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ORIGINAL ARTICLE

A method to improve the nutritional quality of foods and beverages based on dietary recommendations

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Objective: The increasing consumer interest in health prompted Unilever to develop a globally applicable method (Nutrition Score) to evaluate and improve the nutritional composition of its foods and beverages portfolio.
Methods: Based on (inter)national dietary recommendations, generic benchmarks were developed to evaluate foods and beverages on their content of trans fatty acids, saturated fatty acids, sodium and sugars. High intakes of these key nutrients are associated with undesirable health effects. In principle, the developed generic benchmarks can be applied globally for any food and beverage product. Product category-specific benchmarks were developed when it was not feasible to meet generic benchmarks because of technological and/or taste factors.
Results: The whole Unilever global foods and beverages portfolio has been evaluated and actions have been taken to improve the nutritional quality. The advantages of this method over other initiatives to assess the nutritional quality of foods are that it is based on the latest nutritional scientific insights and its global applicability.
Conclusions: The Nutrition Score is the first simple, transparent and straightforward method that can be applied globally and across all food and beverage categories to evaluate the nutritional composition. It can help food manufacturers to improve the nutritional value of their products. In addition, the Nutrition Score can be a starting point for a powerful health indicator front-of-pack. This can have a significant positive impact on public health, especially when implemented by all food manufacturers.
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Keywords: nutritional quality; benchmarks; trans fatty acids; saturated fatty acids; sodium; sugars

Introduction

The increasing consumer interest in health prompted Unilever to develop a globally applicable method to evaluate and improve the nutritional composition of foods and beverages.

In general, measures of nutritional quality are mainly focused on total diets only (Huijbregts *et al*., 1995; Kennedy *et al*., 1995; Kant, 1996; Haines *et al*., 1999; Basiotis *et al*., 2002; Trichopoulou *et al*., 2003). Attempts have been made to define the nutrient quality of individual foods (Guthrie, 1977; Hansen *et al*., 1979) and local nutrient profile systems are available to assess the nutritional quality of food products, such as the New Zealand 'Pick the Tick' (The National Heart Foundation of New Zealand, 2002), the 'Health Check' by the Heart and Stroke Foundation of Canada and the 'Food Certification Program' by the American Heart Association. Recently, also the Food Standards Agency (UK) launched a nutrient profiling method (Rayner *et al*., 2005). Disadvantages of these methods are that they are limited in global applicability because they are based on local legislation, food intake data and/or dietary recommendations. Legislation is not *per se* based on the latest scientific insights on healthy eating and can be very different between countries. Food intake data do not *per se* indicate a healthy diet and data change whenever food consumption patterns change. Furthermore, most of the methods make use of benchmarks per product category, which are often country- or culture-specific. To be able to apply the method to all foods globally, this would require a

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very large number of product categories, some of which would need to be country-dependent. This would make the use of such systems globally relatively complex to apply. Another issue of some of the methods is the use of criteria per serving size, making global applicability challenging, as there are no defined global serving sizes. Some local nutrient profile systems leave out specific product categories from assessment (e.g. carbonated beverages, snacks and sauces), the reason given is that these products would by definition not fit in a healthy diet. Such products can contribute significantly to a lower nutritional quality of the diet when they have a suboptimal composition.

Our aim was to develop a globally applicable method (Nutrition Score) to evaluate and improve individual foods and beverages for their nutritional composition. The choice of the nutrients for the Nutrition Score is in line with currently available scientific consensus on nutrients with undesirable health effects. The method for determining acceptable levels has been based on (inter)national, generally accepted dietary recommendations. We have applied the method on Unilever's whole global foods and beverages portfolio to improve the nutritional quality. We believe the method can be applied to any product portfolio, which will help food manufacturers to develop healthier alternatives. This could have a significant impact on the nutritional quality of the overall diet.

Development of the Nutrition Score

Selection of nutrients

The report of the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) provides an overview of the strength of evidence for dietary factors related to undesirable health outcomes based on the latest scientific insights. Only nutrients with convincing undesirable health effects were selected as key nutrients in the Nutrition Score. This is the case for trans fatty acids, saturated fatty acids, sodium and sugars. The selection of these nutrients is in line with the WHO Global Strategy on Diet, Physical Activity and Health (2004), recommending the private sector to limit the levels of trans fatty acids, saturated fatty acids, salt and free sugars in existing products. A summary of the scientific evidence for each nutrient is presented in Table 1.

