European Journal of Clinical Nutrition www.nature.com/ejcn

PERSPECTIVE

Rethinking the application and adoption of NOVA classification in low- and middle-income countries (LMICs): a Southeast Asian food systems perspective

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Ultra-processed foods have increasingly been associated with chronic disease risk in global analyses. The NOVA classification is positioned to influence dietary guidelines, food manufacturing, and public health policy worldwide. This paper argues that the NOVA classification, when applied without contextual adaptation, may be inappropriate for Southeast Asian food systems. It could misdirect policy interventions aimed at addressing both the double burden of under- and overnutrition. By labelling foods as UPFs, NOVA may obscure the essential role that certain processed foods play in improving nutritional outcomes and advancing public health. An overemphasis on the negative impact of processed and ultra-processed foods risks oversimplifying complex dietary patterns in Asia and other LMICs. It may also undermine nutritional gains achieved over the past four decades.

European Journal of Clinical Nutrition; https://doi.org/10.1038/s41430-026-01843-x

HISTORY AND THE FOUR-TIER NOVA CLASSIFICATION

On 19 November 2025, *The Lancet* hosted and subsequently published its three-part series on ultra-processed foods (UPFs) [1–3]. The central narrative was blunt: ultra-processed foods have been increasingly associated with chronic disease risk in global analyses. In recent years, the discourse on UPFs has intensified, with the NOVA classification positioned to influence dietary guidelines, food manufacturing, and public health policy worldwide. Originally developed by Carlos Monteiro in Brazil in 2009, the publication in Portuguese was titled *Uma nova classificação de alimentos baseada na extensão e propósito do seu processamento* (NOVA in Portuguese for "new"), which translates as "A new classification of foods based on the extent and purpose of their processing". In 2011, the NOVA classification was published in English as *Increasing consumption of ultra-processed foods (UPF) and likely impact on human health: Evidence from Brazil* [4]. Monteiro's 2011 publication had attracted 1426 citations by June 2026, and a more recent publication in 2019 had attracted 3846 citations by June 2026, confirming its rapid increase in interest and global impact [5]. Monteiro also introduced the term "ultra-processed food" (UPF), which has been adopted by many but has also been criticised for its scientific ambiguity and inconsistencies [6–9].

Monteiro and colleagues described four groups in the NOVA classification system:

1. Unprocessed or minimally processed foods (e.g.: Fresh, squeezed, chilled, frozen juice, dried fruits)
2. Processed culinary ingredients (e.g.: Vegetable oils from seeds, butter)
3. Processed foods (e.g.: Canned vegetables and legumes in brine)
4. Ultra-processed foods (UPF) (e.g.: industrially produced foods, formulated and fortified products, canned meat and seafoods, sweetened beverages, confectioneries, and snacks)

Food is inherently complex, with more than 170 components identified in foods and numerous functional and nutritional properties [10]. This level of complexity is not captured in the NOVA classification. While the NOVA framework has contributed meaningfully to understanding dietary transitions in high-income countries, its applicability to low- and middle-income countries (LMICs), particularly in Southeast Asia, remains insufficiently examined Table 1. This is a critical gap, as food systems in this region differ substantially from those in the West in terms of structure, food consumption patterns, sources of dietary intake, and health risks.

This paper argues that the NOVA classification, when applied without contextual adaptation, may be inappropriate for Southeast Asian food systems and could misdirect policy interventions aimed at addressing both the double burden of under- and overnutrition, including the prevention of non-communicable diseases (NCDs) [11].

COUNTRIES ADOPTING NOVA

While NOVA has been adopted, explicitly or implicitly, in some Latin American and Western countries [1], its application remains

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Received: 11 January 2026 Revised: 11 September 2026 Accepted: 9 October 2026
Published online: 26 October 2026

Table 1. Countries that have adopted NOVA.

Country	Status	References
Brazil	Adopted	Monteiro et al. [1, 5]
Uruguay	Adopted	Monteiro et al. [1, 5]
Israel	Partial Adoption	O'Neal I [12]
United Kingdom	Not adopted	O'Neal [12]
Peru	Adopted	Monteiro et al. [1, 5]
France	Partial/under discussion	Liuim et al. [14]
Indonesia	Not adopted	N/A

Table 2. UPF intake in Western and selected Asian countries.

