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THE NUTRI-SCORE SYSTEM FOR FRONT-OF-PACK NUTRITIONAL LABELLING: ALGORITHM UPDATES, BENEFITS, AND RISKS

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Abstract: Front-of-pack (FOP) nutritional labelling systems, such as Nutri-Score, play an increasingly important role in promoting healthier dietary choices and enhancing consumer awareness of food nutritional quality. Nutri-Score offers a simplified, color-coded summary that aligns with public health recommendations and enables product comparisons within the same category. Its regulatory implementation has been adopted voluntarily by several European countries, while efforts toward EU-wide harmonization are ongoing. In 2024, a revised Nutri-Score algorithm has come into effect, aiming to better reflect current dietary recommendations through changes in product classification. For example, milk and dairy-based drinks are now categorized as beverages, with their scores primarily based on fat and sugar content, diet beverages containing sweeteners are also rated less favourably. Improved scores have been assigned to nutritionally beneficial products, such as whole-grain bread, oily fish, vegetable oils, and low-salt cheeses, while lower scores have been applied to sweetened yoghurts, breakfast cereals, and red meat products. Although Nutri-Score facilitates more informed purchasing decisions, it does not fully support consumers in constructing balanced diets and is not equally applicable across all food categories, particularly for single-ingredient or traditional products. This article examines the benefits and limitations of Nutri-Score, considering both regulatory developments and recent scientific literature related to its algorithmic modifications. However, the future of Nutri-Score remains uncertain amid growing political, institutional, and industry-level criticism across parts of Europe.

Keywords: Nutri Score, diet, food labelling, front-of-pack nutritional labelling.

1. INTRODUCTION

Diet plays a crucial role in human health, with both the quality and quantity of food being an upkeep essential. In recent years, there has been a growing shift toward

healthier lifestyles and changing eating habits [Juruć 2020]. Consumers are increasingly seeking products that not only meet certain sensory and quality standards but also offer proper nutritional value. However, the mandatory information on food labels or packaging is often insufficient for selecting the best product, requiring time to interpret, especially for those without the necessary knowledge. This can even result in choosing items with less favourable nutritional profiles [Cannoosamy, Pugo-Gunsam and Jeewon 2014; Temple and Fraser 2014]. Therefore, the information on food packaging plays a significant role in helping consumers make more informed dietary choices, improving overall diet quality, and preventing diet-related diseases [Ikonen et al. 2019; Braesco and Drewnowski 2023].

1.1. Food labelling – Legal requirements

In accordance with Regulation (EU) No 1169/2011 of the European Parliament and of the Council on the provision of food information to consumers (...) there is an obligation to provide nutrition information on the labelling of food products, including: energy value and the content of fat, saturated fatty acids, carbohydrates, sugars, protein and salt. This obligation applies to packaged foods, fortified foods and foods with nutrition and/or health claims. However, certain categories of food are exempt from this requirement, as specified in Annex V of the Regulation. These exemptions include unpackaged foods sold directly to consumers (e.g., in bakeries or restaurants), fresh fruits and vegetables, herbs, salt, chewing gum, and products in packaging too small to accommodate the nutrition declaration. From a legal perspective, these exemptions are intended to ensure proportionality in food labelling regulations by avoiding the imposition of unnecessary burdens on producers of simple or minimally processed products. They reflect a policy choice to focus mandatory labelling on products where nutritional information is more relevant for informed choice or where there is greater variability in composition. From a consumer perspective, many of the exempted products, such as fresh produce or single-ingredient foods, are widely recognized as health-promoting and easily understood without requiring additional labelling. Therefore, mandatory nutrition information in these cases may not significantly enhance consumer understanding or influence purchasing decisions. In accordance with Article 30 of Regulation (EU) No 1169/2011, to facilitate consumer use of nutrition information, repetition of key nutritional data in the principal field of vision is permitted. This may include energy value alone or in combination with the amounts of fat, saturates, sugars, and salt. Additionally, Article 35 allows for the use of graphical forms or symbols, such as front-of-pack schemes, in presenting nutrition information, provided they are based on sound scientific evidence and are not misleading to consumers.