Translation of dietary recommendations into generic nutrient benchmarks for individual products

As no generic and global food-specific benchmarks are currently available, (inter)national generally accepted dietary recommendations formed the basis of the development of the Nutrition Score generic benchmarks. These benchmarks are conversions of dietary recommendations based on an average daily calorie intake. This was estimated to be 2250 kcal for healthy adults based on an average of the energy intake and recommendations that exist globally (Joint FAO/WHO/UNU Expert Consultation on Energy and Protein Requirements, 1985; US Department of Agriculture, Agricultural Research Service, 1997; McLennan and Podger, 1998; Voedingscentrum, 1998; Volatier, 2000; Gezondheidsraad, 2001; Institute of Medicine, 2002a; Mensink, 2002; Food Standards Agency, 2003).

For each of the four nutrients, three categories have been defined. The cutoff level between the first and second category has been based on more stringent global dietary recommendations, such as those of the Joint WHO/FAO

Table 1 Health effects of trans fatty acids, saturated fatty acids, sodium and sugars as described by the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003)

Nutrient	*Health risk*	*Effects*	*Comments*
Trans fatty acids	Coronary heart disease (convincing)	Total cholesterol (up) LDL-cholesterol (up) HDL-cholesterol (down)	No difference between trans fatty acids in dairy products (ruminant) and industrially hydrogenated fats (Weggemans *et al*., 2004)
Saturated fatty acids	Cardiovascular diseases (convincing) Type II diabetes (probable)	Total cholesterol (up) LDL-cholesterol (up)	There is no scientific basis to make a distinction between stearic acid (18:0) and other saturated fatty acids. Stearic acid (18:0) does not raise total and LDL cholesterol but may increase blood clotting tendency (Bladbjerg *et al*., 1995; Bear *et al*., 2004)
Sodium	Cardiovascular diseases (convincing)	Blood pressure (up)	
Sugars	Dental disease (convincing) Obesity (probable)	Dental caries (up)	Probable evidence for an association of sugar-sweetened soft drinks and fruit juices with obesity ('empty calories') and convincing evidence for dental disease (Joint WHO/FAO Expert Consultation, 2003) High pressure from consumers and (inter)national recommendations to lower sugar intakes

Abbreviations: HDL, high-density lipoprotein ; LDL, low-density lipoprotein.

Table 2 Overview of available (inter)national dietary recommendations for trans fatty acids, saturated fatty acids, sodium and sugars

Country	*Fat (% total energy intake)*	*Key nutrients*			
		Trans fatty acids (% total energy intake)	*Saturated fatty acids (% total energy intake)*	*Sodium (g/day)*	*Sugars (% total energy intake)*
Australia (National Health & Medical Research Council, 2003)			8[a]		
Belgium (De Hoge Gezondheidsraad, 2003)	30	1 (goal = 0)	10	2	
Brazil (Guia Alimentar Para A População Brasileira, 2005)	15–30	<1	10	2	
Canada (Institute of Medicine, 2002a, b)	20–35		10	1.5[b]–2.3[c]	25[d]
Czech Republic (Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases, 2003)	15–30	1	10	2	10[e]
Eurodiet (Ferro Luzzi *et al.*, 2001)	30	2	10	2.4	
France (CNERNA-CNRS, 2001)	30–35		8	2.4–3.2	10
Germany, Austria and Switzerland (Deutsche Gesellschaft für Ernährung, Österreichische Gesellschaft für Ernährung, Schweizerische Gesellschaft für Ernährung, Schweizerische Vereinigung für Ernährung, 2000)	30	1	10	2.4	
Italy (Soicieta Italiana di Nutrizione Umana, 1996)	25	<5 g	7–10	2.4	15
Mexico (Recommended Dietary Allowances for Energy, Vitamins and Minerals for Mexicans, 1997)	25		10		10
Netherlands (Gezondheidsraad, 2001)	20–40	1	10	3.6	
New Zealand (Food and Nutrition Guidelines for Healthy Adults, 2003)	30–33		12[a]	0.92–2.3	15
Nordic (Denmark, Finland, Norway, Sweden) (Nordisk Ministerråd, 1996)	30	1	10	2	10
Poland (Polish National Food and Nutrition Institute, 2001)	25–30			0.575[f]	
Portugal (Conselho Nacional de Alimentação, Comissãde Educação Alimentar, 1997)	30		10	2.4	20–30 g
Singapore (Ministry of Health Singapore)	20–30		1/3rd total fat	2	
South Africa (Nutrition Information Centre, University of Stellenbosch, 2002)	20–35				25[d]
Spain (Departamento de Nutricion de la Facultad de Farmacia de la Universidad, 1994).	30–35		7–8	2.4	
United Kingdom (Report of the Panel on Dietary Reference Intakes of the Committee on Medical Aspects of Food Policy, 1991)	35	2	10	2.4	10[g]
United States of America (Institute of Medicine, 2002a, b)	20–35		10	1.5[b]–2.3[c]	25[d]
WHO/FAO (Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases, 2003)	15–30	1	10	2	10[e]

