Policy interventions to promote healthy eating: A review of what works, what does not, and what is promising

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Abstract

Unhealthy diets can lead to various diseases, which in turn can translate into a bigger burden for the state in the form of health services and lost production. Obesity alone has enormous costs and claims thousands of lives every year. Although diet quality in the European Union has improved across countries, it still falls well short of conformity with the World Health Organization dietary guidelines. In this review, we classify types of policy interventions addressing healthy eating and identify through a literature review what specific policy interventions are better suited to improve diets. Policy interventions are classified into two broad categories: information measures and measures targeting the market environment. Using this classification, we summarize a number of previous systematic reviews, academic papers, and institutional reports and draw some conclusions about their effectiveness. Of the information measures, policy interventions aimed at reducing or banning unhealthy food advertisements generally have had a weak positive effect on improving diets, while public information campaigns have been successful in raising awareness of unhealthy eating but have failed to translate the message into action. Nutritional labeling allows for informed choice. However, informed choice is not necessarily healthier; knowing or being able to read and interpret nutritional labeling on food purchased does not necessarily result in consumption of healthier foods. Interventions targeting the market environment, such as fiscal measures and nutrient, food, and diet standards, are rarer and generally more effective, though more intrusive. Overall, we conclude that measures to support informed choice have a mixed and limited record of success. On the other hand, measures to target the market environment are more intrusive but may be more effective.

Key words: Diet and nutrition, Europe, healthy eating, policy interventions

Introduction

Food choices and diets have become a major source of concern during the past decades. Unhealthy diets can contribute to obesity and lead to diabetes, various cancers, and vascular diseases, which in turn can translate into a bigger burden for the state in the form of health services and overall well-being in society. Obesity alone has been estimated to cost the European Union approximately €70 billion per year, with poor diet quality costing 70,000 lives per year in the United Kingdom alone \[1\]. Yet healthy eating has improved across European countries \[2, 3\] in terms of conformity with the World Health Organization (WHO) dietary guidelines \[4\], in clear contrast with the ever-increasing obesity levels, a situation that highlights the complexity of diets and health.

This article summarizes previous systematic reviews, academic papers, and institutional reports. It classifies and evaluates the effectiveness of policy interventions. The review focuses mainly on the developed world (with a particular focus on Europe). However, it may also be relevant to developing countries as they undergo an economic and nutrition transition and face the same problems and policy choices.
Methods

The analysis starts with the recent reviews carried out by the European Union HOPE project [5] and by the Organisation for Economic Co-operation and Development (OECD) [6], as well as the evidence compiled in Mazzocchi et al. [7] and other relevant recent reviews.

The approach involves updating, whenever possible, these reviews with more recent literature. We define policy interventions as government actions that can affect people’s healthy eating behavior by information measures supporting more informed choice or by changing the market environment. We also look at other policy interventions that can indirectly affect healthy eating (e.g., agricultural policies). The classification of policy interventions aimed at influencing healthy eating, adapted from Mazzocchi et al. [7], is shown in table 1.

After analyzing the information contained in the OECD report and the HOPE project, and the evidence compiled in Mazzocchi et al. [7], which already covered a series of institutional reports and systematic reviews, we proceeded to update to the latest literature available via article searches through PubMed, Google Scholar, and ECONLIT databases using combinations of the key terms nutrition, obesity, education, social marketing, away-from-home, food stamps, vouchers, fat taxes, thin subsidies, menus, nutritional information, food labeling, fiscal, nutrition, agricultural policy, and agricultural subsidies. The time period covered for the new literature was solely 2009/10, and the articles included in the review were chosen according to their policy relevance, economic focus, and empirical evidence. Some earlier articles (covered in the base reports and systematic reviews) that we deemed particularly relevant were also highlighted.

It is worth noting that the studies and literature that were used do not necessarily follow the policy classification given above; however, they cover more or less the same topics, albeit in a broader way. Thus, one of the added values of this article, besides updating previous literature reviews, is to be more specific in the types of policies being reviewed and to cover them all in one document.

In what follows, each policy intervention will be analyzed, placing particular emphasis on its potential advantages and disadvantages.

