

Perspective: A Definition for Whole-Grain Food Products—Recommendations from the Healthgrain Forum

Alastair B Ross,¹ Jan-Willem van der Kamp,² Roberto King,³ Kim-Anne Lê,³ Heddie Mejborn,⁴ Chris J Seal,⁵ and Frank Thielecke,⁶ on behalf of the Healthgrain Forum

¹*Chalmers University of Technology, Gothenburg, Sweden;* ²*Netherlands Organisation for Applied Scientific Research TNO, Zeist, Netherlands;*

³*Nestlé Research Centre, Lausanne, Switzerland;* ⁴*Technical University of Denmark, Lyngby, Denmark;* ⁵*University of Newcastle, Newcastle upon Tyne, United Kingdom;* and ⁶*Thielecke Consultancy, Basel, Switzerland*

ABSTRACT

Whole grains are a key component of a healthy diet, and enabling consumers to easily choose foods with a high whole-grain content is an important step for better prevention of chronic disease. Several definitions exist for whole-grain foods, yet these do not account for the diversity of food products that contain cereals. With the goal of creating a relatively simple whole-grain food definition that aligns with whole-grain intake recommendations and can be applied across all product categories, the Healthgrain Forum, a not-for-profit consortium of academics and industry working with cereal foods, established a working group to gather input from academics and industry to develop guidance on labeling the whole-grain content of foods. The Healthgrain Forum recommends that a food may be labeled as “whole grain” if it contains $\geq 30\%$ whole-grain ingredients in the overall product and contains more whole grain than refined grain ingredients, both on a dry-weight basis. For the purposes of calculation, added bran and germ are not considered refined-grain ingredients. Additional recommendations are also made on labeling whole-grain content in mixed-cereal foods, such as pizza and ready meals, and a need to meet healthy nutrition criteria. This definition allows easy comparison across product categories because it is based on dry weight and strongly encourages a move from generic whole-grain labels to reporting the actual percentage of whole grain in a product. Although this definition is for guidance only, we hope that it will encourage more countries to adopt regulation around the labeling of whole grains and stimulate greater awareness and consumption of whole grains in the general population. *Adv Nutr* 2017;8:525–31.

Keywords: whole grains, cereal, food regulation, food guidelines, food labelling, dietary guidelines, dietary intake, public policy

Introduction

The purpose of this perspective is to define what constitutes a whole-grain food in a manner that is scientifically meaningful,

Perspective articles allow authors to take a position on a topic of current major importance or controversy in the field of nutrition. As such, these articles could include statements based on author opinions or point of view. Opinions expressed in Perspective articles are those of the author and are not attributable to the funder(s) or the sponsor(s) or the publisher, Editor, or Editorial Board of *Advances in Nutrition*. Individuals with different positions on the topic of a Perspective are invited to submit their comments in the form of a Perspectives article or in a Letter to the Editor.

The authors reported no funding received for this study. This is a free access article, distributed under terms (<http://www.nutrition.org/publications/guidelines-and-policies/license/>) that permit unrestricted noncommercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Author disclosures: ABR, J-WvdK, RK, K-AL, HM, CJS, and FT, no conflicts of interest. All authors are members of the Healthgrain Forum, a nonprofit organization that brings together academics and industry interested in cereals and health. RK and K-AL are employees of Nestec SA, part of the Nestlé food and beverage company.

Supplemental Information 1, Supplemental References, and Supplemental Table 1 are available from the “Online Supporting Material” link in the online posting of the article and from the same link in the online table of contents at <http://advances.nutrition.org>.

Address correspondence to ABR (e-mail: Alastair.Ross@chalmers.se).

is readily usable by the food industry, and results in labeling that is easily understood and credible to consumers in the context of helping them choose healthier foods. This guidance document does not aim to define what a whole-grain food is for the purposes of health claims based on whole grains.

People who eat more whole-grain food have a lower risk of disease and mortality than people who eat the least (1–5), which has led to many countries including recommendations for whole-grain intake in their dietary guidelines (6). These recommendations range from “consume at least half of all grains as whole grains,” equating to $\geq 48\text{--}85\text{ g/d}$ depending on age and sex (United States) (7), to 75 g/10 MJ (Denmark and Sweden) (8) and less-specific recommendations including “eat a variety of grain (cereal) foods, mostly whole-grain and/or high cereal fiber varieties” (6, 9). Current research indicates that in European countries where whole-grain intake has been measured, the average daily intake is $<15\text{ g}$ in the United Kingdom, France, and Spain

