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Whole grain

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1. Defining whole grain

The term *grain* applies to plants of the *Poaceae* grass family and includes cereal grains and pseudocereals. All grains that belong to the *Poaceae* family are composed of the starchy endosperm, the germ and the outer bran layer.[1] Pseudocereals such as buckwheat and quinoa have a similar macronutrient composition to cereals, and they are often included in the bread cereal group. They are of great significance for persons suffering from intolerance to gluten (*e.g.* coeliac disease), contained in most cereals, and at the same time they allow for a wider consumer choice.[1]

In European Union agricultural legislation, whole grains are referred to as 'grains from which only part of the end has been removed, irrespective of characteristics produced at each stage of milling'.[2] The European Food Safety Authority (EFSA),[3] in a whole-grain related health claim opinion, provides the definition of the American Association of Cereal Chemists (AACC), which states that whole grain 'consist of the intact, ground, cracked or flaked caryopsis, whose principal anatomical components – the starchy endosperm, germ and bran – are present in the same relative proportions as they exist in the intact caryopsis'.[4] *Table 1* provides an overview of the available definitions and the grains that are included in each of them.

Table 1. *Examples of whole grain definitions.*

Source	Definition	Grains included
EU[2]	'Whole grains means grains from which only part of the end has been removed, irrespective of characteristics produced at each stage of milling.'	as in definition
AACC (2000)[4]	'Whole grains shall consist of the intact, ground, cracked or flaked caryopsis, whose principal anatomical components – the starchy endosperm, germ and bran – are present in the same relative proportions as they exist in the intact caryopsis.'	'all' cereals and pseudocereals[5]
Swedish National Food Agency (2015)[6]	Whole grain is defined as the whole kernel of the cereal. The kernel can be ground, crushed or similar, but the components should be included, in their original proportions, for each type of cereal.	wheat, including spelt and durum wheat, rye, oats, barley, corn, rice, millet, durra and other types of sorghum
Danish Task Force (2008)[7]	Whole grain is defined as intact, ground, cracked, or flaked kernels after removal of the husks.	barley, oats, wheat, rye, rice, millet, maize, sorghum, and triticale

1. HEALTHGRAIN Consortium (2013), *Whole grain definition*.
2. Regulation (EU) No. 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No. 922/72, (EEC) No 234/79, (EC) No. 1037/2001 and (EC) No. 1234/2007.
3. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA) (2010), *Scientific Opinion on the substantiation of a health claim related to whole grain*.
4. AACC (2000), *Whole grains definition*.
5. AACC International (2012), *Whole Grain Definition: New Perspectives for Inclusion of Grains and Processing but not for Analysis*.
6. Livsmedelsverket National Food Agency (2015), *Swedish dietary Guidelines – risk and benefit management report*.
7. Danish Task Force (2008), *Fuldkorn. Definition og vidensgrundlag for anbefaling af fuldkornsindtag i Danmark*.

Table 1. *(cont.)*

Source	Definition	Grains included
FDA (2009)[8]	'Whole grains are cereal grains that consist of the intact, ground, cracked or flaked kernel, which includes the bran, the germ, and the inner most part of the kernel (the endosperm).'	'all' cereals and pseudocereals[5]
HEALTHGRAIN (2014)[9]	'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 they exist in the intact kernel. Small losses of components that is less than 2% of the grain 10% of the bran that occur through processing methods consistent with safety and quality are allowed.'	'all' cereals and pseudocereals[9]

Taking into consideration that whole grain products from all cereal grains have higher levels of dietary fibre and bioactive compounds than their refined equivalents, and in line with the suggestion that a whole grain definition should be suitable for both dietary recommendation and labelling purposes, the definitions of AACC and HEALTHGRAIN[1] allow for both cereals and pseudocereals to be characterised as whole grain. Some examples of whole grains included in the aforementioned definitions are whole wheat, oatmeal, whole-grain cornmeal, brown rice, whole-grain barley, whole rye, and buckwheat.[10]

Whole grains can be eaten in cooked form (after boiling) as a food on their own, for instance *brown rice* (wild, red, black), oatmeal, and corn (maize). However, in most cases, whole grains are further processed and thus deliver a variety of edible and safe products for human consumption (*e.g.* whole grain flour). This processing results in an alteration of the grain's physical form and may also affect the nutritional value of the grain.