Supporting more informed choice

Economic utility-maximizing models assume that consumers make decisions on the basis of full information. The policies evaluated under this heading aim to provide information to consumers and educate them to use it. Also under this heading are measures to control attempts by private companies to influence preferences toward unhealthy foods and measures by the public or private sector to influence preferences toward healthy foods. Interventions cover measures targeted to specific vulnerable groups (e.g., children) or the whole population.

Advertising controls

There is widespread concern about the way food is marketed to children [5, 6]. In Europe [8], Sweden has a full ban in place on all food advertisements aimed at

<table>
<thead>
<tr>
<th>TABLE 1. Policy interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies supporting more informed choice</td>
</tr>
<tr>
<td>Advertising controls</td>
</tr>
<tr>
<td>On advertising to children</td>
</tr>
<tr>
<td>On general advertising</td>
</tr>
<tr>
<td>Public information campaigns (e.g., to promote fruit and vegetable consumption, reduce salt intake)</td>
</tr>
<tr>
<td>Nutrition education</td>
</tr>
<tr>
<td>For children (e.g., at school)</td>
</tr>
<tr>
<td>For adults (e.g., in workplace)</td>
</tr>
<tr>
<td>Nutritional labeling</td>
</tr>
<tr>
<td>Nutritional information on menus</td>
</tr>
<tr>
<td>Policies aimed at changing the market environment</td>
</tr>
<tr>
<td>Fiscal measures</td>
</tr>
<tr>
<td>Taxes or subsidies on foods to the population at large</td>
</tr>
<tr>
<td>Subsidies (e.g., vouchers) to disadvantaged consumers</td>
</tr>
<tr>
<td>Regulation of meals</td>
</tr>
<tr>
<td>School meals (including vending machine bans and provision of free fruits and vegetables)</td>
</tr>
<tr>
<td>Workplace canteen meals</td>
</tr>
<tr>
<td>Nutrition-related standards (e.g., limits on unhealthy nutrient content for certain foods and portion sizes)</td>
</tr>
<tr>
<td>Government action to encourage private sector action (e.g., reformulation)</td>
</tr>
<tr>
<td>Policy interventions not explicitly targeted at healthy eating but relevant (e.g., VAT rates, agricultural policy)</td>
</tr>
</tbody>
</table>

Source: adapted from Mazzocchi et al. [7].
children under 12, as well as advertisements before and after children’s television programs. Ireland introduced a new statutory code that bans the use of celebrities, sports figures, or cartoon characters to promote food or drink, and the United Kingdom moved from a voluntary agreement to the introduction of new rules restricting television advertisement of products high in fat, salt, or sugar during children’s programs. The ban started in April 2007, covering children between the ages of 4 and 9, and was extended in January 2008 to cover children aged 4 to 15. Unfortunately, the potential beneficial effects that these bans could have on their target audience are likely to be undermined by the lack of coordination among European countries. Indeed, the European Union’s Television Without Frontiers Directive prevents countries like Sweden from blocking television signals from the United Kingdom or other member countries, thus partially diluting the effects of the national total ban on children’s advertisements. That is why many authors [8–10] have called for global regulation, given that advertisement occurs globally and easily crosses national borders.

But how effective are these bans? In the United Kingdom, for example, the regulatory agency Ofcom carried out a recent evaluation of its ban on advertisements to children and concluded that the amount of time children spent watching advertisements for unhealthy food (at times not covered by the bans) decreased by 39% for children aged 4 to 9 and by 28% for children aged 10 to 15, as compared with the time before the ban was implemented. Clearly the ban has reduced exposure, but its effects on healthy eating have not yet been evaluated, leaving a question mark about the real behavioral effect of the ban. The consensus in the literature is that although advertising increases awareness and even shifts attitudes, studies linking these effects to eating behavior are far from conclusive.

Nevertheless, an increasing number of reviews and empirical tests tend to provide evidence, albeit weak in some cases, that food advertising can influence the amount of unhealthy food being consumed by children. In Canada, for example, Baylis and Dhar [11] found that the ban on advertising to children imposed by the province of Quebec in 1980 reduced the probability of purchasing fast food during any week by 13%, thus reducing the amount spent on fast food by C$88 million in 2010. Translating this into number of fast food meals, the ban might effectively reduce the number of fast food meals being sold in Quebec by between 7.1 and 16.8 million per year, though this only amounts to a handful of meals per child per year.

