight exist side by side within the same country, community, or even household. It is not rare to find homes where a pregnant woman or infant suffers from undernutrition (inadequate nutrition to satisfy energy requirements) while an older child’s diet is rich in high-sugar, high-fat, calorie-dense foods that are cheap but poor in micronutrients. The prevalence of childhood and adolescent obesity is on the rise while malnutrition persists (relative to undernutrition, malnutrition refers to calorie intake that is not only insufficient but unsuited to needs). Indeed, developing countries are facing a triple challenge: accelerated food transitions (excessive calorie intake relative to energy requirements), nutritional imbalances (imbalanced or deficient diets) and of course undernutrition. The issue of hunger and solutions for tackling hunger is the subject of Chapter 9. The next paragraphs explore how to deal with the problem of overnutrition.

Taking Action: A How To

The consequences of excessive calorie intake are extremely grave and constitute a major public health challenge, for developed and developing countries alike. The urgency of the situation is only heightened by the fact that these trends are usually fast-paced. The determining factors responsible for these imbalances have already been outlined, but they may also be seen as windows of opportunity to take action, starting with the consumer, who is ultimately key when it comes to food and nutrition. At this level, matters are anything but simple; the many small decisions consumers make on a daily basis are subject to context, environment, modes of distribution and the constraints and vagaries of everyday life.

Those on the supply side of agricultural products, be they farmers or industrial players, distributors or restaurateurs, must also be taken into consideration. They certainly have a major role in implementing important changes, but are they really able or willing to do so? Is bringing about change in their best interest? Lastly, there are public authorities, whose duty it is to come forward in the name of public health and use all the educational and regulatory tools and incentives to face the issue and stamp out the epidemic. These three categories do not have equal clout in all countries. In-depth studies carried out in industrialised nations serve as a solid basis for action, as they provide thorough knowledge of target systems and populations. The same level of knowledge is unfortunately not available in many developing countries. The actions outlined below are based primarily, but not exclusively, on experiences in France.

Driving Change at Consumer Level

Understanding Trends in the Consumer/Food Relationship

A series of recent health crises in the European Union (mad cow disease in 1996, foot-and-mouth disease in 2001, bird flu in late 2005, etc.) coupled with a surge in overweight, obesity and related degenerative diseases, have resulted in new public awareness of the key role that diet plays in health. This awareness, although perhaps late in coming, presumably marks the beginning of a new era with modified behaviours on the part of the consumer-citizen and decidedly pro-active food policies. After its first National Nutrition and Health Programme (PNNS) in 2001, France, torn between its culinary tradition and a growing prevalence of food-related illnesses, decided to send out a loud and clear message reminiscent of British and American societies, who have entirely different food cultures. When it comes to food, the French place great emphasis on the importance of tradition, sharing and pleasure. A medical discourse that champions health at the expense of cultural or social aspects or pleasure comes at the risk of undermining the very food culture of the French.

The impact of the messages about health sent out by French authorities, but also by industrial players who have taken a stance on the issue, is revealed by people's interpretation of the open question: *what does it mean to "eat well"?* This question has been asked since 1998 in surveys on food-related behaviours in France carried out by Credoc, the French Research Institute for the Study and Monitoring of Living Standards [34]. Until 2003, the vast majority of answers emphasised the importance of shared pleasure. Things changed in 2007, when people started to speak of "balance" in their diets. Today, greater focus is placed on functional foods and the limitations they imply as compared to the 1990s, notably among youth. This reflects, in part, a heightened awareness when it comes to diet and nutrition but may also be explained as a generational shift in mental representations: less emphasis was placed on health in the 1990s, and the issue regained importance in the first decade of the new millennium.

Not all consumers are alike. Likewise, there are differences between perceptions and actual behaviour. Lahlou [35] has observed that “housewives with little free time use processed foods (especially frozen foods), even though they claim not to like them.” Likewise, Raude and Denizeau [36] have shown that those consumers who claim to avoid delicatessen meats for health reasons are not those who eat them the least. It is precisely because people feel guilty, or have a negative opinion, about certain nutritional practices, that it is unlikely that trends in France will follow the American model. Nevertheless, achieving a better understanding of how the relationship between consumers and food evolves remains a challenge. In general, according to surveys conducted among the French on eating habits, a growing number of people believe their diets to be “poor”.

A Clearer Message About the Risk of Overnutrition

A heated public debate about health and nutrition has been taking place in developed countries on a non-stop basis. Governments, consumerist movements, physicians, industrial players, distributors, the media and advertising are constantly contributing to it, often sending out mixed messages to the public. Contradictory information runs rife in the press, not only between different sources and different articles, but often within the very same article: sources are not always cited and accuracy is compromised by omissions, over-simplification and sweeping generalisations. Providers of information (journalists) and those on the receiving end (readers) act as both agents and factors of these distortions. Consumers are thus faced with risks that can be classified according to two main criteria: a health risk *versus* a nutritional risk and a long-term *versus* a short-term risk. Food poisoning is a short-term health risk while obesity is a long-term nutritional risk. How they cope with these risks is a fundamentally subjective matter, depending not only on the value individuals place on staying healthy but also on the perceived likelihood of risks and potential consequences. Evaluations are based on the incomplete or misleading information at their disposal.

