Front-of-Package (FOP) Food Labelling:
Empowering consumers and promoting healthy diets

GLOBAL FOOD RESEARCH PROGRAM
University of North Carolina at Chapel Hill

Unhealthy changes in the foods we eat

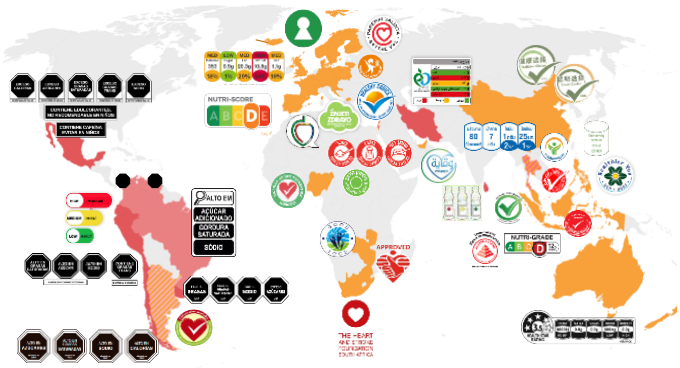
- Pre-packaged, ultra-processed foods and drinks have become readily available in virtually every community around globe, across all income levels and population densities.[1-7] This increased availability — combined with aggressive, pervasive marketing — has dramatically affected the way people eat in many countries and resulted in much less healthy diets.[6-21]
- Many ready-to-eat or ready-to-heat foods and drinks are high in added sugars, sodium, saturated fats, and refined carbohydrates. Excessive consumption of these nutrients increases risk of obesity and many other chronic, nutrition-related diseases.[8,22-33]
  - **Sugar:** Substantial evidence shows that consuming too much sugar increases risks for type 2 diabetes, heart disease, liver and kidney damage, and some cancers.[32-39] Global health experts recommend limiting sugar intake to less than 10% of total daily calories.[31-33,40-43]
  - **Sodium:** Consuming too much sodium is associated with high blood pressure and increased risks for heart disease, stroke, and death.[44-47]
  - **Saturated fats:** Replacing saturated fats with healthy, polyunsaturated fats has been shown to improve blood sugar regulation and reduce heart disease risk.[48-50] The World Health Organization and many national dietary guidelines worldwide recommend limiting intake of saturated fats.[51,52]
  - **Ultra-processed products:** In addition to poor nutritional profiles, ultra-processed foods' and beverages' hyper-palatability (and, some scholars argue, addictive nature[53-55]) and content of biologically harmful compounds (e.g., hormone-disrupting contaminants and industrial additives linked to inflammation and gut dysbiosis)[56-70] are associated with increased overweight and obesity,[71-78] type 2 diabetes,[79-81] depression,[82,83] heart disease and stroke,[70,84-86] and mortality.[85-90]
- Evidence increasingly indicates that growing worldwide consumption of ultra-processed junk foods and sugary drinks is a major driver of the global obesity epidemic — including childhood obesity — and increases in prevalence of other nutrition-related diseases.[6,9,26,91-96]
- An estimated 650 million adults worldwide have obesity and another 1.9 billion are overweight — roughly 40% of the adult population.[97] Prevalence of obesity and overweight for children and adolescents exceeds 340 million for ages 5–19 years and 38 million for children under 5 years.[97]

Front-of-package labels can nudge consumers and industry towards healthier products

- The sheer number of choices when food shopping makes it difficult for consumers to select healthier options, especially as ultra-processed products become more readily available.[6,7,10,72,91]
- Consumers need simple, impactful labels to guide their purchase decisions: Most people spend less than 10 seconds selecting each item while they shop — not enough time to review complicated back-of-the-pack nutrition labels, which are ineffective for most consumers.[98-100]
- Front-of-package (FOP) labels are an evidence-based policy tool, backed by decades of research showing that they can effectively nudge consumers towards healthier foods and drinks while also encouraging industry to improve the nutritional profile of the products they sell.[101]
- The World Health Organization (WHO) recommends FOP nutrition labelling as a key policy to promote healthy diets and reduce NCD prevalence worldwide.[102,103] WHO focuses in particular on reducing consumption of foods high in sodium, saturated and *trans* fats, and added sugar.[104-106]
- Shoppers prefer simple FOP labels that are immediately visible and require little time to assess.[107,108] Labels that minimize effort allow quick identification of which products are less healthy, decrease intention to purchase those, and increase their intention to purchase a healthier product.[100,109-112]

Types of FOP labels in use

A wide variety of FOP labelling approaches and designs are now in use worldwide. These include nutrient warning labels; color-coded "traffic light," Nutri-Score, Health Star Ratings, and the industry-preferred "Guidelines for Daily Allowance" (GDA) labels (See more about each of these below.)