[a]Including trans fatty acids.
[b]Adequate intake.
[c]Upper limit.
[d]Added sugars (maximal intake level (no dietary recommendation given)).
[e]Free sugars.
[f]Minimum requirement.
[g]Non-milk extrinsic sugars.

Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) (see Table 2) for two main reasons:

(1) These recommendations have been set as global guidelines and can therefore be applied to all food and beverage products globally.
(2) These recommendations were published more recently and are based on the most recent scientific evidence.

The cutoff levels between the second and third category are based on the higher end of a range of national dietary recommendations (see Table 2). These benchmarks have been set as a first step to stimulate food innovation into the healthy direction. For technological or consumer acceptance reasons, it is not always feasible to meet the more stringent benchmarks at once. However, in the future the aim is to move these upper benchmarks toward the lower benchmarks based on the more stringent global dietary recommendations.

The specific rationale for the generic benchmarks and the cutoff levels of each nutrient will be discussed below.

In general, all product nutrient data should be scored 'as sold', as this is within the responsibility of the food manufacturer. However, in case of powdered food and

beverage products that need a preparation step before they are ready for consumption it is relevant to collect the product's nutrient data 'as prepared' (using the on label cooking instructions). Examples of such dry and concentrated products are dry soups, broths, table sauces, meal sauces, dressings, shake powders, beverage mixes and meal kits.

Generic benchmarks

Trans fatty acids
Content benchmark. The most stringent dietary recommendations for trans fatty acids in daily diets are 1% of energy or less. This forms the cutoff value between the first and second category. Some national recommendations for trans fatty acids set a limit to the maximum of 2% of energy, which was used as a cutoff between the second and third category.

Saturated fatty acids
Content benchmark. The vast majority of dietary recommendations for saturated fatty acids in the daily diet are 10% of energy or less. This forms the cutoff value between the first and second category. National recommendations for saturated fatty acids vary between countries and sometimes combine trans fatty acids and saturated fatty acids levels in one recommendation. Most national recommendations for saturated fatty acids in the daily diet are maximally set at one-third of the total fat intake (Table 2). This would be approximately 13% of energy when taking the most liberal recommendation for total fat of 40% of energy (Gezondheidsraad, 2001). This percentage has been set as the cutoff between the second and third category.

Quality of fat benchmark. Apart from the amount of calories provided by saturated fatty acids in a product, the quality of the fat is important as well. This is measured by assessing the level of saturated fatty acids relative to the total fat content (as % of total fat). The Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) recommends a maximum of one-third of total fat to be saturated fatty acids, which is similar to the local nutrient profile system of Finland (Kinnunen, 2000). This level defines the cutoff level between the second and third category. Ideally, the fat quality should even be higher, with only one-fourth (25%) of the total fat delivered by saturated fatty acids, which is in line with the local nutrient profile system of New Zealand (The National Heart Foundation of New Zealand, 2002). This level resembles the fatty acid profile of the healthier oils and fats which generally have a saturated fatty acids content below 25 energy percent (e.g. olive oil 14% and sunflower oil 10% (US Department of Agriculture, 2002)) and is selected as the cutoff level between the first and second category.

Sodium
Content benchmark. Dietary recommendations for sodium are given in absolute daily amounts. Therefore, an additional step was needed to convert the daily recommended dietary levels to a level that is applicable for an individual product. For the cutoff level between the first and second category, the frequently used dietary recommendation of 2000 mg sodium/day was divided by the average daily energy intake for healthy adults (2250 kcal). This resulted in a cutoff value of 0.9 mg sodium/kcal. For the cutoff level between the second and third category, the highest national sodium intake recommendation was used (i.e. 3600 mg/day), which also resembles the average Western sodium intake (Australian Bureau of Statistics, 1995; US Department of Agriculture, 1997; Voedingscentrum, 1998; Mensink *et al*., 2000; Volatier, 2000; Food Standards Agency, 2003). With an average daily energy intake for healthy adults of 2250 kcal, this resulted in a cutoff level of 1.6 mg sodium/kcal.