(10–12); 23 g/d among Irish teenagers (13); and 36 and 43 g/d for Scandinavian women and men (14), respectively, still well below recommended intakes. These reports on whole-grain intake suggest that, in spite of greater awareness of whole-grain foods across Europe, much more needs to be done to increase whole-grain intake to meet public health guidelines. To ensure that the public knows how to choose a whole-grain food, it is essential that there is a clear definition that ensures that only foods with a meaningful amount of whole grain can be labeled as such on the front of packaging. Such a definition will also be important for encouraging the food industry to add more whole-grain ingredients into their products and will help scientists better measure whole-grain intake as they research the relation between whole grains and health. The Healthgrain European Union project released a definition for whole grain (15) that covers what ingredients can be called whole grain (**Table 1**). The present guidance document follows this previously published “whole-grain” definition by further outlining a definition for a whole-grain food and suggested requirements for labeling a food “whole-grain food” (such as “whole-grain bread”).

At present there are few legal requirements worldwide for labeling whole-grain food on the front of food packaging. Several diverse guidelines and codes of practice exist from industry organizations within Europe that make nonbinding recommendations for how much whole grain should be included before “whole grain” can be used in labeling and content claims, and industry working groups have called for a recommendation on what constitutes a whole-grain product (16). At present, if “whole grain” is mentioned on the label, the levels of whole-grain ingredients in a product must be listed on the packaging as part of mandatory Quantitative Ingredient Declaration (QUID), which is the basis for food ingredient labeling in Europe. However, this is usually just as part of the ingredients list, which limits the visibility and impact of this information and makes it difficult for consumers to easily identify which products contain more whole grain.

A new proposal would need to cover “front of pack” labeling, which is more important for communicating whole-grain content to consumers than the ingredients list. Clear guidelines on what constitutes a whole-grain food would increase clarity for food manufacturers and encourage greater front-of-pack labeling, which enables the public to make easier choices about selecting foods based on their whole-grain content.

Current Labeling Regulations and Recommendations

Several countries and institutions have existing guidance on minimum requirements for when a food product may be called a “whole-grain food” (see <http://wholegrainscouncil.org/whole-grains-101/existing-standards-for-whole-grains>) with a highly diverse range of requirements ranging from the amount of whole-grain ingredients per serving to a certain percentage of a food product. Even within the European Union, neighboring countries have very different requirements for labeling whole-grain foods, if any exist at all. Some examples of guidelines and regulations are shown in **Table 2**.

This lack of consensus on what constitutes a whole-grain food serves only to confuse the public, create uncertainty in product development for the food industry, and complicate the work of scientists researching the link between whole grains and health. This article is an attempt to provide a science-based guidance for defining whole-grain foods, taking into account traditional and modern manufacturing processes. This guidance should serve as a starting point for discussion by stakeholders (e.g., regulatory authorities, scientists, consumer organizations, and food industry) for setting labeling standards and requirements for whole-grain foods. Agreement on a whole-grain food definition can play an important role in encouraging the general public to improve their nutrition by including more whole grains in their diet.

The minimum levels of whole grain shown in **Table 3** follow 2 general principles:

- 1) Whole-grain amounts need to be substantial enough that consumers can be guaranteed that a product labeled “whole grain” (on the front of the pack) will have a nutrient content that will deliver the nutritional benefits of whole grain (e.g., higher fiber, micronutrient and phytochemical content) that a consumer would expect.
- 2) Some sensory aspects of foods with high whole-grain content are not universally appreciated by consumers, and food manufacturers need some flexibility to produce foods that will not only be high in whole grain but will also be liked by consumers.

These somewhat contradictory aspects may explain why the present recommendations vary between different countries. Denmark has chosen a relatively low starting point for whole-grain content to qualify for the label “whole grain,” whereas Germany and Netherlands have set limits that effectively allow only bread and pasta that have almost all

TABLE 1 The Healthgrain definition of whole grain¹

Whole grains shall consist of the intact, ground, cracked, or flaked kernel after the removal of inedible parts, such as the hull and husk. The principal anatomical components—the starchy endosperm, germ, and bran—are present in the same relative proportions as those which exist in the intact kernel. Small losses of components, that is, >2% of the grain or 10% of the bran that occurs through processing methods consistent with safety and quality are allowed.

Grains that are included in the definition are cereal grasses, wheat, rice, barley, maize, rye, oats, millet, sorghum, teff, triticale, canary seed, Job's tears, and fonio, and the pseudocereals amaranth, buckwheat, quinoa, and wild rice.²

¹ Adapted with permission from reference 15.

² Some definitions include wild rice as a true cereal because it is part of the grass family. In the original Healthgrain definition it is included as a pseudocereal.