Three lessons may be drawn from studies carried out on consumer behaviour in the face of risk: consumers are uncomfortable with risk that is beyond their control; consumers underestimate the risks they run by their own habits; consumers overestimate rare and unfamiliar risks and underestimate common and familiar risks. These three perspectives explain in part the relationship between consumers and food-related technological innovations, especially when these innovations blur the line between what happens on the farm and what ends up on their forks. To the consumer mind, technological innovation and loss of control mean higher risk. From this perspective, during a health crisis, perceived risk is much greater than actual risk for some people. The risk factor gets blown out of proportion when assessing the quality of a food product. Lastly, this explains why outbreaks of new health risks are more likely to influence consumer food habits more than awareness campaigns that serve as reminders of well-known, familiar risks, e.g. alcohol abuse or a diet that is high in fat, sugar or salt. While no one can deny the importance and necessity

of clear, accurate and accessible information about risk, the previous paragraphs reveal that this is not enough to reach targets and significantly change consumer behaviour, especially if information is limited to nutritional aspects alone.

Tapping into the Benefits of Nutrition Education

Nutrition education, a form of intervention widely used by public health professionals, has been the subject of many studies. It entails working in groups within schools, neighbourhoods or specific communities to inform and educate people, and enhance pre-existing favourable conditions in order to improve behaviours. In the majority of cases, the impact of this intervention is gauged in terms of knowledge gained, attitudes and behaviours. Studies show that while nutrition education is indeed effective in boosting knowledge, it is less so in changing actual behaviours. Based on a meta-analysis of articles and reports on nutritional programmes implemented in the UK since 2001, it has been concluded that this lack of effectiveness is linked to the failure to recognize the determining factors that structure food choices, and to social and emotional factors as well [37].

Moreover, nutrition education places nutrition and health at the very core of the question, the underlying principle being that reason guides people to choose healthy foods. This approach may not be appropriate for children, whose reasoning when it comes to health differs from that of adults, and for whom health and taste are mutually exclusive [38]. Nutrition education which takes cultural differences into account can be relatively effective, as the Irish programme *Nutrition Education at Primary School* (NEAPS) has shown: some 453 children aged 8–10 were given 20 lessons over a period of 10 weeks; 3 months after the end of the programme, they were found to eat more fruit and vegetables and fewer salty snacks.

Sensory Education: A Driver of Change, Especially Among Children

Sensory education is well rooted in history. It is based on the intuitive hypothesis that food-related behaviour goes beyond nutritional aspects and involves sensory aspects as well. The role of food is not simply to satisfy nutritional requirements but bring pleasure. What are the sensory properties of food that give pleasure to children? Although it is tempting to think, and even to conclude, that an innate predilection for calorie-dense foods high in sugar and fat govern children's food preferences and choices, this is not at all the case. Numerous studies have shown, in fact, that the food preferences of babies and children can and do change with time. The same holds true for adults. The challenge of sensory training is clear: steer children's dietary preferences toward healthier foods. This idea is not new. Over 30 years ago in France, Jacques Puisais developed a classification method geared toward children aged 7–11 to differentiate between tastes. The goal of the method was to stimulate children's curiosity about food.

These “taste classes” draw children’s attention. Significant progress has been reported in the vast majority of cases: improved verbal expression of sensations, increased willingness to try new foods and an interest in helping to prepare meals. In 2004, two major projects were launched almost simultaneously, one in Finland and the other in France under the aegis of INRA (the EduSens project). Both initiatives were geared toward children aged 8–12, and used a longitudinal approach over several years to determine whether or not observed effects, if any were recorded, stood the test of time. In the Finnish project, five lessons served as a complement to sensory education, itself administered in two phases. Each lesson aimed to educate and inform about a certain type of food, how it is made, how to describe its taste and how it can be modified by different procedures. The French project consisted of three independent experiments based on the “taste classes” method and two derived methods, “taste cafeteria” and “taste families”. Both projects confirmed that sensory education, especially coupled with other information on food behaviours, has a definite impact, notably heightened interest in a wide variety of foods. Despite these positive results, it would be a far stretch to conclude that sensory education alone can bring about a lasting improvement in eating habits. Nevertheless, the method can and must serve as a stepping stone to change.

Social Marketing: Recommendations for Taking Action

Social marketing goes back to the 1970s, when it was widely used in British and American societies as an effective teaching tool for changing behaviours and modifying social norms [39]. When it comes to putting theory into practice, however, the method has its limits, especially with regard to eating habits. In order for this theoretical approach and framework for action to be effective, it must go beyond the strategic analysis of data and identification of obstacles and levers of behavioural change. To bring about lasting change in individual and collective habits within a social group, or in social norms, things must be taken a step further—social marketing must be combined with a multilevel strategy founded on the active participation of all players, with goals for the short, medium and long terms. Action must be taken where it counts: at the heart of families in their immediate settings [40].

In terms of eating habits and public health, social marketing is more than just a concept, it is a philosophy of change that seeks to promote behaviour that is conducive to good health. It is also about fostering a desire for that change. To this end, it proposes a five-step strategy—the “5 Ps”—built around a people-centred frame of thinking and a thorough understanding of personal motivation and the cultural aspects that influence day-to-day behaviour [41]. Each of the 5 Ps (product, place, price, promotion, and partnership) affords a different point of view, builds upon and enhances understanding, and contributes to the ultimate goal of defining the marketing mix. This mix includes targets, the strategic platform that serves as the basis for intervention, and the corresponding operational system that optimises impact on individual and collective behaviours. According to some experts, such as Cairns and Stead [42], social marketing is an effective technique for altering behaviour

and limiting overweight. This perspective is supported by the results of an experiment carried out in the US, *Towards a Healthy Diet* [43], which focused primarily on restaurants, schools and health services. It sought to promote culinary practices that take the nutritional value of foods into account, and coupled this with nutrition education and community events. Evaluation based on a sample population of 1,137 individuals focused primarily on opinions, behaviours and attitudes, and showed that more people frequented “healthy” restaurants and canteens, and their intake of fruit increased.

