

# Development of a valid, yet simple and easy nutrition profiling model

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Report from the National Food Institute, Technical University of Denmark

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# Summary

Nutrient profiling models have been proposed as a labelling system that can help consumers choose a healthy diet.

The objective of the present study was to develop a nutrient profiling model that is simple and easily understandable, but still scientific valid. The prerequisite for the model is that it is usable for all foods and helps the consumers choose a healthy diet in accordance with the dietary guidelines.

Dietary intake data from the national dietary survey were modelled to a diet that fulfils the official dietary guidelines and nutrient recommendations. All foods were divided into food groups and ranked in relation to their nutritional impact on the total diet. With this approach all food groups were divided into categories based on their content of selected nutrients, comprising the key nutrients in a Danish diet: fat, saturated fat, sugar and dietary fibre.

The present modelling provided a nutrient profiling model with 11 food groups and 3 categories. Thresholds for content of 4 nutrients were laid down in a way symbolising the relative quantity of foods that can be eaten within a healthy, varied diet that fulfils the nutrient recommendations.

The proposed nutrient profiling model describes the relative amount of any foods that can be included in a healthy diet. It can be used for practically all foods. Few exceptions from the cut off values dividing foods into categories are inevitable but in general the model is simple and easily understandable. As a supplement to basic nutritional knowledge the model is useful for most consumers with normal nutritional needs. Calculations show that a diet composed of foods from all categories meet the Nordic Nutrition Recommendations.

# Introduction

From a nutritional point of view, all foods can be included in a healthy diet, as long as the amounts of different foods are balanced according to their nutrient content and their contribution to the daily nutrient intake according to the nutrient recommendations. Thus, a labelling system that grades all foods based on their contribution to a healthy diet can be helpful for the consumers in their food choices. The European Union has suggested nutrient profiling systems as a prerequisite for foods being fortified and for foods carrying nutrition or health claims (1, 2). In the US, nutrient profiling systems are used for foods carrying health claims (3). Nutrient profiling has also been proposed in Sweden, UK, and The Netherlands as an attempt to develop a labelling system that can help consumers choose a healthy diet (4, 5, 6).

Many countries have nutrient recommendations, which are either specific for that country or shared with other countries. Nutrient recommendations are difficult for consumers to relate to, because they normally think of foods rather than nutrients eaten. Therefore, most countries have “translated” the nutrient recommendations into foods, and the advice about nutrient intake is expressed in food based dietary guidelines. According to the Danish national dietary survey, only a small proportion of the Danish population follows the Danish dietary guidelines (7). Even though many consumers are aware of the importance of eating a healthy diet, many find it difficult to implement as part of their everyday life. Difficulties in assessing the value of the individual foods in the context of the total diet are possibly part of the problem. Dietary variety i.e. consumption of foods from each of the basic food groups (dairy products, meat and fish, fruit and vegetables, and cereals) and consumption of a variety of foods within these food groups, increases the probability of nutrient adequacy (8). Each food group provides a wide array of nutrients in substantial amounts and it is important to include items from most food groups in a balanced daily diet.

The average Danish diet contains too much fat, especially saturated fat, too much sugar and not enough dietary fibres, whereas the content of micronutrients in general fulfils the Nordic Nutrition Recommendations (NNR) (7, 9). Therefore fat, saturated fat, sugar and dietary fibres are considered key nutrients and included in the Danish nutrient profiling model.

National Food Institute, Technical University of Denmark, Department of Nutrition was asked by the Danish Veterinary and Food Administration to prepare a proposal for a nutrition labelling model that could help Danish consumers choose a healthy diet. The requirement for the model was that it should be simple, easy to understand, and it should be applicable to all foods. The aim of the present work was to develop a nutrient profiling model that fulfils the demands for a simple and easily understandable, but still scientifically valid, nutritional basis in accordance with the official Danish dietary guidelines for labelling all foods in order to help the consumers choose a healthy diet.