TABLE 2 Current whole-grain labeling guidelines or regulations in 5 countries for bread, pasta, and biscuits

	Netherlands (17)	Germany (18–20)	Denmark (21)¹	Italy (22)	France (23)
Bread	All grain ingredients must be whole grain (legal requirement).	90% of the final ingredients, apart from water, must be whole grain.	There must be ≥50% whole-grain ingredients based on dry matter and ≥30% in the final product.	Whole-grain flour must come from the mill.	For moist breads, 10% of the final weight "contains whole grains," and 30% of the final weight must be "rich in whole grains." For rusks, 15% of the final weight "contains whole grains," and 40% of the final weight must be "rich in whole grains."
Pasta (dry)	There are no regulations or guidelines.	100% of the grain component in the final product is whole grain.	There must be ≥60% whole grain based on dry matter.	Whole-grain semolina must come from the mill and contain 100% whole grain in the final product.	There are no regulations or guidelines.
Biscuits	≥50% of the grain component is whole grain. ²	Cereal and starch components must be ≥90% whole grain.	No use of the whole-grain logo is allowed because the category is considered to have too much sugar/fat.	It is possible to add bran to the flour at the bakery.	A minimum of 15% of the recipe should be whole-grain ingredients (guidelines).

¹ This information comes from the Danish public-private partnership for a whole-grain logo on food products (24). The Danish Veterinary and Food Administration does not have an official policy for criteria for labeling whole-grain products.

² Agreement made long before 2000 between the biscuit industry and the Food Inspection Authority.

whole-grain flour to be labeled “whole grain,” with an allowance for small amounts of additives commonly used to improve baking quality. Other countries where whole grains are not frequently consumed have even lower thresholds for allowing whole grain–content claims. The French biscuit industry has introduced guidance for its members that allows communication on the whole-grain content when the recipe contains >15% of the total ingredients based on the following criteria (23):

- 15–39% of the recipe is whole grain (based on QUID): “Source of whole grain.”
- >39% of the recipe is whole grain (based on QUID): “Rich in whole grain.”

Although these are industry guidelines rather than mandated by the French government, they give an idea about the differences in acceptance between countries. Setting the threshold too low would not be acceptable in countries with a tradition of eating food with close to 100% whole grain; mandating that only products with >50% whole grain be labeled as such would position whole-grain products in a niche market and not something to be consumed by all people every day in countries where whole grain is still a novelty. In formulating guidelines for “whole-grain food” definitions that cross national and cultural borders, a balance must be

found between ensuring that products made with whole grains are popular with consumers and consumed regularly with the need to ensure that such products do contribute meaningfully to total whole-grain intake. If lower thresholds for whole-grain labeling are used as a compromise, how can consumers be guided to choose those products that have a higher amount of whole grain?

Why Do We Need a New Definition?

The plethora of new product launches incorporating whole grains over the past decade has led to greater exposure to the importance of whole grains in a healthy diet, although at the same time made it harder for consumers to easily choose products with the most whole grain because of unclear labeling thresholds, especially for front-of-pack communication. Over the period 2000–2011, there were >19,000 product launches worldwide that included whole grains (25). This gives an idea of the wide range of products from which consumers have to choose and understand whether they really contribute a substantial amount of whole grains to their diet. The inclusion of whole grains in a product is done predominantly to improve its nutrition and health image. This has resulted in the introduction of some products with small added amounts of whole grain

TABLE 3 A summary of the criteria for front-of-pack whole-grain labeling proposed by the Healthgrain Forum

There must be ≥30% whole-grain ingredients based on total-product dry weight and a greater proportion of whole-grain ingredients than refined-grain ingredients.
In mixed products (e.g., pizza or ready-to-eat meals with a cereal component and a noncereal component), a whole-grain label can be used, provided the whole-grain ingredients make up ≥30% of total ingredients based on dry weight and there are more whole-grain than refined-grain ingredients. The amount stated on the whole-grain label should be based on the cereal component of the food.

that could be considered to add only marginally to overall whole-grain intake. This has raised the question of whether it is misleading to label a food “whole grain” if it in fact contains more refined grains. Recently the American Association of Cereal Chemists International issued the following characterization of a whole-grain food: “A whole-grain food must contain 8 g or more of whole grain per 30 g of product.” Thirty grams is considered a standard serving of a cereal product. This characterization was proposed based on input from a wide variety of scientific experts and people within the food industry (26) and as yet has not been adopted by any public agency. Since the release of this proposed definition, there have been some concerns raised. These were succinctly summarized in a letter to the FDA from the Oldways Whole Grains Council (27), a US-based non-profit educational organization funded by industry aiming to encourage greater whole-grain intake.

