

The Wheel of Five

Fact sheet

The Wheel of Five is the practical information tool used by the Netherlands Nutrition Centre to give examples of healthy dietary patterns. The Wheel of Five consists of five segments, each containing food groups that contribute to health benefits or that provide essential nutrients. Foods that do neither of these things are excluded from the Wheel of Five.

The Health Council of the Netherlands' Dutch dietary guidelines 2015¹ identify foods that provide health benefits, such as those that reduce the risk of cardiovascular disease or type 2 diabetes. The Health Council's Dietary Reference Values² represent an individual's energy and nutrient needs. In cooperation with the National Institute for Public Health and the Environment (RIVM), the Netherlands Nutrition Centre has calculated various diets that comply with the Dutch dietary guidelines and with the Dietary Reference Values.

The result is the Wheel of Five: a recommended dietary pattern that offers the best possible combination of health benefits and nutrient provision, based on traditional Dutch foods.

The Netherlands Nutrition Centre advises consumers to mainly eat foods from the Wheel of Five, to eat the right amounts each day, from each segment, and to vary the products selected from individual segments. Foods not included in the Wheel of Five should be eaten neither too often nor in large quantities.

Using the Wheel of Five as a point of reference, people can get an idea of their own dietary pattern, and an understanding of those areas in which they could make improvements. We encourage consumers to start improving their own diet one small step at a time.

This fact sheet explains the science on which the Wheel of Five and its associated recommendations are based.



For whom is it relevant?

This fact sheet is relevant to nutrition professionals such as dietitians, physicians, teachers, policymakers and food scientists, as well as to anyone who provides consumer information about nutrition.

What issues are involved?

In 2011, there were more than 5.3 million people with a chronic disease in the Netherlands. This number is expected to rise to 7 million by 2030. Coronary artery disease is responsible for the greatest burden of disease. Some way below that are seven diseases which differ only slightly from one another in terms of disease burden. These include type 2 diabetes, stroke and lung cancer. The main determinants of these diseases are overweight, an unhealthy dietary pattern and smoking.³ A healthy dietary pattern reduces the risk of cardiovascular disease and is associated with a lower risk of type 2 diabetes and certain types of cancer.¹

Furthermore, Dutch people consume excessive amounts of some nutrients, such as saturated fatty acids and sodium, and too little of others, such as dietary fibre. Their intake of many vitamins and minerals is also lower than the recommended amount.⁴ An adequate intake of nutrients helps to keep people in good health, while preventing chronic diseases.

Consumer confusion

Consumers are constantly being confronted with nutritional information. These range from proven health claims to those that are entirely unproven, and from the basic principles of nutrition to new findings from animal studies. It is difficult for consumers to work out whether or not they need to modify their eating habits.

Reliable, scientifically substantiated information on nutrition and useful recommendations are needed to help consumers eat more healthily.⁵ Thus, using the Wheel of Five, the Netherlands Nutrition Centre has put forward a range of recommendations that meet these requirements.

Eating in accordance with the Wheel of Five

The Wheel of Five outlines the frameworks of a healthy dietary pattern. People can then fill in the details of these frameworks, based on their own personal preferences. The Wheel of Five indicates that healthy dietary patterns involve:

- mainly eating foods from the Wheel of Five
- eating the right amounts from each segment, each day
- varying consumption within the different food groups
- limiting the foods that are not part of the Wheel of Five

What does the Wheel of Five include?

The Wheel of Five contains:

- food groups to which the Health Council attributes health gains, when eaten at the recommended frequency and in the recommended amount.
- food groups that are nutrient dense and that provide essential nutrients, yet the Health Council neither ascribes health gains to them nor makes any recommendations concerning them.

