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Perspective: Guiding Principles for Science-Based Food Classification Systems Focused on Processing and Formulation

Jodi Bernstein , Andrew Brown , Britt Burton-Freeman , Mario Estevez , Julie Hess , Patrice Hubert , Marie Latulippe *

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Jodi T. Bernstein [1], Andrew W. Brown [2], Britt Burton-Freeman [3], Mario Estevez [4], Julie M. Hess [5], Patrice A. Hubert [6] and Marie E. Latulippe [7]

[1] Jodi T. Bernstein, PhD, RD, Jodi Bernstein Medical Writing, Toronto, ON, Canada
[2] Andrew W. Brown, PhD, FTOS, FASN Associate Professor, Department of Biostatistics, University of Arkansas for Medical Sciences, Little Rock, AR, USA
[3] Britt Burton-Freeman, PhD, Professor, Food Science and Nutrition, Chair, Department of Food Science and Nutrition, Director, Center for Nutrition Research, Illinois Institute of Technology, Chicago, IL, USA
[4] Mario Estevez, PhD, DVM, Full Professor, Research Institute in Meat and Meat Products, Veterinary School, University of Extremadura, Cáceres, Spain
[5] Julie M. Hess, PhD, Research Nutritionist, USDA, Agricultural Research Service, Grand Forks Human Nutrition Research Center, Grand Forks, ND, USA
[6] Patrice A. Hubert, PhD, RD, Postdoctoral Fellow, Monell Chemical Senses Center, Philadelphia, PA, USA
[7] Marie E. Latulippe, MS MBA RDN, Director of Science Programs, Institute for the Advancement of Food and Nutrition Sciences, Washington, DC, USA
* Correspondence: Marie E. Latulippe (mlatulippe@iafns.org)

Abstract

Food classification systems that focus on processing and formulation have gained traction in research and dietary policies. Yet, their utility and scientific foundations have been debated. To address criticisms and identify paths forward, the Institute for the Advancement of Food and Nutrition Sciences convened a tripartite Working Group and independent Writing Team. Drawing on expert collaboration, a targeted literature review, and stakeholder feedback, the Writing Team developed these principles to guide the development and application of such food classification systems for research that supports public health: 1) Documentation and definitions that allow for reproducibility, rigor, and transparency should be provided; 2) Properties for which there is evidence of a biological link with a health-related endpoint should be used to differentiate foods; 3) Associations without robust causal evidence should be considered preliminary; 4) The impact that processing steps have on the final composition and structure of the food in terms of a putative effect on a health-related endpoint should be considered; 5) The impact of formulation on the final composition and structure of the food in terms of a putative effect on a health-related endpoint should be considered; 6) Systems should evolve over time to reflect advancements in science and changes in the food supply, with previous versions of a system being distinguishable from updated versions; 7) Current scientific evaluations from scientific bodies with relevant expertise should be consulted for each iteration; 8) The context(s) in which a system was validated should be considered in its application; and 9) The probative value of a research question or proposed food classification system should be considered prior to engaging in analysis or development. As understanding of food processing, formulation, and health evolves, these principles can serve as a foundation for designing classification systems that support impactful research and, through this, public health policy.

Statement of Significance: Developed through a multi-stakeholder collaboration, this perspective proposes nine principles to guide the development of food classification systems focused on processing and formulation. It offers a framework for aligning systems with scientific standards and public health policy goals while allowing flexibility for researchers to tailor system design to specific use cases.

Keywords: Food classification systems; food processing; food formulation; ultra-processed foods; highly processed foods; guiding principles; scientific principles; nutrition policy.

Introduction

Food classification systems that categorize foods based on processing and formulation (herein 'food classification systems') and the outputs they generate have gained traction in both epidemiological and interventional research and dietary policies and recommendations [1–12]. Food classification systems have been proposed and applied through religious doctrine, social habits, and policy guidance for millennia. In the last 15 years, various food classification systems have emerged with the intention of using more modern, systematic, or scientific definitions, with several focusing on processing and formulation [13–19]. The Nova classification system [14] was one of the earliest modern food classification systems introduced and is a widely used system in literature today [20]. Most food classification systems describe foods along a continuum according to the extent, purpose, or degree of processing, ranging from un- or minimally processed to highly or ultra-processed[1], with variations in category names and criteria [13–19,22]. Dietary guidance related to food classification systems tends to recommend limiting or avoiding intakes of foods that are highly or ultra-processed or to give preference to un- or minimally processed foods [4–12].