Their main concerns were:

- The proposed definition made no mention of wet weight or dry weight. Many ready-to-eat whole-grain foods have a substantial water content that would put them below the 8 g/30 g threshold—even if the main ingredient aside from water is whole grain. Bread, with a moisture content of usually ~35–40%, would be required to have a much higher whole-grain content than crispbreads and crackers (moisture content ~5%) to be called “whole grain,” purely because of the amount of water in the final product.
- Is it misleading to label a food “whole grain” if it contains more refined-grain ingredients than whole-grain ingredients?

Instead, the Whole Grains Council proposed 3 different levels of labeling that would help consumers easily identify which foods had the most whole grain. These are 1) 100% Whole-Grain Foods (food in which all of the grain is whole; 16 g/serving minimum); 2) Whole-Grain Foods (foods in which ≥50% of the grain is whole; 8 g/serving minimum); and 3) Foods Contributing Whole Grains (foods with ≥8 g whole-grain ingredients/labeled serving). Although this approach is attractive because it is clear about the whole-grain content, experience from within the Healthgrain Forum suggested that consumers find too many levels of labeling confusing, for example, distinguishing between “made with whole grain” and “whole grain” (CJ Seal, unpublished results, 2016). However, 2 levels of labeling are used for nutrition claims in the European Union, and these appear to be well understood by consumers. There is also a lack of clarity for this type of labeling for foods that mix grain ingredients with other food groups (e.g., pizza or ready-to-eat meals).

The Healthgrain Forum believes that there is still a strong need for a whole-grain food definition that allows consumers to easily identify and choose foods with a high whole-grain content. The current suggestion made by the American Association of Cereal Chemists International is a good start and is

attractive in its simplicity. However, a food category as diverse as cereal foods requires a definition that addresses the complexity to encourage greater use of whole grains in foods yet avoids misleading consumers.

Whole-Grain Product Labeling: Issues to be Addressed in Formulating a Whole-Grain Food Definition

Universal guidelines for labeling whole-grain products need to account for the following key issues:

- How much whole grain does there need to be in a product for a whole-grain label to not be misleading to the public?
- Should foods with high moisture content (e.g., bread, fresh pasta) be able to label whole-grain content based on their dry weight?
- Should nutritional guidelines for healthy eating be included in a whole-grain food definition, especially for acceptable levels of salt, sugar, and saturated fat, so that the public is not misled about the health value of whole-grain foods?
- How should whole-grain content be calculated for multicomponent foods such as pizza or ready-to-eat meals?
- How can labeling guidelines be best developed so that they play a role in encouraging the public to eat more whole grains and inducing the industry to improve the range of whole-grain foods available?
- Should a definition also account for the different types of processing used for grains, given that different processing methods can lead to different physiochemical properties compared with the starting material?

Proposed Whole-Grain Food Definition

A whole-grain food is one for which the product is made with ≥30% whole-grain ingredients on a dry-weight basis and more whole-grain ingredients than refined-grain ingredients.

- If they exist, national regulations regarding whole-grain labeling are paramount to this definition.
- We strongly advise that whole-grain foods should meet accepted standards for healthy foods, for example not being high in sodium, saturated fat, and added sugars, based on local regulations.
- We strongly encourage food manufacturers to report the percentage of whole grain in a product in any front-of-pack labeling.
- Based on available data, we do not see any need for restriction on the type of processing for whole grains, unless the processing leads to a >10% reduction in the dietary fiber content (as an indicator of the amount of beneficial components within the whole grain). Country-specific criteria should be observed, however, because some countries do not consider sprouted grains as whole grain (e.g., Denmark).

Proposed Labeling for Whole-Grain Foods

Generic statements about whole-grain content should be allowed based on the following:

- For ≥ 30 g whole grain/100 g dry weight of the overall product, where there are more whole-grain ingredients than refined grain ingredients on a dry weight basis, the product can be labeled as a “whole-grain food.” It can display a whole-grain logo, with a factual statement on the proportion of whole-grain content (either grams or a percentage).
- Whole-grain ingredients are those defined according to the Healthgrain definition of “whole grain” (12).
- QUID regulations still apply for labeling the amount of whole grains in the ingredients list.