Several similar interventions were carried out in the US between 1997 and 1999 among 1,109 students between the ages of 11 and 14 in some 24 schools. Low-fat foods were supplied and sold at all meals and anywhere food was made available (i.e. cafeterias, adjoining shops, etc.). The interventions were designed to get both students and personnel involved, and included a physical component as well. Information on nutrition, however, was not provided. The interventions had a positive impact on the physical activity of students and a negative impact on the BMI of boys. There was no significant effect on the consumption of high-fat foods, but additional research is needed to understand why [44]. Social marketing and multi-level strategies are but tools that alone cannot change behaviours and eating habits or alter lifestyles in any significant or lasting way. They must be part of a broader effort designed to get all players involved and make a contribution to change [45].

Product Labels: A Valuable Source of Information

Consumers who pay attention to the link between diet and health, and to the related risks they run with their own behaviour, are naturally more receptive to practical information on the consequences of their food choices and the nutritional breakdown of food. It comes as no surprise, then, that people who attribute greater value to their health and body, i.e. women, well-educated consumers, and/or those with higher incomes, read nutrition labels and are generally more informed about nutrition. How nutrition labels affect food choices is not so easy to determine, especially since consumers tend to evaluate products in an oversimplified, categorical manner, deeming them good or bad, healthy or unhealthy [46]. Information about nutrition and public health campaigns is often in competition with messages sent out by companies via advertising and clever packaging designed to attract the consumer. This competition fosters what is known as the “halo effect”, which refers to the name of a food product, or unproven claims about the product, holding greater sway on consumer expectations in terms of pleasure or nutritional value than a detailed breakdown of nutritional content. Unfortunately, these expectations are unfounded. Faced with complex nutrition labelling, consumers tend to focus on one indicator, for example added preservatives or fat content (a particularly important criterion in determining what is healthy versus what is not healthy [47]). Given this, it is hardly surprising that consumers assume a product is high in nutritional quality based on isolated indicators [48]. The calorie content of foods deemed healthy is therefore systematically underestimated, and that of foods deemed unhealthy overestimated [49, 50].

The argument for standardising nutrition labelling is very convincing: the market only functions if consumers are well informed. However, nutrition labels have little bearing on the nutritional quality of people's food choices when they are not used or misused, which happens to be the case. This is most likely due to information overload: messages about health and prevention must vie with advertising for consumers' attention. Likewise, nutrition labels, which are often overly complex, are in competition with unproven claims about a product's nutritional quality. While nutrition labelling is mandatory in the US, it is optional in Europe. Nevertheless, in France, close to 80% of products produced by different sectors examined by the French Observatory of Food Quality (OQALI) have nutrition labels. In addition, more and more companies are committed to keeping consumers informed via nutrition labels. Nonetheless, they are more common with national brand products (and mid-range and high-end products) than with discount or generic products.

More generally speaking, public campaigns to build awareness about nutrition can upset balances in the market for products that are recommended, or, on the contrary, deemed a risk to public health. One of the first consequences of these campaigns is an increasingly fragmented market, linked to a small, privileged segment of society—the richest and/or most informed—willing and able to pay for products believed to be beneficial to health. This increase in demand pushes the prices of recommended products up, in turn making them less accessible to those segments of the population that are least receptive to campaigns. As a result, the overall average quality of a population's diet can be seen to improve while that of the underprivileged categories of society witnesses a deterioration, be it absolute or relative [51].

The effects described above depend largely on the industrial structure of the sector and the level of competition that prevails. Research carried out in the US on the effects of campaigns promoting whole grain products (bread, flour, pasta, rice, etc.) have shown that they lead to modifications in existing products and the introduction of new products without increasing prices. Companies have been stepping up competition by promoting whole grain products. In a sector where the elasticity of supply is high, competition for gaining greater market share has no effect on price [52].

Targeting Industrial Players and Food Availability

It is unrealistic to assume that consumer preferences cannot change. Sensory perceptions, which directly influence the quantity of food consumed, are inextricably linked to context. It follows from this that they are also malleable. What is more, consumers learn to associate certain sensory properties with certain foods over the course of time. Past experiences shape present tastes, generating relatively stable eating patterns which are reinforced by social norms. Some studies point to the fact that certain foods that are particularly palatable, especially those high in fat or sugar, can create addictions. Food marketing experts know how to exploit the associations consumers make between the form, aroma and colour of foods, and the pleasure in partaking of them. Seeing or smelling food alone can trigger impulse buying or

unplanned consumption [53, 54]. These stimuli amplify feelings of hunger by setting off dopamine circuits associated with pleasure and reward, especially in people whose calorie intake is restricted [55, 56]. If these interactions can lead to poor eating habits, there is no reason why they cannot be manipulated and used as leverage to do the opposite and bring about positive change.

Engage Industry in Improving the Quality of Food Supply

When it comes to regulating food supply, the relationship between public authorities and companies can take several forms. While some plead for corporate self-regulation, others are in favour of imposing compulsory government regulations. Still others are for coordinated action between the public and private sectors [57]. The argument for corporate self-regulation is part of the broader issue of Corporate Social Responsibility, which aims to reduce the risk of controversy in the public eye, protect the reputation of brands, promote a positive image among shareholders and employees, and lastly to avoid the application of more stringent regulations in the future [58, 59]. Reconciling self-regulation with the laws of the market and competition is only possible, however, if solutions are found that allow companies to prosper and consumers to have a greater say in their food choices, and therefore health. In such a win-win situation, public intervention becomes a moot point [60]. This seems feasible provided at least a portion of the consumer population is able to pay more for better quality foods in terms of nutrition, and costs do not get pushed up significantly.