Despite their growing use, the utility and scientific basis of such food classification systems have been called into question and extensively debated in the literature [2,22–41]. Reviewing and summarizing all critiques is beyond the scope of the present manuscript, but an abbreviated list of concerns with select references is presented in **Box 1**.

Box 1: Recurring concerns about food classification systems focused on processing and formulation*

- Inconsistency within and between food classification systems [2,22–27].
- Ambiguity in definitions, purpose, and methodology [2,22–24,26–35].
- Inadequate consideration of biological mechanisms and relationships with health-related outcomes [23,26,32,35].
- Limited availability and quality of evidence [2,22,23,26,28,32,33,36–38].
- Insufficient separation of food formulation and processing operations [2,24,29,33,39,40].
- Misalignment between food classification systems and prevailing nutrition guidance and science [2,22,24,26,30–32,35,38,40].
- Potential for overgeneralization and application of systems [25].
- The probative value of creating and using food classification systems over and above other nutrition considerations [2,26,34,35,38,41].

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[1] A recent definition of "Ultra-processed foods" according to the Nova classification system is "[i]ndustrially manufactured food products made up of several ingredients (formulations) including sugar, oils, fats and salt (generally in combination and in higher amounts than in processed foods) and food substances of no or rare culinary use (such as high-fructose corn syrup, hydrogenated oils, modified starches and protein isolates)[…]" [17]. The definitions of "highly processed foods" vary by classification system but commonly reference industrial preparation, multiple ingredients, readily edible formats requiring little to no domestic preparation, loss of resemblance to the original plant or animal source, and/or high levels of added sugars, fats, or sodium [13,16,18,19,21].

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*This is not an exhaustive list of all concerns, and the references cited are not intended to represent the entirety of the existing literature.

To reflect on these concerns and identify paths forward, in 2023, the Institute for the Advancement of Food and Nutrition Sciences (IAFNS) convened a cross-stakeholder Food Classification Workshop to evaluate existing food classification systems, including their scientific basis, validity, and utility in researching food-health relationships and informing policy decisions. This collaborative effort resulted in a 2024 perspective piece authored by 18 food and nutrition scientists, highlighting a shared recognition that advancing food classification in a health-relevant direction depends on establishing clear scientific criteria and methodological principles [26]. This call for scientific rigor was reinforced by the 2025–2030 US Dietary Guidelines Advisory Committee (DGAC), which emphasized the need for stronger evidence in its systematic review of the relationship between ultra-processed food consumption and growth, body composition, and risk of obesity [42]. The DGAC graded the overall strength of the evidence as limited, citing concerns over its insufficiency, inconsistency, and lack of directness [42].

To translate these insights into action, IAFNS subsequently convened a Working Group of scientists from government, industry, and academia. The group aimed to build consensus among food and nutrition stakeholders on the guidance and evidence requirements for classifying foods based on processing and formulation to inform research that can support public health. An independent Writing Team was formed to draft a set of guiding principles drawing on expert collaboration, a targeted literature review, and multidisciplinary stakeholder feedback, with the direction that no more than 10 principles should be developed. The Writing Team met in January 2025 to define the process, discuss the literature, and share feedback. Additionally, the Writing Team gathered during a workshop hosted by IAFNS in April 2025. Workshop participants included nutrition scientists, food technologists, toxicologists, public health experts, and regulatory professionals; their inputs were used to refine the principles.

The Writing Team developed nine principles (**Box 2**) to guide researchers in developing and refining food classification systems that incorporate processing and formulation in transparent, robust, and reproducible ways suitable for research intended to inform policy and support public health. The Writing Team adopted the definition of a principle as "a fundamental truth or proposition on which others depend; a general statement or tenet forming the (or a) basis of a system of belief […]; a primary assumption forming the basis of a chain of reasoning" [43]. Each principle was designed to address specific issues with food classification systems highlighted in the literature [2,22–41]. Given the project's focus on health relevance, other outcomes, recognized as relevant to the overall food system and dietary choices, such as affordability, convenience, availability, sustainability, food waste, marketing, among others, were considered outside the scope of these principles.