2. Nutritional value of whole grains

Grains are staple foods and constitute a major source of carbohydrate, protein and fibre for the world's population.[11] In addition, they contain vitamins (B vitamins), minerals (zinc, phosphorus, magnesium, and iron) and bioactive compounds such as antioxidants and other phytochemicals. Some of the beneficial health effects of whole grains are attributed to their content in those bioactive phytonutrients. However, refinement of whole grains results in a significant removal of their bioactive compounds.[10]

Examples of the nutritional value of some whole grains along with two examples of refined grains are included in *Table 2*.

8. FDA Consumer Health Information, *The Scoop on Whole Grains*. Page last updated: 05/13/2015 [accessed 04/09/2017].
9. *Food Nutr Res* (2014), 58:22100.
10. AACC International (2012), *Whole Grains from a Mechanistic View*.
11. British Nutrition Foundation (2004), *Nutritional aspects of cereals*.

Table 2. *Examples of the nutritional value of whole grains.*

Values are given per 100 g of raw product.
For comparison purposes, the refined counterpart of whole grain flour and wild rice are also included.

Nutritional Value (/100 g raw)	Unit	White wheat flour, unenriched [12]	Whole grain wheat flour [12]	Brown rice [13]	Oats [12]	Buck-wheat [14]	Whole grain barley [14]	Wild rice [12]	White rice, unenriched [12]
Energy	kcal	364	340	357	389	335	334	357	365
Protein	g	10.3	13.2	8.3	16.9	11.1	10.6	14.7	7.1
Total fat	g	1	2.5	2.6	6.9	2	2.1	1.1	0.66
Carbohydrates	g	73.6*	61.3*	73.5	55.7*	65.3	60.8	68.7*	78.7*
Fibre	g	2.7	10.7	3	10.6	5.8	14.8	6.2	1.3
Calcium	mg	15	34	12	54	18	50	21	28
Iron	mg	1.2	3.6	1.3	4.7	3.8	6	2	0.8
Magnesium	mg	22	137	157	177	180	91	177	25
Phosphorus	mg	108	357	300	523	320	380	433	115
Potassium	mg	107	363	250	429	460	4	427	115
Sodium	mg	2	2	4.5	2	1	0.5	7	5
Zinc	mg	0.7	2.6	0.8	4	2.5	3.3	6	1.1
Thiamin (B1)	mg	0.1	0.5	0.3	0.8	0.4	0.3	0.1	0.07
Riboflavin (B2)	mg	0.04	0.2	0.03	0.1	0.1	0.1	0.3	0.05
Niacin (B3)	mg	1.3	5	0.3	1	3.5	n/a	6.7	1.6
Vit. B6	mg	0.04	0.4	0.3	0.1	0.4	0.6	0.4	0.2
Folate	DFE	26	44	49	56	40	50	95	8

* USDA carbohydrate content values (referred as carbohydrate by difference) also include fibre content. In the Dutch and Norwegian nutrient databases fibre is not included in carbohydrate content.

12. USDA National Nutrient Database for Standard Reference [accessed on 20/10/2016].
13. Dutch Food composition data (2016) [accessed on 20/10/2016].
14. Norwegian Food Composition table (2012) [accessed on 20/10/2016].

3. Labelling of whole grain in the EU

Whole grain foods (including whole grain flour) are defined differently across the EU.[3] There is no legislation regarding labelling of whole grains at the EU level. For instance, in Denmark[15] and Sweden[16] for a food to be characterized as whole grain, it is required to consist of at least 50% of dry matter from whole grain ingredients. In the Netherlands, 100% of the flour must be whole grain for bread to be labelled as 100% whole grain.[3] In Germany, whole grain bread must be at least 90% whole grain.[17] In the United Kingdom[18] and the USA,[19] whole grain foods must contain ≥ 51% whole grain ingredients by weight. As whole grain foods are high in fibre, the legislation regarding declaration of fibre content is relevant (refer to *Dietary Fibre* in this series).

4. Whole grain intake: effects on health

Whole grains are considered as significant components of a healthy diet.[20] Consumption of whole grains is associated with a reduction in the risk of developing several non-communicable diseases, as detailed in *Table 3*.

