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REVIEW

Public health policies to encourage healthy eating habits: recent perspectives

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Abstract: There is an urgent need to address unhealthy dietary patterns at the population level. Poor diet and physical inactivity are key drivers of the obesity pandemic, and they are among the leading causes of preventable death and disability in nearly every country in the world. As countries grapple with the growing obesity prevalence, many innovative policy options to reduce overeating and improve diet quality remain largely unexplored. We describe recent trends in eating habits and consequences for public health, vulnerabilities to unhealthy eating, and the role for public health policies. We reviewed recent public health policies to promote healthier diet patterns, including mandates, restrictions, economic incentives, marketing limits, information provision, and environmental defaults.

Keywords: food policy, diet, obesity, public health

Introduction

Over the last 40 years global eating patterns have changed in significant ways. Population diets have shifted toward a greater consumption of processed and ultra-processed foods that are low in nutrients and high in energy.[1] There has been an increase in consumption of foods prepared outside the home (eg, fast food) and many of these foods have increased in portion size, which promotes overconsumption.[2] There has also been an increase in foods from animal sources, as well as a greater intake of oils and caloric sweeteners.[1] In many countries, the general population consumes amounts of sodium, unhealthy fats, and added sugars that greatly exceeds recommended levels.[3–5] The overconsumption of unhealthy foods and beverages have also been coupled with a lower intake of healthier dietary components, including high-nutrient, low energy foods such as legumes, coarse grains, and other vegetables.[1]

The past few decades has also seen an enormous increase in consumption of sugar-sweetened beverages (SSBs).[6] Intake of these beverages – including soda, sports drinks, fruit drinks, and energy drinks – increased 3-fold from 1970 to 2001 in the USA alone, and almost half of Americans (48%) report drinking soda every day.[7,8] Recent trends in the USA show that soda intake is falling, but intake of other SSBs, such as sports and energy drinks, is on the rise with SSBs remaining the greatest contributor to added sugar intake in the American diet.[6,9,10] Countries such as the People's Republic of China, India, Vietnam, Thailand, and other Southeast Asian countries are also experiencing rapid increases in SSB intake.[11]

These dietary shifts have major consequences on the public's health. Diet and physical inactivity are now among the leading causes of preventable death and disability in nearly every country in the world.[12,13] More than two billion people worldwide are

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now overweight or obese, while maternal and child undernutrition is responsible for 11% of the total global disease burden.[14,15] Unhealthy diet patterns, including high intake of added sugars, trans fats, and excess sodium intake, are linked with obesity, heart disease, type 2 diabetes, cancer, high blood pressure, and stroke.[16–19] Furthermore, diet-related risk factors (including low fruit consumption and high sodium intake), account for 10% of disability-adjusted life years worldwide.[20] SSBs alone are linked with obesity, weight gain, dental caries, increased energy intake, type 2 diabetes, and heart disease.[6,17,21–23]

In this paper, we discuss the ways in which current food environments exploit biological, psychological, social, and economic vulnerabilities to overeat. We then discuss public health policies designed to accelerate progress in promoting healthier eating habits. We group these policy strategies into the following categories: mandates, restrictions, economic incentives, marketing limits, information provision, and environmental defaults. Although the causes of obesity are multifactorial (and include growing rates of physical inactivity), this review is only focused on strategies to alter the food environment.

Vulnerabilities to unhealthy eating

Biological vulnerabilities

As discussed by Roberto et al in a recent Lancet series on Obesity,[24] although individuals have some control over their diet, the modern food environment has introduced an influx of hyper-palatable foods high in sugar, fat, and salt, that appear to surpass the rewarding properties of non-processed foods.[25] These ingredients, along with flavor enhancers, food additives, and caffeine, are manipulated in ways that maximize the reward value of foods, making it difficult for the body to regulate food intake and weight.[26] Many processed foods are engineered to increase the concentration of refined carbohydrates, such as white flour and sugar. In addition, fiber, water, and protein – ingredients which help with satiety and slowing the absorption of sugar into the bloodstream – are frequently stripped from these foods.[27] The result of this processing is an increased rate at which refined carbohydrates are absorbed into the body, causing rapid spikes in blood sugar. Previous research has demonstrated that highly processed foods with a high glycemic index rapidly raise blood sugar and can lead to excessive hunger, overeating, and a biological preference for high glycemic index foods, propagating cycles of overeating.[28,29]

There is also emerging evidence that certain foods may trigger brain responses that mimic reactions to addictive substances like drugs or alcohol.[26,30] Neuroimaging research in both rats and humans suggests that intake of ultra-processed foods high in added sugar, fat, and salt generate responses akin to other addictive substances.[31,32] In particular, children are biologically vulnerable to developing preferences for highly processed foods because they have a stronger preference for sweet foods compared to adults.[33–35] Finally, humans' complex biological reactions make it difficult to lose weight and maintain weight loss.[36,37] This often traps people in a vicious cycle where weight is initially lost, but regained over time. The difficulty in sustaining weight loss can contribute to feelings of failure, which in turn can push people to cyclical diets and related products that falsely promise quick, lasting change.