# Methods

The official dietary guidelines for Denmark have recently been updated (10) and are now expressed as the Dietary Guidelines (DG) (table 1). These guidelines are the base for the present nutrient profiling model.

Table 1. The Danish Dietary Guidelines 2005 (10).

- 
1. Eat fruit and vegetables – 6 pieces/portions per day
  2. Eat fish and fish products – several times a week
  3. Eat potatoes, rice or pasta, and wholegrain bread – every day
  4. Limit intake of sugar – particularly from soft drinks, confectionary and cakes
  5. Eat less fat – particularly fats from meat and dairy products
  6. Eat a varied diet – and maintain a healthy body weight
  7. Drink water when you are thirsty
  8. Engage in physical activity – at least 30 minutes per day
- 

The starting point for the diet modelling was an average, Danish diet for adults, as identified from the national dietary survey 2001 (11). The number and amounts of individual foods used in the modelling refer to this dietary survey. Thus, all types of foods and beverages were included, both “healthy” and “less healthy” foods. Food groups were constructed from the DG and dietary intake data, which resulted in 8 food groups with similar nutritional and/or usable characteristics central for a Danish diet (table 2).

“Ready-prepared dishes” include foods from several basic food groups, and thus is given its own food group. “Desserts, confectionary and snacks” are combined in one food group, while “Fats and sauces” are divided in two groups, resulting in a total of 11 food groups for the final profiling model (table 3).

Dietary intake data were modelled to a diet that fulfils the official DG (10) and NNR (9) with the exception of vitamin D and iron (for women), resulting in a basic diet (category-1 diet). Several scenarios, where foods from the basic diet were exchanged with their fatter and/or sweeter counterparts, were evaluated, resulting in two additional types of diets, which also meet the NNR (called category-1-2 diet and category-1-2-3 diet). All foods used in the national dietary survey were ranked in relation to their nutritional impact if entered into a diet that fulfils the DG and nutrient recommendations. This ranking was used to place all foods in three main categories, based on their content of fat and saturated fat, and – when relevant – sugar and fibres. Thus, the three categories symbolise the relative amount of the food that can be eaten within a healthy, varied diet. The three categories designated: Category 1 – “Most”, category 2 – “Less”, and category 3 – “Least”, thus mainly allow comparison of foods within food groups but comparisons between food groups can be made.

Table 2. A food intake pattern (based on 10 MJ/day) fulfilling nutrition recommendations and dietary guidelines dividing foods into categories indicating their importance in the diet. Figures in brackets indicate recommended intake.

Category	Bread, cereals, potatoes, rice and pasta (500 g/day)	Fruits and vegetables (600 g/day)	Milk products (500 g/day)	Cheese (25 g/day)	Meat (100 g/day) Eggs (25 g/day)	Fish (35 g/day)	Fats and sauces (Maximum 25-30 g/day)	Beverages (1-1½ L/day)
1= Most	Pasta, wholegrain Bulgur Wholegrain bread Danish rye bread Oatmeal Some breakfast cereals and müsli without added sugar and fat  Boiled/baked potatoes <sup>1</sup>	All fruits and vegetable and fruit and vegetable products without added fat, sugar, and salt.	All milk and milk products without added sugar with ≤1.5% total fat and ≤1% saturated fat  Skim milk, buttermilk and some curdled milk products	All cheese and cheese products without added sugar with ≤15% total fat and ≤10% saturated fat  Some fresh cheese e.g. cottage cheese and white cheese	All meat and meat products with ≤10% total fat and ≤4% saturated fat  Ham, roast beef, chicken, turkey, some lamb cuts	All fish and fish products with ≥ 70% fish content and ≤10% total fat and ≤4% saturated fat <sup>2</sup>  Canned tuna in water or oil, cod roe Anchovy, in own oil	Sauces with ≤5% total fat and ≤1.5% saturated fat	All water e.g. tap water, mineral water still and sparkling.
2=Less	Pasta Rice Some breakfast cereals and müsli without added sugar and/or fat.  Some cornflakes brands Most brown and white breads Couscous	Fruit compote Unprocessed nuts Dried fruit	Milk without added sugar and ≤2.5% total fat and 1-2% saturated fat  Semi skimmed milk, some curdled milk products	Cheese, without added sugar, with 15-20% total fat and 10-13% saturated fat  Danbo cheese 30 <sup>+</sup> , some cheese spreads	Meat and meat products with 10-20% total fat and 4-7% saturated fat  Eggs	Fish products with 10-20% total fat and 4-7% saturated fat <sup>2</sup>  Some fried fish Mackerel in tomato sauce Pickled herrings  Any smoked fish e.g. smoked salmon, mackerel, cod roe	Plant oils Some soft plant based margarines	Pure fruit and vegetable juice