Table 3. *Health effects related to whole grain intake as described by food and health-related organisations.*
For health effects related to intake of fibre specifically, refer to *Dietary Fibre* in this series.

Type		Source	Year	Statement/opinion
CARDIOVASCULAR	Cardiovascular disease	FAO/WHO[21]	2007	• Intake of whole grain cereals is probably associated with decreased risk of cardiovascular disease.
		SACN[22]	2015	• There is moderate evidence that there is an inverse relationship between higher consumption of whole grains and cardiovascular disease.
		NNR[23]	2012	• There is moderate evidence that whole grains are associated with protection against cardiovascular disease.
		DGA[24]	2015	• 'Some evidence indicates that whole grain intake may be associated with reduced risk of cardiovascular disease.'
	Coronary Heart Disease	DGE[25]	2012	• 'There is probable evidence regarding primary prevention of CHD by increasing the consumption of whole-grain products.'
		Health Council of the Netherlands[26]	2006	• There is reason to believe that dietary fibre from whole-grain cereal products and fruit is particularly effective in reducing the risk of coronary heart disease.

15. Fodevareinstituttet, DTU (2008), *Wholegrain. Definition and scientific background for recommendations of whole grain intake.*
16. SNF (Swedish Nutrition Foundation), Health claims in the labelling and marketing of food products, *Scand J Food Nutr* (2007 Mar), 51(1):107-126.
17. BMEL Deutsches Lebensmittelbuch (1993), *Leitsätze für Brot und Kleingebäck.*
18. *Proc Nutr Soc* (2003 Feb), 62(1):161-9.
19. FDA (2001), *Health Claim Notifications for Whole Grain Foods.*
20. WHO (2015), *Healthy diet fact sheet*, No. 394.
21. Joint FAO/WHO Scientific update on carbohydrates in human nutrition.
22. Scientific Advisory Committee on Nutrition – Public Health England (2015), *SACN Carbohydrates and health report.*
23. *Nordic Nutrition Recommendations*, 5th ed. (2012).
24. U.S. Department of Health and Human Services and U.S. Department of Agriculture, *2015-2020 Dietary Guidelines for Americans.*
25. Evidence-Based Guideline of the German Nutrition Society: Carbohydrate Intake and Prevention of Nutrition-Related Diseases, *Ann Nutr Metab* (2012), 60(suppl1):1-58.
26. Health council of the Netherlands (2006), *Guidelines for a healthy diet.*

Table 3. *(cont.)*

Type		Source	Year	Statement/opinion
CARDIOVASCULAR *(cont.)*	Stroke	SACN[22]	2015	• Limited evidence to support that whole grain consumption is associated with reduced incidence of stroke.
	Blood pressure	SACN[22]	2015	• There is no significant relationship between whole grain intake and blood pressure. • Limited evidence to support that higher consumption of whole grain is associated with reduced incidence of hypertension.
		DGE[25]	2012	• 'There is probable evidence that increased dietary fibre consumption in a population with different blood pressure levels lowers the risk of hypertension. This also applies to the food group of whole-grain products.'
	Serum lipids	SACN[22]	2015	• There is adequate evidence to support lack of correlation between whole grain consumption and fasting cholesterol and triacylglycerol levels.
		DGE[25]	2012	• 'There is convincing evidence that an increased consumption of whole-grain products reduces the plasma levels of total and LDL cholesterol.' • 'There is convincing evidence that there is no association between the consumption of whole-grain products and plasma triglyceride concentrations.'
TYPE 2 DIABETES (T2DM) & BLOOD GLUCOSE		NNR[23]	2012	• There is moderate evidence that whole grains are associated with protection against type-2 diabetes.
		SACN[22]	2015	• There is moderate evidence that higher consumption of whole grain is inversely associated with the incidence of type 2 diabetes mellitus. • Whole grain consumption has no significant effect on fasting blood glucose concentration, fasting blood insulin concentration and insulin sensitivity.
		DGE[25]	2012	• 'Prospective cohort studies indicate with high consistency that high intake of whole-grain products or dietary fibre from cereal products, respectively, causes a lower risk of diabetes. The evidence regarding this association is judged as probable.'
		Health Council of the Netherlands[26]	2006	• 'There are also strong indications that high consumption of many whole-grain cereal products can reduce the risk of type 2 diabetes mellitus.'
CANCER		NNR[23]	2012	• There is limited evidence that whole grains could protect against colorectal cancer.
		SACN[22]	2015	• Limited evidence supporting that higher whole grain intake is associated with reduced incidence of colon cancer. • Limited evidence of no association between whole grain intake and colorectal cancer (limited evidence).
BODY WEIGHT/ OBESITY/ ENERGY INTAKE		WCRF[27]	2007	• Foods high in dietary fibre, such as whole grain cereals and vegetables, promote satiety and therefore may influence weight regulation by improving appetite regulation and tending to constrain excess energy consumption.
		SACN[22]	2015	• Limited evidence suggesting that higher whole grain consumption is related with reduced energy intake.

