The Fibre Factor: a fresh look at gut health and beyond

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Learning objectives

1. Raise awareness

- Of the importance of dietary fibre for health

2. Highlight health benefits

- Of dietary fibre across different populations

3. Equip dietitians

- Practical tool kits and strategies to support increased fibre intake in patients

We will cover

- Dietary fibre types
- UK recommendations and sources
- Key health beenfits of fibre
- Recent NDNS data and what this means for the UK
- Barriers to increasing intake
- Practical tips for helping our patients achieve more
- Case studies

Fibre fundamentals

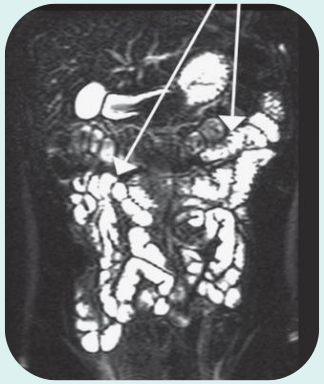
Dietary fibre refers to a diverse range of complex carbohydrates and comes from the edible parts of plants that are resistant to digestion in the small intestine, often fermented in the large intestine.

Dietary fibre is resistant to degradation by human digestive enzymes and therefore reaches the colon largely intact.

Overview of different fibre types

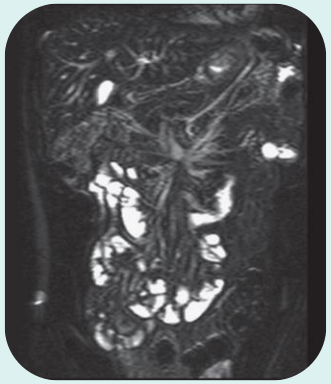
Type	Examples	Key benefits / functions
Soluble	Oats, legumes	Cholesterol reduction, glycaemic control
Insoluble	Wholegrains, vegetable skins	Bowel regularity, bowel muscle integrity
Fermentable	FODMAPs (fermentable oligo-, di-, mono-saccharides and polyols)	Supports microbiome diversity and regulates colonic environment
Gas Forming	Onion, garlic, legumes	May cause bloating or flatulence
Osmotic	Stone fruit, mango, apples	Draws water into the bowel, softens stool
Viscous	Gel-forming fibers	Enhances satiety, improves glycaemic control
Functional	Inulin, FOS, HMO, GOS	Prebiotic effects gut homeostasis and immune health