1.2. Nutrition labelling systems

Front-of-pack nutrition labelling (FOPNL) is a key tool for helping consumers make informed food choices. The World Health Organization (WHO) highlights that FOPL systems are vital for promoting healthy eating by raising consumer awareness [www.who.int/news]. However, it is crucial that such systems are simple, quick, and intuitive, enabling consumers to make the right choice without misleading them about the nutritional value of the product. FOPL systems can encourage the purchase and consumption of products with proven, evidence-based health benefits for the human body [Croker et al. 2020]. Nevertheless, it is important to note that there is no clear evidence showing that specific nutritional knowledge directly influences a consumer's understanding of a product's nutritional value or their ability to make healthier food choices [Feteira-Santos et al. 2020]. There are currently several front-of-pack nutritional labelling schemes for FOPNL in Europe. These are voluntary schemes that comply with the requirements of the repeated nutrition declaration, which include: RWS Voluntary Nutrition Labelling Scheme, Traffic-light Food Labelling and NutrInform Battery. Icons on the front of the pack indicate the percentages of reference intakes of energy and nutrients provided by a serving of the product and the energy provided by 100g/100ml of the product [www.federacja-konsumentow.org.pl]. In contrast, FOPNL systems operating in Europe that do not repeat the nutrition declaration, but present it as additional information, as allowed by EU Regulation 1169/2011 (Article 36), include: The Keyhole Label system ('The Keyhole Label') and the Nutri-Score system. These systems present the overall nutritional value of a food (e.g. by means of a symbol or letter) [www.federacja-konsumentow.org.pl].

2. FOPNL SYSTEMS CONSUMER UTILITY

The majority of consumers report that front-of-pack labelling (FOPNL) is useful to them, as presented in the Report from the Commission to the European Parliament and the Council on the use of additional forms of expression and presentation of nutrition information [www.op.europa.eu/en/publication-detail/-/publication]. However, it is crucial to keep in mind that for these labels to be effective, they need to capture the consumers' attention and be both accepted and understood by them before they can impact their food choices. This was highlighted in an analysis conducted in Poland during 2017–2018 as part of the National Health Programme [Final Report on the Implementation of NZP 2018], which showed that consumers present a variety of approaches to the information provided on food labels. A certain group does not pay attention to labels, making purchases based on personal preferences and habits. In contrast, the largest proportion are those who check selected information on packaging (often expiry date, weight and/or composition).

The nutrition table is used by a small percentage of shoppers, due to difficulties in understanding and interpretation. However, in general, the introduction of nutrition labelling on the front of food packages is welcomed, as it is more attractive and readable for consumers than a traditional table. Given the increasing proportion of overweight and obese people in most European Union member states and the significant health burden associated with the risks of an unhealthy diet, there is growing interest from public authorities in front-of-pack nutrition labelling [Panczyk et al. 2023].

3. NUTRI-SCORE SYSTEM

This is a food labelling system that has been growing in popularity in recent years. It is based on a scientific method for assessing the nutritional value of products, developed in 2005 by a research team from the UK's Oxford University and endorsed in 2007 by the UK's Food Standards Agency (FSA, in French). The system was developed by French researchers from the Nutrition Epidemiology Research Team (EREN, L'Equipe de Recherche en Epidémiologie Nutritionnelle) in collaboration with the French Agency for Food, Environment, Safety and Health at Work and the Public Health Council [Panczyk et al. 2023; http://www.systemns.pl].

The Nutri-Score system presents a product's score using a colour code, from the most favourably rated products (highlighted dark green box with the letter A) to the least favourably rated (highlighted dark orange box with the letter E) (Fig. 1).

Fig. 1. Nutri-Score label

Source: https://www. systemns.co.uk (accessed 6/10/2024).

Based on such factors as energy value, sugars, saturated fats, sodium levels, as well as the amounts of fruits, vegetables, fibre, and protein [Julia et al. 2015], and, starting in 2021, the inclusion of nuts, legumes, and oils (such as rapeseed, walnut, and olive oil) [www.systemns.co.uk], the system classifies products as having a more or less favourable composition per 100 g or 100 ml of product. In this system, a food product is classified into one of five categories, depending on the score obtained.