27. World Cancer Research Fund/American Institute for Cancer Research (2007), *Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective.*

Table 3. *(cont.)*

Type	Source	Year	Statement/opinion
BODY WEIGHT/ OBESITY/ ENERGY INTAKE *(cont.)*	DGE[25]	2012	• In adults, 'increased whole grain product intake is accompanied by a reduced risk of obesity. The overall evidence is judged as possible'. • 'For children and adolescents, the evidence regarding the role of whole-grain product intake in the development of obesity is insufficient.'
	DGA[24]	2015	• 'Some evidence indicates that whole grain intake [...] is associated with lower body weight.'
METABOLIC SYNDROME	DGE[25]	2012	• 'Because there is only 1 prospective study available, the evidence regarding an association between the consumption of whole-grain products or refined grain products and the metabolic syndrome is judged as insufficient.'

5. Recommended intake of whole grains

As already discussed, whole grains are considered an important part of a healthy eating pattern, and therefore is recommended.

Table 4. *Dietary recommendations for whole grain intake as described by food and health-related organisations.*

Source	Year	Dietary recommendation
EU National recommendations[28]		• Prefer wholegrain cereals.
Swedish National Food Agency[6]	2015	• 'There isn't enough scientific evidence to give advice about exactly how much whole grains to optimally consume. An intake corresponding to 75 grams of whole grains per 10 MJ is considered an appropriate amount. This means about 70 grams of whole grains a day for women and about 90 grams for men.'
Norwegian Directorate of Health[29]	2014	• Eat whole grain products every day. Whole grain intake should reach 70-90 grams per day.
Danish dietary guidelines[30]	2013	• Eat at least 75 grams of whole grains per day.
DGE[25]	2012	• 'The total intake of dietary fibre and especially the intake of whole-grain products, which are foods high in dietary fibre, should be increased, as this reduces the risk of various nutrition related diseases.'
AHA[31]	2016	• At least half of the grains consumed should be whole grains.

28. Joint Research Centre, European Commission (expected 2018), *Report on identifying commonalities between EU national nutritional and physical activity guidelines*.
29. Norwegian Directorate of Health (2014) [accessed on 14/11/2016].
30. Danish dietary guidelines (2013), *De officielle Kostråd*.
31. American Heart Association (2016), *Whole Grains and Fiber* [accessed on 27/10/2016].

Table 4. *(cont.)*

Source	Year	Dietary recommendation
DGA[24]	2015	• 'To improve diet quality, the U.S. population should replace most refined grains with whole grains […].' Recommended daily amount of whole grain in terms of a healthy U.S. Style Eating Pattern at the 2000-Calorie Level is 3 ounce equivalents (85 g).

6. Whole grain intake across European countries

Data on whole grain intake in Europe are limited. This could be because whole grains do not have a consistent definition across Europe, but also since many studies limit their scope to the intake of fibre and not whole grains as a food group.

Due to this lack of official intake data, *Table 5* presents the data included in the Global Dietary Database (GDD) for whole grain intake. GDD data comes from governments or ministries of health, researchers and the 2010 NutriCoDE project.[32]

As data on whole grain intake may not be available for all countries or all age groups, the GDD study group developed methods to impute data, based on non-missing exposure data from other regions and available data on country-level covariates. These caveats affect the reading and comparability of the data presented in *Table 5*. According to it, only 11 countries would seem to meet the intake recommendation of 75 grams per day. It could also be concluded that the recommendation is mainly met in ages over 65 years.