Finally, the issues of who would bear the costs of advertising controls or bans and the impacts of alternative advertisement messages substituting unhealthy food media time have not been addressed (e.g., What advertisements would replace food advertisements, and what would be their impact on health?).

**Public information campaigns (social marketing)**

Halpern et al. [12] define social marketing as the process by which governments try to induce voluntary positive changes in the behavior of individuals with the use of a wide range of commercial marketing techniques [14]. However, instead of focusing on profits, as in the private sector, social marketing focuses on the welfare of the individual and the society. Several European Union governments have already embarked on social marketing campaigns to improve diets. In the United Kingdom, for example, the 5 A Day Campaign (designed to increase awareness of the health benefits of fruit and vegetable consumption by providing clear and consistent messages) was launched at the national level in 2003 following a 12-month pilot trial [15]. It is worth noting that these types of interventions usually target the general population, with a focus on overweight and obese people.

Sassi et al. [6] reviewed previous studies and found evidence suggesting these types of interventions could increase consumption of fruit and vegetables. They indicated that the estimated yearly cost of this type of intervention could be around US$2.27 per target individual, with two-thirds of that amount being spent in broadcasting advertisements at the national level and the remaining amount being used to hire personnel to design and supervise the intervention.

However, social marketing needs long periods of time to really achieve changes in attitudes among

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* See Ofcom Restrictions: the restrictions on advertising for foods high in fat, salt, and sugar (HFSS) at http://www.ofcom.org.uk/

** See http://www.ofcom.org.uk/media/speeches/2008/12/hfssslides.pdf.
people and through society. Social marketing campaigns alone could take decades to have a real impact on healthy eating and weight outcomes, which would require constant and adequate funding from governments for a long period of time. Wymer [16, 17] argued that short-lived social marketing campaigns are doomed to fail because of the nature of the environment in which individuals live nowadays, where a series of factors continuously encourages unhealthy behavior.

**Nutrition education**

The main goal of nutrition education is to make people aware of what constitutes a healthy diet and of ways to improve their diets and lifestyles. This can be done through different channels, although in general it occurs within schools targeting young children [18], since food habits in early stages of life are said to determine practices and preferences in adulthood [19]. In Finland, for example, nutrition is taught in schools as part of several courses, including home economics, biology, and environmental and health education. The courses aim to teach students how to choose and prepare healthy foods. With respect to adults, one might wonder if and why - given the huge exposure to healthy eating promotion - people may not know the basics of what constitutes a healthy diet and lifestyle (do not eat too much, exercise more, eat more fruit and vegetables and less junk food). If this is correct, further investment in nutrition education would be ineffective.

Dallongeville et al. [20] studied the effects that nutrition knowledge had on 361 randomly selected men aged 45 to 64 in northern France. They found evidence suggesting that nutritional knowledge indeed influences food consumption (nutrient intake). Nevertheless, even though those with better nutrition knowledge exhibited a better nutrition profile, fat intake was still above recommended guidelines. On the other hand, UK researchers [21] analyzed the relationship between nutritional knowledge and intakes of fruit, vegetables, and fat using measures of nutritional knowledge and a postal survey among 1,040 adult participants selected at random from general practitioners’ lists in England. Their results show that nutritional knowledge is independent of educational level and occupational category, and provide evidence in favor of a positive relationship between nutrition knowledge and consumption of fruits, vegetables, and fat. Kan and Tsai [22] incorporated health risk knowledge as a factor affecting weight using quantile regressions on a sample of the Taiwanese population and found that the relationship between knowledge of the risk of obesity and body mass index (BMI) was negative and statistically significant for obese males.

McGeary [23] assessed the effects of state-level funding of nutrition education programs in the United States. Her findings suggest that a 1% increase in state-level funding results in a 0.006% decrease in BMI per year. Therefore, in order to reach a normal range of BMI, funding for nutrition education should be increased by about 23 times (going from actual spending of some US$1.5 million to US$34 million”). Sassi et al. [6] found that adding health education programs, complemented by appropriate catering services within schools, increased fruit and vegetable intake, although dietary changes diminished after exposure to any program ended. Overall, the literature suggests that nutrition education can have an impact on healthy eating, but the impact is not homogeneous throughout the population.