Different fibres have different effects in the gut

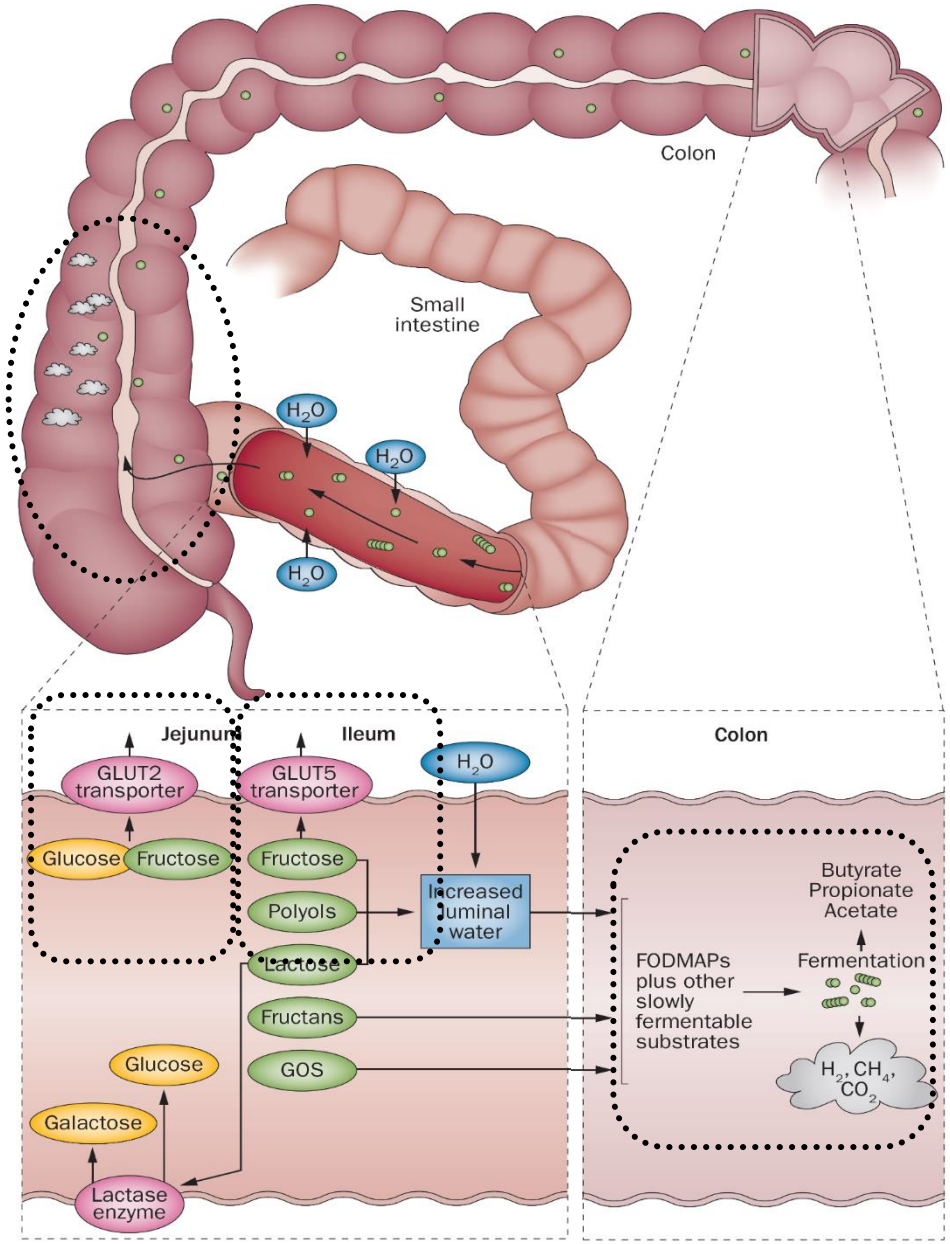


Fructose

Fructose + Glucose

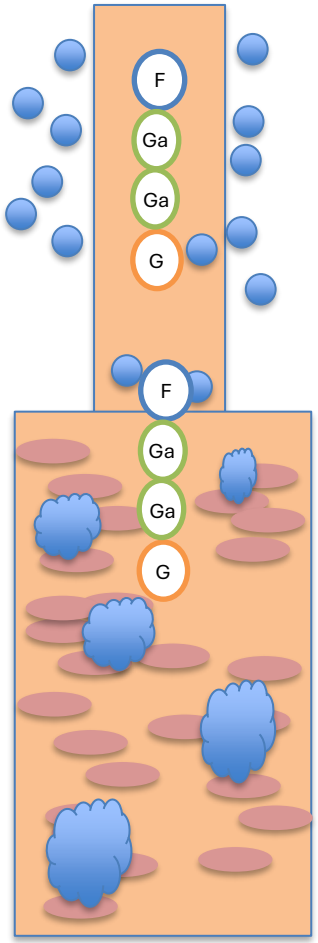


Fructan



Murray et al 2014 AJG; Staudacher et al 2014 Nat Rev

Mechanisms of FODMAPs



Small bowel

Large bowel

H_2O

Fructose + Polyols

Lactose

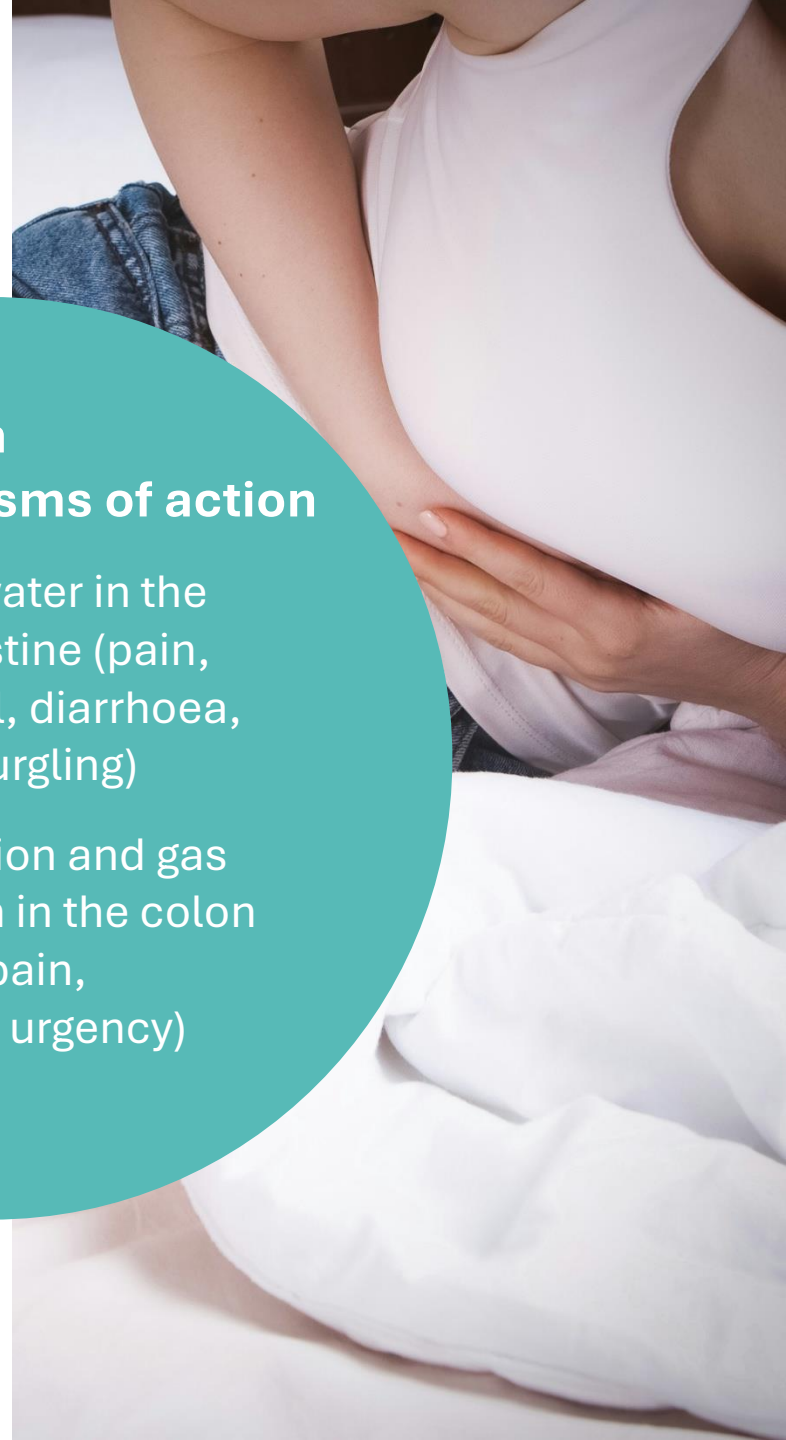
Gas

Fructans + GOS

Two main mechanisms of action

Increase water in the small intestine (pain, loose stool, diarrhoea, urgency, gurgling)

Fermentation and gas production in the colon (bloating, pain, flatulence, urgency)



Fermentable fibres are not the bad guys

Fermentable fibres include prebiotic potential

Consumption of prebiotic fibres leads to:

- increased bifidobacteria
- production of anti-inflammatory short-chain fatty acids such as butyrate, which feeds our gut cells

This means that for most people these have health promoting properties and should not be restricted

Even in people with GI disorders, specific problematic fibres should be identified through elimination and reintroduction and people should aim to include as wide a variety of fermentable fibres in the diet as possible.

Remember – FODMAPs are good for the gut!

Osmotic fibre can be useful in gut health conditions

- A large trial of 150 people with functional constipation demonstrated that compared to placebo dried fruit containing sorbitol and fructose (grapes, apricots and prunes) led to significantly greater stool weight over 7 days, indicating an increase in water retention in the stool.

  (O22 Dried fruit increases stool weight and patient quality of life in chronic constipation: a randomised, placebo-controlled, food intervention trial | Gut)

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DOI: 10.1111/apt.17782

APT Alimentary Pharmacology & Therapeutics WILI

Systematic review and meta-analysis: Foods, drinks and diets and their effect on chronic constipation in adults

Alice Van Der Schoot | Zoi Katsirma | Kevin Whelan | Eirini Dimidi

- Comparing the effect of fruit to the well-established effect of psyllium on chronic constipation showed
  - 46% of sufferers will respond to increased fruit intake (kiwi, prunes (fructose and sorbitol) or mango (fructose)) compared with 37% response to psyllium
- Response defined as > 1 extra bowel movement per week or no longer fulfilling criteria for constipation (Rome III)