To be continued!

Table 2. Continued.

Category	Bread, cereals, potatoes, rice and pasta (500 g/day)	Fruits and vegetables (600 g/day)	Milk products (500 g/day)	Cheese (25 g/day)	Meat (100 g/day) Eggs (25 g/day)	Fish (35 g/day)	Fats and sauces (Maximum 25-30 g/day)	Beverages (1-1½ L/day)
3=Least	Breakfast cereals with added sugar and/or fat. Garlic breads Fast food breads Croissants and similar Biscuits and similar Cakes, fruit tarts  Fried potatoes <sup>1</sup>	Jam Pickled vegetables e.g. beet root, cucumbers	Full fat milk Cocoa milk Milk shakes Fruit yoghurt Cream and whipping cream Crème fraiche Milk-desserts	Full fat cheese and cream cheese Blue cheese Brie	Bacon Sausages Paté Pork rind Some meat cuts	Pickled herring in curry sauce Some fried fish Some fish pâté	Palm oil Butter Blended fat spread Some dressing and sauce Mayonnaise Some soft plant based margarines with >20% saturated fat	Soft drinks Cordials Cider Ice tea
Desserts not included in the other food groups								
Sweets, chocolate, marzipan, sugar, honey, syrup, ice cream, snacks								

1) Potatoes belong to the starchy food group “Bread and cereals” in the Danish Dietary Guidelines and in their placement in meals. But they are evaluated after the same thresholds as fruit and vegetables.

2) If the fat is natural content from the fish, it will be categorized as category-1.

Table 3. Division of foods in categories based on nutrient content (g/100 g) within different food groups.

Food group	Fat			Saturated fat			Sugar			Fibre <sup>1</sup>		
	Category			Category			Category			Category		
	1	2	3	1	2	3	1	2	3	1	2	3
Fruit and vegetables, potatoes and potato products <sup>2</sup>	natural content from fruit and vegetables	≤ 5	> 5	natural content from fruit and vegetables	≤ 4	> 4	0 <sup>7</sup>	≤ 10 <sup>7</sup>	> 10 <sup>7</sup>			
Bread and cereals	≤ 5 or natural content from cereals and seeds	≤ 10	> 10	≤ 1.5 or natural content from cereals and seeds	< 4	> 4	≤ 5 or natural content from cereals and dried fruit	≤ 10	> 10	≥ 6	≥ 3	< 3
Dairy products	≤ 1.5	≤ 2.5	> 2.5	≤ 1	≤ 2	> 2	0 <sup>7</sup>	≤ 5 <sup>7</sup>	> 5 <sup>7</sup>			
Meat, poultry, meat products, eggs	≤ 10	≤ 20	> 20	≤ 4	≤ 7	> 7						
Fish and fish products <sup>3</sup>	≤ 10 or natural content from fish	≤ 20	> 20	≤ 4	≤ 7	> 7						
Cheese	≤ 15	≤ 20	> 20	≤ 10	≤ 13	> 13						
Ready-prepared dishes <sup>4</sup>	≤ 5	≤ 10	> 10	≤ 1.5	≤ 4	> 4	≤ 5	≤ 10	> 10			
Sauces, salad dressings etc.	≤ 5	≤ 10	> 10	≤ 1.5	≤ 4	> 4						
Pure fats <sup>5</sup>				0	≤ 20% of total fat	> 20% of total fat						
Desserts, confectionary, snacks	≤ 5	≤ 10	> 10	≤ 1.5	≤ 4	> 4	≤ 5	≤ 10	> 10			
Beverages <sup>6</sup>	0	≤ 2.5	> 2.5	0	≤ 2	> 2	0	≤ 5	> 5			