Table 5. *Overview of whole grain intake across European countries.*

Intakes are based on Global Dietary Database intake data for EU28 countries.
(Total intake of whole grains includes breakfast cereals, bread, rice, pasta, biscuits, muffins, tortilla, pancake etc.
A whole grain food is defined as a food with ≥1 g of fibre per 10 g of carbohydrate.)

Whole grain – Mean Intake (g/day) by age group (years)												
Country	*Males*						*Females*					
	0-1	5	10-15	20-60	65-70	≥75	0-1	5	10-15	20-60	65-70	≥75
Belgium	10	9	10	11	14	15	10	10	10	11	14	15
Bulgaria	18	19	19	23	30	31	19	19	20	24	31	32
Czech Republic	12	12	12	14	19	19	12	12	12	15	19	20
Denmark	58	58	59	68	86	92	60	60	60	69	88	94
Germany	103	102	104	120	152	161	106	107	106	122	156	166

32. Global Nutrition and Policy Consortium (2016), *Global Dietary Database* [accessed on 14/11/2016].

Table 5. *(cont.)*

Whole grain – Mean Intake (g/day) by age group (years)												
Country	*Males*						*Females*					
	0-1	5	10-15	20-60	65-70	≥75	0-1	5	10-15	20-60	65-70	≥75
Estonia	19	19	19	23	30	31	19	20	20	24	31	33
Ireland	53	53	54	62	79	84	55	55	55	63	81	86
Greece	52	52	53	61	77	82	54	54	54	61	79	84
Spain	10	10	10	11	15	15	10	10	10	12	15	16
France	31	31	31	36	46	48	32	32	32	36	47	50
Croatia	2	2	2	3	4	4	2	2	2	3	4	4
Italy	9	9	9	11	14	15	10	10	10	11	14	15
Cyprus	25	25	26	29	38	40	26	27	26	30	39	41
Latvia	19	19	19	23	30	31	20	20	20	24	31	33
Lithuania	17	17	17	21	27	28	17	17	17	21	27	29
Luxembourg	54	54	55	63	80	85	55	55	55	63	81	86
Hungary	1	1	1	1	2	2	1	1	1	1	2	2
Malta	54	54	55	63	80	85	56	57	56	65	83	88
Netherlands	69	68	69	80	102	108	71	71	71	81	104	111
Austria	52	52	53	61	77	82	55	55	55	63	81	86
Poland	13	13	13	15	20	21	13	13	13	16	21	22
Portugal	54	54	54	63	80	85	56	56	56	64	82	87
Romania	13	13	13	16	21	22	13	13	14	17	22	22
Slovenia	14	14	14	17	22	23	14	14	15	18	23	24
Slovakia	13	15	15	180	24	25	16	15	16	19	25	26
Finland	56	56	57	65	83	88	58	58	58	66	85	90
Sweden	63	63	64	74	94	99	64	64	64	74	94	100
United Kingdom	58	58	59	68	86	91	60	60	60	69	88	94

7. Disease burden related to low intake of whole grain

The Global Burden of Disease (GBD) 2016 study[33] defines diets low in whole grains as average daily consumption of less than 125 grams per day of whole grains (bran, germ, and endosperm in their natural proportions) from breakfast cereals, bread, rice, pasta, biscuits, muffins, tortillas, pancakes, and other sources. According to the GBD2016 study[34] a diet low in whole grains resulted in almost 270000 avoidable deaths from all causes in 2016 in the EU28, as well as in more than 4.5 million Disability Adjusted Life years (DALYs – sum of years lost due to premature death and years lived with disability),[33] of which 250000 are deaths from cardiovascular disease, which accounts for the vast majority of all-cause deaths associated with diets low in whole grain.

8. Policy recommendations on whole grain intake

As whole grains are considered part of a healthy diet, scientific associations, institutions and authorities have issued policy recommendations that aim to increase the availability and accessibility of whole grains and ultimately to increase its intake across the population. A summary of such policy recommendations can be found in *Table 6*. They can be generally categorised in actions that aim to (i) increase the awareness of consumers regarding the benefits of whole grain and also provide information on how to recognize the appropriate products, (ii) make the healthy option available by improving the food environment, *e.g.* increasing the availability of whole grains at school meals, and (iii) implement financial incentives to promote the purchase of healthful foodstuffs by consumers.

