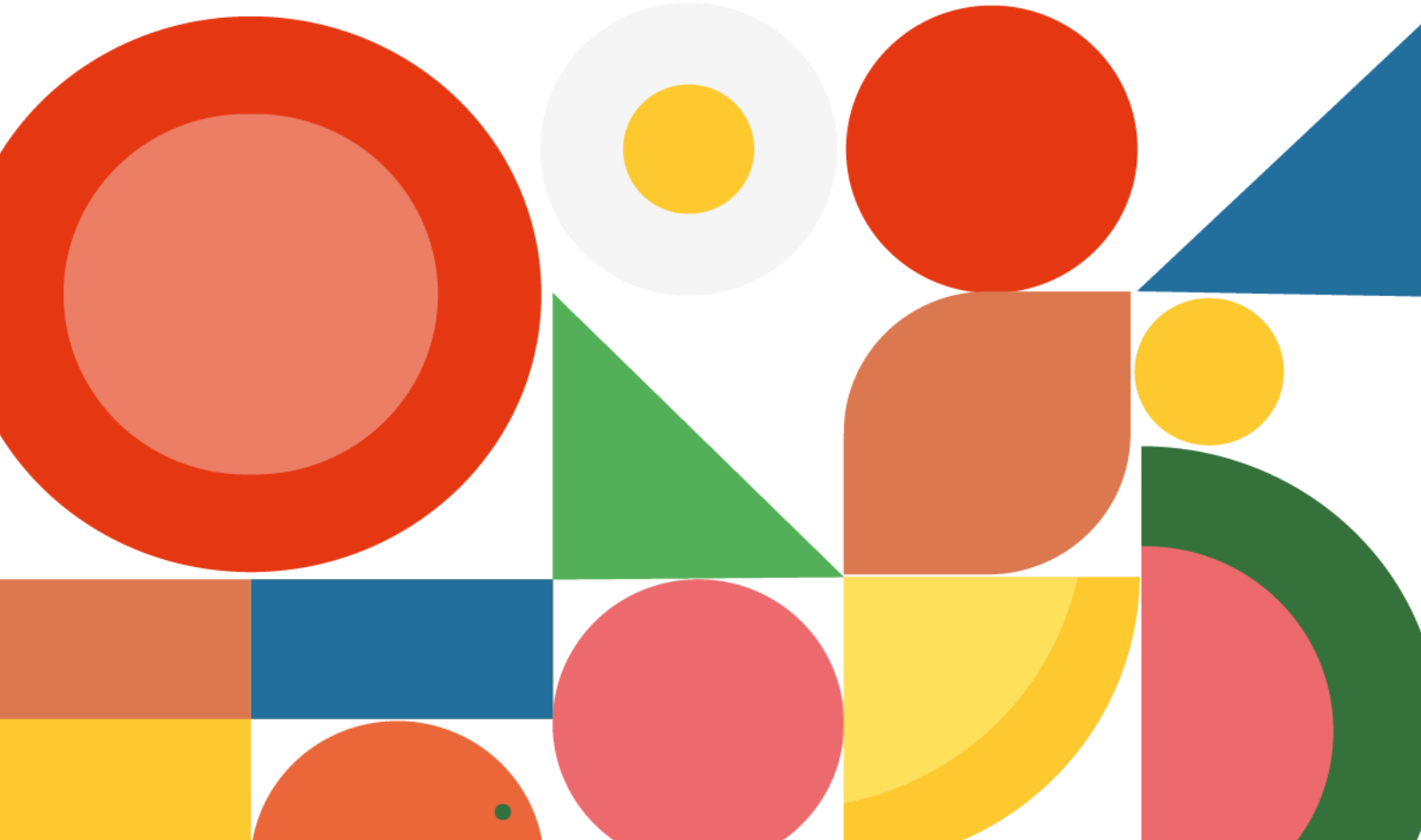
British Nutrition Foundation

Dietary Fibre in 2026

An Update on Barriers & Opportunities to Fill the UK Fibre Gap



Executive Summary

This report has been developed by the British Nutrition Foundation to support practical action to increase dietary fibre across the UK food supply. It brings together current evidence on fibre and health, consumer behaviour, product innovation and food system change to help inform reformulation, renovation and communication. The report focuses on the real-world levers most relevant to industry, including changes to staple foods and everyday meal occasions, the role of product development and fortification, and the ways in which choice environments, cues and defaults shape what consumers select, purchase and consume.

The report highlights that low fibre intake is not driven by a single factor. It reflects a combination of sensory, practical, economic, behavioural and communication challenges, including taste and texture preferences, low awareness of recommendations, limited confidence preparing fibre-rich foods, convenience, cost perceptions, lack of familiarity in high-fibre foods and concerns about digestive discomfort. It also recognises that the foods contributing most to fibre intake are not always the highest-fibre foods, which creates opportunities to improve commonly consumed products while continuing to support greater intake of wholegrains, fruit, vegetables, beans, pulses, nuts and seeds.

Dietary fibre is of growing relevance for industry due to regulatory and policy drivers, nutrient profiling, nutrition and health claims, consumer interest in gut health and plant-forward products, and alignment with sustainability and healthier food environment goals. Staple foods and everyday product categories, including bakery products, breakfast cereals, convenience foods and snacks, present important opportunities because of their broad reach and frequency of consumption. However, reformulation must be carefully managed to protect taste, texture, affordability, repeat purchase and overall nutritional quality.

The report also underscores the importance of collaboration across the food system, from crop breeding and ingredient development to manufacturing, retail, food service, policy and education. Creating supportive food environments through availability, placement, pricing, menu architecture and simple communication cues will be important for shifting behaviour at scale. It concludes with recommendations for policy, industry, retail, out-of-home and catering, science and agronomy, and wider education to help make higher-fibre choices more accessible, appealing and routine across the UK population.

This report is part of a workstream exploring how we change the UK's behaviour around consumption of fibre.

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The programme has been directed by the British Nutrition Foundation alone, which is committed to producing independent, evidence-based information, resources and training on food and nutrition. The funders had no input into this report.

Contents

Why the UK does not eat enough fibre

Dietary fibre and health

Dietary fibre is found almost exclusively in plants. Fibre is defined as carbohydrates that are not digested or absorbed in the small intestine. Chemically they have a degree of polymerisation of three or more monomeric units, together with lignin, a fibrous compound found in plant cell walls (1).

Systematic reviews, prospective cohort studies, and randomised controlled trials have reported links between higher dietary fibre intake, particularly cereal fibres and wholegrain, and lower risk of cardiometabolic disease and colorectal cancer (1, 2). Evidence from large prospective trials, including UK Biobank, have also reported links between higher intakes of cereal fibre and fruit and vegetable fibre and lower risk of several cancers (3).

If the UK population ate a diet aligned with the Eatwell Guide (without increasing total energy intake) this could increase average life expectancy and reduce new cases of type 2 diabetes over a 10-year period (4). Increased fibre consumption was estimated to account for almost one quarter (23%) of these modelled health gains (4).

The reported health effects of fibre are linked to several biological mechanisms. These include increasing faecal bulk, reducing intestinal transit time, lowering blood lipids, improving glycaemic control and helping to maintain healthy gut bacteria (1, 5).

Fibre Types, Functions and Sources

Dietary fibre is not a single entity with one function but is a complex and diverse group of compounds with different fibres have different physical and chemical properties, which influence how they behave in the body. Foods usually contain more than one type of fibre. The fibre content and properties of foods can vary according to ripeness, plant variety, growing conditions, cooking and processing (6). Variation can also exist within fibre types, meaning that not all fibre isolates within the same broad category have identical physicochemical properties or biological effects (6).

Although the terms soluble fibre and insoluble fibre are still widely used, they are not scientifically precise. The Food and Agriculture Organization of the United Nations (FAO) proposed that these terms should be phased out because solubility does not always predict physiological effects (1). However, these terms remain familiar to consumers and are still often used in food and health communication. Fibre may also be described in relation to its properties for solubility, viscosity and fermentability (7, 8)

Table 1. Examples of fibre types, function and food sources (9-11)

Fibre type	Physiological Function	Example of food sources
Viscous fibres, including gums, pectins, psyllium and beta-glucans	Gel forming, slow absorption of glucose, trap bile acids with potential to reduce cholesterol.	Fruit, oats and legumes
Less fermentable fibres, including cellulose, hemicellulose and lignin	Stool Bulking, speed up transit time through gut.	Grains, nuts, seeds and vegetables
Resistant starch	Fermented by gut bacteria.	Bananas, potatoes, grains and pulses
Prebiotic fibres	Fermented by gut bacteria.	Onions, garlic, asparagus and bananas

UK fibre recommendations and intake patterns

The recommended dietary intake for adults in the UK is 30g fibre per day. Detailed recommendations for other age groups are shown in Table 2 (12). Current UK recommendations focus on total dietary fibre intake and do not provide any guidance on intake of different fibre types.

