

## Regulatory Policy to Address Ultraprocessed Foods

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The 20th century witnessed dramatic transformations in crop production and food processing. Contributing factors included the discovery of vitamins, new agricultural practices and

agribusinesses (the “Green Revolution”), shifts in family structure, and increases in women in the workforce. Together, scientific research, government policy, and private-sector innovation substantially reduced rates of vitamin-deficiency diseases and global famine. In light of those successes, no nutrition-related challenge appeared too formidable for business ingenuity and technological manipulation to tackle.

In the late 20th century, food products began to be designed with new goals — modifications to reduce fat or augment flavor, consistency, or shelf-life, which could also increase profits, given consumers’ willingness to pay for perceived added value. Manufacturers

shifted to using the cheapest available ingredients: increases in refined wheat, corn, and rice flour and, to a lesser extent, added sugars and fats accounted for most of the approximately 500-calorie increase in energy consumed per person in the United States between 1970 and 2000.<sup>1</sup> To mask the use of lower-quality ingredients, reduce fat, and enhance uniformity and shelf-life, manufacturers introduced new industrial sweeteners, flavorings, colorants, emulsifiers, thickeners, and preservatives; processes such as partial hydrogenation, fractionation, hydrolysis, and extrusion; and new commercial packaging.

Meanwhile, the tobacco companies R.J. Reynolds and Philip

Morris acquired leading food-manufacturing companies. Leveraging decades of tobacco research and marketing, they developed food products that were engineered to stimulate the brain’s neural pathways related to pleasure and reinforcement, trigger cravings, and cultivate brand loyalty. The proliferation of these processing methods, combined with the increasing size and economic power of the food sector, outstripped the U.S. government’s capacity to monitor and regulate new techniques and additives.

To evaluate the health implications of these industrial methods, Brazilian researchers in 2009 proposed a “Nova,” or new, food-classification system that was based on processing, rather than nutrients.<sup>2</sup> Foods that had undergone the highest levels of processing — those containing industrial substances or made using physical or chemical alterations not typical

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in home cooking — were categorized as “ultraprocessed.” This definition was pragmatic. Although not all substances in ultraprocessed food (UPF) and not all processing methods used to manufacture them have equivalent health effects, the definition was intended to serve as a marker for the interrelated harmful characteristics of commercially processed foods.

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Experimental and interventional studies have provided evidence of harms from particular features of UPF.<sup>2</sup> Loss of natural, intact food structure alters the speed, location, and completeness of nutrient absorption, affecting the host and the microbiome. UPF can contain high levels of starch, sugar, and sodium while offering low levels of fiber, polyphenols, and other bioactive nutrients. UPF often contains added sweeteners, flavorings, colorants, emulsifiers, or preservatives. Toxins such as furans, heterocyclic amines, polycyclic aromatic hydrocarbons, and acrylamide may be introduced during processing, and packaging can be a source of contaminants such as phthalates, bisphenols, mineral oils, and microplastics. In addition, UPF tends to be aggressively marketed, packaged for on-the-go consumption or in ready-to-eat containers, and sold in large portion sizes, which can contribute to excessive consumption.

Despite variation in health harms among individual products, evidence indicates that UPF, as a class, has contributed to high rates of chronic diseases in the United States. More than 80 cohort studies have identified associations between UPF and various conditions, including obesity, diabetes, hypertension, dyslipidemia, cardiovascular diseases, inflam-

matory bowel disease, mood disorders, gestational weight gain, and death.<sup>2</sup> Two well-controlled, short-term trials demonstrated that consumption of UPF, as compared with minimally processed food, increases caloric intake and weight gain, even when the major nutrient profiles of the meals are similar.<sup>3,4</sup> Of note, such effects occur without people perceiving differences in taste, fullness, or amounts eaten. UPF consumption has climbed worldwide, coinciding with increasing rates of obesity, diabetes, and other diet-related conditions. UPF now accounts for about two thirds of all calories consumed in the United States.<sup>2,5</sup>

The broad definition of “ultraprocessed” and the lack of nutrient-specific criteria represent departures from conventional approaches to nutritional assessment. Some food manufacturers and nutrition researchers have challenged the concept of UPF, noting that not all additives con-

sidered under the definition have been proven to have deleterious effects, that the precise mechanisms by which UPF may cause harm haven’t been established, and that certain UPFs may be harmless or even beneficial. Yet evidence demonstrates that, as a group, currently available UPFs are unhealthy. Across studies and cultures, UPF consumption is consistently associated with poor outcomes.