**Nutritional labeling**

According to Sassi et al. [6], a nutritional labeling intervention is intended to be the disclosure of the nutritional characteristics of food being sold in stores, reported as easy-to-read nutritional facts, helping consumers to compose healthier diets, and at the same time, giving incentives to the food industry to reduce serving sizes and/or reformulate their products with healthier nutrients or toward a healthier nutrient profile. In Europe, Food Labeling to Advance Better Education for Life (FLABEL), an EU project assessing consumer exposure to nutritional labeling, found that the majority of products (85%) audited within the European Union contained nutrition information of some kind, with the highest proportions being in Ireland, the United Kingdom, and The Netherlands (95%) and the lowest in Cyprus and Slovenia (75%). Furthermore, the most widespread format across all countries was the nutrition table on the back of the pack, which gives the contents of either the big four (calories, protein, carbohydrates, fat) or the big eight

* The study used the survey Cardiovascular Disease Risk Factors Two-Township Study (CVDFACTS) in Taiwan from the fifth cycle (July 2000 to December 2001), covering 4,161 representative individuals.

** To do so, the author used a pooled cross-sectional database covering the years from 1992 to 2006 by merging information from the Behavioral Risk Factor Surveillance System (BRFSS) of the US Centers for Disease Control and Prevention (CDC) complemented, by data from the US Department of Agriculture related to funding state-specific nutrition education programs.

*** Going from 26.66 kg/m² to just 26.51 kg/m².

**** In the paper, the target body mass index was set to be 23 kg/m².

***** However, extrapolations so far outside the data range should be treated with extreme caution.
the big four plus sugar, saturated fat, fiber, and sodium or salt) [24].

Nutrient profile labeling is still voluntary in the European Union, and as a result, several different labeling formats (e.g., Guideline Daily Amounts [GDA] vs. Traffic Lights [TL]) and different reference settings (e.g., per portion vs. per 100 g) have been developed. In a study covering Belgium and Germany, Möser et al. [25] showed that whereas German consumers preferred the TL system, Belgians preferred GDAs, although in both cases the system that consumers were most familiar with was the most preferred. Nevertheless, the study also showed that consumer awareness of these nutrient labeling schemes was very low.

Empirical evidence, however, suggests that only two-thirds of consumers actually read labels [6]. Wills et al. [26] found that a minority of consumers in Europe actually look at nutritional labels when shopping, and these consumers were limited to those with a particular interest in healthy eating. Therefore, alternative measures, such as front-of-the-pack TL labels, have been proposed and implemented within some countries [27–29]. Indeed, the European Commission has adopted a proposal for regulation [30] of the provision of food information to consumers according to which mandatory nutrition declaration should be included on the front of packs and nutrients must be accompanied by an indication of the percentage of the reference intake value.

From an economic perspective, nutrition information is vital to informed choice, which is the basis of economic decision-making. However, informed choice is not necessarily healthier, as pointed out by Mazzocchi et al. [7]; labeling may improve consumers’ economic welfare by enabling them to make informed choices while yielding no improvements in diet and health. Some studies show that labeling helps or induces people to avoid bad nutrients, but it does not necessarily encourage people to buy products rich in good nutrients [31]. For example, Balcombe et al. [32] used a choice experiment to assess the reaction of UK consumers to TL labels and found that people do tend to reduce the quantity of any nutrient associated with any red light. However, they seemed more concerned about salt and saturated fats than fats and sugars. On the other hand, there is evidence supporting the notion that the social benefits of labeling offset the costs. What is clear is that consumers are more likely to read labels if the information is concise and easy to process. Therefore, the simpler the label, the higher the probability that it will have an impact on food choices.

Nutrition information on menus

Many consumers, researchers, and health officials view the restaurant industry as in part responsible for the increase in unhealthy eating and obesity-related diseases [33]. Therefore, many are pressing for the introduction of nutritional information in restaurant menus. However, this might prove difficult and controversial, and no country has formally regulated or forced the introduction of this type of information in menus, although sometimes private sector initiatives (such as the Heart Beat award in the United Kingdom) and local government regulations go in this direction.