1) Fibre contents only relevant for the bread and cereal group. Rice is placed in category 2.

2) Unprocessed products (can be cleaned, cut up, cooled, frozen) are labelled category 1. Dried fruit and nuts are labelled category 2.

3) Fish products in category 1 must contain at least 70% fish.

4) Fruit or vegetables must make up at least 1/3 of the whole dish (w/w).

5) Oil, butter, spread, margarine, etc.

6) Beverages containing intense sweeteners cannot be labelled category 1. Juice is placed in category 2.

7) Added sugar; that is natural obligingly lactose in dairy products or natural obligingly sugar in fruit and vegetables not included. Added sugar include fruit concentrates, honey and likewise.

# Results

The nutrient profiling model (food intake pattern) illustrated in table 2 is based on an energy need of 10 MJ per day, which corresponds to the energy need of a moderately active child aged 11 to 15 years, an active woman or a sedentary man between 31 and 60 years.

The category-1 foods are mainly foods without added fat and added sugar and comprise the basic diet that can be eaten in the largest amount within each food group every day. The cut off values for fat content in meat (maximum 10% fat) and dairy products (milk: max 1.5% fat, cheese max 15% fat) from the DG were used to construct the basic diet but resulted in saturated fats reaching the maximum recommended 10 energy percent (E%), while the content of mono- and polyunsaturated fat were lower than the recommended level. In order to cut down on saturated fat and make room for the unsaturated fats it was therefore necessary to lower the fat contribution from animal products. This modelling resulted in a profiling model with a maximum level for saturated fat of  $\leq 1\%$  for dairy products,  $\leq 10\%$  for cheese, and  $\leq 4\%$  from meat and fish. In order to fulfil the dietary fibre recommendation, at least half of the bread and cereal intake should be wholegrain with  $\geq 6$  g fibre/100 g, and therefore these foods should belong to category 1, providing they are without added fat and sugar. The category-1 foods are the most micro-nutrient-dense, energy-poor versions of foods in each food group. The category-1 diet contains 8.7 MJ corresponding to 87% of the energy need. The macronutrient profile of the category-1 diet (shown in table 4) is in line with the recommendations and leaves space for discretionary fat and sugar in the diet and for category-2 and category-3 products. The calculated amount of energy from fat is 28% compared to the NNR of 25-35% and the amount of energy from added sugar is 0.5% compared to the maximum advisable level of 10%.

Table 4: Macronutrient profile of a category-1 diet consisting solely of category-1 foods, and a category-1-2-3 diet<sup>1</sup>, compared to the Nordic Nutrition Recommendations (NNR) (9).

Nutrient	Category-1 diet	Category-1-2-3 diet	NNR From 2 years of age
MJ, E% <sup>2</sup>	8.7	9.1	10
Protein, E%	17	15	10 – 20
Total fat, E%	28	31	25 – 35
Saturated fat, E%	8	10	Max. 10
Monounsaturated fat, E%	10	11	10 – 15
Polyunsaturated fat, E%	7	7	5 – 10
Carbohydrate, E%	55	52	50 – 60
Sugar, E%	0.5	1	Max. 10
Dietary fibre, g/MJ	3.4	3.1	3.0 <sup>3</sup>

1) The category-1-2-3 diet is a diet based on category-1 foods, where foods have been substituted with category-2 foods 2-3 times (within each food group) per week and with category-3 foods once (within each food group) per week.