Region	UPF (%) of calorie intake	Dominant Food System (Reference)
United States	~61%	Industrial [36]
United Kingdom	~51%	Industrial [36]
Germany	~46%	Industrial [36]
Ireland	~46%	Industrial [36]
Belgium	~45%	Industrial [36]
Finland	~41%	Industrial [36]
Indonesia	~15%	Informal [15]
Thailand	~20%	Mixed [20]
Sri Lanka	~8%	Unprocessed, minimally processed [13]
Bangladesh	~8%	Unprocessed, minimally processed [13]
N India	~10%	Unprocessed, minimally processed [13]
S India	0%	Unprocessed, minimally processed [13]
Pakistan	0%	Unprocessed, minimally processed [13]

limited and under discussion in Southeast Asia and other LMICs in Asia [12, 13].

APPLYING THE NOVA CLASSIFICATION TO LMICS IN SOUTHEAST ASIA

A key limitation in the global application of NOVA lies in the assumption that UPF consumption patterns are broadly comparable across countries. However, the contribution of UPFs to total energy intake varies substantially between nations. As shown in Table 2, UPFs contribute approximately 62% and 56% of total energy intake in the United States and United Kingdom, respectively [14–16]. By contrast, UPF consumption is negligible in South India and Pakistan, and remains low in North India, Bangladesh, and Sri Lanka, at approximately 8–10% of energy intake [13]. In these countries, 61–78% of food consumption is derived from unprocessed or minimally processed foods.

PROCESSED FOODS ARE NOT THE PRIMARY CAUSE OF RISING OBESITY IN LMICS

Available evidence does not support a simple causal link between processed food consumption and rising rates of overweight and obesity in Southeast Asia. In Indonesia, average daily energy intake has remained relatively stable at approximately 2100 kcal, even as the contribution of processed foods to the diet has fluctuated [15, 16]. This suggests that processed foods are not necessarily adding excess energy to the national diet. These patterns also indicate that increases in overweight, obesity, and related non-communicable diseases (NCDs) in Indonesia cannot be attributed solely to processed food consumption. Notably, the same data show that processed foods consistently provide 22–23% of total protein intake. In a region where protein intake may be compromised, processed foods, including canned fish and packaged or fortified foods and beverages, can provide affordable, acceptable, and important sources of high-quality protein [16]. Unlike Western diets, which are often dominated by industrially processed foods, Southeast Asian diets remain largely structured around home-prepared meals and informal food systems, including small food stalls and other away-from-home food outlets.

POLICY IMPLICATIONS FOR SOUTHEAST ASIA: WHY FOCUS ON UPFS WHEN CONSUMPTION IS LOW?

UPFs may remain relevant to high-income countries and to nations undergoing rapid nutrition transition [17, 18]. However, given the comparatively low contribution of UPFs to total energy intake in many Southeast Asian countries (Table 2), a food policy based primarily on reducing UPF consumption may have limited health impact. Focusing on UPFs, rather than improving diet quality in home-prepared meals, street foods, and informal food retail outlets, may be a misplaced strategy in many LMICs. Dietary risks in this region are more likely to be driven by excessive intakes of salt, sugar, and cooking oils, together with low fibre intake.

Indonesia provides an important example. As one of the largest LMICs in Southeast Asia, ultra-processed foods contribute approximately 15–20% of total dietary energy intake, as in several other countries in the region [13]. Most caloric intake in Indonesia is derived from unprocessed or minimally processed foods and from processed culinary ingredients such as oils, sugar, and salt.

In Asia, the share of UPFs in the diet is highest among young children aged 0–4 years, mainly because of powdered or ready-to-drink milk products [15]. If these foods are classified as UPFs without further contextual assessment, this may create serious challenges for feeding both well-nourished and undernourished children in LMICs.

Moreover, food consumption in Southeast Asia is strongly shaped by home-prepared meals and informal catering environments, including street vendors, hawker centres, and small-scale eateries [15]. These features indicate that Southeast Asian food systems are not UPF-dominant, and that epidemiological relationships observed in Western countries cannot be directly generalised to this region [17].