Policymakers have responded to increasing public concern about UPF. In 2019, New York City banned processed meats from school meals. In 2023, California banned several food additives that have been linked to health harms, and in January 2025, the governor directed state agencies to take additional steps to limit harms associated with UPF. The Texas legislature has passed bills requiring warning labels on foods containing chemical additives and establishing a nutrition advisory committee to examine UPF and chronic diseases. The Trump administration has emphasized the contribution of UPF to high rates of diet-related diseases in the United States, and a federal Make America Healthy Again commission is assessing the potential threats associated with UPF and specific food additives.

To address UPF, policymakers could consider reforms related to taxation, labeling, dietary guidelines, school meals, federal nutrition programs, and food procurement, safety, and marketing (see table). Goals could include reducing consumption of UPF and establishing incentives for the production and sale of minimally processed foods. These actions should account for potential effects on food prices and don’t preclude complementary policies addressing single nutrients, such as

Policy and Regulatory Actions to Address Ultraprocessed Food.*		
Policy Area	Action	Examples
Taxation	Federal, state, or local excise taxes levied on the manufacturing, distribution, or sale of UPF; revenue can be general or earmarked for specific purposes, such as healthy food programs, to reduce regressiveness	Taxes on SSBs in multiple U.S. localities and more than 50 countries Taxes on candy in 19 U.S. states Taxes on junk food in Hungary and Mexico
Labeling	Front-of-package icons or warning labels denoting UPF or the presence of certain additives	Black-box warning labels for artificial sweeteners in Mexico and Argentina Front-of-package icons describing added sugar or sodium content or warning labels indicating high levels of added sugar or sodium in multiple countries
Dietary guidelines	Introduction of national guidelines recommending choosing fewer highly processed foods or UPFs and choosing more unprocessed, minimally processed, or fresh, homemade foods	Guidelines in Belgium, Brazil, Brunei, Canada, Ecuador, France, Israel, Maldives, Peru, Qatar, and Uruguay
School meals	Implementation of nutrition standards limiting the serving of certain types of UPF or food containing certain additives	New York City school meal standards eliminating partially hydrogenated oils and processed meats Texas bill to ban specific food additives in school meals
Federal nutrition programs	Removal of eligibility for certain types of UPF or food containing certain additives	Arizona bill preventing use of SNAP benefits for purchasing SSBs, drinks with artificial sweeteners, or candy Texas bill preventing use of SNAP benefits for purchasing SSBs, candy, potato chips, or cookies
Food procurement	Elimination of certain types of UPF or food containing certain additives in cafeterias, vending machines, or other food services Elimination of certain types of UPF or food containing certain additives in procurement, such as food for the military or prisons	U.S. Food Service Guidelines for Federal Facilities requiring fruits and yogurt options with no added sugar and limiting sodium levels in food options
Food safety	Requirement for strong evidence of safety, review, and public comment for any new substances added to foods Rigorous postmarketing surveillance to support removal of additives linked to harm	European Union, Canadian, and U.K. regulations requiring safety review of food additives and banning many additives California law banning specific additives in food FDA review in progress to revise existing policy that permits companies to add new substances to foods with little or no oversight, review, or public reporting
Food marketing	Elimination of health claims on UPF packages Restrictions on marketing of UPF to children	Prohibition on products high in certain nutrients or with artificial sweeteners from any marketing strategies directed toward children in Mexico Prohibition on advertising or sponsorship of products high in certain nutrients or containing artificial sweeteners in schools in Argentina

