

Perspective: Public Health Nutrition Policies Should Focus on Healthy Eating, Not on Calorie Counting, Even to Decrease Obesity

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ABSTRACT

Calorie-focused policies, such as calorie menu labeling, seem to result in minor shifts toward healthier choices and public health improvement. This paper discusses the (lack of) relations between energy intake and healthy eating and the rationale for shifting the focus of public health nutrition policies to healthier foods and meals. We argue that the benefits of reducing caloric intake from low-quality foods might not result from the calorie reduction but rather from the reduced consumption of low-quality foods. It is better to consume a given number of calories from high-quality foods than a smaller number of calories from low-quality foods. It is not possible to choose a healthy diet solely based on the caloric value of foods because calories are not equal; they differ in nutritional quality according to their source. Foods are more than just a collection of calories and nutrients, and nutrients interact differently when presented as foods. Different subtypes of a macronutrient, although they have the same caloric value, are metabolized and influence health in different ways. For instance, industrial *trans* fats increase lipogenesis and the risk of heart diseases, whereas monounsaturated fats have the opposite effect. Food processing and cooking methods also influence the nutritional value of foods. Thus, public health nutrition policies should stop encouraging people to focus mainly on calorie counting to fight noncommunicable diseases. Instead, policies should focus on ingredients, dietary sources, and food processing and cooking methods. *Adv Nutr* 2019;0:1–8.

Keywords: calories, energy, joules, processed food, food quality, healthy food, obesity, chronic diseases, menu labeling, food guidelines

Introduction

Calorie-focused policies, such as calorie labeling, and dietary guidelines that emphasize calorie counting might not be enough to improve public health, such as to prevent obesity and related diseases (1, 2). For instance, studies have shown

that menu calorie labeling has little or no effect on the consumer's choice of dish (3–7). A study (8) exploring demographic patterns on the use of calorie information in restaurants in the United States showed that only 53% of consumers notice calorie information, and less than half of these use the information. Calorie labeling was associated with binge eating, increase in weight-related concerns, dieting, and unhealthy weight-control practices (8). Thus, highlighting calorie information on food labels or disclosing only this information on menus can complicate eating disorders.

Public nutrition policies are not based solely on caloric consumption, but they emphasize it as the main problem and solution for obesity and other chronic diseases. Although some actions might promote a reduction in caloric intake, it is relevant to debate whether calorie reduction is able to improve health simply because it can result in weight loss. The relation between calorie reduction and health improvement has been contested by other authors (2, 9) and is discussed in this study with the aim of answering the fol-

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Abbreviations used: CAPES, Brazilian Federal Agency for Support and Evaluation of Graduate Education; CNCs, chronic noncommunicable diseases; CNPq, Brazilian National Council for Scientific and Technological Development; NUPPRE, Nutrition in Foodservice Research Centre; UFSC, Federal University of Santa Catarina.

lowing question: Should public health policies focus mainly on calories rather than on the quality and composition of foods?

Some studies claim that nutrition information policies that stress the importance of a food's caloric value stimulate the reformulation of foods and culinary preparations (10, 11). However, we question whether reformulations are directed to healthier options. A study analyzed 11,737 menu items in 37 fast-food restaurants in the USA and observed a mean reduction of 22 kcal in food items from 2012 to 2014. However, the macronutrient composition of the new items did not shift toward a healthier profile (12).

In light of these considerations on calorie-focused policies, we aim to discuss the relation between calories and healthy eating, and propose a shift in the main focus of public policies from calorie counting toward healthier foods and meals.

Current status of knowledge

Concept of calorie and its use in the field of nutrition

We begin by discussing the transposition of a term used in physics to the field of nutrition. Calorie is a unit of energy, also used to express the energy value of foods. The first definition of Calorie (capitalized, referring to kilocalorie or kcal) entered the English language through translation of a French text, which defined Calorie as “the heat needed to raise the temperature of 1 kg of water from 0 to 1°C,” that is equivalent to 4,186 kJ (13). In this paper, the term calorie (lowercase) is used as a synonym for Calorie to refer to the concept of a food's energy value.