Psychological vulnerabilities

Research suggests that more than half of consumers' grocery store purchase decisions are unplanned and made in the store.[38] This leaves consumers vulnerable to subtle environmental influences that promote intake of less healthy foods in places like supermarkets or restaurants. Examples of such environmental influences include large portion sizes at restaurants, which encourage overeating through changing consumption norms; highly visible placement of sugary drinks on supermarket end caps and candy in the check-out aisles, which makes these items salient and increases impulse purchases; and child-targeted marketing using athletes or licensed characters, which can shape taste and snack preferences, and form brand loyalty at early ages.[24,34,39,40] Part of the problem is that incentives are misaligned. Food companies are under immense pressures to maximize profits over maximizing the health outcomes of consumers. Thus, they create and promote foods that take advantage of the aforementioned biological vulnerabilities to help sell more products.

Social and economic vulnerabilities

Modern environments also exploit social and economic vulnerabilities toward consuming unhealthy diets. In many low- and middle-income countries, rising household incomes, rapid urbanization, and increasing female labor force participation have driven a higher demand for unhealthy processed convenience foods.[1,41] For example, from 1999–2012 total per capita processed food consumption increased 3.2-fold in the People's Republic of China, and 3.6-fold in Vietnam. In high-income countries, unhealthy foods tend to be relatively inexpensive compared to healthier options, and lower-income neighborhoods are saturated with unhealthy options.[42,43] For example, restaurants and other ready-to-eat foods are quick

and convenient, making them especially appealing to families with limited time and resources. However, these foods tend to be less healthy than home-cooked meals.[44] In addition, research on low-income populations in the USA has found that black and Latino Americans are often disproportionately the targets of aggressive marketing tactics by the food industry.[45,46]

Policies to accelerate progress on healthy eating

Our understanding of these biological, psychological, social, and economic vulnerabilities has shed light on the ways in which food environments undermine people's ability to make responsible food choices that reflect their long-term goals to be healthy. Therefore, policies may play an important role to better align people's food choices with their desires to live healthy lives. Traditional evidence-based population approaches for improving public health focus on identifying exposures in the environment that can lead to negative health outcomes, and designing interventions or policies that limit exposure to hazards. Current evidence-based policies typically fall into one of six categories that vary in effectiveness and feasibility:

1. Mandates (eg, vaccinations required for children in order to attend school, smoke-free air laws) – these required policies for industries or individuals are designed to protect against the adverse effects of an unhealthy substance or environment
2. Restrictions (eg, prohibit the sale of alcohol to minors) – these policies are designed to limit access to an unhealthy substance or environment
3. Economic incentives (eg, excise tax on cigarettes) – these policies aim to better align price incentives with health outcomes, encouraging higher consumption of healthy products and lower consumption of unhealthy products
4. Marketing limits (eg, regulation of tobacco advertising) – these policies try to limit advertising and promotion of an unhealthy substance or environment
5. Information provision (eg, education campaigns to promote fruits and vegetables, requiring warning labels on tobacco products) – these policies provide the public with important health information, including encouraging healthy behaviors and warning about the dangers of an unhealthy substance or environment
6. Environmental defaults (eg, changing the default restaurant side dish from French fries to salad) – these policies preserve the freedom of individuals to expose themselves to an unhealthy substance or environment, but makes it easier for them to avoid it.

In the next section, we review government policies to promote healthier diets that fit into the six categories described above.

Mandates

As the most restrictive policy tool available, government mandates tend to be effective at changing both industry and individual behaviors. However, they may be harder to enact than less restrictive policies because they limit freedom. An example of an effective government mandate was the New York City (NYC) Board of Health's 2006 ordinance that prohibited restaurants from cooking with trans fats. The ordinance was passed based on scientific literature demonstrating an association between the consumption of trans fats and cardiovascular disease and concerns that trans fats presented a greater risk to health than other kinds of "bad" fats such as saturated fats.[47] Restaurants were able to switch to other cooking fats without complaint from customers.[48] NYC could have pursued other options for behavior change, such as encouraging restaurants to voluntarily stop using trans fats or requiring trans fat to be labeled on restaurant menus. However, these strategies would not have entirely removed trans fats from restaurant food as effectively as the legal mandate.