Average intakes of dietary fibre from the National Diet and Nutrition Survey (NDNS, 2019-2023) remain far below recommendations, with just 14% of children (4-10 years) and 4% of adults eating enough (13). This also shows that cereal and cereal products are the largest contributors to fibre intake in the UK, followed by vegetables and fruit see Figure 1 (13). Evidence suggests that each additional 7g per day of fibre intake is associated with a reduced risk of heart disease, stroke, type 2 diabetes and colorectal cancer, with greater benefits seen at higher total intakes (1).

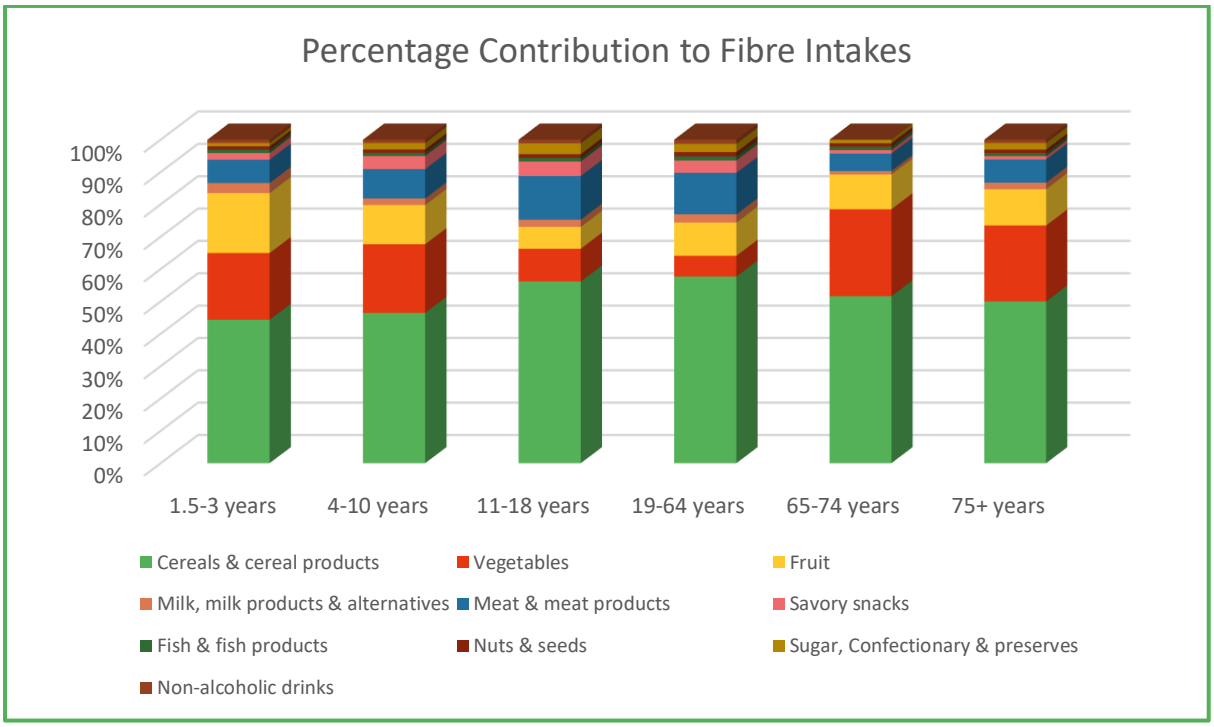
Public interest has also grown around eating a wider variety of plant foods. Messaging around 30 plants per week is based partly on an analysis from the American Gut Project, which found that people who reported eating more than 30 different types of plants per week had a more diverse gut microbiome compared with those eating 10 or fewer (14). However, the study compared only these two categories and did not test a full dose-response relationship. It therefore does not provide evidence for a specific threshold of 30 plants per week, although this message is consistent with broader dietary guidance encouraging a variety of plant foods.

The Eatwell Guide encourages a varied diet, including more fruit and vegetables, higher-fibre starchy foods, beans, pulses, nuts and seeds (15). While a more diverse gut microbiome (the technical name for the community of bacteria living in the gut) is often discussed in relation to health, there is not yet an agreed definition of an ideal or healthy gut microbiota (14). Recent work has also highlighted the need for clearer definitions, validated assessment tools and standardised methods for reporting plant-based food diversity (16).

Table 2. UK Dietary References Values for fibre (12)

Age	g fibre per day
2-5 years	15g
5-11 years	20g
11-16 years	25g
For all aged 16+ years	30g

Figure 1. Food groups contributing to total fibre intake in the UK (13)



The NDNS identified age-related differences in the foods that contribute most to dietary fibre intakes.

In younger children, fruit, breakfast cereals, sandwiches and vegetables made the largest contributions, while white bread contributed more than wholemeal bread in children aged 1.5 to 3 years. Among 11- to 18-year-olds, sandwiches, breakfast cereals and white bread were the largest contributors, with pizza, chips, fried potatoes and savoury snacks contributing more than wholemeal bread. In adults aged 19 to 64 years, sandwiches, vegetables, fruit, breakfast cereals and white bread were the main contributors, while wholemeal bread made

a lower contribution than white bread. In contrast, wholemeal bread was the second largest contributor among adults aged 65 years and over, after breakfast cereals.

These results from the NDNS indicate that foods that are relatively lower in fibre, such as white bread and chips, are making significant contributions to fibre intakes because they are widely consumed in significant quantities. In contrast, high fibre foods such as wholemeal bread, pulses, nuts and seeds make small contributions as, on average, they are consumed less frequently and/or in smaller amounts. This highlights the potential for a large impact of small dietary swaps to higher fibre alternatives of commonly consumed food items.

Consumer-level barriers

Low fibre intake reflects a combination of sensory, practical, social, economic and behavioural factors. Reported barriers include taste and texture preferences, limited awareness of fibre-rich foods, low confidence preparing higher-fibre meals, cost perceptions, convenience, established food habits and concerns about digestive discomfort when increasing fibre intake (17, 18). Taste, texture and appearance are important determinants of food choice. Some consumers associate higher-fibre foods with dryness, hardness, bitterness or reduced palatability (17, 19). Evidence suggests that the effect of fibre enrichment on acceptability depends on the food type, fibre source and level of enrichments (19-22).

Fibre fortification may be more acceptable in staple foods than in some more indulgent products, and that careful selection of fibre type can help manage effects on taste and texture (19-23). Sensory barriers have also been reported in children, however this once again depends on food format (24). Consumer expectations can also shape acceptability, as some consumers assume that foods perceived as healthier, including higher-fibre foods, will be less enjoyable (19).

Knowledge, habits, skills and communication barriers

Consumers may have limited understanding of what fibre is, which foods provide it and why it matters beyond digestive health (17, 25). Awareness of the adult recommendation of 30g per day is also low. One UK survey of 2,000 adults found that only 7% were aware of the 30g daily recommendation (26).

Public understanding of fibre's health effects varies by outcome. Digestive health is more widely recognised, while fewer people are aware of associations between higher fibre intake and lower risk of type 2 diabetes, cardiovascular disease and colorectal cancer (26). Confusion can also arise around wholegrain and refined grain foods, naturally occurring fibre and added fibre, and nutrition or health claims on packaging (27).

Food habits and eating patterns also influence fibre intake. Eating outside the home and reliance on convenience foods have been associated with lower dietary quality and reduced fibre intake (28, 29). Higher intakes of processed foods are associated with lower fibre intake and higher intakes of free sugars, saturated fat and sodium (30-32). However, some processed or packaged foods, such as canned fruit and vegetables, baked beans, wholemeal bread and wholegrain breakfast cereals, can contribute to fibre intake while also offering affordability and convenience (13, 17, 30).

Food preparation skills can influence fibre intake. Some consumers may lack confidence preparing wholegrains, beans or pulses, or may be unsure how to include them in familiar

meals (33-35). Research has suggested that repeated exposure, practical guidance, recipes and skills-based support may help improve acceptance and use of higher-fibre foods (34, 36).

Nutrition and health claims are regulated to protect consumers from misleading information about the nutritional content and health effects of foods and drinks (37). Claims must be accurate, authorised where required and not exaggerated beyond the meaning of the approved wording (37, 38). Authorised fibre-related health claims may be difficult for consumers to understand or may not be appealing in everyday food communication (38-40) e.g. ‘increases faecal bulk’ or ‘increases intestinal transit’.

Why fibre matters to the food industry

Regulatory and policy drivers

Dietary fibre is important to the UK food industry because it is considered within nutrition policy, product reformulation and labelling regulation. In the UK, the Nutrient Profile Model (NPM 2004/5) is used to determine whether food and drink products are classified as high in fat, salt or sugar (HFSS) (41). This classification restricts how HFSS products are advertised, promoted and positioned, including restrictions on media advertising, online marketing and in-store placement (40). The NPM 2004/5 generates a score based on points for negative nutrients e.g. energy, saturated fat, total sugar and sodium compared to points for positive attributes such as fruit, vegetables, nuts, protein and fibre (41, 42). An updated version of NPM (NPM 2018) is currently in consultation and includes proposed up-weighting of fibre, and the addition of seeds, alongside changes to free sugars and energy (43).