Fibre co-administration in gut disorders

Clinical trial in IBS

- 133 Patient with IBS recruited, 8-week trial
- 3-arm trial of inulin + psyllium, nopal fibre or placebo
- All IBS sub-types included

Main findings: no clinical improvement in IBS from fibre supplementation compared to placebo

However, there was no exacerbation of IBS symptoms when inulin given with equal part psyllium (7.5g each per day)

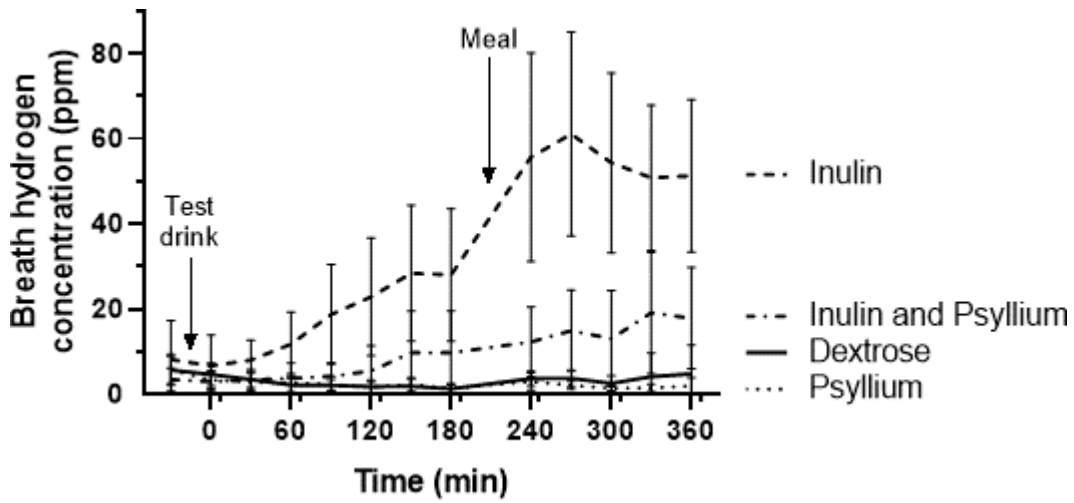


Figure 4 Breath hydrogen concentration (ppm) at fasting and every 30 min after the test drink (n=19). Breath hydrogen rose steadily after 30 min with the inulin test drink but area under the curve analysis demonstrated a significantly reduced rise when inulin was coadministered with psyllium, p=0.0065. Both psyllium and dextrose produced significantly less breath hydrogen than inulin alone, both p<0.0001. Data shown are mean±95% CI.

	Inulin/Psylluim (n=47)	Nopal (n=44)	Placebo (n=42)	P value
Adequate relief of symptoms, n (%)	28 (59.6)	23 (52.3)	22 (52.4)	0.724
IBS-SSS total score, mean (SD)	177.4 (123.2)	201.0 (98.6)	191.3 (99.8)	0.581
IBS-SSS change in score, mean (SD)	-74.4 (123.2)	-64.5 (111.5)	-48.3 (93.0)	0.538
IBS-SSS, 50-point reduction, n (%)	28 (59.6)	21 (47.7)	18 (42.9)	0.264

* Whelan, Wilson et al manuscript under review
* Figure 4: Gunn D, *et al*. Gut 2021;**0**:1–9. doi:10.1136/gutjnl-2021-324784

Key take homes from fibre fundamentals

- Different fibre types have different properties and health benefits
- Patients that struggle with fibre may need adaptation based on their health and response to different fibres
- Understanding the way different fibres work in the gut can help us be more persuasive in promoting fibre intake increase
- Fermentable fibres are good for the gut
- Adding more soluble fibre to fermentable fibres may help them to be better tolerated.