Variyam [34] pointed out that growing consumption and the continuous decrease in the nutritional quality of food eaten away from home are the outcome of economic forces driving supply and demand. On the one hand, consumers demand taste and convenience, while on the other, suppliers deliver by using products that enhance taste but are not necessarily healthy. Therefore, sellers do not have incentives to introduce nutrition information in their menus that could uncover the unhealthiness of their products, and this lack of transparency leads to consumption levels higher than they would be if consumers were informed. However, the extent to which the introduction of mandatory nutrition information in a catering environment would improve diets and reduce obesity-related diseases is uncertain. Moreover, as pointed out by Mazzocchi et al. [7], a mandatory policy could have a greater effect on smaller restaurants, which may lack the skills and capacity to standardize ingredients and portions, driving most of them out of the market and thus restricting patrons’ options.

Policies aimed at changing the market environment

Policies included in this category try to influence...
healthy eating by changing the market environment. Generally, this can be achieved through the introduction of taxes and/or subsidies (fiscal measures) that aim to influence consumption by changing the relative prices of “good” and “bad” foods or nutrients and by measures to influence the availability of foods for consumption.

**Fiscal measures (taxes and subsidies)**

Fiscal measures are viewed by economists as a way of ensuring that consumers pay the true social cost of the food they consume, including the externality element, i.e., the cost imposed on the remainder of society by individuals consuming an unhealthy diet through higher health care costs and lost economic production as a result of diet-related ill health.

In Europe, no government has explicitly introduced such measures, though many governments operate differential value-added tax (VAT) regimes for food products [35]. In the United Kingdom, for example, there is a zero rate for food in general, though not all foods qualify. For example, many specific food items are standard-rated, including alcoholic drinks, confectionery, crisps and savoury snacks, food for catering or hot takeaways, ice cream, and soft drinks. However, the VAT regime also applies to “healthy” foods such as smoothies (fruit drinks).

In the absence of concrete policy interventions of this type, evaluations have been based on simulations using data on the known responsiveness of consumption of different foods to prices. Indeed, the use of such economic instruments to improve healthy eating and prevent obesity has been amply covered by the literature. According to the HOPE narrative report [5], studies suggest that taxing fat-dense foods has modest effects on consumers’ diets and overall weight outcomes. Huge taxes could have large effects on diets, but the issue is that fat taxes of realistic sizes have only modest effects. Indeed, Sassi et al. [6] point out that fiscal interventions may be complex to design and difficult to enforce, given that the impact of such interventions is unpredictable, since the price elasticity of lifestyle commodities varies across individuals and population groups. Much of the fat tax literature is based on estimates of elasticities and simulations of the impact of relative price changes that use considerably aggregated food categories for computational tractability. A major drawback of high levels of aggregation is that substitution within food category levels (e.g., between high- and low-fat cheese) is not picked up. One exception is the study by Griffith et al. [36], who used a discrete choice demand model using disaggregated household purchase level data to estimate responses to a fat tax adding 10 pence to the price of each 100 g of saturated fat. Their results show that, in general, products with high saturated fat intensity tend to lose market share, whereas those with low intensity gain market share, with more households opting to purchase margarine products at the expense of butter products and a consequent reduction in volumes of saturated fat and sodium purchased. Allais et al. [37] simulated a fat tax on nutrients purchased by French households. Their results suggest that such taxes may have only a small effect on nutrients purchased, with a consequent small effect on body weight. According to them, fat taxes have limited and uncertain effects on nutrients purchased, as well as a minor effect on body weight, and are highly regressive (in the sense that they inflict a greater burden on the poor).

Taxation would lead to increases in government revenue that could be used in the form of subsidies to foster initiatives to improve diets. The introduction of taxes without subsidies has been criticized as regressive, since it would be a particular burden for low-income consumers, who spend a higher proportion of their incomes on food, particularly on the types of foods likely to be targeted by taxes.

Nordström and Thunström [38] simulated the effects of tax reforms to encourage consumption of healthier grains in Sweden. Their results show that in order to reach an increase of 38% in fiber intake (the increase needed to achieve the Swedish National Food Administration recommendations), a subsidy of 50% on wholesome bread and breakfast cereals would be required. However, the implementation of such a subsidy would be accompanied by undesired increases in consumption of other nutrients, such as fat, salt, and sugar. To limit these negative effects, the authors proposed to simultaneously tax unhealthy nutrients or foods (ready meals, bakery products, etc.) to fund the subsidy and limit increases in consumption of unhealthy food.

