



# Implementation of the Nutri-Score

## First results and a comparison with the NOVA classification

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### Abstract

Front-of-pack labels like the Nutri-Score can help consumers to compare foods within a product group in order to make a more nutritious choice. However, other dimensions of foods, such as the degree of processing, are not considered.

The aim of the study was to evaluate the labeling frequency of the Nutri-Score shortly after the legally compliant, implementation in the German food retailing sector, and to compare the nutritional composition of the food using the Nutri-Score with the degree of processing according to the NOVA classification. Of 2,333 packaged products examined 12% were labeled with a Nutri-Score at the time of data collection and showed predominantly category A and B (highest nutritional quality categories).

Classification of the food products according to NOVA showed that 100% of the products labeled with Nutri-Score C, D, or E and 41% of the products labeled A were also classified as ultra-processed.

In order to improve food labeling with regard to the prevention of diet-related diseases, it would be useful to extend the front-of-pack-label by taking the degree of food processing into account.

**Keywords:** front-of-pack label, nutrition labeling, Nutri-Score, NOVA classification, ultra-processed food, degree of processing.

### Introduction

In order to prevent obesity and diet-related diseases, the German Federal Ministry of Food and Agriculture (BMEL) introduced the National Reduction Strategy for Sugar, Fats and Salt in finished products in 2018 [1]. In addition, using easy-to-understand food labeling, the nutritional competence of consumers can be further strengthened. Specifically, it is intended to counter the fact that consumers often rate the mandatory nutritional facts table on the back of the package too difficult to read and understand and therefore rarely use it as a basis for purchasing decisions [2]. For this reason, the voluntary use of the so-called Nutri-Score has been legally permitted on packaged foods in Germany since November 2020 [3].

The Nutri-Score is a front-of-pack label (FoPL) that simply summarizes and graphically displays the nutritional quality of food [4]. For this purpose, a five-point scale from dark green (A) to dark red (E) is used to indicate whether the nutritional quality of a product is rather favorable or unfavorable compared to other products within the same category (♦ Figure 1) [3]. To calculate the Nutri-Score of a product, its ingredients per 100 g of food are determined and ranked according to their health impact by assigning positive or negative points [5]. Based on the British reference values for nutrient intake [6], high levels of energy, saturated fat, salt, and sugar are scored negatively, while fiber, protein, the proportion of fruits, vegetables, and nuts, and certain vegetable oils are included as positive factors in the score. For the total score, the sum of the positive points is subtracted from the sum of the negative points. The higher the total score, the "poorer" the Nutri-Score. The total Nutri-Score can also be positively influenced by compensating negative points that a product receives, for example, due to a high sugar content, with positive points due to healthy ingredients (e.g. dietary fiber) [5]. However, not every reformulation leads to a change in the Nutri-Score. Only a maximum of 3 points is needed to raise the Nutri-Score

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from B to A, whereas up to 8 points are needed to improve it from D to C [3].

First results of the National Reduction Strategy show that manufacturers have reduced sugars, fats, and salt in their products [7]; however, these changes have so far been too small. The potential of the Nutri-Score to positively influence consumer health has already been demonstrated in several studies [8, 9]. For example, the widespread introduction of the Nutri-Score could lead to a reduction in energy intake in the population by an average of 9% [8] and a reduction in mortality from cardiovascular disease and cancer [9].

While an evaluation of food quality based on its nutrients is common, the degree of processing is rarely considered. Numerous epidemiological studies already show that a regular high consumption of so-called ultra-processed foods increases the risk for overweight and obesity as well as for type 2 diabetes mellitus type 2, cardiovascular diseases or cancer [10]. Classification systems such as NOVA, which has already been used in many studies [11], form the basis for classifying foods according to their degree of processing [12]. According to NOVA, ultra-processed foods are characterized by a formulation, that results from several industrial processes. In most cases, they contain ingredients that are produced by those high-technology processes (e.g., hydrolyzed proteins, maltodextrin, invert sugar) and therefore serve as markers of "ultra-processing" [13]. Also, a variety of additives are used (e.g. colorants, flavors, sweeteners, and emulsifiers) to make these foods ready to eat, hyperpalatable and prolong shelf life [12]. Although ultra-processed foods are often energy-dense and high in salt, sugar, and fat, these are no criteria for NOVA classification. Thus, there are clear differences between the concepts of the Nutri Score, which evaluates nutritional quality, and the NOVA classification, which is based on food processing [14], both pursue the same goal: to evaluate food composition in terms of its health effects.