These policy frameworks mean that fibre content may influence how some products are classified and marketed. However, the overall nutritional profile remains relevant, and increasing fibre alone does not determine whether a product is considered healthier under nutrient profiling models (44).

Use of nutrition and health claims

The UK Nutrition and Health Claims Committee retains the framework of Regulation (EC) No. 1924/2006 and publishes guidance for compliance around Nutrition and Health Claims in Great Britain (37). Nutrition claims describe the nutrient content of a food without referring to a health relationship. For fibre, a product can be described as a source of fibre if it contains at least 3g of fibre per 100g, or 1.5g of fibre per 100kcal. A product can be described as high in fibre if it contains at least 6g of fibre per 100g, or 3g of fibre per 100kcal (37).

Health claims differ from nutrition claims because they link a food, nutrient or substance to a health effect. For fibre-related health claims, the authorised claims apply to specific fibre types rather than to dietary fibre as a broad category. This is because dietary fibre includes many different substances with different characteristics and physiological effects (37). There is limited flexibility in the wording of health claims, and the meaning must remain consistent with the authorised claim and must not exaggerate the health effect (38, 39).

Table 3. Examples of authorised fibre-related health claim areas in the UK and EU (37)

Fibre or fibre-containing food	Authorised claim area
Barley grain fibre, oat grain fibre, rye fibre, sugar beet fibre and wheat bran fibre	Faecal bulk, intestinal transit or normal bowel function, depending on fibre type and conditions of use
Oat and barley beta-glucans	Reduction or maintenance of blood cholesterol, where conditions of use are met
Pectins, resistant starch, non-digestible carbohydrates and arabinoxylan from wheat endosperm	Reduction of blood glucose rise after a meal, where conditions of use are met
Chicory Inulin	Chicory inulin contributes to normal bowel function by increasing stool frequency.
Dried plums or prunes	Normal bowel function, where conditions of use are met

This table summarises claim areas only and should not be used as a substitute for regulatory guidance and conditions of use set by the framework of Regulation (EC) No. 1924/2006.

Industry-led fibre initiatives have described approaches to increasing the availability and visibility of higher-fibre foods, including recipe reformulation, new product development, on-pack signposting and consumer communication (45, 46). Reported activities include a UK retailer using on-pack fibre signposting and recipe support, a retailer introducing a fibre strategy across product categories, bakery producers increasing fibre in staple bread lines, and breakfast cereal or snack producers increasing wholegrain or fibre content in familiar formats (45, 46).

Gut health, functional foods and consumer trends

Interest in gut health and functional foods has increased the visibility of dietary fibre as both a nutrient and an ingredient. Fibre resists digestion in the small intestine and some types reach the large intestine, where they are fermented by gut bacteria. This fermentation produces short-chain fatty acids, including acetate, propionate and butyrate, which have been studied in relation to gut health (47, 48).

Prebiotic fibres have also been studied as dietary components that may influence the gastrointestinal microbiota (47, 48). However, there is no agreed definition of a healthy gut microbiota or ideal microbial composition (14). Authorised health claims for prebiotics are currently restricted to inulin (49). However, some fermentable fibres may cause gastrointestinal symptoms in some people, which may be relevant to individuals with irritable bowel syndrome (50, 51). SACN advises that fibre intakes should be achieved through a variety of food sources, and notes that it is not known whether extracted and isolated fibres confer the full range of health benefits associated with a mix of fibre-rich foods (1).

Fibre can be incorporated into a range of commonly consumed foods, including breads and bakery products, breakfast cereals, snack foods, yogurts and dairy-based products, drinks, pasta, rice-based products and composite meals (52, 53). Different fibre ingredients have different technical functions. For example, inulin-type fructans, fructo-oligosaccharides, galacto-oligosaccharides and resistant starch are often discussed in relation to fermentability, and beta-glucans and pectins are often discussed in relation to viscosity and

metabolic effects such as improving glucose control and lowering cholesterol (47, 48). Consideration of the technical impact of adding whole or specific isolated fibres to products during new product development or reformulation.

Consumer demand, sustainability and social media context

Consumer research suggests that some shoppers respond to cues linked to wholegrain, less processed and natural foods, and that wholegrains are often recognised as a source of dietary fibre (54). However, consumer uptake of wholegrain or higher-fibre foods can be limited by taste and texture preferences, uncertainty about how to identify wholegrain options, perceived cost and family preferences (54, 55). Qualitative research on plant-based diets suggests that motivations may include health and environmental concerns, while barriers may include availability, affordability, cooking confidence, taste expectations and concerns about nutritional quality (56). Plant-rich dietary patterns that include wholegrains, fruit, vegetables, nuts and legumes are commonly discussed in relation to both health and environmental outcomes.

Low fibre intake occurs alongside broader dietary inequalities. The Food Foundation's Broken Plate report has highlighted differences in the affordability and availability of healthier foods, as well as the role of advertising and promotions in shaping food environments (57). Nutrition and health-related metrics are increasingly being considered in environmental, social and governance reporting (58). Fibre may be relevant to these discussions because it contributes to nutrient profiling models and may influence whether products are classified as healthier or less healthy within some reporting frameworks (41, 43, 58).

Recent social media trends have increased public visibility of fibre. Some online content frames fibre intake in relation to weight management, gut health or self-improvement, and includes high-fibre versions of familiar foods (59-61). While higher-fibre diets are associated with feeling fuller for longer, with potentially plausible biological mechanisms there are no authorised health claims in the UK or EU linking dietary fibre with increased satiety or weight loss (59, 60).

Opportunities for industry action

Product innovation

Increasing wholegrain intake is one route to increasing fibre intake. The Eatwell Guide advises choosing wholegrain or higher-fibre versions of starchy foods, however, unlike some other neighbouring countries does not recommend a specific intake amount (15, 55). Frequently consumed staple foods such as bread and breakfast cereals, pasta, noodles and rice offer opportunities to improve fibre content or increase availability of wholegrain versions (62).

A 2023 survey of major UK food retailers by The Food Foundation reported that just 16% of common carbohydrate foods were wholegrain, with wholegrain foods costing more on average than their white carbohydrate counterparts (63). Availability and price may influence wholegrain access and offering price parity in retail is a key strategy to enable choice (17).

Fortification is another approach to increasing fibre intake. Fortification involves adding fibre-rich fractions to foods or drinks. The approach must be product-specific, as fibre can affect water absorption, dough development, viscosity, structure, volume, mouthfeel, cooking quality, shelf life and flavour. Research on faba bean-enriched white bread reported a 57% increase in fibre when white bread was enriched with 25% faba flour compared with ordinary white bread (64) and high levels of consumer acceptance have been reported (63).

Addition of fibre to pasta using sources such as spent grain, pectin, cellulose, oat bran, whole barley flour and resistant starch has also been explored (65). Studies report that 15% fibre enrichment can contribute between 2.5g and 9g fibre per 100g, depending on the fibre type or combination used (66, 67). However, enriched pasta can have lower sensory scores due to changes in firmness, colour, taste or smell (68).

The effect of fibre fortification on sensory acceptance depends on product type, fibre source and enrichment level (69). Addition of soluble fibres such as pectin, beta-glucan, acacia fibre and resistant starch have been reported to have acceptable or minimal sensory impacts in some product formats (67, 70, 71). However, the extent to which added or isolated fibres deliver the same health effects as fibre naturally present within whole foods is not fully established (72).

Biofortification, which increases endogenous fibre within crops through selection and breeding, has been discussed as a longer-term approach alongside reformulation (72). A UK modelling study estimated that increasing the fibre content of white flour by 50% and wholegrain by 20% could increase total fibre intake by 1 – 1.4g per day in adults (73).

Health-by-stealth approaches

Health-by-stealth (HBS) refers to gradual reformulation of commonly consumed foods to change nutrient profile while maintaining consumer acceptability. Lower-fibre staple foods such as white bread, some breakfast cereals, pasta, rice-based foods and other grain-based products are eaten frequently. Evidence from salt reduction in bread in New Zealand provides an example of stepwise reformulation of a high-volume staple. The programme used voluntary targets developed in consultation with bread producers and reported reductions in sodium content over time (74). Reformulating staple foods may therefore help increase overall fibre intake at population level, provided products remain acceptable and affordable.

HBS reformulation can include gradual grain substitution, increasing wholegrain content, using higher-fibre white flour, incorporating pulse or vegetable ingredients, or selecting fibre ingredients with suitable technological and sensory properties. Consumer acceptability remains central. Higher-fibre products may be nutritionally improved, but if they are perceived as dry, gritty, bitter, dense, unfamiliar or poor value, repeat purchase and consumption may be limited. Reformulation should therefore be supported by sensory testing, consumer insight and monitoring after launch.