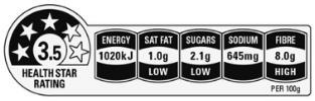


Some labeling schemes are **voluntary** and applied at food manufacturers' discretion (e.g., all GDAs, Health Star Ratings, Nutri-Score, and most traffic light labels). Other systems are **mandatory** and required throughout the food supply, as is the case with all warning label policies.

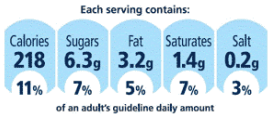
NUTRIENT WARNINGS

TRAFFIC LIGHTS

NUTRI-SCORE



HEALTH STAR RATINGS



GUIDELINES FOR DAILY ALLOWANCE

Prior evidence supports nutrient warning labels

- While a wide variety of FOP labels are now in use worldwide, simple, negative warning labels that clearly identify unhealthy products have the strongest evidence for effectiveness at discouraging junk food and ultra-processed food choices.[101,113-121]
- Warning labels work by helping consumers identify unhealthy products and discouraging them from consuming these products. Evidence shows that nutrient warning labels offer the strongest FOP labelling approach in use today, particularly for the goal of reducing consumption of unhealthy, ultra-processed foods and drinks.
- FOP warning labels such as those used in Chile (*introduced 2016)*, Peru (*2019*), Israel (*2020*), Mexico (*2020*), Uruguay (*2021*), and soon in Brazil, Colombia, Argentina, and Venezuela (*2022–2024*) require packaged foods and drinks that do not meet specific nutrition criteria or that contain certain ingredients (such as non-caloric sweeteners) to carry warning labels clearly indicating that the product is high in sugar, saturated or *trans* fats, sodium, or calories — whichever apply. These labels help consumers quickly and easily identify unhealthy foods and drinks and make healthier choices from the array of available products.

Chilean warning labels

Mexican warning labels

- Requiring FOP warning labels can encourage manufacturers to improve the healthfulness of their products and portfolios to meet nutritional criteria and avoid carrying negative FOP labels.[119,122,123]
- Warning labels only appear on products that pose the greatest health risk. This approach can be easier for consumers to notice (i.e., warning labels are either present or absent on a package) and interpret (i.e., less complex computations or comparisons between products).[124] Warning labels also do not risk creating a "health halo" around products with positive labels, which could lead to overconsumption of foods and drinks with higher-scoring labels.[125,126]

Real-world evidence from Chile: The world's first mandatory FOP warning label policy

Ministry of Health, Santiago, Chile

Since Chile's FOP warning labels began appearing on packages in 2016 (*right*), they have contributed to shifts in social norms and behaviors around purchasing healthier foods and drinks as well as healthier product reformulation. Real-world evidence shows that Chilean consumers are aware of and understand the labels, and they are using them to make food purchase decisions.

- **Purchase changes:** Along with restrictions on food marketing to children and bans on the sale and promotion of regulated foods in schools, Chile's FOP warning label policy was associated with a 24% drop in sugary drink purchases[114] and declines in sodium (–37%), total calories (–24%), calories from sugar (–27%), and calories from saturated fat (–16%) purchased from all foods and beverages during Phase 1 of the law.[115]
- **Social norms:** Focus groups with low- and middle-income mothers suggest profound changes in attitudes toward food purchases, driven both by knowledge gained from seeing the labels and by children telling their mothers not to purchase unhealthy products with warning labels.[116,117]
- Consumers in Chile understand that increasing numbers of warning labels on a package means the product is less healthy and a poorer choice than options with fewer or no warning labels.[118]
- **The food supply:** An evaluation comparing the nutritional profiles of products before and after year one of Chile's FOP regulation found significant reductions in the proportion of products that would be required to carry "high in" sugar and sodium warning labels, suggesting that companies reformulated products to avoid the FOP warning label and other policy restrictions.[119]

More evidence in favor of warning labels:

- A 2021 meta-analysis of over 100 studies examining the effects of color-coded and warning labelling schemes found that nutrient warning labels work better than traffic lights and Nutri-Score labels to discourage unhealthy product purchases and lower purchases of calories and saturated fat.[101]
- A 2020 meta-analysis of 14 experimental studies found that out of all the main FOP label systems currently in use, only "high in" warning labels significantly reduced the calorie and sugar content of purchased products compared to no label.[127] Warning labels also significantly reduced the sodium content of purchases, as did "traffic light" labels, but no effects on purchasing were found for Health Star Rating, Nutri-Score, or "Facts up Front"/Guideline Daily Amount labels.
- Studies using eye-tracking technology to evaluate warning labels compared to industry's Guideline Daily Amount (GDA) labels or to a no-label control have found that warning labels are best able to attract consumers' attention and help them more quickly and easily process and identify whether a product is unhealthy.[128-131]
- FOP warning labels on sugary drinks have been linked to decreased purchases of sugary beverages, decreased perceptions of their healthfulness, and decreased purchasing intent in studies from the **United States** and **New Zealand**.[132,133]
- Among adolescents in six countries (**Australia**, **Canada**, **Chile**, **Mexico**, the **United Kingdom**, and the **United States**), a study comparing five different FOP label types found that octagonal warning labels had the greatest impact on adolescents thinking a sugar-sweetened beverage was unhealthy in all but one country.[134] In fact, roughly twice as many participants who saw the warning labels correctly identified that the sugary drink was unhealthy. While results varied by country, the Nutri-Score, GDA, and Health Star Rating labels had the lowest odds of impact, overall.
- Counter to industry's claims that consumers perceive "high in" FOP labels as too harsh or restricting of their control, a large survey of young adults in **Canada** viewing warning labels on beverages found that the vast majority (93%) felt either more or no change in their own level of control, and most thought that the symbols were either "about right" or "not harsh enough."[135]

- A shopping experiment in **Canada** found that participants who saw "high in" nutritient warning labels purchased less calories, sugar, and saturated fat from beverages and less calories and sodium from foods, compared to participants who saw no FOP label.[136] Traffic light, Health Star Rating, and nutrition grade (i.e., Nutri-Score) labels had no significant impact on nutrients of concerned purchased from beverages and limited effects among foods. Reductions seen with warning labels were further enhanced in experimental conditions with taxes on sugary drinks or snacks.
- In **Brazil**, studies have found that warning labels significantly outperform traffic light labels and GDAs in capturing consumers' attention; improving their ability to identify healthier products and products high in nutrients of concern; and increasing their intention to buy a relatively healthier option.[137,138] Compared to only an ingredient list and a nutrition facts panel, the presence of warning lables improved understanding and perceptions of a product's nutrient profile, and was particularly helpful for identify nutrients in excess.[139]
- A large survey of parents from four **Latin American countries** found that the most vulnerable parents (i.e., those with low education and overweight) preferred a warning label FOP system over GDAs or traffic light labels.[140]
- A survey of adults from **Mexico** and the **United States** (White and Latino) compared consumers' understanding of four FOP label types — warning labels, GDAs, multiple traffic lights, and Health Star Ratings — and a nutrition facts table. Warning labels were the easiest for subjects to understand: Subjects were nearly 5 times more likely to report understanding the warning label compared to the nutrition facts table, whereas subjects who saw the the traffic light and Health Star Rating labels were only 0.56 and 0.34 times more likely, respectively.[141]
- A survey of low- and middle-income **Mexican** consumers similarly found that warning labels outperformed both traffic light and GDA labels for consumer understanding: The odds of subjects correctly identifying a product with the lowest nutritional quality was 4.5 times greater for warning labels compared to GDAs.[142]
- A report from the Health Evidence Network based on evidence from **15 countries** in the WHO European Region concluded that a FOP label system that is 1) mandatory; 2) provides negative, evaluative judgments; and 3) is consistent, government-led, and applied widely across all products is a more effective way to support consumers in making healthier choices.[143]

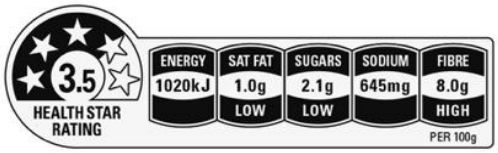
Momentum continues to build behind FOP warning label policies:

- Peru (2019), Mexico (2020), I and Uruguay (2021) have recently implemented policies requiring FOP warning labels similar to Chile's (black-and-white stop sign warnings).[144-147]
- Brazil, Colombia, Argentina, and Venezuela have passed laws that will require FOP warning labels beginning in 2022–2024, and Canada, South Africa, and several other countries are currently developing policies.[148-151]
- In 2020, Israel began requiring negative warning labels on products high in sugar, sodium, or fat as well as a voluntary, positive label for products that meet very high nutrition standards (*right*).[152,153] Early evidence suggests Israeli consumers are already using the labels to make healthier choices:

  - In the first month of label implementation, nearly 60% of Israeli adults surveyed reported using the new FOP labels to some extent, and 70% said they were willing to change their purchases to buy healthier products.[154]
  - Over 80% of adults reported that they intended to buy fewer red-labelled and more green-labelled products. These intentions were even higher for respondents with higher BMI or lower education, suggesting a greater impact for groups that may benefit most from the label policy.[155]

Other FOP label types

Health Star Rating (HSR)



The Health Star Rating (HSR) system uses an algorithm that assesses a product's risk-increasing and risk-decreasing components to calculate a summary score ranging from 0.5 stars (least healthy) to 5 stars (most healthy).[156] HSR labels appear on packages either as a circular label showing only the star score or as a combined HSR-Guideline for Daily Allowance label that also lists calorie, saturated fat, sugars, sodium, and fiber content.

HSR labels were introduced in 2014 as a voluntary measure in Australia and New Zealand, where studies find that the labels are generally liked and understand by consumers.[157] This has not necessarily translated into meaningful behavior change, however. Eight years after implementation, there is still no evidence of HSRs having a significant impact on the nutritional quality of people's food and beverage purchases.

- A systematic review examining experimental evidence through 2019 on different FOP nutrition labels' effects on food purchases included three randomized controlled trials that evaluated HSR labels.[158] None of the three studies reported a significant impact of HSR on food purchases.[159-161]
- A meta-analysis that combined results from five experiments examining HSR labels' impact on purchases found no significant effect on calories or sugar purchased; combined results from three studies similarly found no impact on saturated fat or sodium purchased.[127]

This lack of results could be due to the voluntary nature of previous HSR policies. For example, in Australia, adoption has been low (<50% of products) and the labels have been selectively implemented by retailers, with the majority of products (>75%) being relatively healthy (e.g., displaying ≥3 stars).[162]

Additional concern relates to the potential for HSR labels to misrepresent the healthfulness of packaged food products. A recent study found that the HSR label is being displayed on a substantial proportion of newly released ultra-processed foods: In 3 out of 4 instances, these products were found to be displaying at least 2.5 "health" stars.[163] Taken together, these results suggest that in its current form, the HSR is unlikely to help Indian consumers make healthy choices.

Traffic Light Labels (TLLs)

TLLs use green, amber (yellow), and red colors to indicate whether a product has low, moderate, or high levels of nutrients of concern. TLLs can vary in complexity and appearance, from simple summary indicators (*Sri Lanka, right*) to nutrient-specific coloring (*Ecuador*) or TLLs combined with GDAs (*United Kingdom*).

SRI LANKA

ECUADOR

UNITED KINGDOM

Experiments comparing different label types have found that while TLLs test moderately well for outcomes such as consumer liking/ acceptibility, understanding, and improving intentions, they are still generally outperformed by warning labels in these outcomes and, importantly, in changing actual purchase behaviors.[101,114,124,127,164,165] TLLs can also confuse consumers by sending unclear messages about whether a product contains excessive amounts of added sugar, sodium, or saturated fats.[101,137,142,166]

- A 2017 study comparing different labels found that TLLs and GDAs performed worse than warning labels at helping consumers identify products with high content of unhealthy nutrients and that consumers perceived products with warning labels as less healthy than the same products with TLLs or GDA labels.[167]
- Another 2017 study comparing Uruguyan children's perceptions of foods with TLLs vs. warning labels found that warning labels had greater relative impact on children's food choices.[168]
- TLLs confused consumers in Mexico, who found the multiple colors difficult to compare across products and the intermediate/amber color particularly hard to interpret.[166]