A Minimum Amount for Whole-Grain Content Claims

It is outside the scope of this definition to specify a minimum amount for whole-grain content claims, which will be the topic of a future position article. We strongly encourage the clear labeling of whole-grain content as a percentage of the product on a dry-weight basis to allow consumers to easily decide between different products and product categories based on their whole-grain content. We recommend that whole-grain content claims are carried only on products that contribute a significant amount of whole grain in the diet, although we recognize that there is no agreed-on definition of what a “significant amount” is for whole grains. Several US-based organizations have suggested 8 g/serving as a significant amount (26, 28). A significant amount should factor in the type of product, whether it is frequently eaten and in which amount, what consumers would expect to be in a food with a whole-grain label, and the likelihood that it will help the public reach local guidelines for the recommended minimum whole-grain intake as part of a normal healthy diet, if they exist.

There are several issues with using the idea of a significant amount and with using 8 g/serving as a significant amount specifically. Initial population-based studies (also called observational or epidemiological studies) looking at whole-grain intake and risk of disease used an arbitrary value of 25% whole-grain ingredients as a threshold for whole-grain breakfast cereal to be defined as a whole-grain food (29–31). At this amount, a greater intake of whole-grain foods was associated with a reduced risk of cardiovascular disease (30). Since these early studies, a strong body of evidence associating whole-grain intake with reduced risk of many diseases has been assembled. However, the estimation of whole-grain intake in these studies is poor, because it has been based on FFQs with low correlations with food diaries for whole-grain intake (32) and usually based on estimations of whole-grain foods rather than actual whole grain. In much of the epidemiological literature on whole grains and health, a whole-grain food could contain anywhere between 25% and 100% whole-grain ingredients. Dietary fiber intake has also been used to extrapolate a relevant

serving of whole grains for disease reduction, but on top of the variation in dietary fiber measurements, the range of dietary fiber in whole grains is from 3% for brown rice to $\geq 15\%$ for rye and barley. So the scientific evidence base is not yet strong enough to state a minimum amount of whole grain before a product can be labeled “whole grain” or to set a minimum amount for any kind of front-of-pack whole-grain labeling. We have selected 30% as a starting point for whole-grain food labeling based on the observational evidence that foods with $\geq 25\%$ whole grain lead to disease risk reduction, with an additional 5% “safety margin” to ensure that the recommendation is well within a range where there is current evidence for long-term health benefits. We also acknowledge that there is insufficient evidence to state that 30% of a product is a “significant amount” for health and underline that this definition does not aim to set thresholds for health claims.

Recent research has found that foods with $>10\%$ and $<50\%$ whole grain contributed 45% of total whole-grain intake in adults and 53% of total whole-grain intake in children in the United Kingdom (33). Furthermore 35% of adults and 40% of children/teenagers consume no foods containing $>51\%$ whole grain, which has been the effective threshold for labeling most products “whole grain.” This research indicates that foods with a relatively low amount of whole grain still make up an important part of current whole-grain intakes, and that foods with 30–50% whole grains could still be important contributors to overall whole-grain intake, and thus there is justification for highlighting this content by calling the food “whole grain.” To objectively determine a relevant lower limit of whole grain for a whole-grain food definition related to health outcomes, a meta-analysis comparing the disease risk reduction from the intake of foods with 25–50% whole grain with those $>51\%$ whole grain would be required. This has not been done to date largely because of a lack of products that fit into the latter category in the countries where major observational studies have been carried out.

During the work on this definition, it has become clear that there is a need for more research and clearer reporting of whole-grain intake in intervention and observational studies (34). This will be necessary for defining a lower limit for whole grain–content claims based on scientific evidence.

Appropriate Nutrition Criteria for a Front-of-Pack Whole-Grain Label

Food products that wish to carry a “whole grain” label should also meet generally accepted criteria for healthy food. Various nutrient profiling systems have been proposed with the general purpose of preventing disease and promoting health. There is a substantial amount of heterogeneity in the way these profiling systems are designed depending on their application, which can include the regulation of nutrition and health claims (35), marketing to children (36),

product promotion at the point of sale (37, 38), front-of-package labeling (36, 39–42), and product innovation or renovation by food companies (43). Because none of these systems has been universally recognized, we cannot recommend that whole-grain labeling be tied to one or another of these guidelines, but we emphasize that whole-grain labeling should not be used on foods that are unhealthy based on general and local recommendations. This is to avoid the use of whole-grain labeling to make products that are unhealthy appear healthier, which otherwise risks reducing consumer confidence in a whole-grain label as they look for healthy foods. This should not discourage manufacturers from including whole grains in their foods because generally foods made with whole grains have a healthier nutrient profile than equivalent foods made with the refined grains.

We also note that while this whole-grain food definition is not food-category specific (e.g., different criteria for bread, pasta, biscuits, snacks), dietary guidelines often are food-category specific, and appropriate nutrient profiles for each category should be followed.