Those who argue for public regulatory intervention point to the lack of effort on the part of companies in areas other than the ones listed above, e.g. advertising which targets children, or the incompatibility, inherent to a free market, between health-related expectations and company objectives [61–64]. There is no lack of examples to support their claims. In the US, companies were quick to respond to the ban on trans fatty acids in several states with technical solutions ready at hand. Cutting the sugar or salt content of products is a more complicated matter, not in terms of implementation but gaining acceptance. Indeed, consumers are slow to accept such changes since they tend to blunt sensory pleasure, leaving companies little leeway for modifying products. Between these two extremes, a system of joint regulation between public and private players via partnerships leads to a two-fold awareness. First, companies become aware of their responsibility to contribute to improving the health of populations, or at least to not compromising it. Second, public authorities become aware that companies are in the best position to assess which actions work best in light of the economic constraints of the market.

Several initiatives to promote joint public/private regulation have been taken, either as part of voluntary projects or by way of nutrition charters. Voluntary projects aim to improve the nutritional quality of products (reduced salt or fatty acid content, etc.). They are public and unenforced. Commitment charters are designed to influence impact, measured by indicators correlated to a population's state of health; it is up to companies to take action and punitive measures are taken if there is a breach

of discipline. Inter-company agreements to boost minimum quality standards are difficult to implement since the temptation is great for companies to go along with them without truly making a commitment. One way to remedy this is to monitor and publish the efforts made by individual players in different sectors, for example via an observatory for food quality, thus setting an example for others to follow.

In France, 15 commitment charters were signed between February 2007 and February 2010. Depending on the sector, they represent between 5 and 15% of the market share of related products. These commitments, fully implemented, are far from insignificant: they involve taking 10,000 t of sugar, 400 t of fatty substances and 200 t of sodium off the market. Naturally, the more companies and sectors involved, the more effective these commitment charters are in driving change. In light of this, it is not the number of individual charters signed by players in the food industry that counts, but collective agreements designed to improve the nutritional quality of the most poorly positioned products within each sector. Generic products are particularly problematic since they do not fall within the range of products that come with nutritional claims and/or that are designed with the well-informed consumer in mind. This involves a commercial risk for industrial players in that the modification of a product can influence consumer taste perceptions and alter shelf life. In such a situation, public intervention must have a regulatory component, e.g. imposing minimum quality standards, and incentives to improve, on a voluntary basis, the quality of products.

Regulating the Environment Where Consumer Choices are Made

Given that consumer choices are influenced by systematic biases and that their preferences change according to the environment in which those biases develop, it is perfectly legitimate to question how food marketing should be regulated. This is all the more true given the fact, discussed earlier, that people's knowledge about nutrition is limited. Two types of intervention in particular have been examined: on the one hand, regulations, or even a ban, on advertising that promotes high-fat and/or high-sugar foods, and, on the other hand, regulations on the physical environment where choices are made, i.e. the way in which different options are presented to the consumer in stores [61, 65]. A large portion of advertisements geared toward children and adolescents promotes foods that are high in fat, added sugar or salt; the figure in France stands at approximately 85%. The problem is exacerbated by other factors: these advertisements are usually broadcast outside of normal mealtimes and they reinforce the association between the promoted product and the benefits they allegedly procure, such as relaxation, happiness, an athletic image and/or good health [65]. Although a causal relationship with consumer decisions is indeed difficult to establish, several experimental studies confirm the theory that such a relationship does exist between advertising and consumer eating habits. In light of this, it is logical to look to regulating advertising in order to limit negative behaviours.

The second course of action involves the physical environment where consumers make choices. Seeing and smelling food greatly increases the chances of it being

consumed. It follows that greater visibility of healthier alternatives also increases the chances of consumers taking notice of them. In large and very large supermarkets, fruits and vegetables should therefore be put on more prominent display, and snack foods less so. When it comes to restaurants, one possibility is to keep the number of fast food establishments near schools in check. This measure was proven to work in California: young people with a fast food restaurant within a 0.5 mile radius of their school were found to eat less fruit and vegetables, drink more soft drinks, and have a greater tendency to be overweight or obese. A policy to limit the proximity between schools and fast food establishments would therefore lead to a drop in adolescent overweight and obesity. The need for such a policy is even more pressing in disadvantaged areas where fast food restaurants abound; it is precisely in these neighbourhoods that obesity is most prevalent [66, 67]. The study of systematic biases that influence individual consumer choices provides an irrefutable normative basis for nutritional policies because it challenges the theory of “consumer as king”. Such studies show that actions should be geared more to the environment of consumer choices than to the market itself. This type of intervention would lead to fewer distortions than those that focus on price—traditionally the preferred approach of economists. That said, care must be taken to ensure that regulations in the name of public health do not have the opposite effect of that intended: leaving consumers prey to the manipulation of distributors and severely curtailing their freedom to make their own choices!