In 1887, Atwater (14) defined calorie as “the amount of heat which would raise the temperature of 1 kg of water 1°C,” and according to Hargrove (13), in 1896, a scientific committee proposed that a temperature range between 0 and 20°C should be chosen.

The concept of food calorie as originated from thermodynamics was not adequate to transfer to the human condition because the human body is not a 100% efficient thermal system (15, 16). Therefore, Atwater, using whole body calorimetry, created and validated in humans the concept of metabolizable energy—the amount of heat that is generated from food by the human organism when in thermodynamic equilibrium (balance of intake, excretion, and expenditure of energy and protein) (17).

Since then, the term “calorie” has been widely used to express the energy value of foods and applied in the elaboration of dietary recommendations, diets, and menus as well as in food labeling (18) and menu labeling (19). In all cases, the energy value of foods is considered to adjust an individual's caloric intake to his/her caloric expenditure. Faced with the high global rates of obesity (20, 21), public health policymakers have focused on the caloric value of foods as a strategy to promote weight reduction.

Calorie counting and obesity

Dietary guidelines recommend healthy eating as a means to promote health and prevent diseases, but when it comes to obesity, the premise is that imbalance of energy is the main cause of the condition (16, 19).

According to the WHO (22), “overweight and obesity are defined as the abnormal or excessive accumulation of fat that may impair health.” Still according to WHO (22), the fundamental cause of overweight and obesity is the imbalance between calories consumed and expended as a result of increased ingestion of high-energy foods that are rich in fat and reduced physical activity. Furthermore, they explain that changes in food patterns and physical activity are often the result of environmental and social changes associated with the lack of supportive policies in health, agriculture, transport, urban planning, environment, food processing, distribution, marketing, and education (22). However, the WHO bulletin (22) does not specify foods or food patterns that might be involved in the causes of obesity. In the document, the WHO (22) does not present other causes of obesity, yet, contradictorily, it proposes dietary recommendations to reduce overweight and obesity, for instance, through a reduction in fats, sugar, and sodium. In addition, the consumption of oilseeds (rich in fats and calories) and of foods rich in fibers and minerals are recommended.

When the imbalance between caloric intake and expenditure is considered to be the fundamental cause of obesity, it is assumed that a decrease in caloric intake reduces the energy imbalance and might automatically revert obesity. Even though high caloric intake might be associated with a high BMI, calorie reduction should be associated with an improvement in the nutritional quality of the diet for long-term weight-loss maintenance (23–26).

According to the 2013 American Heart Association/American College of Cardiology Task Force on Practice Guideline for the Management of Overweight and Obesity in Adults (27), an energy deficit is required to achieve weight loss. However, energy deficit is a consequence of changes in diet, physical activity, and metabolism. A variety of dietary approaches can produce weight loss in overweight and obese adults, and even those that suggest a reduction in caloric intake associate calorie reduction with changes in food types (27). Only 1 type of the cited diet is based solely on energy intake reduction (27). Thus, we question whether it is possible to achieve healthy weight loss by only reducing caloric intake from convenience and fast foods, as this behavior can reduce satiety. Following guidelines focused on foods and healthy eating consequently leads to a reduction in caloric intake. On the other hand, reducing caloric intake does not necessarily lead to a healthy diet.

The imbalance between calories consumed and expended cannot explain the entire nutrition factor in the etiology of obesity, as certain foods, food patterns, and behaviors influence cellular metabolism and lipogenesis (25, 26).

Caloric intake is not only influenced by the caloric value of foods, but also by their nutritional composition and by the metabolic singularity of individuals. More specifically, the metabolization and physiological consequences of calories that come from different macronutrients and even of different subtypes of a macronutrient, such as simple and complex carbohydrates, and different types of fats, also differ within the human body (28–30). As each type of nutrient is metabolized via specific pathways by distinct physiological means, their excess can lead to different consequences.