Therefore, the aim of this study was, on the one hand, to identify how many products have already been labeled with the Nutri-Score in the first few months after its introduction in Germany, and secondly, to compare the classification of foods using the Nutri-Score and the NOVA classification.

Category	Designation	Food examples
1	savory frozen products	Frozen fish, meat-, poultry-, vegetable-, potato- products, pizzas, ready-to-heat-products
2	sweet frozen products	Frozen ice cream, fruit, desserts, cakes, sweet pastries, rolls, croissants, doughs
3	yogurts/milk desserts	Yogurts, puddings, milk snacks, vegan alternatives
4	cereals	Mueslis, cornflakes, oat flakes, extrudates, fruit and muesli bars

Tab. 1: Overview of the selected product categories

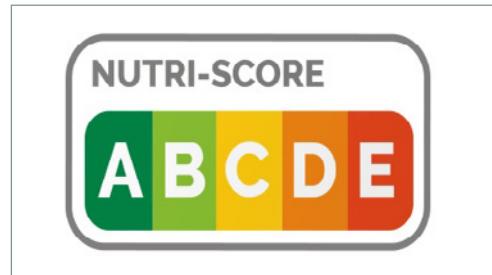


Fig. 1: Nutri-Score Label

## Methodology

In this study, food surveys were conducted (not strictly simultaneously and in random order) from December 2020 to March 2021 in four markets of the German food retail sector, including the discounters Aldi Nord (Aldi Group), Penny (REWE Group) and Lidl (Schwarz Group) as well as the online store of the REWE supermarket (REWE Group). Proportionately more discounters were included since these are the most important group of suppliers in the German food retail sector [15].

The sample was therefore heterogeneous, but not representative. Food products from four different categories were investigated: savory frozen products, sweet frozen products, yogurts /milk desserts, and cereals (♦ Table 1). These categories were selected because they include a particularly large number of packaged and processed products for which, in accordance with EU-Regulation 1169/2011, there is an obligation to declare certain nutritional values and therefore the Nutri-Score can be applied.

For each category, all available foods were identified and products with a Nutri-Score label were documented, including Nutri-Score labels at the point-of-sale. It was also documented whether the food was from a retailer-brand or a manufacturer-brand.

The food products labeled with a Nutri-Score were assigned to one of the four groups of the NOVA classification according to the purpose and extent of processing [12]:

- Group 1 - unprocessed and minimally processed foods
- Group 2 - processed ingredients
- Group 3 - processed foods
- Group 4 - ultra-processed foods

Open Food Facts, which is an open-source database, was used to obtain the NOVA classification [16].

The data analysis was carried out with the program Microsoft Excel 2017 and the statistics and analysis software IBM SPSS Statistics 26.

## Results of the survey in the food retail trade

Out of a total of 2,333 food products surveyed, 278 products (11.9%) were labeled with the Nutri-Score. In comparison to the other retailers, Penny (REWE Group) had the most Nutri-Score labeled foods (32.6%). Differences in the distribution of the Nutri-Score could also be found between product categories. The highest proportion of labeled products was found in the category "savory frozen products" with 20.5%, followed by "yogurts/milk desserts" with 12.5%. In the category "sweet frozen products" 8.9% and in the "cereals" category, only 3.4% of the products were labeled with the Nutri-Score. In all product categories and across all food retailers, Nutri-Score categories A and B (highest nutritional quality categories) were the most common at 62%. Nutri-Score category C, was labeled on 26% of the products and category D on 9%. Nutri-Score E, indicating the worst nutritional quality was found on 3% of the food products (♦ Figure 2).

♦ Figure 3 shows that the distribution of the Nutri-Score differs according to the product category. The category "sweet frozen products" contained by far the largest share of both Nutri-Score levels D and E with 73%, while the category "yogurts/dairy desserts" included the largest share of foods labeled A or B with 81%.

The classification according to NOVA showed that 79% of all products labeled with the Nutri-Score are ultra-processed foods. Foods with a Nutri-Score rating of levels C, D, and E are 100% ultra-processed according to the NOVA classification (NOVA-Group 4) while also foods labeled with a Nutri-Score B predominantly belong to NOVA-Group 4. The largest proportion of unprocessed and minimally processed foods is found among the products that were labeled with the Nutri-Score A. Nevertheless, 41% of these products can also be classified as ultra-processed (♦ Figure 4).