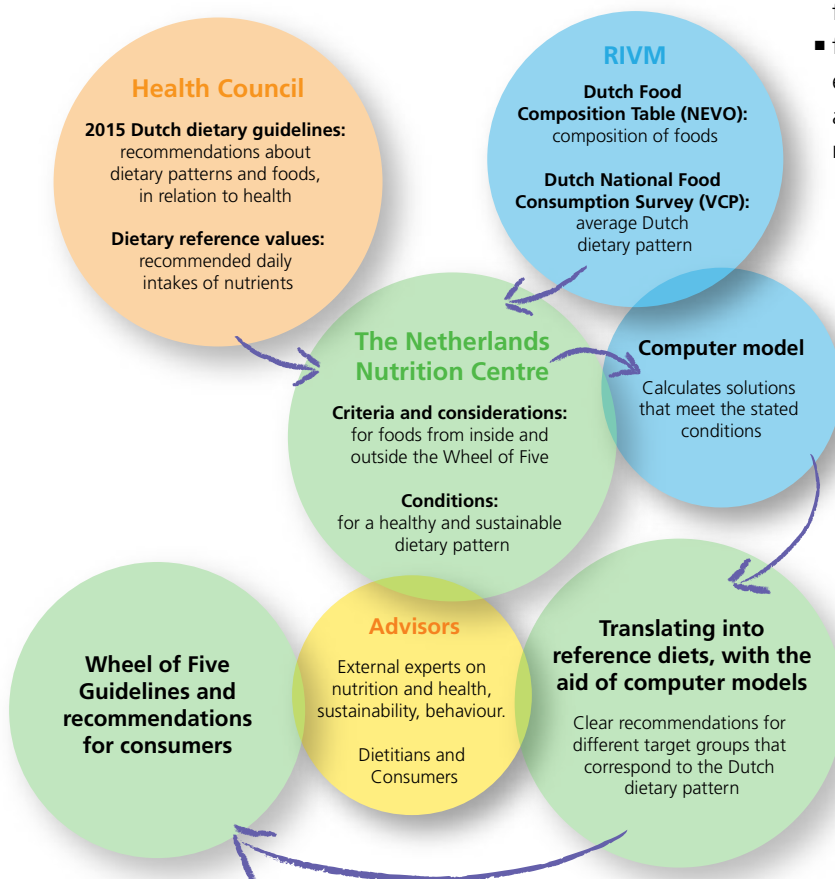


Figure 1:
development of the Wheel of Five

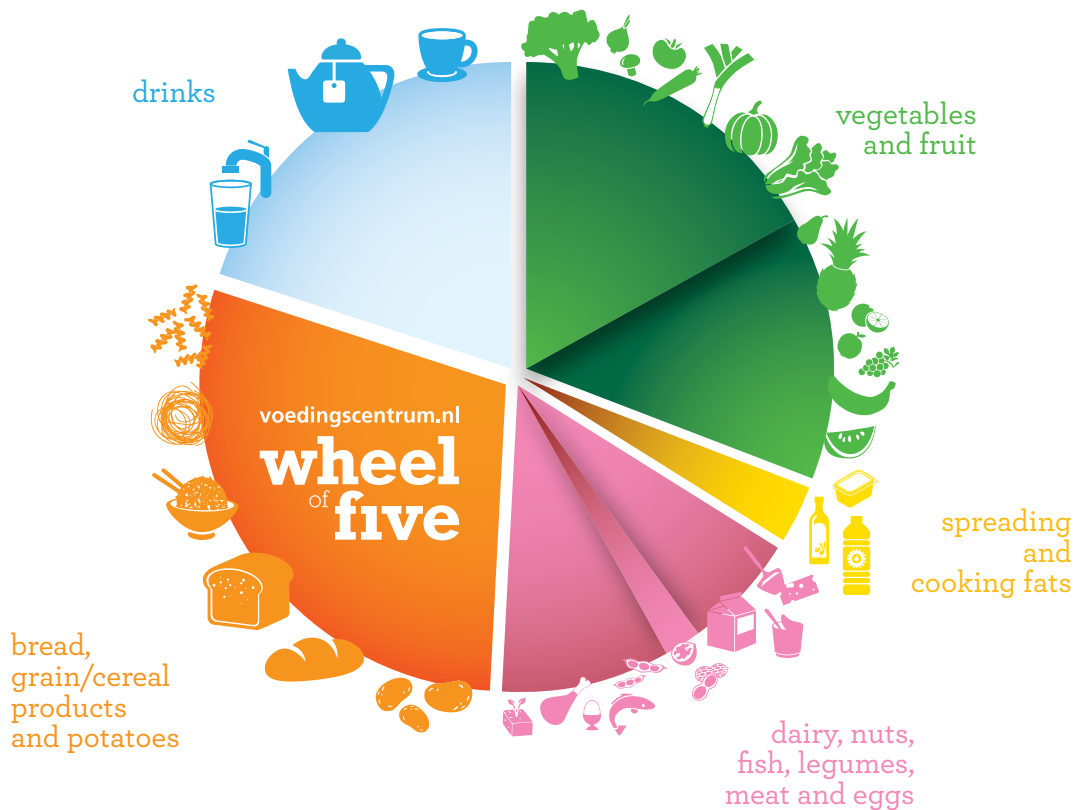
Criteria for foods in the Wheel of Five

Some products contain too many nutrients that have an adverse effect on health (saturated fatty acids, trans fatty acids, sugar, or salt) or too little dietary fibre to be included in the Wheel of Five. For this reason, criteria have been drawn up per food group and per 100 grams of product: with maximum limits for saturated fatty acids, trans fatty acids, sodium, sugar (monosaccharides and disaccharides) and minimum levels for dietary fibre.








This set of criteria is widely used at international level¹⁰, and is generally applied to all food groups, unless stated otherwise. As a result, part of a food group will be included in the Wheel of Five, while another part will be placed outside the Wheel of Five.

When drawing up these criteria, we took the following aspects into consideration: the Health Council's Dutch dietary guidelines, the levels of nutrients with an adverse effect on health, the degree of processing involved, various food-group-specific considerations, and potential options for consumers.

In some cases, entire food groups are not included in the Wheel of Five, because the Health Council strongly recommends that their consumption should be substantially limited or that the amount consumed should be as little as possible. One example is processed meat, another is sugar-rich beverages.



The general recommendations regarding foods in the Wheel of Five are as follows:

-  Lots of fruit and vegetables
-  Especially whole grain products, such as whole-grain bread, whole-grain pasta and couscous, and brown rice
-  Less meat and more plant-based food. Vary the diet, switch between fish, pulses, nuts, eggs and vegetarian products
-  Sufficient dairy products such as milk, yogurt and cheese
-  A handful of unsalted nuts
-  Soft or liquid spreadable fats and cooking fats
-  Sufficient amounts of fluid, such as tap water, tea and coffee

Saturated fatty acids

The Health Council recommends that the consumption of saturated fatty acids be limited to no more than 10 energy percent.¹¹ The Health Council also recommends replacing butter, hard margarines and the fats used in baking and frying with soft margarines, liquid baking and frying fats, and oils.¹