2) E% = percentage of energy from nutrient.

3) For adults.

In the nutrient modelling, the category-2 foods also belong to the basic diet, but they are more energy-dense (cheese 15-20% fat) or nutrient-poor (white bread) versions of basic foods, mainly without added fat and/or sugar. The category-2 foods cannot be eaten every day in the full amount in a diet fulfilling the NNR. The category-2 foods can be regarded as substitution possibilities to the category-1 diet and can be included in the diet 2-3 times a week within each food group as substitute for similar category-1 foods. For example it is possible to eat and drink white bread, juice, cheese (15-20% fat), reduced fat milk 1.5% (500 mL) and meat with  $\leq 20\%$  fat 2-3 times a

week or every day in smaller amounts. This means that it is possible to eat some meat product daily with a higher fat content ( $\leq 20\%$  fat). However, it is not possible to drink 500 mL juice everyday and have a healthy diet. One glass a day is more appropriate and in accordance with the designation “Less”.

The category-1-2 diet, where category-1 foods have been substituted with category-2 foods 2-3 times per week within each food group, provides 89% of the energy needed. The percentage of energy from fat and saturated fat increases to 30 E% and 9 E%, respectively. The dietary fibre content declines but is still at the recommended level. The discretionary energy from sugar is at the same level as in the category-1 diet, because category-2 foods are mainly foods without added sugar. The population goal of 30% of the energy from fat is reached, which is the argument for the upper fat cut off for the category-2 foods.

According to the model, the category-3 foods contain higher levels of sugar and/or fat and therefore cannot on a regular basis substitute healthier counterparts in the diet. However, some of these foods still provide micronutrients to the diet. The category-3 products can be included in the diet once a week within each food group, if the principles for the basic diet (category-1 and category-2 foods) are followed. A further prerequisite is that the category-3 products should mainly substitute category-2 foods. A diet based on category-1 foods, where some foods have been substituted with category-2 foods 2-3 times and category-3 foods once a week (category-1-2-3 diet), provides 91% of the energy needed. The macronutrient profile of this diet (table 4) comprises a total fat content just exceeding the recommended levels, saturated fat is at the maximum advisable 10 E% and the sugar content is still lower than the recommended level. However, the macronutrient distribution will vary between diets, depending on the category-3 products chosen.

Energy-dense and nutrient-poor foods like most foods from the food groups “Dessert, confectionary, snacks” and “Beverages” do not contribute positively to the nutrient intake, and they are often consumed “on top” of the other foods. The energy contribution from such foods may make up 9-10% in a healthy diet (table 4). In the present model these foods are termed category-3.

The thresholds for nutrient content in the present model in the 3 categories within food groups are shown in table 3. For dairy products, both solid and liquid products must keep the same thresholds. The criteria for all nutrients must be met to obtain the category, so if one criterion for one nutrient is exceeded, the food ends in the next category.

# Discussion

The developed nutrition profiling model is intended to be of help for the consumers to choose a healthy diet. Fat, sugar, and dietary fibre content vary considerably between individual foods. What is considered a low fat content in some foods, for example cheese, corresponds to a high fat content in other foods as for example milk. Therefore, the nutrient profiling becomes more useful for the consumer if foods are divided into food groups, considering these differences. The present model divides all foods in 11 food groups, reflecting a natural biological connection between foods within groups. Eleven food groups are considered the smallest possible number of groups where a relevant division can be made based on the selected nutrients.

Since each food group is unique regarding its place, quantity and nutrient contribution to the overall diet, it will be misleading to divide all foods according to the same level of nutrients. To ensure nutritional relevance of the labelling system it is therefore necessary to set up nutrient thresholds for the individual food groups. Within food groups, the model divides foods in 3 categories, symbolising how much of the food can be included in a healthy diet: “Most”, “Less” or “Least”. It can be discussed whether some consumers will interpret the word “Most” as “Eat all you can”. In order to oppose the consequence of such interpretation, some food groups have few or none foods in category 1, because these food groups exclusively consist of foods that can only be included in minor amounts (“Less” or “Least”) in a healthy diet. Likewise, “Less” does not mean “Less than you usually eat”, but “Less than you eat of category-1 products”. At the same time, the designation “Most” is not equal to the same absolute amount (gram food) in all food groups. Thus, these examples illustrate the importance of explaining to the consumers, how to use the model, and it implies that the consumers are acquainted with the dietary guidelines.