Increasing fibre should also be considered alongside overall nutritional quality, including energy, saturated fat, salt and sugars. Added or isolated fibres may not always have the same physiological effects as fibre naturally present within whole foods, where fibre forms part of a wider food matrix. For this reason, reformulation should sit alongside efforts to increase consumption of wholegrains, beans, pulses, vegetables, fruit, nuts and seeds. At scale, HBS approaches require collaboration across the food system, including crop breeders, ingredient suppliers, millers, manufacturers, retailers, caterers, researchers and public health stakeholders.

Public and academic examples

The Danish Whole Grain Partnership is a public-private partnership established in 2008 involving government, health organisations, researchers and food system stakeholders, with the objective of increasing wholegrain consumption in Denmark (75). The approach used gradual reformulation, product standards, a wholegrain logo and mainstream product availability. Reported outcomes include increases in average wholegrain intake from 36g to >80g per day (75).

The Healthy Soil, Healthy Food, Healthy People (H3) research project tested novel high-fibre bread products in UK primary school breakfast clubs, alongside fibre-rich cereals and fruit (76). The study reported that higher-fibre breads were accepted by many children and increased the average fibre content of breakfasts in the trial setting (76).

The Raising the Pulse project also added pulse flour to familiar staple foods, such as white bread, to increase fibre and protein content (77). Real-world trials in university campus food settings increased availability, visibility and acceptability of pulse-containing foods. Reported constraints included the need for food-grade pulse supply chains, processing capacity, manufacturing expertise and price considerations (77, 78).

Other research has explored replacing 30% to 60% of wheat flour in white bread with a chickpea-derived ingredient which reduced postprandial blood glucose response by around 40% compared with standard white bread, without major reported differences in taste, texture or overall acceptability (79, 80).

Public health campaigns have also aimed to increase intake of fibre-containing foods such as vegetables, beans and pulses. Eat Them to Defeat Them, delivered by Veg Power, is a UK-wide behaviour change campaign designed to increase children's vegetable intake by making vegetables more familiar and engaging. The campaign uses school, family and catering resources, including lesson plans, activities and digital materials (81). The Big Bean Boost extends this work into primary and special schools, with resources designed to support exposure and acceptance of beans in familiar meals (82). Bang in Some Beans is a UK-wide campaign led by The Food Foundation in partnership with Veg Power. The campaign aims to increase bean consumption by 2028 and make beans, pulses and legumes more visible, accessible and appealing in everyday meals (83).

Birmingham City Council's Full of Beans campaign aimed to increase the supply, demand and consumption of beans and pulses in schools, families and food businesses (84). Reported activities included recipe resources, holiday club activities and business-facing materials. The work also informed Birmingham City Council's contribution to the national Bang in Some Beans campaign (85).

These campaigns provide examples of approaches that combine public engagement, school-based delivery and changes to the food environment to support intake of fibre-containing foods (82, 85).

Communication, positioning and menu architecture

Menu architecture, which includes item positioning, default choices, availability and use of symbols, can influence what customers see first, what they interpret as the default and what

is easiest to select. This has reported effects on selection of healthier items in some settings (86, 87). Structural interventions that increase availability of healthier items may be less dependent on sustained motivation than information-based approaches (86). For example, making a higher fibre choice part of a set meal or meal deal (default choice) can increase fibre intake, although some default interventions may be less effective or may backfire if perceived as restricting choice (87, 88). Integrating higher-fibre dishes into main menu sections may be more useful than placing them in separate healthy sections (89, 90).

Descriptive naming may influence interest in plant-rich dishes. One study reported that appealing names for plant-rich dishes increased selection compared with basic dish names (91). Symbols and signposting may also influence choices, but menu symbols may be interpreted as claims and therefore require attention to nutrition and health claims rules (92, 93).

Retail evidence indicates that placement, price promotion and signposting may be relevant to fibre-containing foods. A real-world study reported increased sales of fruit and vegetables after placement and store layout changes (94). However another UK trial moving high-fibre, lower-sugar breakfast cereals to eye-level shelves did not report a statistically significant difference in sales (95). Price-based promotion has also been reported to help (96, 97).

Changing weekly menu structure could influence food choices without changing recipes or requiring intentional behaviour change (98). In a university catered hall of residence, a proof-of-concept study reported reductions in carbon footprint and saturated fat intake across monitored meals. Although fibre was not the reported outcome, the approach illustrates how menu structure can be used to test dietary targets where dish-level data are available (98).

Collaboration and monitoring

Improving fibre intake across the population and at scale will require co-ordinated across supply chains, manufacture, catering outlets and retail. Multidisciplinary partnerships between millers, suppliers, industry, scientists, policymakers and non-governmental organisations can help concepts move from research to real world settings, accompanied by strategies for monitoring progress (99). Affordability and availability at scale are vital as higher costs can affect lower-income groups. Crop-based approaches, including higher-fibre wheat, and pulse-based approaches, including food-grade pulse supply, may require long-term procurement commitments and value-chain alignment.

Best-practice guidance on nutrition reporting recommends that manufacturers, retailers and the out-of-home sector set clear, timebound targets and report progress on increasing positive nutrients or food components as well as reducing less healthy nutrients or food components (100, 101). For fibre, possible measures include fibre per portion, fibre per 100g, average fibre density by category and the share of sales meeting a defined higher-fibre threshold (102).

Understanding food choice and behaviour

Food choice is described as a multi-layered process influenced by individual characteristics, interpersonal relationships, social norms and the physical food environment (102). Food choices are often learned, automatic and habit-based, which helps explain why information provision alone may not lead to sustained behaviour change. Research also highlights the

attitude-behaviour gap, where reported attitudes are often weak predictors of what people buy and eat in real-world settings (102).

Consumers may rely on simplified cues to manage information overload. A study of consumer perceptions of bread products found that consumers may use visual shortcuts that do not align with fibre content, such as assuming a seeded product is higher in fibre while overlooking a plain product with higher fibre content (103). This suggests that clear information may be needed when fibre reformulation is not visually obvious.

Evidence from food system policy work supports considering changes across retail, manufacturing and out-of-home settings rather than relying only on consumer information (104). Staples are relevant because they are eaten frequently and can influence population nutrient exposures through small changes to commonly purchased foods (74). Bread has been described as a default staple in the UK and is consumed by a large proportion of the population (72).

Sector spotlights

Bakery products

Bakery products, particularly bread, could be used to increase fibre intake because of their high consumption frequency. NDNS data report that white bread contributes around 5% to 6% of daily fibre intake across age groups (13). Modelling from NDNS data estimated that increasing the fibre content of white flour by 50% and wholegrain products by 20% could increase total fibre intakes by 1 – 1.4g/day for adults (13, 73). Partial replacement of wheat flour with pulse flour or insoluble fibres may increase fibre content with minimal impact on product and sensory profiles (77, 105).

In more indulgent bakery categories, functional fibres can increase fibre content and may also permit reduction of fat or sugar (106)

Convenience foods

Convenience foods include ready meals and other foods requiring minimal preparation (107) and vary in nutritional profile. Some may be high in energy, saturated fat, salt or free sugars, while others can include vegetables, pulses, wholegrains or other fibre-containing ingredients (107-109). Improving commonly consumed processed foods may be a realistic approach because it fits with established eating patterns (110).

Potential approaches include increasing fibre-rich ingredients within familiar formats through greater use of pulses, wholegrains or vegetable-derived fibres, while maintaining taste, texture and convenience (51, 110). A 12-week intervention in Germany reported that fibre-enriched foods were well accepted, particularly convenience foods such as pizza, and that fibre intake in the intervention group increased from 22.5g to 36.0g per day (51).

Snacks

Snacking is common across age groups and can contribute substantially to daily energy intake (111, 112). Some common snack foods are high in fat, sugars or salt and low in fibre,

vitamins and minerals (112, 113). Increasing the fibre content of snacks could therefore be part of a broader fibre strategy, provided overall nutritional composition is considered.

Research into fibre-enriched snacks suggests that increased fibre without unacceptable sensory compromise is possible. For example, fruit snacks, extruded pulse snacks and extruded breakfast cereals have been successfully enriched with fibres such as inulin, carrot fibre or pea fibre to meet a high fibre nutrition claim (114).

Breakfast Cereals

Breakfast cereals are widely consumed and require little preparation. NDNS data report that cereals and cereal products are the main source of fibre across all age groups, contributing 43% to 50% of average daily fibre intakes, and that breakfast cereals are among the top fibre providers within this category (13). The breakfast cereal category has a clear track record of reformulation. Public Health England reported sugar reductions in breakfast cereals of 14.9 % (sugar per 100g, change in sales-weighted average) as part of the voluntary sugar reduction programme (176) indicating that large manufacturers and retailers can make iterative changes at scale without requiring consumer behaviour change. This creates an opportunity to align fibre and sugar objectives together, particularly for family and child-oriented ranges, by gradually shifting recipes and pack architecture so that higher fibre, lower sugar options become the default choice.