AWAY-FROM-HOME MEALS: A DISTINCTIVE FEATURE OF ASIAN FOOD CULTURE

Unhealthy diets are well established as a leading cause of malnutrition, but in Southeast Asia they cannot be attributed primarily to UPF consumption. Many people in the region rely on meals eaten away from home, including street foods, hawker centres, coffee shops, cafés, restaurants, and food delivery services, for daily nutrition. Low- and middle-income communities may consume such meals two to three times per day because they are convenient, affordable, and filling. These meals are often high in sugar, oil, and salt, and may be nutritionally unbalanced. Most sodium (68.9%) and sucrose (57.6%) intake comes from salt and sugar added during cooking, rather than from packaged UPFs [18]. Thus, a large share of unhealthy nutrient intake arises from cooking and seasoning practices at home or in informal food outlets, not simply from processed packaged foods or UPFs [16, 19].

PROCESSED FOODS PLAY A VITAL ROLE IN LMICS

LMICs are countries with gross national income (GNI) per capita below defined thresholds, ranging from US$1145 or less for low-

Table 3. Examples of processed foods classified as UPFs[a].

Food	Function	Potential NOVA category
Fortified biscuits	Child nutrition	UPF by the use of vitamin mineral emulsifiers
Instant noodles	Affordability	UPF use of extrusion processing
Fortified milk powder	Infant nutrition	UPF use of spray drying
Fortified cereals and Rice	Adult and infant	UPF use of extruded cereals, added vitamins, minerals
Ready to eat Therapeutic foods	Treat Undernutrition in community	UPF use of emulsifiers

[a]Adopted from Monteiro CA, Cannon G, Levy RB, Moubarac JC, Louzada ML, Rauber F, et al. Ultra-processed foods: what they are and how to identify them. Public Health Nutr. 2019;22 (5):936–41 [5].

income countries to between US$1145 and US$4515 for lower-middle-income countries. In 2024, LMICs included more than 120 countries and a population of 3.12 billion people, representing a large segment of the global population [11, 18]. While economic statistics provide a broad overview, they may conceal a more urgent reality: many LMICs in Southeast Asia face a high prevalence of undernutrition. For example, stunting rates exceed 30%, wasting is above 15%, and overweight affects more than 20% of children in some settings [11, 18, 20]. Undernutrition is associated with 45% of all deaths in children under five years and contributes to maternal mortality.

An additional challenge in LMICs is hidden hunger, which refers to deficiencies in essential macro- and micronutrients. Common micronutrient deficiencies include iodine, iron, vitamin A, vitamin D, folate, and zinc. According to the World Health Organization, iron and vitamin A deficiencies are among the top 15 causes of global disease burden [11]. Anaemia affects approximately 40% of children under five years and pregnant women and is responsible for more than one million child deaths annually. Pregnant women with anaemia face twice the risk of morbidity and mortality compared with those without anaemia. For more than eight decades, food fortification has been a proven strategy for addressing micronutrient deficiencies [21–23]. In many LMICs, large-scale food fortification (LSFF) of cereal staples, oils, and condiments has played a crucial role in reducing endemic conditions such as goitre, anaemia, and neural tube defects caused by folic acid deficiency. Many countries have also made regulatory provisions for voluntary fortification of a wide variety of processed food products, thereby helping to meet the nutrient needs of population groups [21].

FOOD FORTIFICATION: ISSUES WITH THE NOVA CLASSIFICATION IN RELATION TO LMICS

The current NOVA system categorises fortified foods inconsistently, assigning them to either Group 1 or Group 4 (ultra-processed foods) depending on the nature of the fortification process. For example, vitamin-fortified water may be classified as Group 1, whereas fortified rice grains may be classified as Group 4 because extruded grains are used as fortificants. Classification appears to depend on processing techniques, such as extrusion, formulation characteristics, or the inclusion of additives, sugars, and stabilisers.

Given that fortified rice is a critical intervention for reducing micronutrient deficiencies in LMICs [21], this discrepancy exposes a fundamental weakness of the NOVA classification system. By labelling such foods as UPFs, NOVA may obscure the essential role that certain processed foods play in improving nutritional outcomes and advancing public health. This ambiguity is especially consequential in LMICs, where fortified products such as biscuits, milk powders, flour, oil, and salt play an important role in addressing micronutrient deficiencies (Table 3) [22, 23]. The success of food fortification in reducing micronutrient deficiencies in India and other LMICs is well documented [19].