For instance, carbohydrates are stored as glycogen in cells, but after reaching the maximum storage capacity, they are transformed mainly into fat. Simple carbohydrates and sugars are more rapidly absorbed, transported, and taken up by cells than complex carbohydrates (31, 32), and metabolization depends on the excretion and insulin resistance of each individual (33). Complex carbohydrates, on the other hand, are more slowly digested and absorbed. Some complex carbohydrates, such as resistant starch, have similar structures to that of fibers, which cannot be used as energy sources (31, 32).

A randomized, controlled, parallel-arm controlled-feeding trial was conducted with 81 adults randomly assigned to weight-maintenance diets for 6 wk (34). Diets differed only in whole-grain and fiber contents but were otherwise similar (including in energy value). The whole-grain diet led to a loss of nearly 100 kcal/d as a result of the increase in resting metabolic rate and stool energy content and the decrease in digestibility of other nutrients. These findings show the positive effects of whole-grains on reducing body weight and adiposity without altering the energy value of diets (34).

Lucan and DiNicolantonio (2) argue that calorie counting is inherently biased against fat, as 1 g of fat has twice as many kcal as 1 g of other macronutrients. They highlight that many food sources of fat might be protective against obesity and related diseases (2), corroborating the results of other studies (35, 36). Calorie-focused thinking is also supportive of starchy and sugary replacements, which can be detrimental to health (2). Monteiro and Cannon (9) discussed some sources of rapidly absorbable carbohydrates, such as white rice and potatoes, which are staple foods in several Asian and Latin American countries where they are usually consumed with vegetables and/or legumes as part of freshly cooked meals and often enjoyed mindfully and in company. In this context, the metabolic effect of a meal is quite different from that of individual food items, which together influence the glycemic index of a meal (37).

Therefore, food patterns and food composition seem to perform more important roles in the etiology of obesity than the caloric value of foods. Although not discussed in this paper, cultural, environmental, economic, and social issues might also play an important role. Mozaffarian and Forouhi (38) remind us that there is much to be discovered about the influences of fatty acid metabolites, flavonoids, gut–brain metabolic communication, brown and beige fat, microbiome, and early life experiences on eating behaviors.

Healthy eating should be regarded as an important means of health promotion that goes beyond calorie counting, even to lose weight.

Healthy food choices

Healthy eating may have several meanings depending on the country, region, period, and culture concerned. According to the WHO bulletin, “Diet evolves over time, being influenced by many factors (...). Therefore, promoting a healthy food environment, including healthy food systems, requires involvement across multiple sectors and stakeholders” (18).

More specifically, the WHO (18) stated that a healthy diet for adults should include fruits, vegetables, legumes, nuts, and whole-grains; at least 5 portions of fruits and vegetables/d; <10% of total energy intake from free sugars, but ideally <5% of total energy intake for additional health benefits; <30% of total energy intake from fats, considering that unsaturated fats are preferable to saturated fats and that industrial *trans* fats should be entirely avoided; and <5 g salt/d (6).

We highlight that dietary advice to limit consumption of saturated and *trans* fats should consider differences between nutrient sources, as is commonly done in relation to carbohydrates. *Trans* fats that are naturally produced by gut bacteria in ruminant animals do not seem to have deleterious effects on health and might, in fact, help protect against some diseases (39). In contrast, industrial *trans* fats do not have any beneficial effect on the organism, do not have a safe intake limit, and are associated with several diseases. Thus, artificial *trans* fats should be eliminated from the diet (40–42). Different fat types exert different regulatory effects on metabolism, either increasing or decreasing adipose tissue accumulation (43). Saturated fats also have different health effects depending on the type of food consumed. For instance, plain yogurts and oilseeds are considered healthy sources of saturated fats (44). A recent study emphasized the confounding nature of nutrients substituted for saturated fats in diets, giving broader recognition to the effect of food patterns as a whole (45).