Product Availability at the Consumption Stage

Places where people gather are ideal ground for promoting healthy food. This is especially true for schools, where several initiatives to promote fruits and vegetables have been taken. In a recent meta-analysis, 10 out of 15 cases showed an increase in the number of fruit and vegetable portions consumed: between one and three extra servings per day. Results were even more promising when a multilevel approach was taken over a substantial amount of time, combining several initiatives such as promoting fresh fruit and water and discouraging sweetened beverages [68]. Moreover, follow-up studies showed that this change for the better continued 2 years after the interventions. Efficiency was further improved when initiatives were combined with organisational changes in schools, instruction on diet and nutrition, the adoption of official policies and partnerships with local food and nutrition services [69].

In the same vein, automatic vending machines in schools have gained a bad reputation for promoting calorie-dense foods. In France, vending machines that sell fruit have met with some success, but current legislation prohibits their installation in schools. Within the framework of pro-active, voluntary initiatives, making fruits and vegetables regularly available in schools has had success when it comes to fruit, less so with vegetables (based on experiences in Denmark and Norway). Likewise, several studies show that the promotion of fruit and vegetables where adults eat brings about the desired result and initiatives taken in the workplace or on university campuses are more effective than those taken in shops [70]. Lastly,

smaller portions and packaging containers in shops, vending machines and dining establishments have also been seen to have positive effects, since people tend to eat more when portions and containers are large [71].

Tapping into the Power of Price

This is a prime area of economic research which, in a broad sense, focuses on food consumption behaviours and the policies that are likely to influence them. Studies that examine the consequences of public intervention on consumer demand often take it for granted that supply remains unchanged, in terms of price or otherwise. This assumption is not always well founded, and in some cases the reaction of companies must also be taken into consideration. In other words, the impact of measures taken must be assessed by looking at the big picture: the interplay between supply and demand. Several recent studies have illustrated the dynamics of supply and demand and the importance of balance when it comes to price, taking all adjustments into account.

Public food policy oriented toward supply via prices aims to change consumer habits and improve health, including for those who are not well informed or aware of the link between diet and health [72]. This supply-oriented approach is an example of “passive prevention”, which can be beneficial to consumers but does not require any significant effort on their part. The reduction of health inequalities is often cited as justification for such an approach. Nevertheless, the debate about public intervention at supply level is still going strong [60, 73] and examples at international level are few and far between. There are two non-exclusive ways to manipulate the price of products: subsidies and taxes. Several studies have been carried out on food stamp programmes, which are, practically speaking, subsidies to income. Two principle lessons have been drawn from studies carried out in the US: the health benefits of food stamp programmes among qualifying populations are offset, in part, by a negative carryover effect among middle-income populations who are not eligible for such programmes. In other words, a rise in demand for recommended products among consumers who benefit from food stamps drives up prices [74]. A similar risk, albeit theoretical, was found in France in the case of fruits and vegetables. However, it has yet to be empirically confirmed (or disproved) [51].

Few studies have been carried out on the potential effects of nutritional taxes on corporate behaviour. To be sure, this is an area that merits further research. Recent work on this topic by S. Sugarman illustrates the relevance of this point [75]. This US scholar, focusing on one particular market leader in a concentrated industry, showed that companies, whose primary concern is to maintain demand, will not always raise the price of products to compensate for higher taxes. In fact they are more likely to look for ways to cut production costs by compromising the quality of products, thus offsetting the beneficial effect of the tax on consumer health. This theory has yet to be supported by concrete figures.

Bolstering Impact with a Multilevel Approach: Easier Said than Done

One thing is clear from this analysis of different strategies to improve the impact of diet on health: each one is highly unlikely to make a difference if implemented on its own. Clearly, then, a multilevel approach combining several strategies at once to tackle the issues of overnutrition and related illnesses would be much more effective. While no one would deny that such an approach makes sense, establishing a causal relationship between multilevel programmes and public health is another, much more complicated, matter. Some are convinced that a multilevel approach is what is needed [76], especially when it comes to children. Others have doubts about the causal relationship between childhood obesity and environment [77].

Today, with the benefit of hindsight, we are able to assess the impact of wide-scale projects combining several actions implemented in eating environments outside of the home, both in schools and in the workplace. As far as schools go, several programmes deployed in the US have met with success by combining nutrition education, access to “healthy” products, marketing adapted to children and modifying the school environment [78] or promoting physical exercise, nutrition education, programmes to educate and inform parents and providing advice on diet and nutrition [79]. In Belgium, the aggregated school socioeconomic status programme (AGG SES), which examined the influence of availability of food items, nutrition education and adolescent food habits, has also proven somewhat effective in the case of secondary school students. With primary school children, however, its impact was not significant [80]. In Scotland, a multilevel approach geared toward children (aged 6–7 and 10–11), their parents and teachers led to a significant increase in fruit consumption [81].

When it comes to combined programmes in the workplace, they are found to be more effective when people are given an active role in implementing them (increased involvement) and when their scope is broadened to include surrounding social environments (families, neighbours, etc.). Organisational barriers on site must also be overcome [82]. Combined programmes which aim to boost the consumption of fruit and vegetables have also met with success in Finland, as long as they took into account the socioeconomic aspects and cultural differences of targeted populations [83]. The diversity of situations goes to show that there is no one-size-fits-all solution. This has been further confirmed by the teachings of the EU programme Identification and prevention of dietary and lifestyle induced health effects in children and infants (IDEFICS), with the participation of eight member states (Germany, Belgium, Cyprus, Spain, Estonia, Hungary, Italy and Sweden). It is based on the analysis of 20 groups of children aged 2–8, and 36 groups of parents. The programme sheds light on the different obstacles to improving food habits: lack of time, financial constraints, personal preferences, influence of family and peers, school policies, etc. [84].