Whole-grain products should also be aligned with public health nutrition recommendations for whole-grain intake. In a review of the whole-grain intake recommendations of 30 countries almost all recommended either having at least half of grain foods be whole grain or that whole-grain products be chosen in preference to refined-grain products (6). To achieve this recommendation to eat more whole grains than refined grains, it follows that a whole-grain product should contain more whole grains than refined grains. Including this criteria in the definition helps ensure that products labeled as “whole grain” will help people meet the recommendation to eat more whole grains than refined grains.

Applying the Whole-Grain Food Definition

Although the definition that has been developed for whole-grain foods is simple, interpreting the definition for the purposes of applying it for labeling or regulation could lead to differences in how it is applied. To avoid such situations, we have explained how the definition should be used in detail in a question-and-answers format (**Supplemental Information 1**), along with examples of how different types of theoretical cereal foods should be labeled based on the proposed whole-grain food definition (**Supplemental Table 1**).

A number of products also include added bran, especially in the breakfast cereal category, and it is important to clarify the status of bran for the purposes of this whole-grain food definition. Bran is not included in the Healthgrain whole-grain definition (15), and the relative benefits of bran compared with whole grain remains a topic of debate (34). In this definition, added bran is considered a cereal ingredient but not a refined cereal ingredient. A product may be described as both “whole grain” (based on the ratio of whole-grain to refined-grain content) and as “containing added bran” (when bran is itemized as a separate ingredient).

Conclusions

A whole-grain food definition is necessary to allow fair comparison of whole-grain content between different products. We have strived to make a definition that both protects consumers from statements about trivial amounts of whole grains, while allowing enough room for food manufactures to create new innovative products that incorporate more whole grains (Table 3). Worldwide there is very different knowledge about the benefits of replacing refined grains with whole grains in the diet, consumer preference for whole grains, and very different availability of whole-grain products that would make this simple positive dietary change possible. Public-private campaigns to increase awareness of whole grains and encourage greater intake of whole grains have been demonstrated to be very effective in Denmark, where whole-grain intake was increased over a period of ~4 y by an average of 20 g/d per person. This is in part through clear labeling of whole-grain foods that made it easy for consumers interested in increasing their consumption of whole-grain products to find them on the shelves (44). As a consortium of experts in cereal science and nutrition from academia and industry, the Healthgrain Forum sees this definition as an important step in providing a clear framework for whole-grain labeling that will ultimately be a key component in achieving population-wide higher whole-grain intake.

Acknowledgments

The authors' responsibilities were as follows—ABR: coordinated the writing of the paper; and all authors: contributed to the content and writing of this perspective paper and read and approved the final manuscript.

References

1. Ye EQ, Chacko SA, Chou EL, Kugizaki M, Liu S. Greater whole-grain intake is associated with lower risk of type 2 diabetes, cardiovascular disease, and weight gain. *J Nutr* 2012;142:1304–13.
2. Chanson-Rolle A, Meynier A, Aubin F, Lappi J, Poutanen K, Vinoy S, Braesco V. Systematic review and meta-analysis of human studies to support a quantitative recommendation for whole grain intake in relation to type 2 diabetes. *PLoS One* 2015;10:e0131377.
3. Aune D, Keum N, Giovannucci E, Fadnes LT, Boffetta P, Greenwood DC, Tonstad S, Vatten LJ, Riboli E, Norzat T. Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies. *BMJ* 2016;353:i2716.
4. Zong G, Gao A, Hu FB, Sun Q. Whole grain intake and mortality from all causes, cardiovascular disease, and cancer: a meta-analysis of Prospective Cohort Studies. *Circulation* 2016;133:2370–80.
5. Chen G-C, Tong X, Xu J-Y, Han S-F, Wan Z-X, Qin J-B, Qin L-Q. Whole-grain intake and total, cardiovascular, and cancer mortality: a systematic review and meta-analysis of prospective studies. *Am J Clin Nutr* 2016;104:164–72.
6. Seal CJ, Nugent AP, Tee ES, Thielecke F. Whole-grain dietary recommendations: the need for a unified global approach. *Br J Nutr* 2016; 115:2031–8.
7. USDA. Dietary guidelines for Americans [Internet]. 2010 [cited 2014 Oct 22]. Available from: <http://health.gov/dietaryguidelines/dga2010/dietaryguidelines2010.pdf>.