Restrictions

Governments can enact policies that do not impose mandates on everyone, but only restrict products in publicly-funded spaces (including government departments, schools, hospitals, and prisons). For example, they may require that these places only offer food that follows national dietary guidelines, or limit the sale of certain products (such as alcohol or SSBs).[49] Recent policy examples include a 2011 ban on the sale of SSBs from city property in Boston, Massachusetts, as well as a SSB ban in all food establishments within a children's hospital in Ohio (USA). The latter was linked with a decrease in carbonated beverage sales and an increase in milk, juice, water, and coffee sales, without a revenue loss at non-vending locations.[50]

Policies may also restrict sales of unhealthy items or ingredients to particularly vulnerable populations, such as children. The most common examples are implementing a minimum legal age to purchase alcohol and tobacco.[51] Within the food arena, in 2014 Lithuania became the first country in the European Union to ban energy drink sales to anyone under the age of 18 years, a measure that is being pursued at the

state and local levels in the USA.[52] Some scholars have suggested policies that would place a per-capita limit on the amount of a product one can purchase (eg, only one 500 mL SSB container per purchase), or restrict sales to certain locations or hours within a given purchasing location.[53]

Policies have also been enacted to influence school food environments. Children spend more time in schools than any other environment away from home,[54] and school practices affect children's diets,[55,56] and weight status.[57] In 2010, the USA enacted a policy to update the federal nutrition standards for all foods and beverages in schools, requiring more servings of fruits and vegetables, limiting kilocalories (calories), saturated fat, and sodium, and restricting access to candy and SSBs.[58] Peru, Uruguay, and Costa Rica have all banned "junk food" in public schools since 2012, and programs in countries such as Brazil, Ethiopia, Malawi, and Senegal have changed procurement policies to increase the amount of school foods sourced by local producers.[24,59] In 2014, the UK released new school food standards, limiting fried foods and desserts, and emphasizing water, whole grains, fruits and vegetables.[60] Although research has documented links between school food policies and improvements in diet quality and lower weight gain among children,[61] more evidence is needed to better elucidate how these changes impact children's overall diet quality (both in and outside of school), as well as their weight over time.

Economic incentives

Spurred on by successful pricing policies for tobacco control, there has been a growing interest in the role of economic incentives (taxes and subsidies), to shift food and beverage consumption patterns toward more healthy diets.[13,62] Most research evidence to-date has focused on price data. Findings suggest that changing prices of specific foods and beverages alters consumption, where larger price changes are associated with more meaningful changes in consumption.[13,62–65]

Several recent studies have also focused on the association between state-level soda taxes and individual data, showing that small sales taxes (1%–7%) have had a minimal impact on overall soda consumption or on weight/obesity.[66–68] Many places have implemented special taxes on foods of low nutritional value, including soda, junk food such as potato chips and candy, and high-fat items.[69,70] In the USA, 29 states have a sales tax on candy, while 34 states have a sales tax on soda, although none of the funds generated from these taxes are used for obesity prevention efforts.[62] Sales taxes vary widely across and within the USA, with higher taxes in vending machines than grocery stores. In addition to sales taxes, the city of Berkeley, California, passed an excise tax on SSBs (US$0.01 per ounce [~30mL]) in 2014, the first of its kind in the USA.[71] In 2014, Mexico enacted a one peso (US$0.08) per liter excise tax on SSBs and an 8% sales tax on junk food (energy-dense, non-staple foods), prompting similar proposals in other Latin American countries.[59,72] When Denmark enacted a saturated fat tax in 2012, pre-tax simulations estimated that it could reduce saturated fat consumption by 8% in the population.[70] Despite its later repeal due to pressures from retailers and consumers, the tax raised US$216 million in revenue.[73]

Together, these findings suggest that small taxes or subsidies are not likely to produce significant changes in obesity prevalence, although small taxes may generate substantial government revenue. However, non-trivial pricing interventions have shown measurable effects on weight outcomes, particularly in price-sensitive populations such as children and low-income adults.[13,62,74] More research is needed to understand how specific policy changes – including the size of taxes/subsidies, specific items taxed/subsidized, and the tax/subsidy design – alter behavior and impact weight and other health outcomes.[62] Research is also needed to better understand substitution effects, compensatory eating, and longer-term changes in behavior in response to pricing interventions.