The challenge before us is daunting: provide food for 9 billion people. The stakes are enormous, both in the quantitative and qualitative sense. That is why we must look for ways to combat behaviour that leads to malnutrition issues rooted,

ironically, in the overabundance that today is the cause of a growing number of public health issues all over the world. The issue is all the more pressing considering that a rise in overweight and obesity is occurring side by side with undernutrition, which affects close to 1 billion people, primarily in poor countries but also among the disadvantaged classes of wealthy nations. These two issues will more than likely have to be addressed simultaneously in order to boost the effectiveness of proposed solutions and achieve real results.

Several lessons from this chapter must be kept in mind when drawing up a plan of action. First and foremost is the fact that the consumer is not king, in that he has little control over his food choices. Consumers are subject to a wide range of constraints, both conscious and unconscious, and are influenced by education, information, advertising and the actions of those who supply food. Direct intervention on food prices is one possible solution, but it must be well thought out in order to limit indirect adverse effects, and implemented in tandem with other actions that target the entire spectrum of variables that influence consumer behaviour and environment: nutrition policies unrelated to price, campaigns that educate and inform about health, easier access to “healthy” food and more difficult access to “unhealthy” food, regulations for advertising and packaging, reduced food portions, etc.

Taking action strictly geared toward changing people’s behaviour is not enough; action must also be geared toward environment. The multilevel programmes discussed above will be all the more effective if they are implemented within a framework that gets all players involved, is long-term, and adapted to specific communities in terms of the people themselves but also of their environments. Lastly, public intervention must also have a regulatory component to incite all players—producers, agribusinesses and distributors—to step up and take responsibility. Despite auspicious initiatives that have, for the most part, met with success, such programmes are still all too rare. The gap must be bridged between being aware of overnutrition and actually doing something about it. Although there is still much to learn and uncertainties abound, this must not serve as an excuse to postpone—or worse, renounce—tackling the issue.

References

1. Combris P (2006) Le poids des contraintes économiques dans les choix alimentaires. *Cahiers de Nutrition et de Diététique* 41(5):279–284
2. Balanza R, Garcia-Lorda P, Pérez-Rodrigo C, Aranceta J, Bonet MB, Salas-Salvadó J (2007) Trends in food availability determined by the Food and Agriculture Organization’s food balance sheets in Mediterranean Europe in comparison with other European Areas. *Pub Health Nutr* 10(02):168–176
3. Grignon C, Grignon C (1999) Long-term trends in food consumption: a French portrait. *Food Foodways* 8(3):151–174
4. Combris P, Amiot-Carlin MJ, Baberger-Gateau P, Bouhsina Z, Caillavet F, Causse M, Chervin C, Chevassus-Lozza E, Codron JM, Dallongeville J, Dauchet L, Delcourt C, Demigné C, Dosba F, Dupont C, Gurviez P, Martel P, Mauget JC, Nicklaus S, Padilla M, Renard C, Requillart V, Roy C, Soler LG, Verger P, Volatier JL, Sabbagh C, Savini I, Fournier D,

- Champenois A (2008) Les fruits et légumes dans l'alimentation: enjeux et déterminants de la consommation. Éditions Quae, Versailles, 127 p
5. Besson D (2008) Le repas depuis 45 ans: moins de produits frais, plus de plats préparés. *Insee Première* (1208):1–4
 6. Nichèle V, Andrieu E, Boizot-Szantai C, Caillavet F, Darmon N (2008) L'évolution des achats alimentaires: 30 ans d'enquêtes auprès des ménages en France. *Cahiers de nutrition et de diététique* 43(3):123–130
 7. Herpin N, Verger D (2008) Consommation et modes de vie en France: une approche économique et sociologique sur un demi-siècle. Éditions la Découverte, collection Grands repères, Paris, 256 p
 8. Bellamy V, Léveillé L (2007) Enquête budget de famille 2006. *Insee Résultat* (73).
 9. Courson JP (1990) L'hypermarché se rapproche, l'épicier quitte le village. In *Données sociales*, Insee, Paris, pp 202–205
 10. Lemel Y, Mercier MA (1987) L'approvisionnement alimentaire. In *Données sociales*, Insee, Paris, pp 406–409
 11. Lutinier B (2002) Les petites entreprises du commerce depuis 30 ans: beaucoup moins d'épiceries, un peu plus de fleuristes. *Insee Première* (831):1–4
 12. Guilbert PD, Perrin-Escaló HD, Lamoureux PP (2002) Baromètre nutrition santé. Édition 2002, Inpes
 13. Escalon H, Bossard C, Beck F, Bachelot-Narquin RP (2009) Baromètre nutrition santé. Édition 2008, Inpes
 14. Dubuisson-Quellier S (2009) Circuits courts: partager les responsabilités entre agriculteurs et consommateurs. In *Déméter 2009*, pp 87–111
 15. Herpin N (1988) Le repas comme institution: Compte-rendu d'une enquête exploratoire. *Revue française de sociologie* 29(3):501–521
 16. Chauffaut D (2001) L'évolution des relations entre générations dans un contexte de mutation du cycle de vie. *Cahier de recherche*. Credoc, Paris, p 163
 17. Volatier JL (1999) Le repas traditionnel se porte encore bien. *Consommation & modes de vie* (132):1–4
 18. Popkin BM (2008) Will China's nutrition transition overwhelm its health care system and slow economic growth? *Health Aff* 27(4):1064–76
 19. Kearney J (2010) Food consumption and drivers. *Philos Trans Royal Soc B* 375(1554):2793–2808
 20. Cépède M, Lengellé M (1970) L'économie de l'alimentation. Presses universitaires de France, Paris, p 128
 21. Périssé J, Sizaret F, François P (1969) Effet du revenu sur la structure de la ration alimentaire, Rome, FAO. *Bulletin de nutrition* 7(3):1–10
 22. Apfelbaum M, Romon M, Dubus M (2004) Diététique et nutrition. Éditions Masson, *Abrégés de médecine*, 6^e édition, p 535
 23. Finlayson GKN, Blundell JE (2007) Liking versus wanting: importance for human appetite control and weight regulation. *Neurosci Behav Rev* 31:987–1002
 24. Freedman MR, Brochado C (2010) Reducing portion size reduces food intake and plate waste. *Obesity* 18(9):1864–1866
 25. Kamphuis CBM, Giskes K, de Bruijn G-J, Wendel-Vos W, Brug J, van Lenthe FJ (2006) Environmental determinants of fruit and vegetable consumption among adults: a systematic review. *Br J Nutr* 96(4):620–635
 26. Cohen D, Farley TA (2008) Eating as an automatic behavior. *Prev Chron Dis* 5(1):A23
 27. Popkin BM, Duffey K, Gordon-Larsen P (2005) Environmental influences on food choice, physical activity and energy balance. *Physiol Behav* 86(5):603–613
 28. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K (2008) Creating healthy food and eating environmental approaches. *Annu Rev Pub Health* 29:253–272
 29. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM (2006) Prevalence of overweight and obesity in the United States, 1999–2004. *J Am Med Assoc* 295(13):1549–1555