Table 6. *Examples of policy recommendations to address whole grain intake.*

Area*	Policy recommendations	Source	Year
ENABLE OR GUIDE CHOICE THROUGH CHANGING DEFAULT	• Wholemeal bread, grains, pasta, rice or potatoes should constitute the main body of all school meals. • '[...] introduce targeted subsidies to influence the affordability of, and thus improve the access to, vegetables, fruits and whole grains, particularly for vulnerable groups.'	WHO[35,36]	2006, 2014
	• 'The total intake of dietary fibre and especially the intake of whole-grain products, which are foods high in dietary fibre, should be increased, as this reduces the risk of various nutrition related diseases.'	DGE[25]	2012
	• 'Encourage the availability, affordability, and appropriate distribution of fruits, vegetables, fiber-rich whole grains, fish (especially fatty fish), and low-fat dairy products to at-risk or vulnerable populations.'	AHA[37]	2010
	• Only healthy foods should be advertised and marketed to children (these foods would include fruit, 100% fruit juice, vegetables, low fat dairy products and whole grain foods)	AHA[38]	2015

* Based on the Nuffield intervention ladder as described in *Public Health: ethical issues* from the Nuffield Council on Bioethics, Nov 2007.

33. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016, *The Lancet*, Vol. 390, No. 10100.
34. Institute for Health Metrics and Evaluation (IHME), Seattle, United States (2017), *Global Burden of Disease Study 2016 (GBD 2015) Results Tool* [accessed on 11/10/2017].
35. WHO (2006), *Food and nutrition policy for schools*.
36. WHO (2014), *European Food and Nutrition Action Plan 2015-2020*.
37. *American Heart Association Public Policy Agenda 2010-14*.
38. American Heart Association (2015), Fact Sheet: *Food Advertising and Marketing to Children*.

Table 6. *(cont.)*

Area*	Policy recommendations	Source	Year
ENABLE OR GUIDE CHOICE THROUGH CHANGING DEFAULT *(cont.)*	• Support increased funding for implementation of Healthy Food Financing Initiatives at the local, state and federal level in an effort to provide access to healthy foods such as fruits, vegetables, low-fat dairy, whole grains, seafood, and lean meats.	AHA/ ASA[39]	2016
	• Adopt marketing techniques to promote healthy dietary choices by 'placing nutritious products so that they are easy for students to choose, such as featuring fruits and vegetables, low-fat and fat-free milk and other dairy products and whole grain in prominent places in school cafeteria lines'. • 'Working with distributors to increase availability of healthier foods. This method involves working with the existing companies that distribute foods in order to help stores acquire healthier foods and beverages such as low-sodium soups, whole grain bread, low-fat milk, and fresh produce.'	CDC[40,41]	2011, 2014
PROVIDE INFORMATION	• 'Implement a curriculum that addresses a clear set of behavioural outcomes that promote healthy eating and physical activity.' As a result of the participation in health education curriculum, students should have the knowledge and skills to eat, among others, a variety of whole grain products, fruits, vegetables, non-fat or low-fat milk. • School nutrition service staff members should receive professional development to support the improvement of school nutritional environments by, among others, including healthy food preparation methods; fruits, vegetables, whole grain; competitive food policies etc.	CDC[40]	2011

* Based on the Nuffield intervention ladder as described in *Public Health: ethical issues* from the Nuffield Council on Bioethics, Nov 2007.

9. Implemented policies addressing whole grains

Despite the aforementioned positive impact of whole grains on health, the little dietary intake data available indicate that in many countries whole grain intake is lower than the levels recommended by the institutions detailed in *Table 4*.

Some countries are however addressing this point and have implemented policies to promote whole grain consumption. Some of these are described in *Table 7*. They either fall under a legal framework or rely on voluntary agreements – and use tools such as economic incentives or directly working on the food environment to increase the purchase and consumption of whole grains.

39. *American Heart Association/American Stroke Association Strategic Policy Agenda 2014-2017.*

40. CDC, MMWR (2011), *School Health Guidelines to Promote Healthy Eating and Physical Activity.*

41. CDC, *Improving Distribution Systems for Healthier Food Retail.*

Table 7. *Examples of implemented policies to address whole grain intake.*

(Policies that specifically address fibre intake are described in ***Dietary Fibre*** in this series.)