The category to which the product belongs is distinguished by the colour and the letter:

- A – dark green (products with the most favourable nutritional score);
- B – light green;

- C – yellow;
- D – light orange;
- E – dark orange / red (products with the least favourable nutritional score).

In response to the updated Nutri-Score algorithm, the classification of products is based on a points system that evaluates both negative and positive nutritional components. Table 1 summarizes the point-based structure of the algorithm, indicating how foods and beverages are scored based on their composition. Notably, in certain product categories, such as fats, cheeses, and beverages, the scoring criteria and weighting differ slightly from the general food category. For example, the fruit, vegetable, pulse, and specific oil content (FVPN%) may be scored up to 10 points for cheese and fats, rather than the standard 5-point scale used for general foods [https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/articles/nutri-score].

Table 1. Components and scoring ranges in the revised Nutri-Score algorithm

Component type	Nutrient/ Component	Scoring range	Criteria [per 100 g or 100 ml]
Negative points	Energy	0–10	Based on total kJ
	Total Sugars	0–10	Higher sugar = more points
	Saturated Fatty Acids	0–10	Higher SFA = more points
	Sodium (salt)	0–10	Higher sodium = more points
Positive points	Fruit, vegetables, legumes, nuts, rapeseed, walnuts, and olive oils	0–5 (or up to 10 for some foods)	Higher content = more favourable score (scored up to 10 in specific product groups)*
	Fibre	0–5	Higher fibre = more favourable score
	Protein	0–5	Higher protein = more favourable score

Explanatory notes: cheeses (excluding quark and plant-based spreads); added fats (understood as fats sold in the form of finished products, not fats that are part of the recipe, i.e. e.g. vegetable oils, margarines, butter, cream or dairy products used as added fats); drinks (flavoured waters, fruit juices, smoothie nectars, vegetable juices, drinks with added sugar and/or sweeteners, teas, brewed coffee or coffee dissolved in water only) [https://www.systemns.pl].

Final Nutri-Score = Total negative points – Total positive points.

From 1 January 2024, a new algorithm for the Nutri-Score – a voluntary front-of-pack nutrition labelling system – is in place. Following a review of the algorithm,

the calculation rules have been revised to better reflect the current nutritional recommendations for European consumers (Tab. 2). The main changes include:

- a new division of foods for the Nutri-Score calculation (1 – General foods, 2 – Animal and vegetable fats, nuts and seeds, 3 – Beverages);
- modification of the scoring thresholds for sugars, salt, fibre and protein;
- modification of the desirable ingredient to fruits, vegetables and legumes (without including nuts and oils - walnut, rapeseed and olive oil);
- the reclassification of milk and dairy drinks from general food to beverages;
- the introduction of a category for red meat and red meat products and the establishment of specific calculation rules for this category;
- taking into account the presence of sweeteners in beverages [https://www.nutri-score-europe.com/news/; https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/articles/nutri-score].

Table 2. Revised Nutri-Score algorithm structure (2024 update)

Component type	Nutrient/ Factor	Scoring range	Key updates and notes
Negative Points	Energy (kJ)	0–10 points	Stricter thresholds applied
	Total sugars	0–10 points	Includes free and intrinsic sugars; stricter scoring
	Saturated Fatty Acids	0–10 points	Penalizes higher content more sharply
	Sodium (Salt)	0–10 points	Increased penalty for high salt levels
Positive Points	Fruits, vegetables, pulses, nuts, and specific oils (FVPN%)	0–5 points (up to 10 for cheeses/fats)	Higher recognition of plant-based ingredients; 10 points possible in certain categories
	Fibre (g/100 g)	0–5 points	Reinforced differentiation between refined and whole foods
	Protein (g/100 g)	0–5 points	Weight varies depending on product category
Special rules by category	General foods	Full algorithm applied	Bread, cereals, ready meals, snacks, etc.
	Fats, oils, nuts, seeds	Adjusted FVPN scoring	FVPN% scoring up to 10 points possible
	Cheese	Adjusted algorithm	Allows higher FVPN points to better reflect nutritional value

	Beverages	New classification	Includes milk, plant-based drinks, and fruit juice; only water can score A
	Red meat and products	New subcategory	Specific adjustments for negative component scoring
	Artificially sweetened beverages	New penalty logic	Lower scores to discourage sweetener-based reformulation