Marketing limits

Currently, most child-targeted food and beverage marketing is for products which are high in sugar, fat, or sodium.[75] Previous research has documented that advertising shapes children's food preferences, purchase requests, beliefs, and dietary intake.[76–78] Because of this, many countries have restrictions on marketing to youth. More than 60 countries around the world currently have some regulations on food and beverage television advertising to children.[79] Some countries have also begun banning television advertising to children, but the effectiveness of such bans is difficult to evaluate. Australia has banned television advertisements aimed at children 13 years old and younger, while Sweden, Norway, and Quebec now ban all television advertising aimed at children, regardless of the product involved.[13] After South Korea restricted television advertising of energy-dense and nutrient-poor foods targeting children in 2010, Korean food companies placed significantly fewer television advertisements of these foods targeted to children.[80] Previous studies have estimated that banning television food advertisements to children

in the USA could reduce the prevalence of obesity,[81,82] although estimating the magnitude of such effects requires better accounting for the non-linear relationship between calorie reduction and weight loss.[83] Food industry pledges to limit television advertising to children are also widespread, although evidence suggests that further efforts are needed to reduce the exposure and power of marketing to children.[84]

Other policies to limit food marketing to children include curbing advertising and marketing of less healthful foods and beverages in schools and removing toys in children's fast food meals (eg, Chile and Peru have banned Happy Meal toys).[59,76] Most ongoing policy efforts to address food marketing in high income countries focus on television advertising and in-school product marketing. In the USA, issues of free commercial speech present a major barrier to enacting laws that would limit food advertising. Most research on food marketing to-date has focused on television advertising, but further research is needed to understand the scope and impact of other marketing strategies and marketing efforts directed at specific sub-populations such as low-income groups or children.

Information provision

Policies that inform the public are often met with less resistance than some of the more restrictive interventions we previously described. A variety of mandatory and voluntary efforts are underway to include calorie labeling on restaurant menus and labels on the front of packaged foods that would provide consumers with key nutrition information. For example, the USA has passed a law requiring menu labeling in large chain restaurants.[85] The research on the influence of calorie labeling in restaurants on consumer food choices and intake is mixed,[86–93] with some studies finding that labeling encouraged lower calorie choices and others observing no effect on food choices. The current state of the evidence suggests that calorie labeling promotes lower calorie food choices for some consumers, some of the time, at some restaurants.[94] Longer-term studies, particularly after the USA implements calorie labeling nationally, will be needed to determine its long-term impact.

There has also been a growing interest in placing labels on the front of packaged foods to improve consumer understanding of the nutritional profile of foods and/or improve the healthfulness of their dietary choices. In 2014, Ecuador passed a mandatory traffic light labeling policy for packaged foods, while voluntary labeling schemes are used in countries such as Denmark, Norway, Sweden, and Singapore.[24,59] In the UK, some food manufacturers have adopted a multiple traffic light labeling system on packaged food and beverage products to signal whether products have low (green), moderate (yellow), or high (red) levels of sodium, sugar, and unhealthy fats.[95] One study of a single traffic light labeling intervention in a USA hospital cafeteria found that sales of red items decreased and green items increased over a two-year period and results were maintained after two years.[96,97] Another study found that translating calorie labeling into physical activity equivalents on SSBs (eg, displaying the number of minutes of exercise required to burn the equivalent amount of calories in a product) may reduce SSB purchases among adolescents.[98] These results suggest that certain labeling schemes may be an easy, cost-effective way to encourage healthier purchases. The Netherlands, along with several other countries, have implemented the "Choices" checkmark symbol, which is used as a supermarket shelf tag to flag products that meet dietary guidelines for healthfulness as established by an independent international scientific committee.[99] Although more research is needed on the influence of front-of-package or shelf-tag labeling systems, some studies have found that they can encourage purchasing of healthier products.[93] It is important for future research to evaluate the optimal design of nutrition labels and how they influence purchasing habits and food intake.

Although the primary goal of nutrition and menu labeling policies is to inform consumers, their largest effects on public health may occur through providing incentives for manufacturers to reformulate products (eg, calorie reduction, lower portion sizes).[27] For example, trans fats were reduced in some packaged foods following their mandatory inclusion on the nutrition facts label in the USA.[100–102] More research is needed to understand how labeling spurs product reformulation among food manufacturers.