Potential routes include increasing wholegrain content in familiar formats and using carefully selected functional fibres such as inulin-type fibres, resistant starches, wheat bran fractions or pulse-derived fibres. Inclusion levels and processing conditions need to be optimised to protect texture, appearance and flavour (115). Authorised health claims for specific fibres, such as oat or barley beta-glucans could also be utilised (9, 116-118).

Key recommendations for action to improve population fibre intakes

Meaningful progress will undoubtedly require coordinated action across the entire food system. However, the evidence presented here highlights five actions with the greatest potential impact:

- **Reformulate** widely consumed staple foods (where possible) to increase fibre through the "Health By Stealth" approach.
- **Collaborate** across supply chains to facilitate new ingredients, breeding and varietal selection, ultimately to increase dietary fibre without compromising on quality or taste.
- **Enable** higher fibre choices across the food environment, including retail, out-of-home and online, by making them easier and more attractive, for example, by using choice architecture and/or engaging product descriptors.
- **Strengthen communication** through simple, consistent and trustworthy cues (e.g., fibre content on front-of-pack and menu's), supported by educational activities.
- **Develop** a coordinated national consumer campaign to increase awareness and drive demand for higher-fibre foods, supported by education through schools, retail partnerships, and public campaigns to help normalise fibre-rich choices.

Recommendations by sector

Policy

Policy action is needed to support fibre intake by improving the visibility, accuracy and consistency of fibre information. This may include mandatory fibre labelling on back of pack and consideration of including fibre in front of pack traffic light labels, reviewing fibre-related health claims to support clearer consumer communication, strengthening national food composition datasets using consistent fibre values, and aligning fibre-related activity across public procurement, agriculture, health, school food and marketing policies.

Industry and manufacturers

Industry can support higher fibre intakes through stepwise reformulation of frequently consumed foods, including development of higher fibre versions of familiar staple and convenience products. Approaches may include gradual grain swaps, higher-fibre white versions of familiar foods, wholegrain integration, and incorporation of pulses, vegetables and functional fibres. Product development should protect taste, texture, affordability and overall nutritional quality, as these are important for consumer acceptance and sustained intake.

Retail

Retail settings can support fibre intake through pricing, availability, placement and clear signposting of higher-fibre options. Priority could be given to lower-cost everyday staples and own-label ranges to support wider access. On-pack cues, such as wholegrain logos or simple visual information, may help consumers identify higher-fibre options, provided they are accurate and do not imply that fibre content alone determines overall healthiness.

Out-of-home and catering settings

Out-of-home and catering settings, including schools and educational facilities, should increase the availability and visibility of higher-fibre options. This may include providing fibre

information on menus, highlighting dishes that are a “source of fibre” or “high in fibre” where appropriate, offering options such as brown rice, wholemeal bread, wholegrain pasta, pulses, vegetables, nuts and seeds, and using menu architecture to make higher-fibre dishes easier to choose. These approaches should not be used to promote products or dishes with an overall poor nutritional profile.

Science and agronomy

Science and agronomy can support longer-term fibre improvements through crop-based solutions, including higher-fibre wheat, pulse-based ingredients and greater crop diversification. Strengthening domestic supply chains for fibre-rich crops may require procurement commitments, grower incentives and collaboration between academic, agricultural and food system stakeholders. Continued funding for academic and food system partnerships may support innovation and evaluation.

Wider education and upskilling

Fibre should be positioned as part of prevention and long-term health, to drive public awareness beyond bowel health or constipation management. Practical tools and training resources could be used in primary care, community health services, schools, retail and out-of-home settings. Realistic advice, taking into account limited time, money or cooking confidence. Bespoke training for all (e.g. health and medical professionals, chefs and product developers etc.) may help support consistent, evidence-based fibre communication.

Fibre in the UK Out-of-Home Sector: Availability, Gaps and Opportunities

This section summarises the results of an audit of fibre availability in the UK out-of-home sector (OOH) carried out by the British Nutrition Foundation.

The audit provides a snapshot of fibre content and the availability of fibre-rich foods across the UK out-of-home (OOH) sector, drawing on quantitative analysis of 3,799 items from 30 outlets and qualitative review of 33 menus (42 outlets overall).

From a total sample of 3,799 items:

- 2,599 (**68.5%**) were categorised as being **'low in fibre'**,
- 376 (**10%**) were categorised as being **close to 'source of fibre'**,
- 579 (**15.2%**) were a **'source of fibre',**
- 245 (**6.5%**) were '**high in fibre'**.

Overall, the findings highlight that while higher fibre options do exist, the majority of foods and drinks available in the OOH sector are relatively low in fibre. Across all items analysed, 68.5% were classified as 'low in fibre', with only 15.2% qualifying as a 'source of fibre' and 6.5% as 'high in fibre'. This indicates that consumers are unlikely to achieve recommended fibre intakes when eating out without actively seeking higher fibre choices, which may not always be readily available or clearly signposted.

There was considerable variation in fibre content across outlet types and meal categories. Supermarket "food to go" meal deals performed comparatively well, providing the highest fibre per 100 g and per 100 kcal on average. In contrast, quick service, casual dining and takeaway outlets offered the highest fibre per portion (mean 5.6 g), although this is likely influenced by larger and more variable portion sizes. Despite this, even within full-service restaurants, only 27% of main meals provided at least 9.3 g fibre per portion, the benchmark aligned with healthier and more sustainable catering guidance, highlighting a gap at the level of complete meals.

The analysis also identified that foods naturally rich in fibre, such as nuts, vegetables and wholegrains, were the main contributors to dishes classified as high in fibre. However, these ingredients were not widely or consistently integrated across menus. The qualitative review reinforced this, showing limited availability of higher fibre starchy options (e.g. wholemeal bread, brown rice, wholewheat pasta), with particularly low provision of wholewheat pasta (13% of outlets) and wholemeal bread (32%). Similarly, fresh fruit and pulses were not consistently available, especially on children's menus, although vegetable-based sides were more common.

Taken together, the findings point to structural challenges in achieving adequate fibre intake in OOH settings. While some outlets and dishes demonstrate that higher fibre offerings are feasible and acceptable, these are not yet the norm. Instead, consumers face a food environment where lower fibre options predominate and higher fibre alternatives, such as wholegrain substitutions or pulse-based dishes, are often absent, optional or less visible. The audit is intended to highlight both the constraints in accessing fibre when eating outside the home and the opportunity for the sector to help consumer increase their fibre intakes. The OOH sector plays a significant role in shaping dietary behaviours and preferences, and

even modest shifts in menu composition and choice architecture could help normalise higher fibre consumption. Increasing the availability and prominence of fibre-rich ingredients, such as wholegrains, pulses, nuts, seeds, fruits and vegetables, has the potential to reduce barriers, including perceptions around taste and familiarity.

Given that fibre intake remains low in the UK population, and that eating out constitutes a growing proportion of overall dietary intake, the sector represents a key lever for public health improvement. Industry-led reformulation, menu innovation and increased provision of fibre-rich options could make a meaningful contribution to improving dietary quality at population level, positioning the OOH environment as part of the solution rather than a barrier to adequate fibre intake.

Consumer Insights on Fibre: Awareness, Behaviours and Barriers to Higher Intake

This section summarises the results of a survey of consumers on their attitudes and behaviours in relation to fibre. The survey was carried out online by YouGov from 9-10 April 2026. The total sample size was 2088 adults, and the figures are weighted and representative of all UK adults aged 18 and over.

The consumer survey highlights a consistent gap between awareness, motivation and behaviour in relation to fibre. Awareness is largely centred on digestive health: 81% associate fibre with supporting digestive health, and around 77% with preventing constipation. However, fewer consumers recognise wider benefits, with 32% linking fibre to reduced risk of type 2 diabetes and 39% to cholesterol reduction. Behaviourally, engagement with fibre remains low: only 8% report always paying attention to fibre intake and 19% often do so, while nearly 39% rarely or never consider it. This is reflected in purchasing behaviour, where fibre is among the least checked nutrients on labels (14%), compared with sugar (39%), calories (33%) and fat or saturated fat (32%).

Dietary patterns further illustrate the gap between intent and intake. While vegetable and fruit consumption is relatively frequent (around 92% and 85% consuming weekly or more, respectively), intake of key fibre-rich staples is much lower: only 59% consume wholemeal/wholegrain bread weekly or more, 53% nuts and seeds, 53% pulses such as beans and lentils and 29% brown rice or wholewheat pasta. Notably, 28% report never consuming brown rice or wholewheat pasta, and 12% never eat pulses. Despite this, there is some motivation for change, with 31% saying they want to eat more fibre, alongside 45% wanting to increase fruit and vegetable intake and 32% to eat more “gut friendly” foods.