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Guiding Principles for Food Classification Systems Focused on Processing and Formulation

Box 2. Nine guiding principles for classifying foods based on processing and formulation

1. Documentation and definitions that allow for reproducibility, rigor, and transparency should be provided.
2. Properties for which there is evidence of a biological link with a health-related endpoint should be used to differentiate foods.
3. Associations without robust causal evidence should be considered preliminary.
4. The impact that processing steps have on the final composition and structure of the food in terms of a putative effect on a health-related endpoint should be considered.
5. The impact of formulation on the final composition and structure of the food in terms of a putative effect on a health-related endpoint should be considered.
6. Systems should evolve over time to reflect advancements in science and changes in the food supply, with previous versions of a system being distinguishable from updated versions.
7. Current scientific evaluations from scientific bodies with relevant expertise should be consulted for each iteration.
8. The context(s) in which a system was validated should be considered in its application.
9. The probative value of a research question or proposed food classification system should be considered prior to engaging in analysis or development.

1. Documentation and definitions that allow for reproducibility, rigor, and transparency should be provided.

Food classification systems must be underpinned by rigorous and transparent documentation to enable consistent and appropriate applications. A key tenet of science is that results should be repeatable under the same conditions by independent researchers, which is facilitated with comprehensive accompanying documentation; the same applies to food classification systems. This principle emphasizes the importance of clearly documenting, at a minimum, the point of classification (e.g., purchase vs. consumption), all required inputs (e.g., ingredients, processing steps, chemical analyses), relevant food properties (e.g., bioavailability, digestibility), intended outcomes of interest (e.g., cardiometabolic risk), target populations (e.g., adults, specific countries), methods for quantifying intake (e.g., biomarkers, self-report, purchase history), assumptions made (e.g., foods in a given classification group have the same effect on health), foreseeable limitations, and exhaustive definitions of key terms.

The second component of this principle focuses on definitions. Definitions should be objective, measurable, and grounded in scientific consensus. Including a glossary of terms can further support transparency. A central criticism of the term "ultra-processed food", as conceptualized within the Nova system and now adopted in nutrition and public health discourse, is that it lacks clarity and is neither explicitly nor quantitatively defined [23,27,29,34]. While the introduction of new terms when creating or refining food classification systems is not discouraged, this principle holds that it should be accompanied by a clear definition and measurement methods (e.g., "energy density" measured as kilocalories per gram). The use of novel or ambiguous terms (e.g., "natural", "culinary preparations", "home cooking", "whole food", "normally") should be scientifically justified and consistently applied [22,23,34]. When reusing existing terms, definitions should be explicitly reiterated with reference to the original source and supported by a defensible scientific rationale. Researchers should avoid undermining cross-disciplinary understanding by misusing or indiscriminately co-opting

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terms. To guard against this, engaging multidisciplinary expertise spanning nutrition science, toxicology, food science, food engineering, public health, and behavioral science is essential.

Terminology should also be clearly distinguished from related but non-equivalent concepts such as "formulation" versus "processing". Food processing has been described as "the use of methods and techniques involving equipment, energy, and tools to transform agricultural products such as grains, meats, vegetables, fruits, and milk into food ingredients or finished food products" [44]. From a food science and technology perspective, processing is distinct from formulation, which refers to the selection and proportioning of ingredients (e.g., macronutrients, micronutrients, additives, and other components) used to create a final product [39,40].

This principle emphasizes the importance of clearly documenting methodologies, underlying assumptions, and limitations to ensure appropriate and transparent application of food classification systems to enable replication and evaluation of related research that could be used to support decision-making. Given its foundational nature, this principle also serves as an overarching requirement that applies across all other principles presented here.

2. Properties for which there is evidence of a biological link with a health-related endpoint should be used to differentiate foods.