According to studies in mice (46) and humans (47), macronutrient distribution plays a role in energy homeostasis in a manner that goes beyond energy content. A study analyzing data from the 1960–2011 NHANES concluded that the increase observed in the average BMI of the US population over the years was not caused by changes in total caloric intake but by the shift in macronutrient intake from fat to carbohydrate (47).

The recommendation to limit the intake of free sugars (18) is clearly not based on caloric value but on the physiological consequences of their consumption, as free sugars provide the same 4 kcal/g as complex carbohydrates. The consumption of sugars, especially added sugars, is associated with an increased risk of chronic noncommunicable diseases (CNCDS), such as diabetes mellitus type 2 (48), and cardiovascular diseases (49), as well as an increased risk of mortality (50). Kearns et al. (51) analyzed internal documents

from the sugar industry and found that companies sponsored a research program that successfully promoted fats as the dietary culprit in cardiovascular disease. In another paper (52), the authors discussed the findings of a project financed by the sugar industry, revealing that the industry withheld information that sucrose intake is associated with a greater cardiovascular disease risk than that of starch intake.

According to the WHO (53), there is good scientific evidence that nutrients interact differently when presented as foods, and methods of food processing and cooking influence the nutritional value of foods. Taking into account these considerations, the WHO recommends that dietary guidelines should be elaborated on foods, not on nutrients (53).

This approach has been adopted in the new food- and meal-based Dietary Guidelines for the Brazilian Population (54). The document provides no recommendation on caloric intake, nor does it on macronutrient consumption. Its golden rule is “always prefer natural or minimally processed foods and freshly made dishes and meals to ultraprocessed products” (54). The Brazilian Dietary Guidelines (54) also include the WHO recommendation to encourage culinary and cooking skills. In this framework, we highlight the importance of using cooking methods that preserve the nutritional quality of foods (55) and reduce the formation of potentially toxic compounds (56). According to the healthy dietary diversity classification system developed by Bernardo et al. (57), healthier foods include those that are grilled, baked, or broiled as opposed to fried. However, the use of dry heat for long periods, as in grilled or baked culinary preparations, may lead to the formation of toxins. It occurs especially in culinary preparations that are rich in proteins, such as meat and fish (56). Thus, special attention should be paid when grilling or baking foods because, under the aforementioned conditions, these are not the healthiest cooking methods. Many commercially processed foods contain toxic compounds as a result of heat processing, especially products with large amounts of proteins or carbohydrates, such as canned soups. At high concentrations, these harmful compounds can contribute to diabetes and other diseases (58).

In addition to these factors, healthy eating addresses not only issues related to food composition but also those related to food safety, genetically modified organisms, pesticides, and hormones, among others. Considering the WHO recommendations (18) and the health issues in food production and consumption in a comprehensive manner, we underscore the importance of eating unprocessed and, especially, agroecologically produced organic foods for a healthy diet.

We question whether the choice of low-calorie foods necessarily leads to the consumption of healthier foods. Burton et al. (59) hypothesized that, when only calorie information is available, consumers that comprehend and use this information tend to choose products that have fewer calories, as they are perceived as healthier. Because

of the complexity of food composition, however, such a relation is not always true (7). It is preferable to consume a given amount of higher-quality food than a smaller amount of lower-quality food. As a result, health benefits stem from calorie reduction as well as from a general improvement in food quality. When calorie reduction is achieved by the consumption of smaller portions without changes to ingredients and cooking methods, although some health benefits may follow, there is no improvement in the nutritional quality of the diet.

We also cast doubt on the effectiveness of calorie labeling as a public policy action to promote healthy eating choices. Although dietary recommendations depend on individual preferences, philosophies, and health conditions, the concept of healthy eating should be appropriate for everybody and should lay the foundation for public policies, which requires going well beyond calorie counting.