Sugars
Content benchmark. Various different dietary recommendations for sugars have been published. The Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) did not define a goal for total sugars but used the concept of free sugars instead. The definition of free sugars was found difficult to apply in practice because it is unclear which ingredients are included and which excluded. Moreover, the chemical analysis of free sugars is currently not possible. Besides this, the undesirable effect of high sugar intake on dental caries, mentioned in the report of the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) as main reason to restrict sugars intake, is not limited to free sugars alone. Also, non-free sugars or intrinsic sugars contribute to dental caries. An alternative and probably more practical measure is the concept of total sugars (defined as all mono- and disaccharides). From dietary intake data, it is estimated that on average two-thirds of the total sugars intake comes from non-milk extrinsic sugars, which is comparative to the term free sugars (Food Standards Agency, 2003). The goal of the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) of 10% of energy for free sugars would therefore be equal to two-thirds of the goal for total sugars intake. This leads to a total sugar intake of 15% of energy (cutoff between the first and second category). For the cutoff between the second and third category, the maximal intake level (25% of energy) of the Food and Nutrition Board of the Institute of Medicine (Institute of Medicine, 2002a) was used.

Added sugars benchmark. Applying the benchmark of total sugars as % of energy to all types of products may sometimes be in conflict with current dietary advises to increase the consumption of fruits and vegetables and low-fat dairy

products. In these products, the majority of energy comes from (naturally present) sugars, but these products also provide a significant amount of micronutrients and fiber and can thus not be regarded as providing 'empty calories'. Therefore, apart from evaluating the level of total sugars, it is reasonable to also take into account the source of these sugars (naturally present and added) when scoring a product.

In the Nutrition Score, added sugars are defined as 'all caloric (>3.5 kcal/g) mono- and disaccharides from other sources than fruits, vegetables and dairy'. For the cutoff level between the first and second category, the recommendation of the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) of 10% of energy by free sugars (comparable to added sugar) was taken and multiplied by an average daily energy intake for healthy adults of 2250 kcal. In this way, the maximum allowed daily sugars intake (225 kcal divided by 4 kcal/g sugar = 60 g) was derived. A reasonable low level of added sugar per 100 g product was set at 5%, that is, 3/100 g. A similar calculation was carried out to define the cutoff level between the second and third category but then using the maximal intake level of the Institute of Medicine (25% of daily energy, i.e. 562.5 kcal). Then the maximum daily allowed sugar intake is 140 g (562.5 kcal divided by 4 kcal/g sugar), resulting in a cutoff level of 7 g added sugar (5% of 140 g) per 100 g product.

'Insignificant levels'

In products with low absolute levels of nutrients and calories, the generic criteria lead to unrealistic scores (e.g. trans fatty acids in dry soups, saturated fatty acids in unsweetened low-fat dairy products and naturally present sodium in vegetables). Therefore, not all nutrients in these low energy products could be scored by generic benchmarks. Specific benchmarks were developed for these, from a nutritional perspective, 'insignificant levels' of nutrients. An 'insignificant level' was defined as <5% of the daily allowed nutrient level in 100 g of food product. This percentage is based on a daily intake of 20 food servings (Federal Register, 1993). Details are given below.

Trans fatty acids. For the cutoff value between the first and second category, the level of 1% of energy from trans fatty acids was multiplied by an average daily energy intake for healthy adults (2250 kcal). In this way, the maximum daily allowed trans fatty acids intake of 2.5 g was derived (22.5 kcal divided by 9 kcal/g fat). Five percent of 2.5 g resulted in a rounded cutoff of 0.1 g/100 g. A similar calculation was carried out to define the cutoff level between the second and third category, using the highest national dietary recommendation for trans fatty acids (2% of energy). This resulted in a maximum daily allowed trans fatty acids intake of 4.5 g, resulting in a rounded cutoff of 0.2/100 g.

Saturated fatty acids. Similar calculations as for trans fatty acids were carried out to define the cutoff levels for saturated fatty acids. This resulted in a rounded cutoff between the first and second category of 1/100 g and between the second and third category of 2/100 g.