This principle ensures food classification systems are grounded in properties supported by mechanistic, preferably causal, evidence (see Principle 3), rather than assumptions or heuristic proxies. Current systems have been criticized for using properties to classify foods based on associative logic rather than validated health outcomes [22]. For example, using the Nova classification system, foods prepared with the same ingredients and in the same proportions can be categorized differently based on the **location or scale of preparation**, such as home-cooked versus industrially produced, reflecting the concern that some systems embed socio-cultural assumptions [22].

Food classification systems should distinguish foods based on properties that are empirically testable and linked to health-related endpoints. At the discretion of the system developers, endpoints may include acute outcomes (e.g., food safety, pathogen risk), chronic conditions (e.g., obesity, cardiovascular disease, type 2 diabetes), related biomarkers (e.g., hypertension, cholesterol), or intermediary mechanisms (e.g., satiety, postprandial glucose response). Food properties may cover aspects of the whole food (e.g., texture), processing changes (e.g., nutrient loss, contaminants formed) (Principle 4), or aspects of formulation (e.g., sugar content, added nitrates) (Principle 5). The responsibility falls on the developers to proactively justify the inclusion of each food property in the system and produce evidence for each property–health relationship.

Full adherence to this principle depends on advancing our mechanistic understanding of how specific food properties are beneficial or detrimental to health [45]. In the meantime, transparency in documentation (Principle 1) can be leveraged to clearly distinguish food classification systems that incorporate exploratory associations from those grounded in confirmatory evidence, as well as the implications of using such a system for public health decision-making in the absence of complete data.

3. Associations without robust causal evidence should be considered preliminary.

This principle builds on Principle 2 and extends the requirement for strong evidence to associations between foods categorized by food classification systems and health outcomes. In the absence of strong evidence supporting causal relationships, any conclusions should be considered preliminary and explicitly communicated as such.

In nutrition research, much of the literature is observational in design. Although observational studies represent a continuum of designs, most observational nutrition studies are based on dietary intake and association tests that can suggest associations and generate hypotheses, but are limited in their ability to establish causality —a limitation acknowledged in the literature on food classification systems [34,37,46]. Randomized controlled trials (RCTs) are considered the gold standard for establishing cause-and-effect relationships, but they are not always feasible, ethical, or well-executed [47]. In the absence of robust causal data from RCTs, other well-conducted study designs can be

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considered collectively, and can be evaluated using frameworks like the Bradford Hill criteria [48], Grading of Recommendations Assessment, Development and Evaluation (GRADE [https://www.gradeworkinggroup.org/]), or other systems that provide a structured approach for assessing plausible causation through epidemiological evidence.

As in all scientific disciplines, research using food classification systems should strive for the highest standards of methodological rigor. The need for robust evidence is particularly important given recent reviews of the evidence linking ultra-processed food consumption to health outcomes that noted the evidence base was suboptimal and at high risk of bias [20,42]. Some of the available research has been criticized for not adequately controlling for potential confounding factors (e.g., macronutrient content, energy density, socioeconomic factors, lifestyle and dietary patterns, reporting, and misclassification bias [34,37,49]) or including inappropriate comparison groups [2]. Principle 3 is important because drawing definitive conclusions about health impacts without robust evidence can overstate the strength of the findings [37,45]. Researchers should therefore consider the implications of developing food classification systems based on preliminary evidence that may nevertheless be adopted by decision-makers or policymakers [34].

4. The impact that processing steps have on the final composition and structure of the food in terms of a putative effect on a health-related endpoint should be considered.

The effects of processing steps, such as cooling, heating, freezing, mixing, extruding, filtering, cooking, fermenting, drying, forming, and packaging, can have positive, negative, or neutral impacts on a food's physical, biological, or chemical properties depending on the context. Yet, some food classification systems have been criticized for simplistically implying that food processing is inherently harmful [36,39,50]. Rather than relying on broad categorizations such as “highly processed” or “unprocessed,” Principle 4 emphasizes that food classification systems should differentiate foods based on the specific processing steps involved and the evidence-based effects of those steps on final food properties and health-related endpoints (Principle 2). A putative effect on a target health-related endpoint should be established to support any claim that the classification of foods based on processing is related to negative health outcomes. A demonstrated association, or at a minimum, a plausible hypothesis, is required to support the assumption that processing steps make foods more harmful or beneficial to human health. Researchers should specify the processing steps considered in the classification system and justify their inclusion based on demonstrated relationships with health-related endpoints.