In addition to nutrition labels, an emerging area of future research and policy interest is in placing warning labels on certain beverages with added sugar. State legislation has recently been introduced in New York and California,[103,104] with a goal of educating consumers on the scientific evidence linking SSB consumption with weight gain, diabetes, and tooth decay.

Governments can also inform the public through national dietary guidance. Although both sugar and caffeine – the two main ingredients of SSBs – are recognized as potential health concerns,[105–107] few governments worldwide have strong or quantitative recommendations to reduce their consumption.[108] Including limits on added sugar in national dietary guidance to reflect current scientific evidence would be a first step toward addressing this issue.[109]

Powerful interest groups have traditionally slowed the actions of governmental and non-governmental organizations (such as the World Health Organization) in addressing reductions in added sugar.[110,111] However, in 2014, the World Health Organization issued draft guidelines to limit sugars to 5% of total daily energy intake, while in 2015, the USA Dietary Guidelines Advisory Committee issued a scientific report recommending that the federal government limit added sugars to below 10% of total daily energy intake.[112,113] Both sets of recommendations are currently in draft format.

Another way to inform the public is through mass media campaigns, which can raise awareness, increase knowledge, and prompt healthier behavioral intentions.[114] Several government initiatives have launched such campaigns to inform the public about diet-related chronic diseases. In 2008 the Australian government launched the 'Measure-Up' campaign to link waist circumference with chronic disease risk. An evaluation showed increased public awareness of the link between waist circumference and chronic disease, but did not result in changes in fruit and vegetable intake or physical activity.[115] Similarly, the Los Angeles County Department of Public Health (California) launched the "Sugar Pack" health marketing campaign in 2011 to educate the public on reducing excess calorie intake from SSBs. An evaluation showed increased knowledge and self-reported intention to reduce SSB consumption, potentially complementing a comprehensive obesity prevention strategy.[116]

Environmental defaults

Mandatory or voluntary "nudge" strategies – behavioral science approaches involving small, usually unnoticed environmental changes – can complement traditional public health policies and inform the design of new policies to increase effectiveness.[117,118] One advantage of these types of interventions is that they are designed to be simple and cost-effective. Part of the reason such interventions are appealing is that they do not rely on people making effortful changes or comprehending complex health information.[119] For example, in 2015 major fast-food chains McDonald's, Wendy's, and Burger King all dropped soft drinks from their children's menus,[120] shifting the default beverage to a healthier option. In conjunction with major policy efforts, these types of voluntary nudges have the potential to reduce soft drink consumption among children.

Policies may also change the default food environment by increasing access to healthy foods through farmers' markets and mobile vendors of healthful foods.[24] Attempts to nudge consumers to make healthier food choices through subtle environmental cues such as smaller plate size and pre-committing to healthier food choices by ordering food ahead of time, have shown some potential to reduce calorie consumption.[121] However, these types of strategies typically represent small "p" policies that must be undertaken voluntarily by companies or institutions. One example of a government policy designed to change the large portion size that is default in restaurants was a 2012 proposal in NYC to limit the portion size of sugary drinks sold in food service establishments to 16 ounces (~500 mL). This policy was struck down because the NYC Board of Health did not have the legal authority to enact it, but it remains a viable policy option. Although there are no shortage of creative ideas to use nudges to improve the food environment,[122] a recent randomized controlled trial found no long-term effects for a school-based nudge intervention, and there have been few other evaluations of such interventions in the long-term.[123,124] More longer-term experiments are needed.

Future prospects

Most food environments across the globe make it difficult to eat a healthy diet. Given the magnitude of the obesity pandemic and the rapid, global changes in unhealthy diet patterns, it is unlikely that general population eating habits will improve without major policy interventions. Echoing previous findings,[24] we see a need for systematic, large-scale efforts to address unhealthy diets. Policymakers must also recognize the double burden of under nutrition and obesity, particularly in low- and middle-income countries, and design policies with both issues in mind. Further, funding levels to evaluate the impact of major food policies in high-income countries are very low, and there is essentially no funding for evaluation in low- and middle-income countries.[1,13] New efforts are needed to establish more comprehensive and rigorous approaches to evaluating programs and policies aimed to improve diet, coupled with feedback to improve the effectiveness and efficiency of implemented policies. Examining long-term effects of policies in different locations and among different populations, as well as best practices for implementation, are urgently needed to increase the evidence base in this field. Reversing the obesity epidemic will require a demand for change from civil society, actions and innovations from the food industry, and most importantly, policy implementation from governments and institutions.

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