In practice, this means that:

- in beverages – only water will still receive a Nutri-score A. All other beverages will receive a maximum grade of B. Milk will also be included in the drinks category, although previously, these products were in the general food category. Defatted and semi-fat milk receives a better nutritional score than full-fat milk. This allocation is based on fat content. Milk-based and plant-based drinks are also included, with a distinction being made between unsweetened and sweetened milk drinks. Sugar content will be given more consideration in drinks, so diet soft drinks will move from Nutri-score B to C;
- in solid foods – more attention is paid to the salt and sugar content of solid foods. Sweetened yoghurts and breakfast cereals scored lower. A better distinction was used between fibre-rich whole-grain products and refined products. Some fatty fish species go from a B to an A. The new adjustment is based on the high nutritional value of these fish species and the fact that they deserve a place in a healthy diet. A better grade is given to hard cheeses with low salt content. A better grade is given to oils with a lower saturated fat content. This score changes from a C to a B. This is the case for olive oil, rapeseed oil and sunflower oil, etc. Poultry meat scores better than, for example, red meat [https://www.nutri-score-europe.com/news/; https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/articles/nutri-score].

Although the updated Nutri-Score algorithm better aligns with dietary recommendations, certain regional or traditional products, such as 100% fruit juices without added sugar, continue to receive lower scores (typically C or D). This is primarily due to their naturally high sugar content and lack of fibre, which the algorithm considers as factors contributing to excess energy intake and limited satiety. From a nutritional profiling perspective, the algorithm treats intrinsic sugars similarly to added sugars, which may create a discrepancy between consumer perception and the assigned score. While such ratings aim to discourage excessive consumption of sugary beverages, they may cause confusion among consumers who consider these products healthy due to their natural origin and absence of additives.

Clarifying the rationale behind these ratings is essential to improve public understanding and support informed dietary choices [European Food Safety

Authority (EFSA) 2018]. There is a transition period until 31/12/2025 for the implementation of the new calculation rules – after this date, all products on the market will have to have a Nutri-Score label calculated on the basis of the new algorithm. The updated algorithm also means that products with labels bearing the 'old' Nutri-Score will still be found on shop shelves alongside those with the 'new' label until the end of 2025. However this, instead of making purchasing decisions easier, will only add conflicting information to consumers and cause consumer confusion.

4. NUTRI-SCORE LIMITATIONS

Recent policy documents and scientific reports confirm that Nutri-Score remains a central point in the EU's efforts to harmonize front-of-pack (FOP) nutrition labelling, as emphasized in the European Commission's "Farm to Fork" strategy [European Commission 2020a] and its associated regulatory review [European Commission 2020b]. The Joint Research Centre (JRC) and the World Health Organization (WHO), including the International Agency for Research on Cancer (IARC), continue to support Nutri-Score as a scientifically validated tool to improve population health and guide healthier dietary choices [IARC/WHO 2021; World Health Organization (WHO) 2023]. However, implementation across Member States remains fragmented. France and Germany have institutionalized Nutri-Score through national legislation, while countries such as Italy have actively opposed it and promoted alternative labels like NutrInform Battery [Fialon et al. 2022; Traczyk and Jaworski 2023]. Furthermore, empirical studies reveal that although Nutri-Score positively influences consumer decisions and nutrition literacy, it may conflict with cultural perceptions of traditional products, particularly 100% fruit juices and protected-origin foods [Stiletto et al. 2024].

The identification of clear indicators that accurately reflect a product's nutritional value and are effective for food profiling remains a challenge. Overly complex information can overwhelm consumers and complicate classification algorithms, while oversimplification may result in the omission of important health-relevant components. Experts recommend expanding current models to include bioactive compounds, vitamins, minerals, and trans fatty acids to improve public health utility [Panczyk et al. 2023]. This aligns with findings from EFSA (2022), which highlight widespread dietary deficiencies in fibre and potassium, as well as the inadequate intake of calcium, iron, folate, vitamin D, and iodine in certain population groups [Turck et al. 2022]. These nutrients are essential for nerve function, immune response, metabolic regulation, and skeletal development [Cashman 2007; Weaver 2013; Ebara 2017; Wang et al. 2017; Nairz and Weiss 2020; Głąbska and Włodarek 2022].