In the present model very few foods as for example spices, wine vinegar, and gelatine are not included in any food groups and thus cannot be labelled. However, these foods do not contribute significantly to the energy intake, and labelling these foods according to their place in a healthy diet is therefore regarded irrelevant.

The present model is based on four macronutrients (total fat, saturated fat, sugar and dietary fibres), which - based on representative dietary surveys - are considered key nutrients for optimising a Danish diet in accordance with the nutritional recommendations. The model ensures that foods are placed in categories, where the contribution to micronutrient intake is taken into consideration as well. Adding more nutrients to the model makes it more complicated, as it will most likely require a subdivision of some food groups, increasing the grey area between groups. However, if a particular micronutrient – for example salt/sodium or calcium, is considered relevant, it is possible to add it to the model.

For the “Bread and cereal” group limits for dietary fibre content are included. It can be discussed whether a requirement for wholegrain content is more relevant than the content of dietary fibre. However, choosing the dietary fibre content allow products with fibre rich ingredients (for example bran) and with added, purified fibres to be category 1, which is not the case with a whole grain limit.

In agreement with the food based dietary guidelines to eat 600 g fruits and vegetables a day (“6-a-day”), an extra requirement for the “Ready-prepared dishes” is added. To be labelled category 1, fruit or vegetables must constitute at least one third of ready-prepared dishes on a weight basis. Potatoes are not considered as vegetables in this respect.

In accordance with the food based dietary guidelines that consumers should limit their fat intake – especially saturated fat, none of the pure fats can be labelled category 1. As most cooking oils are 100% fat, any fat threshold will discriminate the oils. Pure fats are therefore excepted from the total fat thresholds in order to have the oils labelled in the same category as spreads with low saturated fat content. Thus, the division of the pure fats is based solely on saturated fat content.

### **Advantages of the model**

The proposed nutrient profiling model has several advantages. One is, it can be used by all consumers with normal nutritional needs, whether a child or an adult, or a light or a heavy eater, because it refers to relative amounts related to the total diet of an individual and not to absolute amounts in gram.

Another advantage of the proposed nutrient profiling model is that it can be applied to practically all foods. This enables the consumers to relate to all foods in the context of the total diet, which is different from other models that only accentuate the “healthy” foods or the “best choice” such as the Swedish Keyhole symbol (4), which is used only on selected food groups and shows the best choice within these groups. Another difference from the present model is that the Keyhole symbol is allowed on foods that can only be included in a healthy diet in minor amounts, like pizzas. The British Traffic light signposting (5) categorises foods as High, Medium or Low with respect to four individual nutrients (total fat, saturated fat, sugar and salt). Foods are not divided into food groups, but the same criteria are used for all foods. This means that hardly any meat or fish products can be labelled “Low” due to their fat content, and neither can oats. Likewise, many fruit and dairy products exceed the sugar limit for Low, and thus the consumers are left without much help when choosing among these foods. The Traffic Light signposting, showing the category of all four nutrients on the front of pack instead of one combined symbol as proposed in the present model, may confuse the consumers. When using the present model, the consumer does not have to relate to several nutrients individually.