The criterium for saturated fatty acids is always food group specific, as the levels involved vary widely from one food group to another. The saturated fat content of a food group, based on the Dutch Food Composition Table (NEVO)¹², is the basic principle for the amount specified in the criterium. A total daily diet may not exceed the saturated fatty acid level of 10 energy percent.

Trans fatty acids

The Health Council has indicated that it is important for the intake of trans fatty acids to be kept low and for this intake to be monitored.¹

The criterium for trans fatty acids is 'not added' when trans fatty acids are naturally present in the food in question. The criterium is ≤ 0.1 grams/100 grams, if trans fatty acids are not naturally present. This level is taken from the 2011 Food-based Dietary Guidelines.¹³ We use the criterium because it has proven useful for most food groups. Because trans fatty acids are generated during the process of hardening vegetable oils, a food-group-specific criterium has been drawn up for spreadable fats and cooking fats, based on the contents quoted in NEVO.¹²

Salt (sodium)

The Health Council recommends that the intake of salt be limited to no more than 6 grams per day.¹

The criterium for salt is 'not added'. In cases where technical considerations require added salt, or where the criterium excessively limits consumer choice, a food-group-specific criterium for sodium is drawn up. This is the case for bread, pulses (canned or in jars), ready-to-eat meat substitutes, cheese, spreadable fats and cooking fats. Levels are determined based on NEVO¹², on results obtained from the RIVM's Herformuleringsmonitor (Reformulation Monitor)¹⁴, and on a report by the Netherlands Food and Consumer Product Safety Authority (NVWA)¹⁵ and/or the Dutch Bakery Centre.¹⁶

Sugar

The Health Council has stated that using starch as a substitute for sugar leads to a reduction in LDL cholesterol.¹ In addition, sugar increases the energy density of a product and reduces its nutrient density. We use the term 'sugar' here to refer to monosaccharides and disaccharides. This includes any sugars that occur naturally in products such as honey, syrups, fruit juices and fruit juice concentrates.