Calories and healthy food choices

A multiplicity of parameters can be used to define healthy eating and focusing only on the energy value of foods or culinary preparations means reducing the universe of possibilities to only 1. According to Cappuccio and Pravst (60), media communications have a great effect on health-sensitive consumers and can be used as a strong marketing instrument. In search of healthy foods, consumers often opt for products that are reduced in, or free of, nutrients or calories, especially “diet” or “light” products (61–64).

However, the changes made to create diet or light versions of products do not necessarily make them healthier. Nishida et al. (65) evaluated the labels of 3,449 packaged foods and observed that diet and light products had an average sodium content 43% higher than that of similar conventional products. Also, to create diet or light versions, companies commonly replace sugar with noncaloric sweeteners, frequent consumption of which has been associated with increased risk of excessive weight gain (66, 67), metabolic syndrome (66), cardiovascular disease (66), type 2 diabetes (66, 68), and glucose intolerance (69). Moreover, foods containing sweeteners retain their sweet flavor, which may affect neuronal signaling pathways responsible for satiety and thereby induce a compensatory increase in food intake (70).

The food environment has changed radically with the increase in the supply of hyperpalatable foods, which contain high amounts of fat, sugar, salt, flavorings, and other food additives. A recent study concluded that obesity is the result of a “food addiction” for hyperpalatable foods (71). Satiety signals to the brain about gastric volume begin in the gastrointestinal tract and are enhanced by nutrient absorption, gastrointestinal and adipose tissue hormones, and signals from the cerebral cortex. These physiological mechanisms influence feeding behavior (72). Food activates the reward system in the brain and induces the release of peptides that modulate dopaminergic activity (i.e., insulin and leptin) depending on its palatability. In vulnerable individuals, repeated exposure to hyperpalatable foods can result in low control of food intake, compulsive consumption,

TABLE 1 Nutritional composition of 2 foods with calculated portions providing the same number of calories¹

Food	Chewy fruit-flavored candy (UP) (6 units, 25 g)	Almond (MP) (14 units, 15 g)
Energy	97 kcal	97 kcal
Carbohydrate	21.2 g (76% sugar)	3.6 g (80% complex carbohydrates)
Protein	0 g	3.5 g
Fat	1.5 g (58% <i>trans</i> and saturated fats)	8.4 g (88% mono- and polyunsaturated fats)
Fiber	0 g	2.1 g
Sodium	17.5 mg	0 mg
Other minerals	No	Potassium, phosphorus, calcium, magnesium, iron, and zinc
Vitamins	No	E, folate, niacin, riboflavin, thiamin, and B-6
Additives	Acidulant, emulsifiers (including transgenic soy lecithin), and flavorings	No

¹MP, minimally processed food; UP, ultraprocessed food. Sources: product label (candy) and USDA, Agricultural Research Service, Nutrient Data Laboratory (almond) (77).

and weight gain (71). Borges et al. (73) analyzed the role of artificially sweetened beverages in preventing weight gain and promoting health, and concluded that such drinks should not be considered part of a healthy diet.

Restriction of caloric intake for the purpose of weight loss might contribute to eating disorders, such as bulimia nervosa, anorexia nervosa, and binge eating (74–76). Theories on the subject suggest that caloric restriction precedes the emergence of pathological eating patterns, including compulsive overeating and purging. Thus, the recommendation is that diets that promote healthy eating behaviors should be encouraged, and conversely, that caloric restriction should be discouraged (76).

Individuals that choose healthy foods based on caloric value alone are likely to fall into error. In Table 1 we present a comparison between the nutritional characteristics and components of 97 kcal portions of a minimally processed food and an ultraprocessed food.