8. Frølich W, Åman P, Tetens I. Whole grain foods and health - a Scandinavian perspective. *Food Nutr Res* 2013;57:18503.
9. National Health and Medical Research Council of Australia. Australian dietary guidelines [Internet]. 2013 [cited 2014 Oct 22]. Available from: <http://www.nhmrc.gov.au/guidelines/publications/n55>.
10. Bautista-Castaño I, Sánchez-Villegas A, Estruch R, Martínez-González MA, Corella D, Salas-Salvadó J, Covas MI, Schroder H, Alvarez-Pérez J, Quilez J, et al. Changes in bread consumption and 4-year changes in adiposity in Spanish subjects at high cardiovascular risk. *Br J Nutr* 2013;110:337–46.
11. Thane CW, Jones AR, Stephen AM, Seal CJ, Jebb SA. Comparative whole-grain intake of British adults in 1986–7 and 2000–1. *Br J Nutr* 2007;97:987–92.
12. Bellisle F, Hebel P, Colin J, Reye B, Hopkins S. Consumption of whole grains in French children, adolescents and adults. *Br J Nutr* 2014;112:1674–84.
13. Devlin NFC, McNulty BA, Gibney MJ, Thielecke F, Smith H, Nugent AP. Whole grain intakes in the diets of Irish children and teenagers. *Br J Nutr* 2013;110:354–62.
14. Kyrø C, Skeie G, Dragsted LO, Christensen J, Overvad K, Hallmans G, Johansson I, Lund E, Slimani N, Johnsen NF, et al. Intake of whole grains in Scandinavia is associated with healthy lifestyle, socio-economic and dietary factors. *Public Health Nutr* 2011;14:1787–95.
15. van der Kamp JW, Poutanen K, Seal CJ, Richardson DP. The HEALTHGRAIN definition of 'whole grain'. *Food Nutr Res* 2014;58:22100.
16. Institute of Grocery Distributors. UK whole grain guidance note [Internet]. 2007 [cited 2014 Oct 22]. Available from: <http://www.igd.com/Research/Nutrition-food-and-farming/UK-Whole-Grain-Guidance/>.
17. State Secretary for Health, Welfare and Sport, The Netherlands. Warenwetbesluit meel en brood (decision of June 4, 1998, amending the commodities act decree on flour and bread) [Internet]. [cited 2015 Feb 25]. Available from: http://wetten.overheid.nl/BWBR0009669/geldigheidsdatum_25-02-2015.
18. Bundesministerium für Ernährung und Landwirtschaft. Leitsätze für Feine Backwaren (Guidelines for fine bakery products) [Internet]. 2010 [cited 2015 Feb 25]. Available from: <http://www.bmel.de/SharedDocs/Downloads/Ernaehrung/Lebensmittelbuch/LeitsaetzeFeineBackwaren.html>.
19. Bundesministerium für Ernährung und Landwirtschaft. Leitsätze für Brot und Kleingebäck (Guidelines for bread and small bread-related products) [Internet]. 2005 [cited 2015 Feb 25]. Available from: <http://www.bmel.de/SharedDocs/Downloads/Ernaehrung/Lebensmittelbuch/LeitsaetzeBrot.html>.
20. Bundesministerium für Ernährung und Landwirtschaft. Leitsätze für Teigwaren (Guidelines for dough based products [Internet]. 2008 [cited 2015 Feb 25]. Available from: <http://www.bmel.de/SharedDocs/Downloads/Ernaehrung/Lebensmittelbuch/LeitsaetzeTeigwaren.html>.
21. Manual for brug af Fuldkornslogoen. [Manual for use of the whole-grain logo]. 2015. [cited 2017 May 11]. Available from: http://www.fuldkorn.dk/media/707444/2015-Logo-manual_english.pdf.
22. Ministero delle Politiche Agricole Alimentari e Forestali. Regolamento per la revisione della normativa sulla produzione e commercializzazione di sfarinati e paste alimentari, a norma dell'articolo 50 della legge 22 febbraio 1994, n. 146. [Regulations for the revision of the production and sales norms for flour and pasta, an update of article 50, n. 146 dated 22 February 1994] [Internet]. 2001 [cited 2015 Feb 25]. Available from: <http://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/LIT/IDPagina/2772>.
23. Les Fabricants de biscuits et gâteaux de France. Charte de deontologie des fabricants de biscuits et gâteaux. [Charter of ethics for French biscuit and cake manufacturers] [Internet]. 2009 [cited 2016 Apr 29]. Available from: http://www.alliance7.com/wp-content/themes/alliance7/pdf/charter_de_deontologie/charter_de_deontologie_biscuiterie.pdf.
24. Fuldkornspartnerskabet/Fødevarestyrelsen. Vælg fuldkorn først. [Choose whole-grain first] [Internet]. 2009. [cited 2016 Apr 5]. Available from: www.fuldkorn.dk.