The criterium for added sugar is 'not added'. This refers to sugar added to food by manufacturers, cooks or consumers. In addition, food-group-specific criteria have been drawn up for milk and milk products, based on their total sugar content, due to the presence of lactose (based on NEVO¹²). The same applies to bread, as sugar has to be added to activate the yeast.



Fibre

The Health Council recommends that people should eat at least 90 grams of brown bread, whole-grain bread, or other whole grain products per day. It also recommends that they consume whole-grain products rather than refined grain products.¹

A fibre criterium has only been drawn up for bread, grains and grain products. This relates to fibre that is naturally present in these foods. The level was determined based on NEVO¹², by which brown bread, whole-grain bread and whole-grain products were included in the Wheel of Five.

Testing the criteria

It is quite possible to create a healthy dietary pattern that meets our conditions, using only foods that are based on Wheel of Five criteria. This is tested using the Optimeal® optimization model. Details of our conditions and of the model are given under the heading 'recommended daily amounts'.

Composite foods

Composite foods are products that consist of two or more components, from different food groups. No quantitative criteria have been drawn up for these products. A composite food falls within the Wheel of Five if it consists of components from the Wheel of Five.

For specifications of the criteria and a detailed explanation, see Section 3 of the Wheel of Five Guidelines (in Dutch). There is also a summary of the criteria used, in Annex 5 of these guidelines, via www.voedingscentrum.nl/richtlijnen.

Recommended daily amounts in the Wheel of Five

Reference diets were used to determine the recommended daily amounts of various foods. These are examples of dietary patterns that RIVM has calculated for different target groups. Target groups are determined on the basis of people's energy and nutrient requirements. The target groups are men and women, children, young people, adults, the over 50s, the over 70s, and pregnant or lactating women. We also provide specific recommendations for vegetarians.

Reference diets are derived in two steps:

1. The Optimeal® optimization model (www.optimeal.info), which was modified for this purpose¹⁷, was used to calculate a dietary pattern for each target group that:

- complies with the Dutch dietary guidelines and with the Health Council's dietary reference values. The calculation of an adult's energy requirement was based on the requirements of individuals with an inactive lifestyle. The physical activity levels (PAL) used were 1.4 for women and 1.5 for men. Because an individual's energy requirement is also influenced by their height and weight, we used the most recent data for these parameters (Public Health Monitor 2009-2010).¹⁸ The corresponding BMI values are 23.2 kg/m² for men and 22.4 kg/m² for women.
- does not supply too many nutrients that have an adverse effect on health.
- corresponds with the different target groups' customary dietary pattern.⁷⁻⁹ One of the aims here is that consumers must be able to relate to the amounts and combinations of foods that are being recommended. This is the basic principle of food-based dietary guidelines⁵, such as the Wheel of Five Guidelines.
- takes into account the composition of the foods¹² consumed by the various target groups.⁷⁻⁹
- takes into account the environmental impact involved, by setting maximum limits for animal products.
- takes account of a ratio of foods from inside and outside the Wheel of Five. The Netherlands Nutrition Centre's recommendations relate to food groups both inside and outside the Wheel of Five. The basic principle here is that foods in the Wheel of Five deliver 100% of the essential nutrients. This applies when an average of 85% of the total energy requirement is derived from foods in the Wheel of Five.



The optimization calculations generate a dietary pattern that complies with the conditions, while involving the minimum amount of change relative to the current dietary pattern. Nevertheless, the optimization model occasionally generated solutions which deviated considerably from the current dietary pattern, or solutions that involved substantial differences between different age groups, or no solutions at all.

2. The Netherlands Nutrition Centre has translated the results of the optimization step into recommended daily allowances of food groups for the various target groups. This translation step took account of the Health Council's recommendations, as well as complying with the dietary reference values. It also made allowance for practical feasibility, sustainability, and comparability between the various target groups (to facilitate clear communication).