30. Flegal KM, Carroll MD, Ogden CL, Curtin LR (2010) Prevalence and trends in obesity among US adults, 1999–2008. *J Am Med Assoc* 303(3):235–241
31. Van Dam RM, Willett WC (2009) Unmet potential for cardiovascular disease prevention in the United States. *Circulation* 120(13):1171–1173
32. Stewart ST, Cutler DM, Rosen AB (2009) Forecasting the effects of obesity and smoking on US life expectancy. *N Engl J Med* 361(23):2252–2260
33. Reneham A et al (2008) Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *Lancet* 371:569–578
34. Mathé T, Pilorin T, Hébel P, Denizeau M (2008) Du discours nutritionnel aux représentations de l'alimentation. *Cahier de recherche C252, Credoc, Paris*
35. Lahlou S (1992) Si/alors: bien manger? Application d'une nouvelle méthode d'analyse des représentations sociales à un corpus constitué des associations libres de 2 000 individus. *Cahier de recherche C34, Credoc, Paris*
36. Raude J, Denizeau M (2008) La perception des risques alimentaires: une influence complexe et incertaine sur le comportement des consommateurs. *Économies et sociétés, systèmes agroalimentaires (AG)* 30:1271–2188
37. Attree P (2006) A critical analysis of UK public health policies in relation to diet and nutrition in low-income households. *Matern Child Nutr* 2(2):67–78
38. Wardle J, Huon G (2000) An experimental investigation of the influence of health information on children's taste preferences. *Health Educ Res* 15(1):39–44
39. Kotler P, Armstrong G (2005) *Principles of marketing*. Prentice Hall International, 11th edn, p 768
40. Henley N, Raffin S (Forthcoming) EPODE (Ensemble, prévenons l'obésité des enfants or "Together, Let's Prevent Childhood Obesity") Case Study: Preventing Childhood Obesity. *J Mark Manag*
41. Glanz K, Rimer B, Lewis F (2002) *Health behavior and health education. theory, research and practice*. Wiley, San Fransisco
42. Cairns G, Stead M (2009) Obesity and social marketing: works in progress. *Proc Nutr Soc* 68:11–16
43. Dunt D, Day N et al (1999) Evaluation of a community-based health promotion program supporting public policy initiatives for a healthy diet. *Health Promot Intern* 14(4):317–327
44. Sallis JF, McKenzie TL et al (2003) Environmental interventions for eating and physical activity—a randomized controlled trial in middle schools. *Am J Prev Med* 24(3):209–217
45. Swinburn B, Egger G, Raza F (1999) Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med* 29(6):563–570
46. Wertenbroch K (1998) Consumption self-control by rationing purchase quantities of virtue and vice. *Mark Sci* 17(4):317–337
47. Oakes ME, Slotterback CS (2005) Too good to be true: dose insensitivity and stereotypical thinking of foods' capacity to promote weight gain. *Food Qual Prefer* 16(8):675–681
48. Keller SB, Landry M, Olson J, Velliquette AM, Burton S, Andrews JC (1997) The effects of nutrition package claims, nutrition facts panels, and motivation to process nutrition information on consumer product evaluations. *J Pub Policy Mark* 16(2):256–279
49. Wansink B, Chandon P (2006) Can 'Low-Fat' nutrition labels lead to obesity? *J Mark Res* 43(4):605–617
50. Carels RA, Konrad K, Harper J (2007) Individual differences in food perceptions and calorie estimation: an examination of dieting status, weight and gender. *Appetite* 49(2):450–458
51. Dallongeville J, Dauchet L, de Mouzon O, Requillart V, Soler LG (2010) Increasing fruit and vegetable consumption: a cost-effectiveness analysis of public policies. *Eur J Pub Health* (published online on February 25, 2010)
52. Mancino L, Kuchler F, Leibtag E (2008) Getting consumers to eat more whole-grains: the role of policy, information, and food manufacturers. *Food Policy* 33(6):489–496
53. Cornell CE, Rodin J, Weingarten H (1989) Stimulus-induced eating when satiated. *Physiol Behav* 45(4):695–704