## Discussion

In the food retail sector examined, the Nutri-Score was still rarely used in the first three months after its introduction, with only 12% labeled products within the examined categories. However, even in Belgium, only 10% of the total food supply was labeled with the Nutri-Score in the first year after its introduction [17] and approximately 90% of those labeled foods were private label products from two large food retailers (retailer-branded products), while the remaining products were manufacturer-branded products (national brands) [17].

In contrast, in this study in the German food retail sector, shortly after the legally compliant introduction of the Nutri-Score, it was observed that only 33% of the foods labeled were private label products and therefore national brands dominated. Similar results were seen in the studies by Marczuk et al., who also looked at the distributors of the Nutri-Score in Germany based on the Global New Product Database [18].

The percentage of manufacturer-branded products (national brands) labeled with the Nutri-Score was 78.6% of all labeled products in the reference period of this study from May 2019

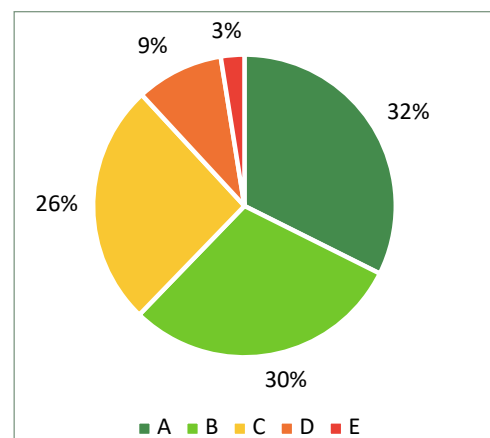


Fig. 2: Occurrence of the individual Nutri-Score levels summarized in the four product categories.

to November 2020. However, the authors assume that the share of private-label products will increase over time, similar to the situation in France. Some food retailers, already had the Nutri-Score-labeling on their private-labels as part of their market strategy [19].

### Distribution of the five Nutri-Score Categories

Only a minor share of the foods analyzed were labeled with a Nutri-Score E or D, while the majority of foods labeled with a Nutri-Score (89%) exhibited level A, B, or C. Marczuk et al. also showed for the period before the introduction on the German market (May 2019 to November 2020) that favorable Nutri-Score labels predominated (A, B, and C labels in 91.5% of products) and the proportion of products with a Nutri-Score D and E was only 8.5% [18]. Similar labeling behavior was also found in Belgium, where 74% of products were labeled with A, B, or C one year after introduction [17], and in France, where favorable A/B labeling also predominated on foods within the first two and a half years, with more than 82% of labeled products [18]. A similar labeling behavior was also found in Belgium, where 74% of products were labeled with A, B, or C, one year after introduction [17], as well as in France, where favorable A/B labeling also predominated on foods within the first two and a half years, with more than 82% of labeled products [18].

These results suggest that products that received a more favorable Nutri-Score were preferentially labeled. However, continuous data from France also shows that the proportion of more unfavorable labeling (Nutri-Score D and E categories) increases over time [18].