Area*	Type	Description	Country
GUIDE CHOICE THROUGH (DIS) INCENTIVES		• The Healthier US School Challenge aimed to improve children's health. In 2010 monetary incentive awards were available for schools that implemented whole grain-rich criteria. There were 3 levels of award of distinction depending on the extent to which schools met the whole-grain rich criteria.	USA[42]
ENABLE OR GUIDE CHOICE BY CHANGING DEFAULT	School food policies	• Various EU Member States school food policies include standards to promote whole grain intake at schools by increasing the availability of whole grain products. For example, Bulgarian standards suggest that whole grain options for bread should be available at least twice per week.	EU[43]
		• The German Nutrition Society (DGE) has set voluntary guidelines on quality standards for school meals in Germany, which require that in a 20-day serving plan, whole grain should be served at least 4 days (that would correspond to one serving per week). These guidelines were implemented as a legal requirement in two German Länder (Berlin and Saarland).	Germany[44]
		• Swiss food-based standards recommend that 50% of the bread offer is wholegrain.	Switzerland[43]
		• The grain requirements implemented for the National School Lunch Program (NSLP) and the School Breakfast Program (SBP) are: - for lunch, all grains must meet the whole grain-rich criteria; - for breakfast, all grains must meet the whole grain-rich criteria.	USA[45]
	Retail initiatives	• As part of the 'Healthier Dining Programme' food operators are encouraged to offer lower calorie meals and use healthier ingredients such as oils with reduced saturated fat content, and/or whole grains without compromising taste and accessibility.	Singapore[44]
PROVIDE INFORMATION	Labelling legislation	• Manufacturers can make statements about whole grains on the label of their products such as '100% whole grain' (as percentage) or '10 grams of whole grains' provided that the statements are not false or misleading and do not imply a particular level of the ingredient, *i.e.*, 'high' or 'excellent source'. Additionally, manufacturers may use health claims on their product labels for qualifying foods.	USA[46]
	Voluntary labelling	• The Keyhole label emphasises the better choice of foodstuffs based on certain criteria. Keyhole label can be used for whole grain products such as flour, rice, grain cereals and breakfast cereals when certain nutrient content criteria for each food category are fulfilled, *e.g.* rice containing 100% whole grain and fibre at least 3 g/100 g.	Denmark, Norway, Sweden[47]

* Based on the Nuffield intervention ladder as described in *Public Health: ethical issues* from the Nuffield Council on Bioethics, Nov 2007.

42. USDA (2014), *Whole Grain Resource for the National School Lunch and School Breakfast Programs*.
43. Joint Research Centre, European Commission (2015), *Joint Research Centre School food policy factsheets in EU28 plus Norway and Switzerland*.
44. World Cancer Research Fund NOURISHING framework [accessed 07/11/2016].
45. USDA Grain Requirements for the National School Lunch Program and School Breakfast Program (2012).
46. FDA (2006), *Whole Grain Label Statements*.
47. Keyhole (2015), *Regulation on voluntary labelling with Keyhole*.

Table 7. *Examples of implemented policies to address whole grain intake.*
(Policies that specifically address fibre intake are described in the Dietary Fibre Brief.)

Area	Type	Description	Country
PROVIDE INFORMATION *(cont.)*	Voluntary labelling *(cont.)*	• The Whole Grain Partnership introduced the Fuldkorn logo which is a whole grain logo which can be put on products with a high whole grain content and low sugar, fat and salt contents.	Denmark[48]
	Public health campaign	• The Whole Grain Partnership created, among others, flyers for consumers, pictures and videos of famous whole grain 'ambassadors', advertisements and posters to encourage consumers to buy products that have the whole grain logo. They also introduced a whole grain campaign and established the National Whole Grain Day in order to inform the public about whole grains.	Denmark[48]

* Based on the Nuffield intervention ladder as described in *Public Health: ethical issues* from the Nuffield Council on Bioethics, Nov 2007.

48. Danish Whole Grain Partnership (2014), *The evolution of Whole Grain Partnership in Denmark*.

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