Sodium. For sodium an 'insignificant level' was defined as <2.5% of the daily allowed nutrient level in 100 g of food product, because <5% would be too liberal when taking into account the sodium levels naturally present in vegetables. A cutoff between the first and the second category of 50 mg/100 g was established, based on 2.5% of the daily sodium allowance from (inter)national dietary recommendations. A factor 2, as also apparent in the benchmarks of saturated fatty acids and trans fatty acids (see above), was applied to define the cutoff between the second and third category (100 mg/100 g).

Score per nutrient

Table 3 shows an overview of the generic benchmarks for each of the four nutrients. If multiple benchmarks are available for one nutrient (e.g. content and quality of fat for saturated fatty acids), the benchmark score in the highest category determines the final key nutrient score (category 1 dominates over category 2 and 3, category 2 dominates over 3). For example, for olive oil the quality of fat (14% of energy from saturated fatty acids: category 1) is the determinant for the benchmark score over the content of fat (100% of energy: category 3).

Final Product Nutrition Score

Using the Nutrition Score benchmarks, foods and beverages are classified for each of the four nutrients into one of three categories. The combination of the four-key nutrient scores gives the Final Product Nutrition Score:

(1) when all nutrients score in the first category, the product meets benchmarks based on the most stringent dietary recommendations, such as those set by the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003).
(2) when at least one nutrient is scoring in the second category whereas the others in the first category, the product meets benchmarks based on less stringent national dietary recommendations.
(3) when at least one nutrient is scoring outside the first or second category, the product does not meet benchmarks based on dietary recommendations.

Summarized, the lowest category and thus the least favorable score of the four-key nutrients determines the Final Product Nutrition Score.

Table 3 Generic Nutrition Score benchmarks to evaluate individual foods and beverages for their nutritional quality

Nutrient	*Benchmark*[a]	*Category 1 (based on global dietary recommendations)*	*Category 2 (based national dietary recommendations)*	*Category 3 (not meeting dietary recommendations)*	*Range of (inter)national dietary recommendations*	*Unit*
Trans fatty acids	Content	⩽1	1–2	>2	1–2	% of energy
Saturated fatty acids	Content	⩽10	10–13	>13	8–13	% of energy
	Quality	⩽25	25–33	>33		% of total fat
Sodium	Content	⩽0.9	0.9–1.6	>1.6	0.9–1.6[b]	mg/kcal
Sugars	Total sugars	⩽15	15–25	>25	10–25	% of energy
	Added sugars	⩽3	3–7	>7		g/100g

[a]If multiple benchmarks are available for one nutrient, the benchmark score in the highest category determines the final key nutrient score (category 1 dominates over category 2 and 3, category 2 dominates over category 3).
[b]Based on an average daily energy intake of 2250 kcal.

Applying the Nutrition Score: from theory to practice

The application of the generic benchmarks, based on dietary recommendations, to the global Unilever foods and beverages portfolio, demonstrated that some generic benchmarks could not be applied to a very limited number of product categories. Certain products did not meet dietary recommendations because of nutrient characteristics that are inherent to the type of product (products with a low calorie density and a preferred savory taste, e.g. sodium in soup). In ice cream and water ice, sugar is essential to influence freezing properties to produce palatable products. To assess the nutritional quality of such products, refinement of the generic benchmarks was necessary and product category-specific benchmarks were developed for sodium and sugars. The cutoff levels for the three categories of the product category-specific benchmarks for sodium were based on local nutrient profile systems, for sugars they were based on product properties/technological factors. The specific rationale will be discussed below.

Product category-specific benchmarks

Sodium

The generic sodium benchmark could not be applied to low energy dense foods (soups, sauces) and small portion size foods with preferred savory taste (spreads as underlayer, mustards and other dressings). The savory taste is key/inherent to these type of products and requires a relatively high sodium level compared to the energy levels in such products. For example, soup contains around 50 kcal/100 g, applying the generic sodium benchmark of 1.6 mg/kcal would allow 80 mg of sodium to be present in 100 g soup. This would lead to products with an unacceptable taste and therefore there would not be any incentive for food manufacturers to optimize product formulations toward a healthier composition.