To further avoid oversimplification, researchers should consider the nature of the food being processed, the interplay between multiple operations, and that both beneficial and adverse effects can result from the same processing step. Examples reflecting these nuances include extrusion used to make foods with different textures and different nutrient profiles (e.g., fiber-rich cereal, puffed snacks) [23], canned and frozen yellow corn retaining comparable nutrient profiles despite differences in processing steps [51], heating to reduce microbial risk while simultaneously degrading thermolabile nutrients (e.g., vitamin C) [52], treating milk with ultra-high temperature to extend shelf-life while simultaneously altering protein structures in ways that affect digestibility [53], and cold-pressed juicing to preserve nutrients longer under refrigeration than using centrifugal methods [23,51–54]. Ongoing advances in processing science and novel technologies further amplify this complexity [55,56], highlighting the need for food classification systems to remain dynamic and responsive to emerging innovations and understanding (Principle 6).

Given the variable and context-specific effects of processing steps, researchers face the complex task of disentangling these relationships to generate sufficient evidence on how specific processing steps may influence health outcomes. It is, therefore, integral that food classification systems clearly distinguish between well-supported findings and areas of scientific uncertainty (Principle 3). This challenge is compounded by the reality that identifying the processing steps a food has undergone may require specialized food science expertise, access to proprietary manufacturing information, or comprehensive processing databases – resources that are often limited or unavailable [24]. In the

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absence of such data, formulation (described in Principle 5) should not be used as a proxy for the range or impact of processing steps.

5. The impact of formulation on the final composition and structure of the food in terms of a putative effect on a health-related endpoint should be considered.

Principle 5 highlights that food formulations can have distinct and measurable impacts on a food depending on what is added, removed, or modified. This principle emphasizes that food classification systems based on food formulation should differentiate foods according to specific formulation components and their evidence-based effects on final food properties and health-related endpoints (Principle 2), with considerations for the quantity and interplay between food components.

Formulation has been conflated with processing in some food classification systems, yet it is a distinct concept as discussed in Principle 1 [39,40]. For instance, common components of formulation, such as the presence of additives intended for preservation (e.g., antioxidants), food safety (e.g., antimicrobials), modifying sensory features (e.g., flavors, colors), or technological properties (e.g., emulsifiers, gelling agents), have been used as markers to identify highly or ultra-processed foods that are presumed to be potentially harmful [19,57]. Such assumptions oversimplify the complex role of food components and fail to account for functional distinctions and the diversity of modern food supplies [29]. Distinguishing between processing and formulation enables a clearer understanding of how each independently influences food properties and health outcomes.

Like in Principle 4, researchers should justify with evidence and clearly specify which aspects of formulation, if any, are considered in their classification system, their source of formulation information (e.g., ingredient lists, food composition or product databases, manufacturer data, patent filings, biochemical or laboratory analyses), the implications of relying on alternative data sources, and acknowledge any associated limitations and assumptions of their decisions in this regard (Principle 1).

6. Systems should evolve over time to reflect advancements in science and changes in the food supply, with previous versions of a system being distinguishable from updated versions.

Food classification systems should be designed with built-in mechanisms to evolve in response to advances in science, shifts in food supplies, and emerging public health priorities, thereby avoiding obsolescence and misalignment with current understandings and limiting their utility for research and policy. Researchers must also decide whether a system requires minor refinements or fundamental changes to continue fulfilling its intended purpose or if complete abandonment is necessary.

A key shortcoming mentioned in the literature is a lack of transparent version control [27]. Critiques of the Nova system have highlighted its evolution, which has lacked systematic documentation of changes, undermining reproducibility and interpretability with undifferentiated iterations [22,27]. In line with Principle 1, researchers should establish clear versioning protocols, document modifications, and explain the rationale for updates, assess the impact on reproducibility and interpretation, and minimize the creation of excessive exceptions. As an example, the Food Compass nutrient profiling system, which incorporates the Nova system to identify processing levels, has released clearly versioned updates informed by emerging evidence, new data, and community feedback, demonstrating how structured evolution can improve clarity and reproducibility while preserving the tool's core purpose [58,59].