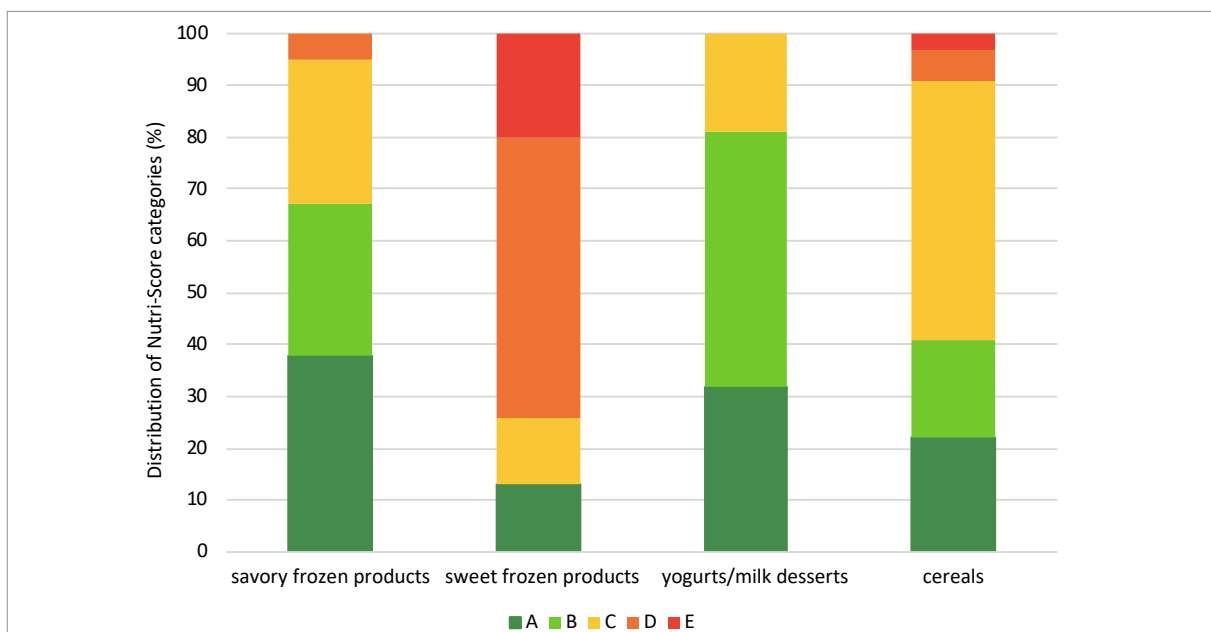


Fig. 3: Distribution of the five Nutri-Score levels within the respective defined product category.

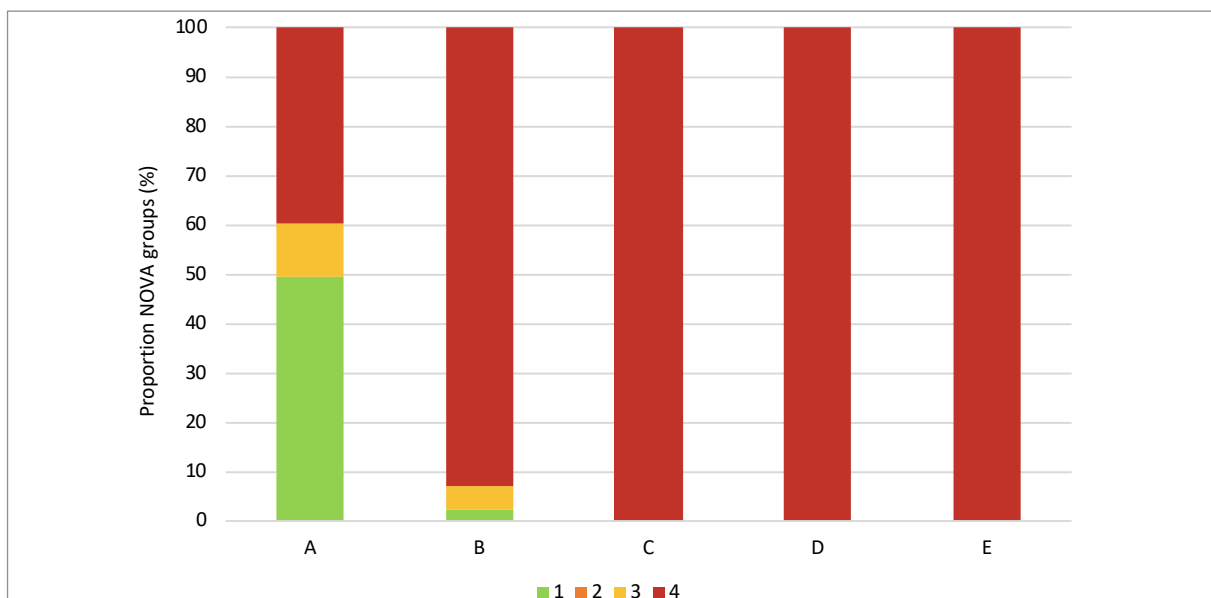


Fig. 4: Proportions of the four NOVA levels within each Nutri-Score. (Nutri-Score A significantly different from the other Nutri-Scores B-E, Kruskal-Wallis:  $p < 0.001$ ; Dunn-Bonferroni:  $p < 0.01$ ).