Barriers to higher fibre intake are multi-dimensional and relatively evenly distributed. The most frequently cited barrier is preference for the taste of lower fibre foods (16%), followed by cost (12%), uncertainty about which foods are high in fibre (12%) and fibre not being a priority (11%). Other factors include household preferences (10%), preparation time (8%), gut concerns (7%) and perceived lack of availability, both in retail (4%) and when eating out (6%). Consumers also identify practical enablers that could support change: 25% highlight affordability, 25% would like easy recipes and meal ideals, 22% would welcome clearer fibre labelling on pack, 19% chose better in-store signposting and 18% selected more options in foodservice.

Attitudes towards product reformulation suggest a strong role for industry innovation, provided sensory expectations are met. 35% find products with added fibre appealing (vs 20% not appealing). 50% say they would be more likely to purchase a familiar product with added fibre if it tasted the same, compared with only 8% less likely. Finally, while around 39% find preparing higher fibre meals easy (vs 13% difficult), this varies by age and is not universal, reinforcing the need to reduce effort through convenient, familiar and accessible options.

Overall, the survey indicates that improving fibre intake will require a combination of clearer communication, better availability and product reformulation—making higher fibre choices easier, more visible and more appealing in everyday contexts.

References

1. SACN. Carbohydrates and Health. TSO. 2015.
2. Aune D, Chan DS, Lau R, Vieira R, Greenwood DC, Kampman E, et al. Dietary fibre, whole grains, and risk of colorectal cancer: systematic review and dose-response meta-analysis of prospective studies. Bmj. 2011;343.
3. Parra-Soto S, Araya C, Knight K, Livingstone KM, Malcomson FC, Sharp L, et al. Different Sources of Fiber Intake and Risk of 17 Specific Cancers and All Cancers Combined: Prospective Study of 364,856 Participants in the UK Biobank. American Journal of Epidemiology. 2023;193(4):660-72.
4. Cobiac LJ, Scarborough P, Kaur A, Rayner M. The Eatwell Guide: Modelling the Health Implications of Incorporating New Sugar and Fibre Guidelines. PLoS One. 2016;11(12):e0167859.
5. World Cancer Research Fund. American Institute for Cancer Research. Wholegrains, vegetables and fruit and the risk of cancer 2018 [Available from: https://www.wcrf.org/wp-content/uploads/2024/10/Wholegrains-veg-and-fruit.pdf.
6. Khorasaniha R, Olof H, Voisin A, Armstrong K, Wine E, Vasanthan T, et al. Diversity of fibers in common foods: Key to advancing dietary research. Food Hydrocolloids. 2023;139:108495.
7. Gill SK, Rossi M, Bajka B, Whelan K. Dietary fibre in gastrointestinal health and disease. Nat Rev Gastroenterol Hepatol. 2021;18(2):101-16.
8. British Nutrition Foundation. Fibre 2023 [Available from: https://www.nutrition.org.uk/nutritional-information/fibre/.
9. EFSA. Beta-glucans from oats or barley and reduction of postprandial glycaemic responses: Modification of an authorised health claim pursuant to Article 13(1) of Regulation (EC) No 1924/2006 following a request in accordance with Article 19 of Regulation (EC) No 1924/2006 2025 [Available from: https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2025.9630.
10. Mathews R, Kamil A, Chu Y. Global review of heart health claims for oat beta-glucan products. Nutrition reviews. 2020;78(Supplement_1):78-97.
11. Shevlyakov A, Nikogosov D, Stewart LA, Toribio-Mateas M. Reference values for intake of six types of soluble and insoluble fibre in healthy UK inhabitants based on the UK Biobank data. Public Health Nutr. 2021;25(5):1-15.
12. Public Health England. Government Dietary Recommendations: Government recommendations for energy and nutrients for males and females aged 1 – 18 years and 19+ years 2016 [Available from: https://assets.publishing.service.gov.uk/media/5a749fece5274a44083b82d8/government_dietary_recommendations.pdf.
13. NDNS. National Diet and Nutrition Survey 2019 to 2023: report 2025 [Available from: https://www.gov.uk/government/statistics/national-diet-and-nutrition-survey-2019-to-2023/national-diet-and-nutrition-survey-2019-to-2023-report.
14. Whelan K, Staudacher HM. Fibre is good for the microbiome: but what is the evidence? Lancet Gastroenterol Hepatol. 2022;7(11):988.
15. OHID. Eatwell Guide 2016 [13 October 2025]. Available from: https://assets.publishing.service.gov.uk/media/5bbb790de5274a22415d7fee/Eatwell_guide_colour_edition.pdf.
16. Creedon AC, Hubbard V, Gibson R, Dimidi E. Diversity of Plant-Based Food Consumption: A Systematic Scoping Review on Measurement Tools and Associated Health Outcomes. Nutr Rev. 2025;83(10):1985-2014.
17. Norton V, Kaimila Y, Lovegrove JA, Lignou S. Exploring UK older adults' dietary fibre consumption habits and associated factors: a national diet and nutrition survey perspective. Br J Nutr. 2024;132(4):1-8.
18. Forde CG, de Graaf K. Influence of Sensory Properties in Moderating Eating Behaviors and Food Intake. Front Nutr. 2022;9:841444.

19. Grigor JM, Brennan CS, Hutchings SC, Rowlands DS. The sensory acceptance of fibre-enriched cereal foods: a meta-analysis. International Journal of Food Science and Technology. 2015;51(1):3-13.
20. Mohr P, Quinn S, Morell M, Topping D. Engagement with dietary fibre and receptiveness to resistant starch in Australia. Public Health Nutr. 2010;13(11):1915-22.
21. Robin F, Schuchmann HP, Palzer S. Dietary fiber in extruded cereals: Limitations and opportunities. Trends in Food Science & Technology. 2012;28(1):23-32.
22. Brennan MA, Monro JA, Brennan CS. Effect of inclusion of soluble and insoluble fibres into extruded breakfast cereal products made with reverse screw configuration. International journal of food science and technology. 2008;43(12):2278-88.
23. Tudorica CM, Kuri V, Brennan CS. Nutritional and physicochemical characteristics of dietary fiber enriched pasta. J Agric Food Chem. 2002;50(2):347-56.
24. da Quinta N, Alvarez-Sabatel S, Martinez de Marañón I, Alfaro B. Children's acceptability profiles for biscuits with different fiber content. J Texture Stud. 2022;53(1):41-51.
25. Donin AS, Goldsmith LP, Sharp C, Wahlich C, Whincup PH, Ussher MH. Identifying barriers and facilitators to increase fibre intakes in UK primary school children and exploring the acceptability of intervention components: a UK qualitative study. Public Health Nutr. 2024;27(1):e59.
26. FDF. New research shows millions of Brits are missing out on health benefits of fibre 2025 [updated Jul 31. 2026/01/15:[Available from: https://www.fdf.org.uk/fdf/news-media/press-releases/2025/new-research-shows-millions-of-brits-are-missing-out-on-health-benefits-of-fibre/.
27. Norton V, Rodriguez-Garcia J, Wagstaff C, Lovegrove A, Shewry P, Charlton M, et al. Exploring the relationship between physical properties and sensory characteristics of newly developed white breads with improved nutritional composition – initial insights. LWT. 2025;230:118297.
28. Nagao-Sato S, Reicks M. Food Away from Home Frequency, Diet Quality, and Health: Cross-Sectional Analysis of NHANES Data 2011-2018. Nutrients. 2022;14(16).
29. Ziauddeen N, Almiron-Roig E, Penney TL, Nicholson S, Kirk SFL, Page P. Eating at Food Outlets and "On the Go" Is Associated with Less Healthy Food Choices in Adults: Cross-Sectional Data from the UK National Diet and Nutrition Survey Rolling Programme (2008-2014). Nutrients. 2017;9(12).
30. Chavez-Ugalde IY, de Vocht F, Jago R, Adams J, Ong KK, Forouhi NG, et al. Ultra-processed food consumption in UK adolescents: distribution, trends, and sociodemographic correlates using the National Diet and Nutrition Survey 2008/09 to 2018/19. European Journal of Nutrition. 2024;63(7):2709-23.
31. Torquato BMdA, Madruga M, Levy RB, da Costa Louzada ML, Rauber F. The share of ultra-processed foods determines the overall nutritional quality of diet in British vegetarians. British Journal of Nutrition. 2024;132(5):616-23.
32. Rauber F, da Costa Louzada ML, Steele EM, Millett C, Monteiro CA, Levy RB. Ultra-Processed Food Consumption and Chronic Non-Communicable Diseases-Related Dietary Nutrient Profile in the UK (2008–2014). Nutrients. 2018;10(5).
33. David Hesse CB, Allison Dostal, Robert Jeffery, Len Marquart. Barriers and Opportunities Related to Whole Grain Foods in Minnesota School Foodservice. School Nutrition Association. 2009;33.
34. Leak TM, Gangrade N, Tester J. Facilitators and barriers to preparing and offering whole grains to children diagnosed with prediabetes: qualitative interviews with low-income caregivers. BMC Public Health. 2021;21(1):931.
35. Eating Better TFF. Public Attitudes Survey 2025. 2025.
36. Weingarten N, Hartmann M. Fifty shades of grain – Increasing whole grain consumption through daily messages. Appetite. 2023;187:106608.
37. Government U. Great Britain nutrition and health claims spreadsheet [Available from: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fassets.publishing.service.gov.uk%2Fmedia%2F67bf42ef16dc9038974dbbcc%2Fgreat-britain-nutrition-and-health-claims-spreadsheet-27-february-2025.ods&wdOrigin=BROWSELINK.