One study has moved beyond consumption to look at the health implications of fiscal interventions. Cash et al. [39] simulated the effects of “thin subsidies” covering fruits and vegetables in the United States. Their results show that a 1% decrease in the price of all fruits and vegetables could translate into a mean decrease of around 6,700 cases of coronary heart disease and almost 3,000 ischemic strokes. More interestingly,
they calculated the economic cost per life saved and argued that the cost was lower than the normal cutoff applied by the federal government. Furthermore, poor consumers tend to eat less fruits and vegetables and are more responsive to any economic incentives, such as subsidies, and are more likely to change their diets than other individuals.

A recent systematic review of the effects of fiscal policies on diets and their related chronic diseases (e.g., obesity) by Thow et al. [40] suggests that food taxes and subsidies can influence consumption in high-income countries and highlights the absence of research into consumer responses to taxes in developing countries. Indeed, according to their findings, substantial taxes on unhealthy foods may improve health outcomes through reductions in body weight and chronic disease risk. The authors acknowledge that implementation and related administrative costs need further analysis, since they were not duly addressed in the studies covered in the review and might represent the real barriers to the feasibility of any fiscal intervention.

**Vouchers to disadvantaged consumers**

Food vouchers to reduce the price of healthy foods targeted to specific parts of the population (poor people, pregnant women, mothers of young children, and the elderly) may be viewed as a variant of a fiscal intervention. The rationale for food vouchers is that many vulnerable population groups have poorer diets because they cannot afford healthy food.

Within Europe, the United Kingdom has a food voucher scheme called Healthy Start, whereby eligible families get free vouchers every week which they can exchange for milk, fresh fruit, fresh vegetables, and infant formula milk. In the United States, the Food and Nutrition Service administers the nutrition assistance programs of the US Department of Agriculture. As part of these programs, a variety of schemes, such as the Women, Infants, and Children (WIC) benefits and the Supplemental Nutrition Assistance Program (SNAP), previously known as the Food Stamp Program, are just some examples of food voucher programs available to children and poor families in order to guarantee them better access to food and a more healthy diet in the United States. The WIC”’ scheme was designed to preserve the health of low-income women, infants, and children up to age five by providing nutritious foods to supplement diets, general information on healthy eating, and access to health care. The Food Stamp Program, now SNAP, was originally designed to encourage the consumption of surplus farm commodities by redirecting them to poor and ill-fed people within the country, as well as acting as a welfare scheme for poor families unable to afford an adequate diet.***

Zagorsky and Smith [41] investigated whether the Food Stamp Program contributed to participants’ weight gain. Their findings suggest that female participants tended to gain weight (on average, 2.6 kg) and that the longer they participated, the greater their BMI.

Alston et al. [42] pointed out that restricting food choice within the Food Stamp Program could induce price changes that might result in declines of consumption of healthy food by other consumers.

Lin et al. [43] examined the effectiveness of price subsidies to the poor and food stamps in the United States. Their results suggest that a 10% fruit and vegetable price subsidy to low-income consumers would increase the consumption of fruits and vegetables by 4% to 7%, at an estimated cost of $734 million a year; if the same amount were used to finance food stamps, consumption of fruits and vegetables would increase by only 0.35% to 0.40%, suggesting that price subsidies are a much better alternative to the income subsidy of food stamps.

Overall, the literature suggests that vouchers for healthy foods targeted to low-income consumers are an effective way of increasing fruit and vegetable consumption. However, research into cost-effectiveness is still needed.

**Food availability in the school or workplace**

The school environment is thought to exert a significant influence on pupils’ dietary habits. Most developed countries offer free or subsidized school meals, and food availability in schools is often complemented by vending machines offering a range of snacks and soft drinks high in sugar, fat, and calories. The response

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* Families with a child under 4 years of age who are on certain benefits qualify for Healthy Start and receive one voucher a week. Families with a child under 1 year of age get two vouchers a week. All pregnant women under the age of 18 qualify, regardless of whether they are on benefits. The vouchers are currently worth £3.10 each.

** In the United States alone, during 2008 about 28 million individuals, or almost 1 in 11 residents, received benefits from the program in a given month. Programs of this type or developments from it have been running since 1965.

*** The WIC is regarded as one of the most successful and cost-effective US nutrition intervention programs. See http://www.fns.usda.gov/wic/aboutwic/howwichepts.htm#dietoutcomes.