This can probably be attributed to the mandatory labeling of all products of a brand within two years of the company's registration. The food products in the "yogurts/milk desserts" category had the best Nutri-Score ratings compared to the other product categories. Especially natural yogurts, vegan yogurt alternatives and plain yogurts with added fruit, with a low fat and salt content were labeled with a Nutri-Score. The largest proportion of the two categories D and E indicating the lowest nutritional quality (73%) was found in the product category "sweet frozen products". This is due to the high proportion of high-sugar and high-fat products such as ice cream, cakes, tarts and small baked goods. Consumers must know how to interpret the Nutri-Score correctly and therefore be aware that it is intended to be used for compari-

son within a product category. A frozen pizza with a Nutri-Score A does not mean that this product should be on the menu every day, but that this product has a better nutritional composition than other pizzas. Also the allocation of a food to the corresponding product group is not easy to understand for consumers. For example, a chocolate flavored drink-powder is calculated according to the points table for foodstuffs and not according to the points table for beverages, since the ready-prepared product is rated as a dairy product. As a food product, the product thus gets a B printed on

the packaging, but as a beverage it would be labeled with E (♦ Figure 5) [20].

### Comparison of NOVA and Nutri-Score

Dréano-Trécant et al. already investigated the ability of the Nutri-Score regarding to discriminate the nutritional quality of foods and its consistency with national dietary recommendations in eight European countries [21]. They have shown that the large majority of recommended foods, such as fruits, vegetables, legumes, and nuts, as intended, have a better Nutri-Score compared to sweet, fatty and salty products.

In line with the results of our study, Dréano-Trécant et al. have also shown that packaged but unprocessed foods such as frozen fruits and vegetables, meat and fish, and natural yogurt accounted for the majority of Nutri-Score A ratings in the respective product categories and that processed products were mainly classified with Nutri-Score C, D or E [21].

In the present study in the German food retail sector, the foods in the Nutri-Score C, D, and E categories were 100% assigned to NOVA 4. But also over 90% of the products with Nutri-Score B and even 41% of the products with Nutri-Score A fell into the group of ultra-processed foods according to the NOVA classification (♦ Figure 4). These are, for example breakfast cereals, vegan yogurt alternatives or frozen potato products (e.g., wedges).

The Nutri-Score is not designed to consider the degree of processing and packaged foods labeled with a Nutri-Score may therefore occupy different classifications in the NOVA system. However, the results of the present study show that a comparably high proportion even of the favorable Nutri-Score labels are found on ultra-processed foods.

Examples of products with the same favorable Nutri-Score within a category but very different levels of processing are fruit yogurts: There are low processed fruit yogurts with a favorable Nutri-Score rating that consist of few ingredients such as yogurt and fruit and provide additional nutrients due to the fruit content.

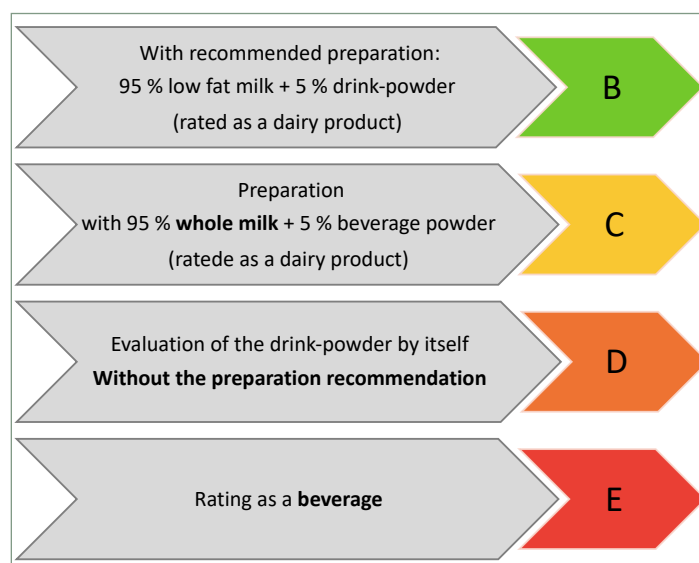


Abb. 5: Nutri-Score for a chocolate drink-powder depending on the preparation method [mod. nach (20)]

On the other hand, there are also those with a likewise favorable Nutri-Score that contain cosmetic additives such as colorings and flavorings in order to save on expensive ingredients such as fruit.