Local nutrient profile systems (such as the New Zealand 'Pick the Tick' and the Canadian 'Health Check') use sodium levels per product group as a basis for approval. The average levels for sodium of available local nutrient profile systems (American Heart Association. Food Certification Program – heart-check mark; Hammink, 2003; Heart and Stroke Foundation. Health Check. Canada; Heart Foundation South Africa. The Heart Mark; Kinnunen, 2000; The National Heart Foundation of New Zealand, 2002; UK salt intakes: Modelling salt reductions), expressed per 100 g product, were taken to define the cutoff levels between the first and second category for sodium for these product groups. The ratio between the highest national intake recommendation for sodium and the goal of the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) (3600/2000 mg = 1.8) was applied to obtain the cutoff levels between the second and third category for these product groups.

Also for meal replacement products, the generic sodium benchmark could not be applied. Meal replacement products are positioned at overweight people who aim at weight management. This matches with a daily energy intake that is generally lower than that of the average population. Instead of the 2250 kcal/day, calculations were made with 1500 kcal/day (Heymsfield *et al*., 2003). Sodium cutoff levels for meal replacement products are thus 1.3 mg/kcal between the first and second category and 2.4 mg/kcal between the second and third category. These cutoff levels are thus higher than for non-diet products as fewer calories are consumed, although sodium recommendations remain the same.

Sugars

In frozen desserts and edible ice (including ice cream and water ice), sugar has technical properties that are essential for the structural characteristics of these products, which means that it is required to have a certain amount of sugars present in the product. Adhering to the

generic benchmarks for sugars would make it impossible to produce frozen desserts and edible ice with preferred product properties.

The product category-specific benchmarks were set for added sugars and not for total sugars to allow for and stimulate the use of fruit and low-fat dairy as ingredients. Products belonging to the edible ice category typically have levels of sugars around 25 g per 100 g of product, mostly consisting of added sugars. Although challenging, it would be technically feasible to reduce these levels by one-third, therefore, setting the cutoff level at 17 g of added sugars per 100 g of product between the second and third category. The lower benchmark level was defined as a reduction by two-thirds, thereby allowing 8 g of added sugars per 100 g of product (cutoff level between first and second category).

Table 4 shows an overview of the product category-specific Nutrition Score benchmarks.

Figure 1 gives a schematic overview on how the Nutrition Score was developed. Product category-specific benchmarks are only developed when it is impossible for all foods or beverages in that product category to meet a Final Product Nutrition Score in category 1 or 2. However, regulations, food intake patterns or the role of a product in a diet should

Table 4 Product category-specific Nutrition Score benchmarks. Benchmark for only one specific nutrient (sodium or sugars), other three nutrients scored with generic benchmarks

Nutrient	*Product category*	*Products*	*Category 1*	*Category 2*	*Category 3*	*Unit*
Sugars	Frozen desserts and edible ice with preferred product properties	Edible ice, added sugars	⩽8	8–17	>17	g/100 g
Sodium	Low energy dense foods with preferred savory taste	Soups	⩽200	200–360	>360	mg/100 g
		Meal sauces	⩽300	300–540	>540	mg/100 g
		Table sauces	⩽600	600–1080	>1080	mg/100 g
	Small portion size foods with preferred savory taste	Spreads	⩽400	400–720	>720	mg/100 g
		Dressings	⩽600	600–1080	>1080	mg/100 g
	Foods consumed as part of a weight management plan[a]	Meal replacement (weight management) products[a]	⩽1.3	1.3–2.4	>2.4	mg/kcal

[a]Positioned at overweight people who aim at weight management, does not include light products.