**** For more details on the US Food Stamp Program, see http://www.fns.usda.gov/.
Nutrition-related standards

Nutrition-related standards could be applied to portion sizes as well as composition standards of trans fats, salt, saturated fats, and sugar.

Value pricing (the bigger the portion, the lower the price per unit) is a widespread practice in the food industry. Furthermore, portion sizes have been increasing over the past decades, particularly in the United States, where supersizing, mainly in fast-food restaurants, has been blamed for increased energy intake, overweight, and weight gain [45–48].

Vermeer et al. [49] found that linear pricing (banning the use of value pricing) would encourage consumers of fast food to choose smaller portion sizes of foods and soft drinks. Although unhealthy eating habits and growing obesity trends have been linked to food portion sizes, there are no examples of policies that specifically regulate portion sizes.

Mandatory food standards for nutrients other than those regulated by food safety law are not common in Europe. L’Abbe et al. [50] reviewed the approaches being followed in various countries to remove trans fats from their food supplies. Their review shows that a number of governments are actively engaged in reducing trans-fatty acid (TFA) intakes by a variety of methods, ranging from nutritional recommendations, programs to raise awareness of the adverse effects of TFAs, voluntary or mandatory labeling of the trans fat content in foods, and voluntary programs to encourage industry to reformulate food products to remove TFAs. However, in Europe only Denmark and Switzerland have introduced a regulatory ban on TFAs [51] (the bans mandate that all oils and fats used in locally made or imported foods contain less than 2% industrially produced trans fat). Thus far, there have been no published analyses of the impact of these measures.

Government action to encourage private sector action: Reformulation

With rising trends of attention to health and nutrition around the globe, the food industry is under constant pressure to change and adapt. Therefore, reformulation is starting to gain a central role for health policy makers. The food industry, due to market forces and the determination to avert specific government regulation, has preventively embarked on its own reformulation programs. Indeed, Golan and Unnevehr [52] highlight that raising consumer awareness with respect to the properties of processed food has induced some manufacturers to reformulate in order to

* Some examples include the following: the British Junk Food Ban; the Swedish Good Food in institutions, in schools, and at work; the Greek nutritional guidelines for food canteens; rules imposed on vending machines placed in schools for the inclusion of healthy snacks in Spain and Italy; and the distribution of fruit or other healthy snacks to schoolchildren in Denmark, Norway, Belgium, France, and Italy. Outside Europe, in 2000, 43% of elementary schools, 89.4% of middle or junior high schools, and 98.2% of senior high schools in the United States had either vending machines or a store, canteen, or snack bar where students could purchase “competitive foods” (a term used mainly by US researchers to refer to foods with minimal nutritional value) or beverages. Since 2003, most US states have enacted regulations concerning vending machines in schools. In Japan, school meals have been subject to food standards since 1954, with strict limits on fats and a ban on vending machines. Some states in Australia and New Zealand have banned foods and beverages with high fat or sugar contents from school canteens.

** From an economic point of view, consumers will prefer to pay less for more; thus, lower unit prices for larger portions will make these products more attractive to consumers, rather than paying more, in relative size prices for a smaller food portion.
capture first-mover profits. In other cases, the issuing of guidelines by governments may be enough to trigger industry reformulation. In 2005, the US Department of Agriculture and the Department of Health and Human Services issued guidelines reducing TFA consumption and calling for the food industry to reduce trans fat content, which induced some product reformulation [50]. However, there is still a lack of studies assessing the real effects of reformulation on healthy eating and obesity. In some cases, reformulation of processed foods to avoid the inclusion of one ingredient might not be healthier if the addition of alternative ingredients reduces the food’s nutritional profile. One clear example is the increased use of sweeteners in low-fat products in an attempt to offset changes in taste caused by fat reduction [53].

Policy interventions not explicitly targeted at healthy eating, but relevant

There is concern that many policies that are not necessarily directly aimed at healthy nutrition, such as agricultural policy, are indirectly affecting food consumption patterns across the United States and Europe, consequently contributing to rises in overweight and obesity-related diseases. HOPE [5] pointed out that the role of food production together with its relative policies and subsidies has come under greater scrutiny as research linking food and health continues to evolve.