According to the concepts of healthy eating choices explored in this paper, the consumption of 14 almonds is considered healthier than the consumption of 6 chewy fruit-flavored candies, even though both portions provide the same number of calories. The 2 foods induce different metabolic, hormonal, and neuronal responses and have different consequences in terms of satiety and weight gain. In this example, a consumer using only calorie information to evaluate the 2 food items might conclude that they are equally healthy (or unhealthy). Public health policies in nutrition, like most important initiatives and food and menu labeling legislations, do not define healthy eating as an end goal. They refer to the fight against obesity as an objective, and this leads to completely different actions (19, 78–82).

Healthy eating and public health nutrition policies

Nutritional information policies do not necessarily represent a solution to reduce obesity or promote healthy choices. It is not enough to make nutrition information available and focus on calorie counting if healthy foods and meals are difficult to find or expensive, if portion sizes are larger than

recommended, or if culinary preparations are not culturally and sensorially adequate. Nutritional information should be considered primarily as a part of an individual's right to information about food. Consumers can choose to make healthy choices if they have access to information, if they comprehend nutritional information, and if healthy food preparation is available. Healthy eating concepts are closely related to food quality. Therefore, it seems that information on ingredients, food origin, processing level, and cooking methods may be more important for public health nutrition policies than calorie information, although the 2 are not mutually exclusive.

In this way, authors from a *Lancet Commission* report reinforce that undernutrition and obesity both result from poor diet quality and a low variety of healthy foods, and that recognizing this is a more helpful perspective to resolve nutrition problems than the perception that undernutrition and obesity are simply a consequence of too few or too many calories (83).

According to Levine (84), a calorie is simply an energy unit and has a neutral meaning, whereas foods and portions have powerful cultural, social, medical, scientific, and political meanings. US history shows that this discrepancy has resulted in more than a century of disconnection between policy aims, personal behaviors, and public health outcomes (84). Thus, policymakers may need to think beyond calories to promote healthy eating and to reduce obesity. For example, food labeling policies can focus on nutrient/ingredient-based warning labels, which seem to help consumers make healthy choices (85). In restaurants, it is important to improve menu quality and introduce other interventions, such as providing price incentives (7). Menu labeling should focus on qualitative information, such as healthy food signs, and criteria to classify foods based on healthy eating parameters (e.g., added sugars, types of fats, whole-grains, culinary techniques), and not only on energy value or total fat (7).

Thus, the shift of focus from calorie counting to healthy eating is justified, even in the fight against obesity. As

discussed throughout the manuscript, encouraging consumption of foods of high nutritional quality invariably leads to increased consumption of less processed foods and balanced intake of macronutrients and bioactive compounds that help prevent CNCs and chronic inflammation, which is both a cause and consequence of overweight. In addition, healthy foods promote satiety, affecting meal size and caloric intake. Calorie counting, in contrast, does not necessarily lead to healthy eating habits or increased satiety. Both factors are necessary for a substantial reduction in caloric intake and for weight loss, as demonstrated in population studies.

Conclusions

Food and menu labels should be analyzed differently. Calorie and fat information may be of importance when comparing similar products of different brands. In these cases, fats are usually responsible for differences in caloric value. As a rule, packaged products that are low in fat are preferable to those high in fat because fats present in ultraprocessed foods are generally industrial *trans* fats. Nonetheless, it is necessary to read the ingredients list to have information on the sources of nutrients. In addition to fats, other nutrients should be evaluated, such as fibers, added sugars, and sodium. When analyzing meals (not packaged products), calories and fats are not the key point of evaluation. Similar culinary preparations can use different ingredients and be prepared in distinct ways.

Calorie focusing is an approach that reduces food to a single aspect that, in most cases, is not the most important for health promotion. Researchers and policymakers should stop discussing whether actions can decrease “calorie intake” (people eat food, not calories) and should start focusing on food and healthy eating patterns to reduce obesity. We also suggest adoption of nutrient/ingredient-based warning labels as part of food and menu labeling policies that consider factors associated with healthy eating besides energy value and total fat, as well as the implementation of dietary guidelines that recognize and value food patterns.

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