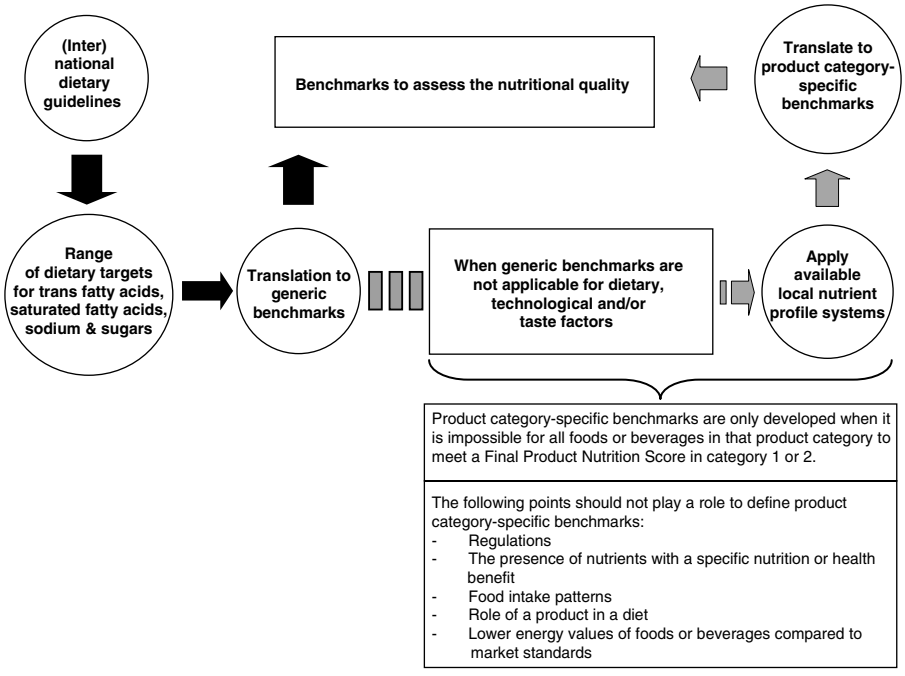

Figure 1 Schematic overview of the Nutrition Score methodology.

Table 5 Examples of products scored with the Nutrition Score

Product	*Trans fatty acids*	*Saturated fatty acids*	*Sodium*	*Sugars*	*Final product Nutrition Score*[a]
Milk (skimmed) (Voedingscentrum, 2001)	■	■	■	■	■
Milk (full fat) (Voedingscentrum, 2001)	▒		■	■	
Bread, brown, average (McCance *et al*., 2002)	■	■		■	
Chicken roasted (McCance *et al*., 2002)	■	▒	■	■	▒
Mince from beef, stewed (McCance *et al*., 2002)			▒	▒	
Egg (boiled) (Voedingscentrum, 2001)	■	▒	▒	■	▒
Apple (Voedingscentrum, 2001)	■	■	■	■	■
Potato (boiled) (McCance *et al*., 2002)	■	■	■	■	■
Clear vegetable soup (Voedingscentrum, 2001)	■	■	▒	■	▒
Frozen meal (spinach and ricotta cheese ravioli in tomato sauce) (Unilever)	■	▒		■	
Olive oil (Extra Vergine) (Unilever)	■	■	■	■	■
Tomato-based pasta sauce (capri sundried tomato, garlic and oregano) (Unilever)	■	■	▒	■	▒
Liquid margarine (Unilever)	■	■	■	■	■
Wrapper margarine (Unilever)	■		■	■	
Leaf tea (Unilever)	■	■	■	■	■
Carbonated drink (Unilever)	■	■	■		
Carbonated drink diet (Unilever)	■	■	■	■	■
Mayonnaise (Unilever)	■	■	▒	■	▒
Ice cone (Unilever)	■		■		
Water ice (Unilever)	■	■	■	▒	▒
Asparagus cream soup (Unilever)	■			■	
Onion soup (Unilever)	■	■	▒	■	▒

[a]The combination of the four-key nutrient scores gives the Final Product Nutrition Score; the lowest category and thus the least favorable score of the four-key nutrients determines the Final Product Nutrition Score.
■ Category 1 (based on global dietary recommendations).
▒ Category 2 (based on national dietary recommendations).
□ Category 3 (not meeting dietary recommendations).

not be reasons to generate product category-specific benchmarks, as these are not based on dietary recommendations. In addition, lower energy values of foods or beverages compared to market standard should also not be a reason to generate product category-specific benchmarks, as the Nutrition Score is a system to judge quality of calories, not quantity of calories. Furthermore, the presence of nutrients with a specific nutrition or health benefit (e.g. vitamins, minerals, phytosterols, probiotics) should never be a reason to generate product category specific-benchmarks, because nutrients with a beneficial health effect can, to our opinion, never compensate for a high level of a nutrient with an adverse health effect.

The Nutrition Score benchmarks were subsequently used to score all food and beverage products from the global Unilever portfolio (>17 000 products).

More than 80% of the nutrients of Unilever's whole global foods and beverages portfolio are scored with the generic benchmarks, the remaining with product category-specific benchmarks. Table 5 shows some examples of products scored with the Nutrition Score.