\* Examples include proposed or implemented policies addressing specific subtypes or components of ultraprocessed food (UPF). Evidence exists to support each of these policies (see <https://food-price.org/index.php/publications>), with varying degrees of efficacy, depending on the intensity of the policy (e.g., the size of a tax). Policies could be broadly implemented for UPF, with exemptions considered for healthier options and for products for which developing non-ultraprocessed formulations may be challenging, such as infant formula and medical foods. Policymakers should also consider the ways in which reformulations and marketing of non-ultraprocessed foods or exempted UPFs could address any shortfalls in fiber or fortified nutrients currently provided by UPF. Natural added sugars (e.g., cane or beet sugar, honey) and salt are considered culinary ingredients; such ingredients alone wouldn't lead to a UPF designation. SSBs denotes sugar-sweetened beverages, SNAP the Supplemental Nutrition Assistance Program, and FDA the Food and Drug Administration.

sodium, or individual food additives for which there is evidence of harm. Such additives should be regulated under existing pathways.


Any UPF-focused policy will require a clear, evidence-based definition of “ultraprocessed” that is pragmatic and defensible against industry challenges. I believe the

most appropriate set of criteria is the one that has been used to establish the health harms of UPF: the Nova system. Using this system, UPF can be defined on the basis of classes of additives that are indicative of extensive processing, such as industrial sweeteners, colors, flavorings, or preserva-

tives and modified sugars, oils, or proteins, which are identifiable on ingredient lists.

Various policies could be applied to subtypes of UPF. For example, harms have been more consistently identified for sugar-sweetened beverages, processed meats, ready-to-eat or ready-to-

heat meals, refined breads, and sauces and condiments than other UPF. In contrast, UPF made with more healthful, less-processed ingredients — such as whole grains, fruits, vegetables, legumes, or yogurt — generally have neutral or positive health associations.<sup>5</sup> To survive litigation, carve-outs or exemptions from UPF policies must be based on standardized, accepted regulatory definitions. One sensible approach could be to exempt UPF that falls under a December 2024 Food and Drug Administration (FDA) rule governing which products can be labeled as “healthy.” In contrast to the previous, decades-old policy, which emphasized selected nutrients and allowed manufacturers to market vitamin-fortified UPF as healthy, the new rule prioritizes healthful ingredients. Any product labeled as “healthy” must contain minimum amounts of fruits, vegetables, whole grains, nuts, beans, dairy, or lean proteins and may not contain excessive amounts of added saturated fat, sodium, or sugar. This FDA rule provides a reasonable approach to considering exemptions to UPF policies.

 An audio interview with Dariush Mozaffarian is available at NEJM.org



Alternative regulatory definitions of “ultraprocessed” have been

proposed, such as definitions based on amounts of saturated fat, sugar, and sodium — in keeping with a front-of-package labeling rule recently proposed by the FDA. However, such criteria wouldn’t capture all UPF-related harms and are only moderately sensitive and specific to ultraprocessing. Many UPFs are high in refined starch and additives, rather than sugar, sodium, or fat, for example; healthful, minimally processed foods can contain cane or beet sugar, honey, salt, or natural fats. Definitions focused on isolated nutrients don’t reflect the innovative approach introduced by Nova, which centers commercial processing and its multifaceted adverse effects.

Federal, state, and local policies have successfully defined other categories of heterogeneous foods — such as “junk food,” which is taxed in multiple states — to promote public health. Given high rates of diet-related disease and evidence of harms of UPF, I believe the federal government has the responsibility to ensure food safety and protect the public’s health by regulating UPF. The food sector, in turn, should comprehensively evaluate specific processing methods and additives to inform regulatory updates and

support the production of safer, more healthful packaged foods. Sufficient evidence and imperative exist for defining and taking action to address UPF.

Disclosure forms provided by the author are available at NEJM.org.

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## The Health Equity, Medical, and Scientific Costs of Dismantling DEI

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Current attacks by the Trump administration on diversity, equity, and inclusion (DEI) initiatives — in the form of executive orders and administrative actions

— reveal a critical misunderstanding of the relationship between DEI and health equity.

DEI initiatives are structured efforts within organizations de-

signed to create inclusive educational and work environments, redress discriminatory policies, and mitigate the effects of systemic inequities. In medicine, these