38. Lockyer S, Ryder C, Jaworska S, Benelam B, Jones R. Developing a digital toolkit to enhance the communication of health claims: The Health Claims Unpacked project. Nutrition Bulletin. 2020;45(4):432-43.
39. Department of Health and Social Care. Update on flexibility of wording for health claims published 2013 [Available from: https://www.gov.uk/government/publications/update-on-flexibility-of-wording-for-health-claims-published.
40. Stancu V, Grunert KG, Lähteenmäki L. Consumer inferences from different versions of a beta-glucans health claim. Food Quality and Preference. 2017;60:81-95.
41. DoH. Nutrient Profiling Model 2004/2005: Technical Guidance. 2005.
42. GovernmentUK. Restricting promotions of products high in fat, sugar or salt by location and by volume price: implementation guidance 2023 [Available from: https://www.gov.uk/government/publications/restricting-promotions-of-products-high-in-fat-sugar-or-salt-by-location-and-by-volume-price/restricting-promotions-of-products-high-in-fat-sugar-or-salt-by-location-and-by-volume-price-implementation-guidance.
43. Department of Health. UK nutrient profiling model: review and consultation outcome. London; 2026.
44. Gov.uk. Consultation to the UK Nutrient Profiling Model 2018 review: Individual responses K-P. 2018.
45. FDF. Action on Fibre [Available from: https://www.fdf.org.uk/fdf/our-work/our-campaigns/action-on-fibre/.
46. FDF. Action on Fibre Signatories 2025 [Available from: https://www.fdf.org.uk/fdf/our-work/our-campaigns/action-on-fibre/action-on-fibre-signatories/.
47. Holscher HD. Dietary fiber and prebiotics and the gastrointestinal microbiota. Gut Microbes. 2017;8(2):172-84.
48. Slavin J. Fiber and prebiotics: mechanisms and health benefits. Nutrients. 2013;5(4):1417-35.
49. Efsa Panel on Dietetic Products N, Allergies. Guidance on the scientific requirements for health claims related to the immune system, the gastrointestinal tract and defence against pathogenic microorganisms. EFSA Journal. 2016;14(1):4369.
50. Mysonhimer AR, Holscher HD. Gastrointestinal Effects and Tolerance of Nondigestible Carbohydrate Consumption. Adv Nutr. 2022;13(6):2237-76.
51. Ehret J, Brandl B, Schweikert K, Rennekamp R, Ströbele-Benschop N, Skurk T, et al. Benefits of Fiber-Enriched Foods on Satiety and Parameters of Human Well-Being in Adults with and without Cardiometabolic Risk. Nutrients. 2023;15(18).
52. Dhingra D, Michael M, Rajput H, Patil RT. Dietary fibre in foods: a review. J Food Sci Technol. 2012;49(3):255-66.
53. Gilbert-Moreau J, Pomerleau S, Perron J, Gagnon P, Labonté M, Provencher V. Nutritional value of child-targeted food products: results from the Food Quality Observatory. Public Health Nutr. 2021;24(16):5329-37.
54. Foster S, Beck E, Hughes J, Grafenauer S. Whole Grains and Consumer Understanding: Investigating Consumers' Identification, Knowledge and Attitudes to Whole Grains. Nutrients. 2020;12(8).
55. Meynier A, Chanson-Rollé A, Riou E. Main Factors Influencing Whole Grain Consumption in Children and Adults—A Narrative Review. Nutrients. 2020;12(8):2217.
56. Yang J, Bernard L, Ting A, Sullivan VK, Rebholz CM. Perceived motivators and barriers to consuming a plant-based diet: a qualitative research study. BMC Nutr. 2025;11(1):108.
57. Foundation TF. The Broken Plate 2025. 2025.
58. O'Hearn M, Reedy J, Robinson E, Economos C, Wong JB, Sacks G, et al. Landscape analysis of environmental, social and governance (ESG) investing metrics for consumer nutrition and health in the food and beverage sector. BMJ Nutr Prev Health. 2023;6(2):139-52.

59. Guarneiri LL, Kirkpatrick CF, Maki KC. Protein, fiber, and exercise: a narrative review of their roles in weight management and cardiometabolic health. Lipids Health Dis. 2025;24(1):237.
60. Delzenne NM, Bindels LB, Neyrinck AM, Walter J. The gut microbiome and dietary fibres: implications in obesity, cardiometabolic diseases and cancer. Nat Rev Microbiol. 2025;23(4):225-38.
61. Finnegan Y, and Krzyzaniak, S-A,. Clean Labels in the Food Industry: Regulatory Considerations and Challenges in Balancing Consumer Demand, Safety and Sustainability. Food Science and Nutrition Cases 2024 [Available from: https://www.cabidigitallibrary.org/doi/10.1079/fsncases.2024.0017.
62. Kutepova I, Rehm CD, Smith SJ. Whole grain intake remains unchanged in the UK, 2008/2012-2016/2019. Br J Nutr. 2025;134(3):213-9.
63. Foundation TF. Parents on lower incomes fac barriers to affording fruit, veg and wholegrains 2024 [13 October 2025]. Available from: https://foodfoundation.org.uk/press-release/parents-lower-incomes-face-barriers-affording-fruit-veg-and-wholegrains.
64. Falsafi SR, et al.,. Recent trends in fortifying bread with nutrients: Comprehensive insights into chemical, physical, functional, and nutritional attributes. . Future Foods. 2025;11:100674.
65. Sissons M. Development of Novel Pasta Products with Evidence Based Impacts on Health-A Review. Foods. 2022;11(1).
66. Makhlouf S, Jones S, Ye S-H, Sancho-Madriz M, Burns-Whitmore B, Li YO. Effect of selected dietary fibre sources and addition levels on physical and cooking quality attributes of fibre-enhanced pasta. Food Quality and Safety. 2019;3(2):117-27.
67. Sempio R, Nyhan L, Sahin AW, Zannini E, Walter J, Arendt EK. Enriching pasta with soluble and insoluble fibre: A strategy for boosting fibre intake. Applied Food Research. 2025;5(1):100737.
68. Dziki D. Current Trends in Enrichment of Wheat Pasta: Quality, Nutritional Value and Antioxidant Properties. Processes. 2021;9(8):1280.
69. Curutchet A, Serantes M, Pontet C, Prisco F, Arcia P, Barg G, et al. Sensory Features Introduced by Brewery Spent Grain with Impact on Consumers' Motivations and Emotions for Fibre-Enriched Products. Foods. 2021;11(1).
70. Sempio R, Nyhan L, Zannini E, Walter J, Arendt EK. Cake fortification with dietary fibre: Impact of fibre ingredients in a cake model system. Innovative Food Science & Emerging Technologies. 2025;105:104196.
71. Hernández-Figueroa RH, López-Malo A, Mani-López E. Evaluating the effects of acacia gum on physicochemical and sensory properties of dough and bread from wheat flour with different protein content. International Journal of Food Science and Technology. 2025;60(1).
72. Julie A. Lovegrove KGJ, Yankho Kaimila, Stella Lignou, Alison Lovegrove, Victoria Norton, Donal M. O'Sullivan, Peter Shewry, Paola Tosi and Marcus J. Tindall. Importance of dietary fibre, strategies for increasing intake and maintenance of the supply chain in the UK. Phil Trans R Soc B. 2025;380.
73. Shewry PR, Prins A, Kosik O, Lovegrove A. Challenges to Increasing Dietary Fiber in White Flour and Bread. J Agric Food Chem. 2024;72(24):13513-22.
74. Monro D, Hu N, McLean RM. Food Reformulation in New Zealand: A Success Story of Reducing the Sodium Content in Bread from 2003 to 2023. Nutrients. 2025;17(22).
75. Boyle NB, Adolphus K, Caton SJ, Croden FC, Dye L, Glass A, et al. Increasing fibre intake in the UK: lessons from the Danish Whole Grain Partnership. Br J Nutr. 2024;131(4):672-85.
76. Wilkinson N, Tann E, Boyle N, Caton S, McColl V, Croden F, et al. The children may not be the problem: evidence of acceptance and enjoyment of higher fibre breads from choice architecture studies in school breakfast clubs. Philos Trans R Soc Lond B Biol Sci. 2025;380(1935):20240151.