54. Painter JE, Wansink B, Hieggelke JB (2002) How visibility and convenience influence candy consumption. *Appetite* 38(3):237–238
55. Volkow ND, Wise RA (2005) How can drug addiction help us understand obesity? *Nat Neurosci* 8(5):555–560
56. Polivy J, Herman CP, Coelho JS (2008) Caloric restriction in the presence of attractive food cues: external cues, eating, and weight. *Physiol Behav* 94(5):729–733
57. Lang T (2006) Food, the law and public health: three models of the relationship. *Pub Health* 120(Suppl 1):30–40
58. Herrick C (2009) Shifting blame/selling health: corporate social responsibility in the age of obesity. *Social Health Fit* 31(1):51–65
59. Mikkelsen BE (2005) Declining role of governments in promoting healthy eating: time to rethink the role of the food industry? *Scandinavian J Nutr* 49(3):127–130
60. Pramming S (2008) Should we use regulation to demand improved public health outcomes from industry? No. *BMJ* 337:a1761
61. Harris JL, Pomeranz JL, Lobstein T, Brownell KD (2009) A crisis in the marketplace: how food marketing contributes to childhood obesity and what can be done. *Annu Rev Pub Health* 30:211–225
62. Hawkes C (2007) Regulating and litigating in the public interest: regulating food marketing to young people worldwide: trends and policy drivers. *Am J Pub Health* 97(11):1962–1973
63. Pomeranz JL, Brownell KD (2008) Legal and public health considerations affecting the success, reach, and impact of menu-labeling laws. *Am J Pub Health* 98(9):1578–1583
64. Stanley F, Daube M (2009) Should industry care for children? Public health advocacy and law in Australia. *Pub Health* 123(3):283–286
65. Seiders K, Petty RD (2004) Obesity and the role of food marketing: a policy analysis of issues and remedies. *J Pub Policy Market* 23(2):153–169
66. Kumanyika S, Grier S (2006) Targeting interventions for ethnic minority and low-income populations. *Future Child* 16(1):187–207
67. Davis B, Carpenter C (2009) Proximity of fast-food restaurants to schools and adolescent obesity. *Am J Pub Health* 99(3):505–510
68. Knai C, Pomerleau J et al (2006) Getting children to eat more fruit and vegetables: a systematic review. *Prev Med* 42(2):85–95
69. Laurence S, Peterken R et al (2007) Fresh kids: the efficacy of a health promoting schools approach to increasing consumption of fruit and water in Australia. *Health Promot Intern* 22(3):218–226
70. Seymour JD, Yaroch AL, Serdula M, Blanck HM, Khan LK (2004) Impact of nutrition environmental interventions on point-of-purchase behavior in adults: a review. *Prev Med* 39(Suppl 2):108–136
71. Devitt AA, Mattes RD (2004) Effects of food unit size and energy density on intake in humans. *Appetite* 42(2):213–220
72. Barling D, Lang T, Caraher M (2002) Joined-up food policy? The trials of governance, public policy and the food system. *Soc Policy Adm* 36(6):556–574
73. Sugarman S (2008) Should we demand improved public health outcomes from industry with more regulation? Yes. *BMJ* 337:a1750
74. Alston JM, Sumner DA, Vosti SA (2008) Farm subsidies and obesity in the United States: National evidence and international comparisons. *Food Policy* 33(6):470–479
75. Sugarman S (2009) No more business as usual: enticing companies to sharply lower the public health costs of the products they sell. *Pub Health* 123(3):275–279
76. Cawley J (2006) Markets and childhood obesity policy. *Futur Child* 16(1):69–88
77. Sallis JF, Glanz K (2006) The role of built environments in physical activity, eating, and obesity in childhood. *Futur Child* 16(1):89–108
78. Briggs M, Safaai SA et al (2003) Position of the American Dietetic Association, Society for Nutrition Education, and American School Food Service Association; Nutrition services: an essential component of comprehensive school health programs. *J Nutr Educ Behav* 35(2):57–67

79. Ritchie LD, Crawford PB et al (2006) Position of the American Dietetic Association: Individual-, family-, school-, and community-based interventions for pediatric overweight. *J Am Diet Assoc* 106(6):925–945
80. Vereecken CA, Bobelijn K, Maes L (2005) School food policy at primary and secondary school in Belgium-Flanders: Does it influence young people's habits? *Eur J Clin Nutr* 59(2):271–277
81. Anderson AS, Porteous LEG et al (2005) The impact of a school-based nutrition education intervention on dietary intake and cognitive and attitudinal variables relating to fruits and vegetables. *Pub Health Nutr* 8(6):650–656
82. Sorensen G, Linnan L et al (2004) Worksite-based research and initiatives to increase fruit and vegetable consumption. *Prev Med* 39:94–100
83. Prattala R (2003) Dietary changes in Finland—success stories and future challenges. *Appetite* 41(3):245–249
84. Haerens L, De Bourdeaudhuij I et al (2009) Developing the IDEFICS community-based intervention program to enhance eating behaviors in 2- to 8-year-old children: findings from focus groups with children and parents. *Health Educ Res* 24(3):381–393



<http://www.springer.com/978-94-017-8568-6>

The World's Challenge

Feeding 9 Billion people

Guillou, M.; Matheron, G.

2014, XV, 226 p. 10 illus., 9 illus. in color., Hardcover

ISBN: 978-94-017-8568-6