Key focal area

For young children and women of childbearing age, the amount of iron provided by the reference diet is lower than the dietary reference value. But the current intake of iron for women of childbearing age is even lower than that.⁸ As yet, this has not prompted the Health Council to draw up specific recommendations for these groups. Key focal areas in the consumer information provided by the Netherlands Nutrition Centre are targeted recommendations on the use of foods that naturally contain iron, and an emphasis on improving iron uptake, by eating fruit with meals, for example.

Example of recommended daily amounts for an adult woman (aged from 19-50)

-  250 grams of vegetables
-  2 portions of fruit
-  4-5 brown / whole-grain sandwiches
-  4-5 serving spoons of whole-grain products or 4-5 potatoes
-  1 portion of fish / pulses / meat
-  25 grams of unsalted nuts
-  2-3 portions of dairy products
-  40 grams of cheese
-  40 grams of spreadable fats and cooking fats
-  1,5-2 litres of fluids

What does the Wheel of Five not include?

Three types of products are not included in the Wheel of Five:

- Products that are not included in the Wheel of Five based on specific criteria (excessive amounts of salt, sugar, trans fatty acids, saturated fats, or too little fibre).
- Products which, according to the Health Council, must be replaced by other products, or which must only be consumed in very limited amounts.
- Products that do not contribute to a healthy diet, such as sweets and snacks..

Subdivision: daily selection and weekly selection

A healthy dietary pattern allows for the limited consumption of foods from outside the Wheel of Five. The limit is an average of no more than 15% of the total energy involved. Products outside the Wheel of Five differ greatly from one another in terms of their use and energy, and in terms of the nutrients they contain that have a potentially adverse effect on health. The Netherlands Nutrition Centre has placed those products

that are not included in the Wheel of Five into two categories: the daily selection and the weekly selection.

Criteria for classification into daily selection and weekly selection

The basic principle, when drawing up criteria for daily selections, is that it should be possible to select foods from outside the Wheel of Five several times a day. Due to the great diversity of products and to consumers' freedom of choice, the criteria are the same for all food groups and have been drawn up per portion. Using a model newly developed by RIVM, the Netherlands Nutrition Centre has identified energy, saturated fatty acids and salt as the limiting nutrients for products outside the Wheel of Five.¹⁷ A cut-off value is then determined for these nutrients, based on the smallest range in men and women aged from 31 to 50, for energy, salt, and saturated fatty acids.⁶ This resulted in the following criteria: no more than 75 kilocalories, 1.7 grams of saturated fatty acids and 0.5 grams of salt per portion. Soft drinks and juices have their own, very distinctive (4 kcal per portion), energy criterium.

Examples of daily selections and weekly selections

The following are examples of a daily selection: a spoonful of sauce, sandwich fillings like jam or fruit sprinkles, cold meats, a small biscuit, a piece of chocolate or a spoonful of honey.

The following are examples of a weekly selection: products high in salt, saturated fat or energy per portion, such as canned soups, processed meats, white pasta, sugary desserts, cakes or large biscuits.

Rule of thumb outside the Wheel of Five

The Netherlands Nutrition Centre has designed this rule of thumb as a practical guideline for choosing products from outside the Wheel of Five: "Choose an item from the daily selection no more than three to five times per day, and something from the weekly selection no more than three times a week." So the idea is neither too often nor in large quantities. The rule is: keep it small and don't eat the same things too often. There are different recommendations for children under the age of nine. They have less scope for foods from outside the Wheel.



Figure 2: rule of thumb for daily selection and weekly selection of foods from outside the Wheel of Five

Go for variety and stay in balance

When following a healthy diet in accordance with the Wheel of Five, there are more important aspects to be considered than simply eating foods from the Wheel of Five in the recommended daily amounts.

Go for variety

It is important to vary the foods consumed within the different food groups, to gain the maximum possible health benefit and to obtain essential nutrients. No single product provides all of these nutrients. In addition, some of the products in a given segment may provide more health benefits than others. By alternating between food groups in the segment containing fish, pulses, meat, eggs, nuts and dairy products, consumers can comply with the recommendation that they eat 'more plant-based foods and fewer animal products'.

Outside the Wheel of Five, by varying the products they eat consumers can help to ensure that they stay within the acceptable limits for salt, saturated fat and energy.