- **Real-world evidence:** In 2014, Ecuador implemented a mandatory TLL for packaged, processed food products.[144] Evidence thus far indicates that despite consumers' awareness and understanding of the label, it has not led to the purchase changes observed under Chile's warning label policy:
  - Data from Ecuador's 2018 National Health and Nutrition Survey indicate that while 79% of the survey's nearly 41,000 participants reported being aware of the country's TLL — of whom 88% said they understood the label — only 21% reported actually using the TLL to inform their purchases.[169]
  - Two studies examined consumer purchases in the first year of regulation and found no evidence that TLLs significantly affected households' carbonated soft drink-buying habits.[164,170]
  - In the first year of Ecuador's TLL policy, one study found evidence of modest product reformulation, with an observed average sugar reduction of 0.93 grams per 100 mL of beverage.[170]

Nutri-Score

Introduced as a voluntary label in France in 2017 and since taken up by five other European countries,[171] the Nutri-Score label (*right*) uses a color spectrum along with letter grades to provide a summary indicator of product healthiness. Scores are based on a nutrient profiling model that takes into account product ingredients' health benefits as well as risks (e.g., fiber, protein, or fruit, vegetable, legume, nut, or healthy oil content).[172]

Like TLLs, Nutri-Score labels have tested relatively well in some surveys and laboratory experiments in terms of consumer liking and ability to rank relative healthiness within a given product set,[101,124,173-179] but it is unknown whether this will translate into meaningful behavior changes, including reducing consumption of unhealthy, ultra-processed foods and beverages.

- A 2021 meta-analysis found that in experiments, warning labels were more effective than Nutri-Score labels at discouraging unhealthy purchases and improving the overall healthfulness of purchases.[101]
- A 2016 field experiment examined changes in the nutritional profile of food purchases after placing Nutri-Score labels on real foods in four product categories across 60 French supermarkets.[180]
- While labels were associated with a 14% increase in the nutritional profile of purchases from the healthiest categories (e.g., fresh, prepared foods), they had no impact on the profile of purchases from less-healthy categories. Nutri-Score's net effect was a modest 2.5% improvement in the average nutritional score of purchases.
- Notably, effect sizes observed in the study were on average 17 times smaller than those found in comparable laboratory studies, highlighting the importance of evaluating real-world effects of FOP labeling policies.[180]
- Two years after Nutri-Score's adoption in France, self-reported awareness of and support for the label was very high in a consumer survey, but less than half of respondents reported changing their shopping behaviors because of the label.[181]
- A pilot study in Spain found that while subects noticed Nutri-Score labels on packages, they did not have a significant effect on attitudes, taste perceptions, and purchase intentions.[182]

Studies have not yet examined the real-world impact of Nutri-Score labels on purchase patterns, consumption, or the food supply in the countries where they are in use. It is also not yet well understood how widely food companies are choosing to apply the voluntary label and whether this coverage differs by product type (eg, used more for healthy products vs. unhealthy products).

- For example, a 2020 study in Belgium estimated that in the first year of Nutri-Score label use, only 10% of the country's food supply featured the label, and the majority of those products were given healthy "A" or "B" ratings.[183] This could have important implications for the label's effectiveness, as an experiment found greatly reduced benefits when labels are not widely adopted.[184]

Industry-endorsed, voluntary FOP labels are not effective

The most common FOP system in use globally is industry's voluntary **Guidelines for Daily Allowance** (**GDAs**, also called Guideline Daily Amounts, "Facts Up Front," Reference Intakes, or Daily Intake Guides, depending on region).[185-188] GDA-style labels were developed by grocery manufacturing and distribution associations in the UK and US and later adopted with slight variations by industry associations in many other countries, despite little to no evidence of positive impact for consumers.[189] In the US, the 2011 introduction of "Facts Up Front" labelling by the Grocery Manufacturers Association was viewed by health experts as a strategic — and successful — maneuver to pre-empt ongoing government development of a mandatory FOP labelling policy.[190,191]

GDA-style labels typically display nutrient content per serving (not necessarily per package) for nutrients such as calories, saturated fat, sugars, and sodium, as well as the percentage of an average adult's recommended daily intake for each nutrient. Despite their ubiquity, these labels are regarded as unhelpful or confusing for customers.