Discussion

With the Nutrition Score we have shown that, without major adaptations, it is possible to translate (inter)national dietary recommendations into generic benchmarks that can define the nutritional quality of individual foods and beverages. For a limited number of product categories, we had to develop product category-specific benchmarks based on local nutrient profile systems or product properties to make the method applicable for all foods and beverages. Overall, the Nutrition Score is the first simple, transparent and straightforward method that can be applied globally and across all food and beverage categories to evaluate the nutritional composition and steer toward more optimal nutrient composition. We would like to stress that the upper

benchmarks, which are based on the higher end of national dietary recommendations, should only be considered as a first step to stimulate food innovation into the healthy direction. In the future, the aim is to move these upper benchmarks toward the lower benchmarks based on the more stringent global dietary recommendations.

We have proven the applicability of the Nutrition Score by evaluating all food and beverage products from the global Unilever portfolio (>17 000 products). The outcome gave clear direction for nutritional improvements. In 2005 and 2006, the company aims to remove in total 15 000 tons of trans fatty acids; 10 000 tons of saturated fatty acids; 2000 tons of sodium and 10 000 tons of sugar from their products. Reductions of these nutrients will positively influence public health. For example, reducing the sugar content of a carbonated beverage currently on the market from category 3 to category 2 (from 8/100 to 7/100 g), would yearly lead to a 17 million kg lower sugar intake (68 billion kcal). This could result in a body weight loss of 9.5 million kg.

The choice of the nutrients for the Nutrition Score is in line with currently available scientific consensus on nutrients with undesirable health effects. In the light of the global obesity epidemic, we as well aimed to include a benchmark for energy quantity to the Nutrition Score. However, energy differs from the four-key nutrients in the Nutrition Score, as it is not possible to come up with one generic benchmark for energy because of the large variation in serving size and energy density between product categories. Energy benchmarks for each product category would be required, which is not in line with our aim to develop a simple, transparent and straightforward method that can be applied across all food and beverages categories. Also it lacks clear direction as what optimal energy levels are. The complexity is indicated by the fact that the majority of other available methods do no include energy as criterion.

Other benchmarks we considered for the Nutrition Score were glycemic index/glycemic load and dietary cholesterol. The evidence of glycemic index or glycemic load on health effects is accumulating but currently not conclusive (Augustin *et al*., 2002; Pi-Sunyer, 2002), and therefore this measure has not been included in the Nutrient Score. The scientific consensus on the health impact of dietary cholesterol on cardiovascular disease is less strong compared to saturated fatty acids and trans fatty acids and therefore has not been included as a key nutrient in the Nutrition Score. If scientific consensus on these concepts or other nutrients would change, the Nutrition Score can be adapted accordingly.

The Nutrition Score is based on (inter)national dietary recommendations for the general population. From a nutritional point of view, there is little substantiation for making distinct benchmarks for the four-key nutrients for children (excluding infants) than for adults. For benchmarks expressed as % of energy, that is, trans fatty acids, saturated fatty acids and sugars, there is no need for different benchmarks. The advice of the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases (2003) for sodium is in general for the global population, only few sodium recommendations exist specifically for children (Scientific Advisory Committee on Nutrition, 2003). Based on specific energy and sodium recommendations for children, the cutoff levels for children are comparable to the current benchmarks (ranging from 0.6 to 1.1 mg/kcal (depending on the country and the age of the child)). If calculated with specific energy recommendations for children (Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases, 2003; Scientific Advisory Committee on Nutrition, 2003), the cutoff levels of added sugars are similar to the current benchmarks (ranging from 2 to 7 g/100 g). Based on these data, it seems pragmatic and reasonable to use the same benchmarks for products targeted at children or families.

The Nutrition Score is easy to apply, as the benchmarks are generic and expressed in general units (% of energy, per 100 g product or mg/kcal). The use of different benchmarks per food category was disadvantaged, because there is no globally agreed food groups structure. Benchmarks 'per serving' (as choice of base) were disadvantaged, as there are no globally defined serving sizes.

Summarizing, the Nutrition Score is the first simple, transparent and straightforward method that can be applied globally and across all food and beverages categories to evaluate the nutritional composition. We believe, the method can be applied to any product portfolio, which will help food manufacturers to develop healthier alternatives. In addition, in the current era with increasing consumer interest in health, the Nutrition Score can be a starting point for a powerful health indicator front-of-pack. This can have a significant positive impact on public health, especially when implemented by all food manufacturers.

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