WHO (2024) further emphasizes that effective FOP labelling systems should be science-based, government-led, and focused on nutrients of public health concern, including those underconsumed across European populations. Incorporating these nutrients into nutrient profiling algorithms could enhance transparency and align labelling systems with dietary priorities. There is also growing support for the inclusion of trans fats and cholesterol data, as well as the clear identification of the whole grain content in FOP systems [Cannoosamy, Pugo-Gunsam and Jeewon 2014; Prieto-Castillo, Royo-Bordonada and Moya-Geromini 2015; Kissock et al. 2022]. The Whole Grain Initiative (2021) called on the European Commission to ensure whole grain products are recognized within harmonized EU labelling.

While recent updates to the Nutri-Score algorithm have addressed some of these concerns, including improved scoring for whole grains and certain healthy oils, issues remain. Notably, 100% fruit juices without added sugar continue to score C or D, while some diet sodas score as high as C, raising questions about consistency and clarity for consumers. The 2024 update has also recalibrated ratings for dairy and plant-based beverages: low-fat milk dropped from A to B, full-fat milk to C, and sweetened yoghurts to grades between C and E. Plant-based drinks are now rated B to E, and some artificially sweetened beverages have improved from E to D or C. Studies such as Braesco et al. (2022) have shown that despite their nutritional density, foods like nuts were previously penalized under Nutri-Score due to high energy or saturated fat content. This underscores the need for a more nuanced system that recognizes the composite nutritional value of whole foods.

In sum, while Nutri-Score has made significant progress as a public health tool, continued refinement is essential to ensure it reflects evolving scientific understanding and adequately informs consumer choices across Europe.

5. PRACTICAL IMPLICATIONS AND RECOMMENDATIONS

To enhance the effectiveness and public acceptance of the Nutri-Score system, targeted nutrition education is essential. Efforts should focus on improving consumer understanding of key nutrients frequently underconsumed in Europe, such as fibre, potassium, vitamin D, and folate, and clarifying the rationale behind Nutri-Score evaluations, particularly for traditional or naturally nutrient-dense products. Communication strategies should include the development of educational materials (e.g., infographics, animations, and short videos) that explain how the Nutri-Score algorithm functions and why certain foods, such as fruit juices, full-fat milk, or nuts, may receive lower ratings despite their nutritional value. Training programs for educators, dietitians, and healthcare professionals can further ensure consistent messaging across public health channels.

Moreover, marketing initiatives should be adapted to include segmentation of communication tailored to specific consumer groups (e.g., parents, older adults,

athletes), promotion of reformulated products with improved scores, and transparent messaging about the nutritional strengths of regional and traditional products. Collaborations with retailers and digital platforms, such as highlighting Nutri-Score ratings on shelves and online catalogues, or offering "health filter" options in shopping apps, could further support informed purchasing decisions. These integrated actions may help bridge the gap between scientific labelling systems and real-world consumer behaviour.

6. CONCLUSIONS

This analysis highlights that the voluntary Nutri-Score front-of-pack nutrition labelling system is distinguished by its simplicity, transparency, and ease of interpretation. It aligns with healthy eating recommendations and enables consumers to quickly compare the nutritional quality of products within the same category, thereby supporting more informed purchasing decisions. However, despite its strengths, the system has several limitations, as it does not fully support the construction of a balanced diet, is not universally applicable across all food categories, lacks consideration of the degree of food processing, and may undervalue nutritionally dense or traditional products.

These shortcomings are particularly relevant in the context of ongoing discussions within the European Union regarding the development of a harmonised, mandatory front-of-pack nutrition labelling (FOPNL) scheme.

Moreover, as the European Union continues deliberations on a harmonised, mandatory FOP nutrition labelling scheme, the experiences of Member States using Nutri-Score can provide valuable lessons. Ensuring transparency, scientific validity, and cultural sensitivity will be essential in shaping a system that is both widely accepted and effective in promoting healthier eating patterns. Continued interdisciplinary research and evidence-based policy development will be critical in informing the design and implementation of an optimally balanced and equitable labelling framework.

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