25. Whole Grains Council. Whole grain growth worldwide 2000–2011 [Internet]. 2017 [cited 2015 Sep 28]. Available from: <http://wholegrainscouncil.org/newsroom/whole-grain-statistics>.
26. Ferruzzi MG, Jonnalagadda SS, Liu S, Marquart L, McKeown N, Reicks M, Riccardi G, Seal C, Slavin J, Thielecke F, et al. Developing a standard definition of whole-grain foods for dietary recommendations: summary report of a multidisciplinary expert roundtable discussion. *Adv Nutr* 2014;5:164–76.
27. Whole Grains Council. Letter to the FDA on a whole grain food definition [Internet]. 2014. [cited 2015 Feb 25]. Available from: <https://wholegrainscouncil.org/sites/default/files/atoms/files/WGCToFDAJan2014.pdf>.
28. American Association of Cereal Chemists International. AACI's whole grains working group unveils new whole grain products characterization [Internet]. 2013 [cited 2016 Apr 9]. Available from: <http://www.aaccnet.org/about/newsreleases/Pages/WholeGrainProductCharacterization.aspx>.
29. Jacobs DR Jr, Marquart L, Slavin J, Kushi LH. Whole-grain intake and cancer: an expanded review and meta-analysis. *Nutr Cancer* 1998;30: 85–96.
30. Jacobs DR Jr, Meyer KA, Kushi LH, Folsom AR. Whole-grain intake may reduce the risk of ischemic heart disease death in postmenopausal women: the Iowa Women's Health Study. *Am J Clin Nutr* 1998;68:248–57.
31. Jacobs DR, Pereira MA, Meyer KA, Kushi LH. Fiber from whole grains, but not refined grains, is inversely associated with all-cause mortality in older women: the Iowa women's health study. *J Am Coll Nutr* 2000;19: 326S–30S.
32. Jensen MK, Koh-Banerjee P, Hu FB, Franz M, Sampson L, Gronbaek M, Rimm EB. Intakes of whole grains, bran, and germ and the risk of coronary heart disease in men. *Am J Clin Nutr* 2004;80: 1492–9.
33. Mann KD, Pearce MS, McKeith B, Thielecke F, Seal CJ. Low whole grain intake in the UK: results from the National Diet and Nutrition Survey rolling programme 2008–11. *Br J Nutr* 2015;113:1643–51.
34. Ross AB, Kristensen M, Seal CJ, Jacques P, McKeown NM. Recommendations for reporting whole-grain intake in observational and intervention studies. *Am J Clin Nutr* 2015;101:903–7.
35. FDA. Guidance for industry: a food labelling guide (8. Claims) [Internet]. 2013 [cited 2016 Apr 9]. Available from: <http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm064908.htm>.
36. Rayner M, Scarborough P, Kaur A. Nutrient profiling and the regulation of marketing to children. Possibilities and pitfalls. *Appetite* 2013; 62:232–5.
37. Katz DL, Njike VY, Rhee LQ, Reingold A, Ayoob KT. Performance characteristics of NuVal and the Overall Nutritional Quality Index (ONQI). *Am J Clin Nutr* 2010;91:1102S–8S.
38. Katz DL, Njike VY, Faridi Z, Rhee LQ, Reeves RS, Jenkins DJ, Ayoob KT. The stratification of foods on the basis of overall nutritional quality: the overall nutritional quality index. *Am J Health Promot* 2009; 24:133–43.
39. Scarborough P, Rayner M, Stockley L. Developing nutrient profile models: a systematic approach. *Public Health Nutr* 2007;10:330–6.
40. Scarborough P, Payne C, Agu CG, Kaur A, Mizdrak A, Rayner M, Halford JC, Boyland E. How important is the choice of the nutrient profile model used to regulate broadcast advertising of foods to children? A comparison using a targeted data set. *Eur J Clin Nutr* 2013;67: 815–20.
41. Nijman CA, Zijp IM, Siersma A, Roodenburg AJ, Leenen R, van den Kerkhoff C, Weststrate JA, Meijer GW. A method to improve the nutritional quality of foods and beverages based on dietary recommendations. *Eur J Clin Nutr* 2007;61:461–71.
42. van Raaij J, Hendriksen M, Verhagen H. Potential for improvement of population diet through reformulation of commonly eaten foods. *Public Health Nutr* 2009;12:325–30.
43. Buttriss JL. Food reformulation: the challenges to the food industry. *Proc Nutr Soc* 2013;72:61–9.
44. Mejborn H, Ygil KH, Fagt S, Trolle E, Christensen T, Danskernef fuldkornsindtag 2011–2012. [Wholegrain intake among Danes, 2011–2012]. Søborg (Denmark): DTU Fødevareinstituttet; 2013.