In Indonesia, the government has long mandated food fortification for staple products such as wheat flour, cooking oil, and salt [24, 25]. In 2024, a new LSFF programme was launched to expand micronutrient coverage for vulnerable groups. In many remote, low-income, or disaster-prone areas, fortified processed foods are the most practical, affordable, and safe means of delivering essential vitamins and minerals when fresh foods are unavailable, too expensive, or unsafe [24, 25]. These facts highlight the crucial role that processed and fortified foods play in supporting nutrition, food safety, and equitable access to food across Indonesia's many islands. Processed foods are also important for helping populations in Southeast Asia meet nutritional needs, especially in inland or hard-to-access communities. Indonesia, for example, is an archipelago of more than 17,000 islands, with uneven natural food resources. Many regions face challenges related to logistics, cold-chain distribution, and food safety infrastructure. In such settings, processed foods are often essential because they are designed to be safe, shelf-stable, and reliable sources of energy and protein. This is particularly important because Indonesia continues to face high rates of stunting and wasting. For these reasons, applying the NOVA classification uncritically, or proscribing UPF consumption broadly in Southeast Asia, may jeopardise efforts to improve nutritional status and meet development goals.

READY-TO-USE THERAPEUTIC FOODS: AN EXAMPLE OF A NOVA-CLASSIFIED UPF WITH A MAJOR ROLE IN CHILD NUTRITION

In 2022, 13.6 million children under five years suffered from severe acute malnutrition (SAM), particularly wasting. Within Asia, rates of SAM are especially high in South Asian countries, with more than half of the global burden occurring in Afghanistan, Bangladesh, India, Indonesia, and Pakistan [11, 18].

Ready-to-use therapeutic foods (RUTFs) are the main home-based nutritional therapy for severe wasting. RUTFs are energy-dense, high-protein, ready-to-eat processed foods that are also rich in micronutrients required for catch-up growth [26, 27]. The treatment of SAM includes two metabolic phases: stabilisation and rehabilitation. During rehabilitation, RUTFs may serve as the sole food source for catch-up growth over 8–14 weeks. Under the current NOVA classification, RUTFs would fall into NOVA Group 4. This has serious implications for the management and treatment of severe malnutrition in children worldwide [26, 27].

NATURE OF DIETARY RISK: PROCESSING OR FORMULATION?

A central tenet of the NOVA classification is that industrial processing is a key driver of unhealthy diets. However, evidence from Southeast Asia suggests that this relationship is more complex. Data from Indonesia indicate that approximately 68.9% of sodium intake originates from processed culinary ingredients and cooking practices, while around 57.6% of sugar intake is derived from beverages and food preparation rather than

packaged UPFs [14, 15]. These findings indicate that the primary drivers of excessive salt, sugar, and fat intake, which are key risk factors for NCDs, are embedded in food formulation and consumption practices rather than in industrial processing per se or UPF consumption alone.

This distinction is critical. In Southeast Asia, high salt, sugar, and fat intake is frequently associated with home cooking, street foods, and traditional culinary practices. Thus, processing level alone is not a sufficient proxy for health risk in this region.

POLICY RISKS OF UNCRITICAL UPF ADOPTION IN LMICS

If food policies in Southeast Asia focus primarily on UPF consumption without sufficient attention to local dietary practices, they may misdirect public health priorities and produce limited health benefits. Policies centred narrowly on reducing UPF consumption may weaken or divert attention from national and regional nutrition strategies that address the region's more immediate dietary risks. These include reducing excess sodium, sugar, and fat in commonly consumed meals; strengthening food-service and food-safety regulations in informal food environments such as hawker centres and street-food settings; supporting reformulation of prepared foods sold by street vendors, hawker centres, and small-scale eateries; and developing interventions that reflect local food cultures, affordability, and consumption patterns.

Thus, UPF-related policies that are appropriate in Western settings may not be suitable in Southeast Asia without careful consideration of the cultural and traditional food patterns that shape diets in the region [16, 28].

UNCRITICAL ADOPTION OF UPF POLICY FRAMEWORKS IN LMICS

A cautious approach is necessary before adopting broad ultra-processed food policy frameworks in LMICs. Applying the NOVA classification uncritically risks oversimplifying dietary recommendations for Southeast Asia [29]. A broad proscription of UPFs may discourage consumption of affordable, fortified, or shelf-stable processed foods that provide important nutrients, especially where food insecurity and undernutrition remain major concerns. By concentrating on processing level alone, policy may divert attention from more harmful dietary risks, such as excessive intakes of sugar, sodium, and unhealthy fats; low dietary diversity; and inadequate consumption of fruits, vegetables, legumes, and animal-source foods.