Limitations of the GDA/DIG/"Facts Up Front" label approach include:

- Benchmark values are not based on international nutrition recommendations and are calculated using an average adult's intake, even on products specifically targeted to or consumed by children;
- GDA labels are displayed in arbitrary serving sizes — making it difficult for consumers to compare different products in the same category — and are smaller than what people realistically consume;
- Serving sizes are also shown in very small text, which could lead shoppers to think that label values refer to the full package contents;
- The nutrients included in a GDA label are inconsistent across products. For example, a product with very high sugar and saturated fat content may only show a GDA label for calories.
- When fiber and micronutrients are included in the label, companies present percentages of *minimum* recommended intakes, whereas for sugars, fats, saturated fats, and sodium, they present percentages of *upper* consumption limits;
- Interpreting a GDA label takes more time than most shoppers spend reading a nutritional label and requires a high level of nutritional knowledge and mathematical skills.[192]

GDAs perform poorly compared to other FOP labels and do not help consumers:

- Independent studies comparing GDA-style labels with other systems (e.g., multiple traffic lights, Nutri-Score, Choices International, Health Star Rating, and warning labels) consistently find that GDAs are the most confusing, take shoppers the most time to evaluate, and are ultimately least effective for encouraging consumers to make healthier choices.[134,138,142,159,193-200]
- Studies in Mexico, Uruguay, Mexico, Ecuador, Chile, and Brazil have all found GDAs to be the weakest of any labelling system currently used in Latin America.[129,130,134,166,168,192,198,201-203]
- In Mexico, studies show that consumers across age, education, and income groups have a hard time understanding GDA labels and do not use GDAs to make food choices.[141,142,166,192,204]
- Eye-tracking studies from the United States, Uruguay, and Chile found that compared to warning labels, GDAs are less effective at getting consumers' attention, harder to process, and worse at helping to identify unhealthy products.[128,130,205]
- Studies in Australia and New Zealand found that GDAs (referred to there as Daily Intake Guides) were least preferred by consumers and least helpful for discriminating between healthy and unhealthy products, compared to traffic light and Health Star Rating labels.[206,207]
- In the United Kingdom, introduction of GDA labels did not affect shoppers' product choices among yogurts or ready-meals.[208]
- Companies often place GDAs on packages alongside other, more prominent labelling and marketing such as nutrient or health claims, which further confuses consumers.[209-213]

Key elements for developing an effective FOP labelling system

- Developing or selecting a **strong nutrient profiling model** is a key first step toward creating the FOP label policy.[214-216] The model should set clear and meaningful criteria based on evidence of diet-related health risk and nutritional guidelines to determine which products must carry labels.[103,217]
- FOP labels should be **immediately and easily visible on the package**. Sizing and placement specifications should be made clear in the regulation. For example, the Chilean FOP policy sets specific size requirements for a wide range of packaging formats — from bubble gum to breakfast cereal — and offers a good starting point for other countries to consider.
- Label **designs should be simple and clear**:
  - Simple FOP labels enhance understanding and use of nutrition information, especially for consumers with less education and nutrition knowledge.[110,218,219]
  - Interpretive FOP labels work by using simple designs and easy-to-understand language to draw attention to key nutrition information, facilitate rapid comprehension, encode information into working memory, and make it easier to discriminate between healthy and less healthy options.[110,120,219-222]
  - To this end, lables should avoid numeric information, use symbols, shapes, and colors that leverage consumers' automatic associations, and warn or caution consumers using words or phrases such as "excess," "high," "avoid," or "warning."[120]
- Successful development and implementation of a FOP label policy will depend on **strong supporting evidence**, a transparent process that includes pilot-testing of label systems, collaboration by different stakeholders, and strong political leadership.[223]
- A strong FOP label system must be **mandatory for all companies and apply to all product types**. Evidence indicates that applying a label to only some products can lead to misleading perceptions of the healthfulness.[101,224] Voluntary labelling systems can lead to multiple types of logos and labels, which increases confusion and decreases the usefulness of the logos.
- Ideally, where FOP warning labels are required, **health and nutrition claims should be prohibited**. Product packages that feature both warning labels and positive claims confuse consumers. In Mexico, for example, the FOP warning label law implemented in 2021 prohibits products with one or more warning lables from featuring health or nutrient claims on the package.[147]
- **Endorsement of a label by trusted government or scientific organizations** increases credibility.[110,225]
- **Criteria for the labels should be made public** in advance to educate consumers and manufacturers and to encourage product reformulation.[122] Industry should be allowed to comment publicly on the criteria but should not be permitted to intervene in its development.[223]
- Ongoing **monitoring procedures and mechanisms for enforcement** should be established as part of the policy to ensure consistent uptake and compliance, evaluate the policy's impacts, and inform continuous improvements and updates, as needed.[103] These should be coordinated through a government agency or independent group without conflicts of interest.

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