In Europe, the Common Agricultural Policy, in particular, influences relative food prices, but its effect has primarily been to raise consumer prices of dairy products and sugar, which should promote healthier eating [7]. Alston et al. [54] pointed out that subsidy policies in the United States have hundreds of provisions for particular commodities that could lead to both increases and decreases in commodity prices. Thus, their impact on nutrition and obesity is uncertain. In their study, they argue that for any particular agricultural policy to have a real effect on obesity, the policy needs to be proven to have reduced the price of inputs used in the production of unhealthy or fattening foods and the prices paid for those foods, and that consumers need to be responsive to these lower prices and as a result increase their consumption of these types of foods. They found little evidence supporting any of these conditions.

Conclusions

This article has reviewed the existing academic literature on policy interventions to tackle unhealthy eating and obesity in order to assess their effectiveness. Policy interventions are classified into two groups: information measures supporting informed choice and policies aimed at changing the market environment. We also looked at other policy interventions, such as agricultural policies, that can indirectly affect healthy eating. Measures to support informed choice have a mixed and limited record of success:

- Reducing or banning unhealthy food advertisements (in particular those aimed at children) generally has a weak positive effect on improving diets.
- Public information campaigns have been successful in raising awareness of unhealthy eating and its consequences but less successful in translating the message into action.
- Nutrition education can have an impact on unhealthy eating and overweight, but the impact is not homogeneous throughout the population.
- Nutritional labeling contributes to informed choice, but informed choice is not necessarily translated into healthier dietary choices.
- The introduction of nutritional information on menus is relatively recent and partial, with only some restaurants including the information on their menus. Thus, there is no conclusive evidence for or against the effectiveness of this policy.

Measures to target the market environment are more intrusive but may be more effective:

- Fat taxes and thin subsidies have not been implemented anywhere, so there is no actual evidence of their marketplace effectiveness and applicability. In general, the present review suggests that a small tax on certain foods, even if it does not induce behavior change, could raise valuable funds for health-promoting interventions. However, even if the health effects were progressive, the distributional effects of fat taxes might be regressive.
- Providing vouchers for healthy foods to the poor or to vulnerable population groups is a relatively new policy with early signs that it may be highly effective.
- In general, the existing literature agrees that the school environment matters and that efforts to encourage pupils to adopt a healthy lifestyle, which includes promoting healthy eating, providing healthy meals, and banning junk foods, are effective.
- The same is true for adults, where healthy meal provision in the workplace can be expected to have positive behavioral and health outcomes.
- Compulsory standards have not been implemented anywhere in Europe except for a ban on trans fat in Denmark and Switzerland. The cost-effectiveness of this policy compared with, for example, voluntary collaboration between government and industry to phase out trans fats has not been studied.

On the one hand, many studies focus on the impact of interventions on consumer awareness, knowledge, and attitudes; we are beginning to see more emphasis on their impact on consumption, but we are a long way from having a complete picture of the relative cost-effectiveness of alternative interventions aimed at the
promotion of healthy eating.

On the other hand, unhealthy diets and their related chronic noncommunicable diseases are multicausal. Existing studies have attempted to isolate the effects of individual policies on diets and health, but controlling for confounding in such studies is difficult. Most countries typically have multiple dietary policies in place running simultaneously, often with similar or complementary objectives, and various components of these policy measures interact in complex ways to achieve a given effect on diets and health. Such interactions are under-researched and not yet well understood.

Finally, although this review has focused mainly on the developed world (with a particular focus on Europe), it is worth highlighting that other countries in the world are undergoing transitions related to demographic, economic, and nutritional trends. The nutritional transition, in particular, drives countries into a double-burden situation in which undernutrition and its related comorbidities coexist with food- and lifestyle-related chronic nontransmissible diseases such as diabetes mellitus, cardiovascular disease, and cancer. Moreover, globalization has had as a consequence that many processed products, most of them rich in calories, are available to all populations, thus discouraging the consumption or production of local traditional foods and hence fuelling the consequences of the nutritional transition. The experience of Europe and the evidence provided by this study could therefore serve as eye-openers and supporting material for timely preventive action in the developing world.

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References

Policy interventions to promote healthy eating

42. Alston JM, Mullally CC, Summer DA, Townsend M, Vosti SA. Likely effects on obesity from proposed changes to the US food stamp program. Food Policy 2009;34:176–84.