7. Current scientific evaluations from scientific bodies with relevant expertise should be consulted for each iteration.

Principle 7 calls for researchers to acknowledge and consider core concepts from nutrition science and public health when developing and refining food classification systems, including the well-established benefits of including fruits, vegetables, pulses, and whole grains and limiting saturated and trans fats, sodium, and added sugars in the diet [60,61]. Researchers should explicitly consider evaluations by scientific bodies with relevant expertise. The outputs from institutions that synthesize large bodies of evidence to inform food safety standards, nutrient intake recommendations, dietary guidance, and regulation of additives and other ingredients may be consulted, including, but not limited to, the Dietary Guidelines Advisory Committee (DGAC), US Food and Drug Administration (FDA), US Department of Agriculture (USDA), UK Scientific Advisory Committee on Nutrition (SACN), European Food Safety Authority (EFSA), Food and Agriculture Organization of the United Nations / World Health Organization (FAO/WHO), and Codex Alimentarius.

Operationalizing a classification system that contradicts scientific consensus raises legitimate concerns about its validity and regulatory coherence and risks undermining public trust [62]. For example, items such as whole-grain bread, plant-based milk, or fortified cereal may be classified as highly or ultra-processed, potentially discouraging the consumption of foods that have been recommended as part of dietary guidelines [2,24,40]. This discrepancy is further illustrated by a modeling study, showing that a diet primarily composed of ultra-processed foods as defined by the Nova system can be designed to meet most nutrient requirements and receive a high diet quality score [63]. Such inconsistencies highlight the need for careful system design.

Importantly, this principle does not require researchers to uncritically align with outputs from relevant scientific bodies but instead encourages them to consider these inputs in their development and refinement. To uphold transparency (Principle 1), researchers should explicitly state whether and how evaluations from scientific bodies were incorporated, justify and document any divergences, and ensure classification and operational logic are not contradicted by widely accepted scientific consensus unless supported by robust evidence.

8. The context(s) in which a system was validated should be considered in its application.

At its core, Principle 8 ensures that food classification systems are scientifically valid, appropriately contextualized, and responsibly applied. To ensure this, food classification systems should be validated within their intended context before being applied more broadly, and unvalidated systems should be treated as exploratory. No food classification system is universally applicable; each system is developed within a specific context, defined by target population, intended purpose, available datasets, and regulatory, regional, and cultural settings, and may not translate effectively across all use cases [25]. Understanding and respecting these contextual boundaries is essential to avoid misclassification and misinterpretation. Researchers should clearly define the scope and boundaries of their classification system and detail the original validation context, including the constraints, assumptions, and necessary conditions for generalization. Researchers applying an existing classification system outside its original validation context should report any modifications made and expressly acknowledge any potential limitations (Principle 1).

9. The probative value of a research question or proposed food classification system should be considered prior to engaging in analysis or development.

Developing or applying a classification system should be driven by a clear scientific purpose. Principle 9 calls on researchers to identify the specific gap or challenge their classification system or study is designed to address, articulate how it advances or improves upon existing approaches, and clarify what new evidence, interpretation, or practical application it is intended to generate. In contrast, systems that closely replicate existing models without meaningful differentiation may contribute little conceptual advancement and risk adding redundancy to the literature. While replication strengthens scientific rigor, repeating studies without a clear rationale can lead to redundancy and wasted resources [62]. Given the resource-intensive nature of developing, analyzing, or applying food classification systems, researchers should prioritize efforts with the greatest potential for meaningful impact.

This principle promotes intellectual discipline, encouraging researchers to provide a clear statement of the probative value of their work, engage with the existing research landscape, and justify their approach. Importantly, this principle does not discount the value of publishing completed studies as a safeguard against publication bias, but it underscores the importance of strategic design and clearly articulated probative value from the outset.