Energy balance

Maintaining a healthy weight and not gaining weight if you are already overweight is of primary importance in a society where over half the population is overweight.¹⁹

The Netherlands Nutrition Centre has based the recommended daily amounts for foods in the Wheel of Five on the average energy requirements of different age groups and gender groups. However, the exact amount of energy a given individual requires depends on their height, weight, body composition, level of physical activity, growth and state of health.¹¹ For this reason, everyone stands to benefit by attuning their food choices and the amounts eaten to their personal energy balance. In this connection, it is also worth focusing on limiting the products selected from outside the Wheel of Five.

Getting started with the Wheel of Five

It is ultimately consumers themselves who decide what type of diet to follow, whether they want to take steps to improve their diet and, if so, what type of steps this would involve. The Netherlands Nutrition Centre encourages people to make improvements one small step at a time, and not by suddenly introducing major changes. This is because small changes to the dietary pattern make it easier to achieve minor successes, which boosts people's self-confidence.²¹

The Netherlands Nutrition Centre's website offers a range of information and tools to help consumers get started. Mijn Eet-update (My Eating Update) is a tool

More than healthy

Sustainability

The Wheel of Five takes sustainability into account. For instance, we provide maximum limits for the use of animal products such as meat (including red meat), milk products and fish. We encourage people to adopt a dietary pattern with less meat but with more pulses and nuts. We advise consumers on how to make sustainable choices.

Food safety

If food is handled safely and hygienically, there will be less risk of a foodborne infection. For this reason, we focus on the hygiene and safety issues involved when buying, storing and preparing food. In addition, from the point of view of food safety, it is advisable to adopt a varied diet. Food can contain small amounts of harmful substances. Legal standards have been put in place to ensure that consumers do not ingest excessive quantities of such substances.²⁰ Consumers themselves can further reduce the potential health risks involved by varying their dietary options.

Food temptations

The food choices that an individual makes are, to some extent, determined by the physical environment in which they live. It is easier to make healthier choices if these feature prominently in your everyday physical environment. The parties that help to create the physical environment, such as caterers and the retail sector, have an important part to play here. The Netherlands Nutrition Centre offers consumers practical guides to help them recognize and deal with unhealthy food temptations.

that sends people feedback, via email, concerning a particular aspect of their eating behaviour. This enables us to offer them attainable short-term goals. Feedback offered in this way can help to bring about behavioural changes.²²

Looking to the future

As more and more data from new scientific discoveries becomes available, our understanding of nutrition and health continues to grow. However, any modifications to the Wheel of Five will be based on a new scientific consensus, not on the latest findings. In addition, new insights or data can cause the criteria to be modified.

The Wheel of Five is based on solid evidence, and the Netherlands Nutrition Centre promotes its use among consumers and professionals alike. Thus, the Centre

makes a significant contribution in terms of informing the public about healthier and more sustainable dietary options, while actively encouraging people in the Netherlands to adopt them. In order to encourage people to adopt healthier diets, the dissemination and implementation of such information is indispensable. The professional assistance given by dietitians, physicians, teachers, policymaker and food scientists is essential. It is essential that industry, the retail sector and the

catering industry all help to make it easy for people to choose a healthy diet. Consumers will find it easier to translate their good intentions into healthy behaviour if there is a wider range of healthier products in the food environment. Implementing measures to reformulate foods can also be helpful in this regard. This could involve cutting the levels of saturated fat, salt and energy in processed foods, using the Wheel of Five as a guide.

The following experts were consulted in the course of drafting this document:

This document was prepared based on the Wheel of Five Guidelines.⁶ In drawing up these Guidelines, a broad group of scientists were consulted, as were representatives of various dietitians' associations in the Netherlands.

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Relevant links:

www.voedingscentrum.nl/richtlijnen: the 2016 Guidelines for the Wheel of Five, for full details of the supporting evidence.
www.voedingscentrum.nl/materialen: a list of materials for professionals.
www.voedingscentrum.nl/schijfvanvijf: website for consumers.
www.voedingscentrum.nl/video: brief film clip giving an explanation of the Wheel of Five.
www.voedingscentrum.nl/mijnschijf: customised recommendation including recommended portions and ten examples of daily menus.
www.voedingscentrum.nl/aandeslag: practical guides for a first step.
www.voedingscentrum.nl/mijneetupdate: the Mijn Eet-update (My Eating Update) tool.

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