Since both products within a product category have the same Nutri-Score, consumers consider them to be of equal nutritional value. However, this shows that possible negative effects due to increased consumption of ultra-processed foods are in some cases not considered in the concept of the Nutri-Score. For example, the current failure to consider additives and highly processed ingredients in the calculation of the Nutri-Score means that e.g. an apple spritzer made of natural ingredients receives a Nutri-Score of C, while a sugar-free lemonade with coloring, flavoring, and sweeteners can be labeled with a better Nutri-Score B.

Equally, examples to show the opposite can be found where foods have an unfavorable Nutri-Score without necessarily being ultra-processed. For example, there are products such as ketchup or tomato sauce that do not use indicators of ultra-processing such as modified starch, thickeners and sweeteners and are therefore not classified as ultra-processed foods, but due to a high salt and sugar content they fall into the Nutri-Score category for the lowest nutritional quality.

Linking the conceptual differences of the Nutri-Score and NOVA classification should be considered in response to the above-mentioned "gaps" in the assessment, as well as the increasing evidence for health risks associated with consumption of ultra-processed foods. Thereby, the presumed mechanisms for ultra-processed foods are partly consistent with the Nutri-Score dimension (nutritional quality) and, in addition to poor carbohydrate and fat quality and low nutrient density [22], relate primarily to an altered food matrix, which shows an influence on satiety and glycemic index [23], as well as the presence of processing- and packaging-dependent contaminants (e.g., trans fatty acids, phthalates, bisphenols) [24, 25]. Additives frequently present in ultra-processed foods have been associated with adverse health effects, although to date these have so far been studied almost exclusively in animal studies and are discussed controversial [26–28].

One way to integrate the degree of processing of food into the algorithm for calculating the Nutri-Score is the Siga classification [13]. This is an extended form of the NOVA system with additional subgroups, in which so-called mark-





ers for ultra-processing such as additives, highly processed ingredients such as maltodextrin, and ultra-processing of the end product are taken into account [13, 29].

## Limitations

The data collection in the three food retail markets and the online store was not performed strictly simultaneously over a period of 3 months, which could have led to a bias in the results, especially in the dynamic initial phase of the introduction of the Nutri-Score. In addition, EDEKA (Edeka Group), the food retailer with the highest sales in Germany, was not considered, which may also have influenced the results. After the end of the data collection, some food retailers announced the introduction of the Nutri-Score on their retail-branded items and explicitly advertise this. Therefore, it can be assumed that in the meantime more products overall and proportionately more retail-branded products are labeled with the Nutri-Score.

In addition, the food classification according to the degree of processing in this study may be incorrect because the OpenFoodFacts database was used to determine the NOVA classification.

This database processes nutritional information and ingredients of foods and beverages provided by users. Incorrect entries may have caused incorrect NOVA levels to be displayed.

the NOVA system based on food processing. The NOVA classification considers the use of additives such as emulsifiers, stabilizers, preservatives or colorants and flavorings and other markers of ultra-processing. If manufacturers change their recipes to advertise a better Nutri-Score, there could be an increased use of additives to maintain taste, consistency and a long shelf life that is not reflected by a change in the Nutri-Score. To combat this, the degree of processing should be integrated into the Nutri-Score.

## Conclusion and outlook

The implementation of the Nutri-Score is an important step towards helping consumers choose healthier alternatives. A complete and thus mandatory labeling of all packaged foods, as proposed by the EU Commission in the context of the "Farm to Fork" strategy [30], would be desirable.

Food retail surveys should be repeated periodically to evaluate how the implementation of the Nutri-Score is progressing and to investigate whether the prevalence of the labeling with the unfavorable Nutri-Score D and E levels is increasing as suspected and as shown in France. At the same time, prospective studies should investigate the actual health effects associated with the application of the Nutri Score.

However, it should be considered to include other health-related criteria in the calculation of the Nutri-Score. For example, a diet, containing more plant-based foods and less meat is associated with both, better dietary quality and with a lower environmental impact [31]. The so-called Eco-Score is intended to indicate exactly this environmental impact of food and is already labeled on some food packaging in France. A European citizens' initiative is even calling for a mandatory labeling throughout Europe [32], which could also be communicated as an additional aspect in the Nutri-Score. This would have the advantage that consumers would not be overwhelmed by another, new label.

In terms of optimizing nutritional quality, more attention should be drawn to the degree of food processing. Therefore, the classification of foods according to the Nutri-Score was compared with




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**Conflict of interest**

The authors declare that there is no conflict of interest.

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