Discussion

This perspective presents nine guiding principles for the scientific community to consider when developing, refining, and applying food classification systems based on processing and formulation, with the intention of supporting research that informs effective health policies. These principles do not endorse or advocate for the creation of new food classification systems or the use of existing food classification systems in research. Instead, these principles provide a shared foundation and a standardized approach to guide researchers from diverse disciplines who choose to pursue this line of inquiry. Adherence to these principles is also intended to reduce the likelihood of future resources being diverted toward critiquing, defending, or responding to skepticism about the merits of new food classification systems.

We anticipate that few existing food classification systems will fully align with all the principles. However, the intention of these principles is to support research and innovation, not to establish an insurmountable barrier. Indeed, the deliberate use of the word 'should' in each principle, rather than 'will', 'must', or 'shall', is an indication of this spirit. Some of the principles, particularly those related to causal inference and mechanistic validation, are considered aspirational given the current state of evidence. As causal evidence and processing-focused databases emerge, these principles can be operationalized more fully. Any remaining evidence gaps can be used to identify future research priorities and areas for investment.

Many of these principles reflect best practices in nutrition epidemiology that ideally would be embedded in any scientific inquiry from the outset. However, in practice, subjectivity enters at multiple stages of the research process, and re-articulating these concerns within subdomains of science is a valuable practice, particularly given the widespread criticisms of some food classification systems and their applications in the literature [2,22–41]. When researchers choose to develop, refine, or apply a food classification system without meeting these principles (e.g., in the absence of strong foundational evidence), the onus should fall on the researcher to acknowledge limitations and explain the implications of such choices as described in Principle 1. In the future, these principles could be formalized into a structured checklist, similar in spirit to CONSORT or PRISMA [64], to assist both system developers and users in evaluating them systematically. By following these principles, food classification systems can be developed and applied for a wide range of use cases, and they may be helpful for those implementing interventions or health policies, offering a framework for assessing whether the food classification systems underpinning those efforts are fit for purpose.

These principles can complement recent and ongoing initiatives from a growing number of organizations that are actively engaging with the complexities of these food classification systems, although not all such efforts are listed here [33,65,66]. The British Nutrition Foundation's position statement on the concept of ultra-processed foods echoes several of the principles outlined here [65]. It highlights the need to establish mechanistic links between food attributes or processing techniques and health outcomes, as well as to distinguish between types of processing methods [65]. It also acknowledges challenges with data availability in composition databases, as well as the need to research the potential effects of avoiding ultra-processed foods [65]. The International Union of Food Science and Technology (IUFoST) recently proposed the IUFoST Formulation and Processing Classification (IF&PC) scheme, which aims to address ambiguities in existing food classification systems, such as Nova, by separately evaluating formulation and processing factors, offering quantitative tools to assess nutritional and health impacts and incorporate a host of relevant food attributes in product classification (e.g., safety, sustainability, palatability, affordability, convenience) [33]. The Novo Nordisk Foundation is also funding a project led by researchers at the University of Copenhagen to build a science-based understanding of how food processing methods and additives impact health [66]. Together, these efforts reflect a shared commitment to improving food classification systems and underscore the value of clear principles to guide their development.

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Conclusion

In sum, these nine principles are intended to support the development and application of food classification systems focused on processing and formulation that are transparent, reflect biological plausibility, and are capable of supporting meaningful interpretations and informed actions. They are aspirational yet actionable, flexible to evolving science, and agnostic to system design, allowing adaptability across different use cases. These principles set high standards for scientific rigor while also acknowledging the possible need for public health judgments in the face of incomplete evidence. To quote Albert Einstein, "For science can only ascertain what is, but not what should be, and outside of its domain value judgments of all kinds remain necessary." As debates continue about the role of food processing in health, a principled approach can help the scientific community avoid conceptual drift and ultimately better serve public health.

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Abbreviations

IAFNS	Institute for the Advancement of Food and Nutrition Sciences
DGAC	Dietary Guidelines Advisory Committee

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FDA	US Food and Drug Administration
USDA	US Department of Agriculture
EFSA	European Food Safety Authority
FAO	Food and Agriculture Organization
WHO	World Health Organization
IF&PC	IUFoST Formulation and Processing Classification
RCT	Randomized Controlled Trial

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