77. Lovegrove JA, O'Sullivan DM, Tosi P, Millan E, Todman LC, Bishop J, et al. 'Raising the Pulse': The environmental, nutritional and health benefits of pulse-enhanced foods. Nutr Bull. 2023;48(1):134-43.
78. Sempio R, Segura Godoy C, Nyhan L, Sahin AW, Zannini E, Walter J, et al. Closing the Fibre Gap-The Impact of Combination of Soluble and Insoluble Dietary Fibre on Bread Quality and Health Benefits. Foods. 2024;13(13).
79. Bajka BH, Pinto AM, Ahn-Jarvis J, Ryden P, Perez-Moral N, van der Schoot A, et al. The impact of replacing wheat flour with cellular legume powder on starch bioaccessibility, glycaemic response and bread roll quality: A double-blind randomised controlled trial in healthy participants. Food Hydrocolloids. 2021;114:106565.
80. Quadram Institute. New flour brings health power of pulses to our daily bread 2022 [Available from: https://quadram.ac.uk/new-flour-health-pulses-bread/.
81. VEGPOWER. Eat Them to Defeat Them 2025 [Available from: https://eatthemtodefeatthem.com/.
82. VEGPOWER. The Big Bean Boost [Available from: https://simplyveg.vegpower.org.uk/your-food/the-big-bean-boost/.
83. Foundation TF. Bang in some beans [Available from: https://foodfoundation.org.uk/initiatives/bang-in-some-beans#latest.
84. Local Government Association. Birmingham City Council's Full of Beans Campaign 2025 [Available from: https://www.local.gov.uk/case-studies/birmingham-city-councils-full-beans-campaign.
85. The Food Foundation. Food industry giants sign up to the Bang in Some Beans campaign aiming to double UK bean consumption 2026 [Available from: https://foodfoundation.org.uk/press-release/food-industry-giants-sign-bang-some-beans-campaign-aimin.
86. von Philipsborn P, Stratil JM, Burns J, Busert LK, Pfadenhauer LM, Polus S, et al. Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health. Cochrane Database Syst Rev. 2019;6(6):Cd012292.
87. Ferrante MJ, Johnson SL, Miller J, Bellows LL. Switching up sides: Using choice architecture to alter children's menus in restaurants. Appetite. 2022;168:105704.
88. Taufik D, Bouwman EP, Reinders MJ, Dagevos H. A reversal of defaults: Implementing a menu-based default nudge to promote out-of-home consumer adoption of plant-based meat alternatives. Appetite. 2022;175:106049.
89. Edwards KL, Blissett J, Reynolds JP. The effect of Position and Availability interventions on adolescents' food choice: An online experimental study. Appetite. 2025;204:107770.
90. Fechner D, Karl M, Grün B, Dolnicar S. How can restaurants entice patrons to order environmentally sustainable dishes? Testing new approaches based on hedonic psychology and affective forecasting theory. J Sustain Tour. 2024;32(10):2225-44.
91. Gavrieli A, Attwood S, Wise J, Putnam-Farr E, Stillman P, Giambastiani S, et al. Appealing dish names to nudge diners to more sustainable food choices: a quasi-experimental study. BMC Public Health. 2022;22(1):2229.
92. Bergman C, Tian Y, Moreo A, Raab C. Menu Engineering and Dietary Behavior Impact on Young Adults' Kilocalorie Choice. Nutrients. 2021;13(7).
93. Department Nutrition and health claims: guidance to compliance with Regulation (EC) 1924/2006. London; 2021.
94. Vogel C, Crozier S, Penn-Newman D, Ball K, Moon G, Lord J, et al. Altering product placement to create a healthier layout in supermarkets: Outcomes on store sales, customer purchasing, and diet in a prospective matched controlled cluster study. PLoS Med. 2021;18(9):e1003729.
95. UK). [Online]. Available at: https://urbanhealth.org.uk/wp-content/uploads/2021/02/14-Supermarkets-and-Obesity-rebrand-optimised.pdf., IoUHCshtttooArfoyotCfHLitUC.
96. IGD. Healthy sustainable diets: Driving change 2022 [Available from: https://www.igd.com/reports/healthy-sustainable-diets-driving-change-oct-2022/38667.

97. Bunten A, Shute B, Golding SE, Charlton C, Porter L, Willis Z, et al. Encouraging healthier grocery purchases online: A randomised controlled trial and lessons learned. Nutr Bull. 2022;47(2):217-29.
98. UK Food Systems. SNEAK [Available from: https://ukfoodsystems.ukri.org/research-projects-training-reports/sneak/.
99. Spiro A, Bardon L, Fanzo J, Hill Z, Stanner S, Traka MH. Every Person Counts in a Fair Transition to Net Zero: A UK Food Lens Towards Safeguarding Against Nutritional Vulnerability. Nutr Bull. 2025;50(4):683-702.
100. Access to Nutrition Initiative. ATNi publishes its first research on the out-of-home (OOH) food sector in the UK 2022 [Available from: https://accesstonutrition.org/news/atni-publishes-its-first-research-on-the-out-of-home-ooh-food-sector-in-the-uk/.
101. Access to Nutrition Initiative. UK Retailer Index 2022 2022 [Available from: https://accesstonutrition.org/app/uploads/2022/05/UKRI-Final-Report-20220510-KH.pdf.
102. Fernqvist F, Spendrup S, Tellström R. Understanding food choice: A systematic review of reviews. Heliyon. 2024;10(12):e32492.
103. Jezewska-Zychowicz M, Królak M. The Choice of Bread: The Association between Consumers' Awareness of Dietary Fiber and Declared Intentions to Eat. Nutrients. 2020;12(2).
104. NIHR. https://www.ncbi.nlm.nih.gov/books/NBK602343/pdf/Bookshelf_NBK602343.pdf 2024 [Available from: https://www.ncbi.nlm.nih.gov/books/NBK602343/pdf/Bookshelf_NBK602343.pdf.
105. Barber TM, Kabisch S, Pfeiffer AFH, Weickert MO. The Health Benefits of Dietary Fibre. Nutrients. 2020;12(10).
106. Canazza E, Grauso M, Mihaylova D, Lante A. Techno-Functional Properties and Applications of Inulin in Food Systems. Gels. 2025;11(10).
107. Bogard JR, Downs S, Casey E, Farrell P, Gupta A, Miachon L, et al. Convenience as a dimension of food environments: A systematic scoping review of its definition and measurement. Appetite. 2024;194:107198.
108. Action on Salt & Sugar. Are ready meals ready for a change? 2025 [Available from: https://www.actiononsalt.org.uk/media/action-on-salt/awareness/saw25/Ready-Meals-Report--May-2025.pdf.
109. Huang Y, Burgoine T, Essman M, Theis DRZ, Bishop TRP, Adams J. Monitoring the Nutrient Composition of Food Prepared Out-of-Home in the United Kingdom: Database Development and Case Study. JMIR Public Health Surveill. 2022;8(9):e39033.
110. Onyeaka H, Nwaiwu O, Obileke K, Miri T, Al-Sharify ZT. Global nutritional challenges of reformulated food: A review. Food Science & Nutrition. 2023;11(6):2483-99.
111. Almoraie NM, Saqaan R, Alharthi R, Alamoudi A, Badh L, Shatwan IM. Snacking patterns throughout the life span: potential implications on health. Nutr Res. 2021;91:81-94.
112. Bermingham KM, May A, Asnicar F, Capdevila J, Leeming ER, Franks PW, et al. Snack quality and snack timing are associated with cardiometabolic blood markers: the ZOE PREDICT study. Eur J Nutr. 2024;63(1):121-33.
113. Okpiaifo GE, Dormoy-Smith B, Kassas B, Gao Z. Perception and demand for healthy snacks/beverages among US consumers vary by product, health benefit, and color. PLoS One. 2023;18(6):e0287232.
114. Taştan Ö. Effect of Dietary Fiber Enrichment on Quality Characteristics and Consumer Acceptance of Fruit Snacks. Akademik Gıda. 2023;21(4):343-52.
115. Grigor JM, Brennan CS, Hutchings SC, Rowlands DS. The sensory acceptance of fibre-enriched cereal foods: a meta-analysis. International Journal of Food Science & Technology. 2016;51(1):3-13.
116. EFSA. Oat beta-glucans and reduction of postprandial glucose peak: Evaluation of a health claim pursuant to Article 13(5) of Regulation (EC) No 1924/2006 2026 [Available from: https://www.efsa.europa.eu/en/efsajournal/pub/9942.
117. Legislation GOV UK. Commission Regulation (EU) No 432/2012 2012 [Available from: https://www.legislation.gov.uk/eur/2012/432/annex.

118. GOV UK. UKNHCC scientific opinion: beta-glucan from oats or barley and reduction of blood glucose rise after a meal 2024 [Available from: https://www.gov.uk/government/publications/uknhcc-scientific-opinion-beta-glucan-from-oats-or-barley-and-reduction-of-blood-glucose-rise-after-a-meal/uknhcc-scientific-opinion-beta-glucan-from-oats-or-barley-and-reduction-of-blood-glucose-rise-after-a-meal.