In the present model consumers may change the categorisation of a ready-prepared dish by adding more ingredients. If a ready-prepared dish is low in fat, saturated fat and sugar, but contains very little vegetables, it will be a category-2 dish. However, if the consumer adds enough vegetables to the dish, it can be changed to a category-1 dish. Some consumers may prefer to add their own freshly cooked vegetables to ready-prepared dishes. Therefore, food producers should be allowed – and encouraged – to inform the consumers about this possibility of creating a healthier meal. On the other hand, category-1 ingredients can be composed into a category-2 meal, if the consumers are not aware that a healthy meal includes food from several food groups and always include a certain amount of fruits or vegetables. The nutrient profiling model cannot take this into account, and consumers must be educated about how to use the model.

### **Exemptions from the nutrient limits**

Like most other nutrient profiling models, this proposed model has exemptions for nutrient content for some foods. Products like oats and breads containing fatty seeds or nuts are exempted from the stated fat limits and placed in category 1, even though their natural fat content exceeds the cut off level for fat content. This is because fat from both oats and many seeds and nuts have a high content of unsaturated fat (a favourable fatty acid composition). Similarly, the natural fat content in unprocessed fish will not disqualify the foods from being placed in category 1. Likewise, the natural sugar content in breakfast cereals containing dried fruit may exceed the category 1-limit, but still be accepted in category 1. However, if one of the fat or sugar limits for category 3 is exceeded, the product must be labelled category 3.

Some foods are placed in a specific category, even though they do not fulfil the nutrient limits (table 3). Rice (polished and brown) is defined as category 2, even though it does not fulfil the dietary fibre limit. However, rice is an important starchy food. Another exemption is nuts that are energy dense foods, so even though they contribute to the diet with important nutrients, the signal to the consumers should be that they should only be eaten in “Less” amount. The same goes for dried fruits. Therefore nuts and dried fruit are placed in category 2.

When setting the limits for sugar content in dairy products, the naturally occurring lactose content is exempted from the calculation of the sugar content, resulting in a model where only added (purified) sugar is of importance.

It was decided that beverages that contain intense sweeteners cannot be labelled category 1, no matter what their fat and sugar content is. This is due to the fact that many beverages are acidic, and therefore are potentially harmful for the teeth. A labelling system that promotes potentially harmful foods is unacceptable, so this exception must be made.

In the present model, products containing intense sweeteners are excluded from category 1 in all food groups. This is because of the ongoing scientific discussion on the role of intense sweeteners for appetite control (12) and about habituation to sweet foods (13). These “doubts” related to the consequences of intake of intense sweeteners should benefit the consumers, at least until more research is done in this area.

### **General considerations**

Before introducing any labelling system, it is necessary to examine how the consumers interpret the system and how they intend to use it. The model could be compared to other labelling systems, for example the Swedish “Keyhole” (4), and the British system with “traffic lights” equal to high/medium/low for key nutrients (5). Both the consumers’ understanding of the labelling system and the resulting choice of diet should be taken into consideration. A prerequisite for any nutrient profiling system is that consumers are educated about the system. Three points are particularly important: 1) A category-1 label does not mean you can eat unlimited amounts of the food in a healthy diet, 2) You cannot just pick a few category-1 products and live on those – variation is important and a healthy diet includes components from several food groups, 3) Category-1 products must make up most of the diet, but products from the other categories can be included in a healthy diet as long as you limit the intake. Education about this labelling system cannot replace common education about the food based dietary guidelines, but can be a good supplement for this purpose.

In general the proposed nutrient profiling model is simple and easily understandable. The model signals the relative amount of any foods that can be included in a healthy diet. Calculations of nutritional composition of different types of diets show that a diet composed of foods from all categories meet the Nordic Nutrition Recommendations.

### **Postscript**

The proposed nutrient profiling model was accepted and used by the Danish Veterinary and Food Administration as a basis for a voluntary nutrition labelling system called “SPIS-mærket” (The “EAT label”)(14). However, the system was not supported by the food industry and retailers oppose it. The labelling system was notified to the European Commission and applied in Denmark since April 2007. The nutrient profiles in “SPIS-mærket” are not completely identical to the model suggested by the National Food Institute. Some food groups were further divided in subgroups, some nutrient limits were changed, and sodium was added as a threshold nutrient.

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