DIFFUSION OF GLOBAL NUTRITION POLICY FRAMEWORKS

A second and more significant concern is the diffusion of global nutrition policy frameworks, notably through the World Health Organization and the Food and Agriculture Organization. These organisations may generate policy guidance and political pressure for LMICs to adopt UPF policies developed primarily for Western food systems, which differ substantially from those in Southeast Asia, Policy transfer is not a neutral process. Policies developed in high-income countries may be introduced into local markets and food consumption patterns with which they are poorly compatible [30]. Such diffusion has already occurred with the publication of an FAO document on UPFs [31]. Following this, Malaysia and Maldives have included UPFs in their dietary guidelines [32]. Rather than treating UPFs as a single entity, we suggest developing a broader consensus on diet-disease prevention strategies grounded in the region's actual dietary patterns and food consumption practices.

For Southeast Asia, we propose a more context-specific UPF policy framework in which food processing is supported where appropriate, while greater attention is paid to culinary practices, informal food environments, food affordability, and the regulatory frameworks that operate in this region. The present analysis may also be relevant to other LMICs in Africa, Latin America, and Central Asia.

CONCEPTUAL LIMITATIONS OF THE NOVA CLASSIFICATION: CLASSIFICATION VERSUS POLICY APPLICATION

It is essential to distinguish between NOVA as a classification system and its application as a policy instrument. While NOVA may have analytical value, its use in policy formation, including food-based dietary guidelines (FBDGs), requires far greater scrutiny. In Southeast Asia, the issue is not simply whether NOVA can classify local foods. A key consideration is whether it is being transformed into a policy framework that blunts dietary complexity and traditional food practices, legitimising regulations that are poorly aligned with local food cultures and nutritional needs [29, 30].

The limitations outlined above call into question the legitimacy of a processing-based classification as the dominant framework for evaluating food systems in Southeast Asia. While such classification schemes may be relevant in Western countries, they are less applicable in Southeast Asia, where food patterns, preparation methods, place of consumption, and forms of consumption differ markedly [11]. Rather than relying exclusively on processing-based classification, a more appropriate analytical approach for Southeast Asia would consider formulation characteristics, including salt, sugar, and fat composition; the functional roles of foods in relation to food security and nutritional adequacy; and prevailing consumption patterns within specific food environments.

This also raises concerns about the validity of processing-based classification as a standalone indicator of diet quality in non-Western countries.

CONCLUSION AND RECOMMENDATIONS

The prevailing narrative around ultra-processed foods has become highly polarised [33, 34]. Proponents of the NOVA classification system often overlook the significant implications that these classifications may have for the health and well-being of individuals living in LMICs. If food fortification, which may be categorised as NOVA Group 4, is restricted, the negative effects on children, mothers, and older adults across many LMICs could be substantial. The NOVA classification has contributed significantly to the global conversation on diet quality and has encouraged efforts to separate food formulation from processing [28, 35, 36]. However, its application in Southeast Asian LMICs requires careful reconsideration. An overemphasis on the negative impact of processed and ultra-processed foods risks oversimplifying complex dietary patterns in Asia and other LMICs. It may also undermine nutritional gains achieved over the past four decades. We urge policymakers in LMICs to recognise that assessment of diet quality should be grounded in the actual nutrient and non-nutrient composition of foods, rather than determined primarily by the degree of processing. Adopting this approach will support dietary guidelines that are balanced and evidence-based, thereby mitigating the risk of uncritical acceptance of the principles underlying the NOVA classification. Although NOVA was developed as a classification system, its increasing use in policy contexts raises concerns about its applicability across diverse food systems. In Southeast Asia, policies focused primarily on reducing UPF consumption may misidentify the dominant drivers of malnutrition and NCDs. Ultimately, the challenge in Southeast Asia is not over-processing, but the optimisation of diet quality within context-specific food systems.

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AUTHOR CONTRIBUTIONS

CJH conceptualised and crafted the initial manuscript. MAW, EST, and PH refined the manuscript and added regional information.

FUNDING

No external funding was utilised for this manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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