Health benefits of fibre

Health benefits of fibre

- The UK Scientific advisory committee on nutrition (SACN, 2015 and 2019*) published a report of multiple meta-analyses of the health benefits of dietary fibre.
- For every 7g per day of increased fibre intake there was a significantly reduced risk of:

Condition	RR (95% CI)	% Risk Reduction	95% CI Range (Risk Reduction)
Cardiovascular disease	0.91 (0.88–0.94)	**9%**	6% – 12%
Stroke (haemorrhagic + ischaemic)	0.93 (0.88–0.98)	**7%**	2% – 12%
Colorectal cancer	0.92 (0.87–0.97)	**8%**	3% – 13%
Rectal cancer	0.91 (0.86–0.97)	**9%**	3% – 14%
Diabetes	0.94 (0.90–0.97)	**6%**	3% – 10%
All-cause mortality* (25–29 g fibre/day)	0.85 (0.79–0.91)	**15%**	9% – 21%

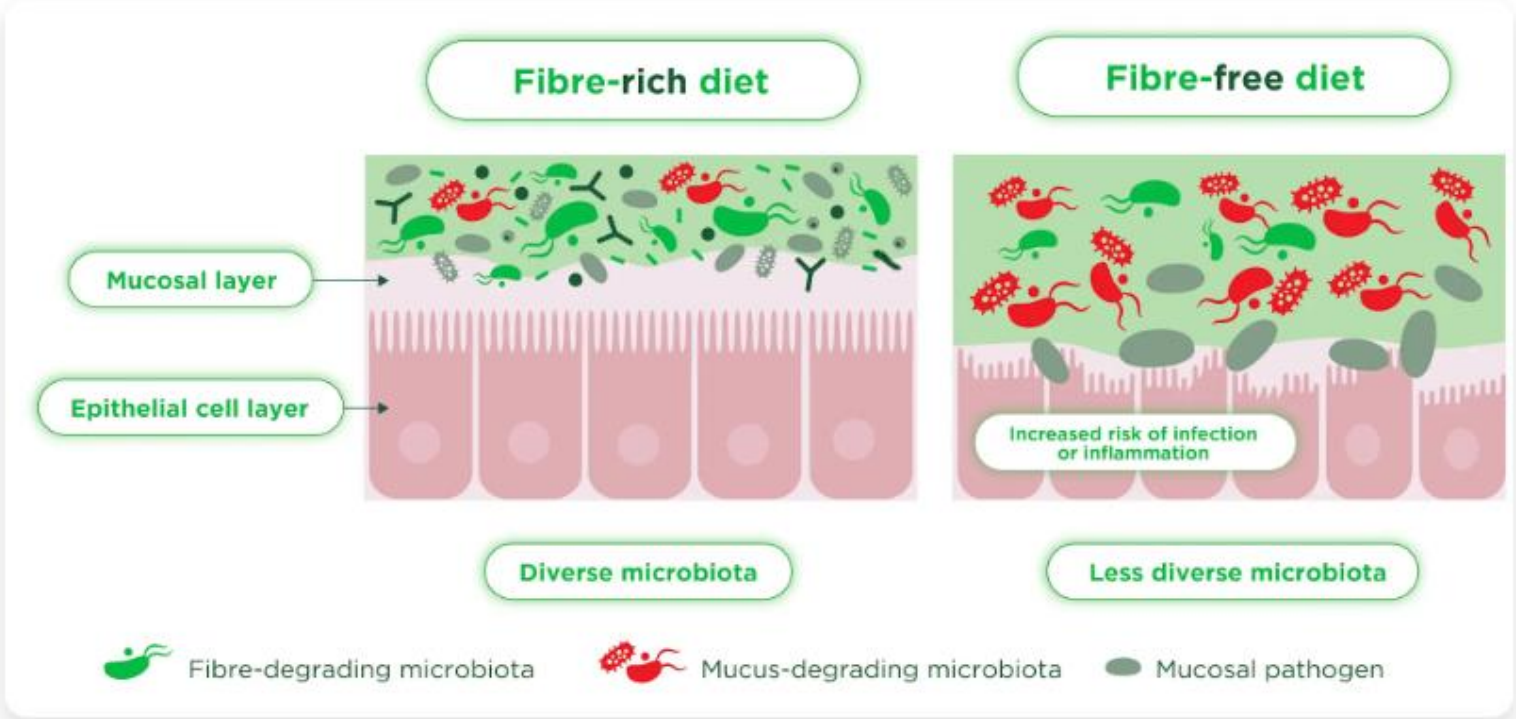
Most countries globally recommend a dietary fibre intake for the general population of 25-35g fibre per day

Despite this worldwide adult fibre intake remains low, typically <20g of fibre per day.

Health benefits of fibre – Gut health

Gut health and the gut microbiome benefits:

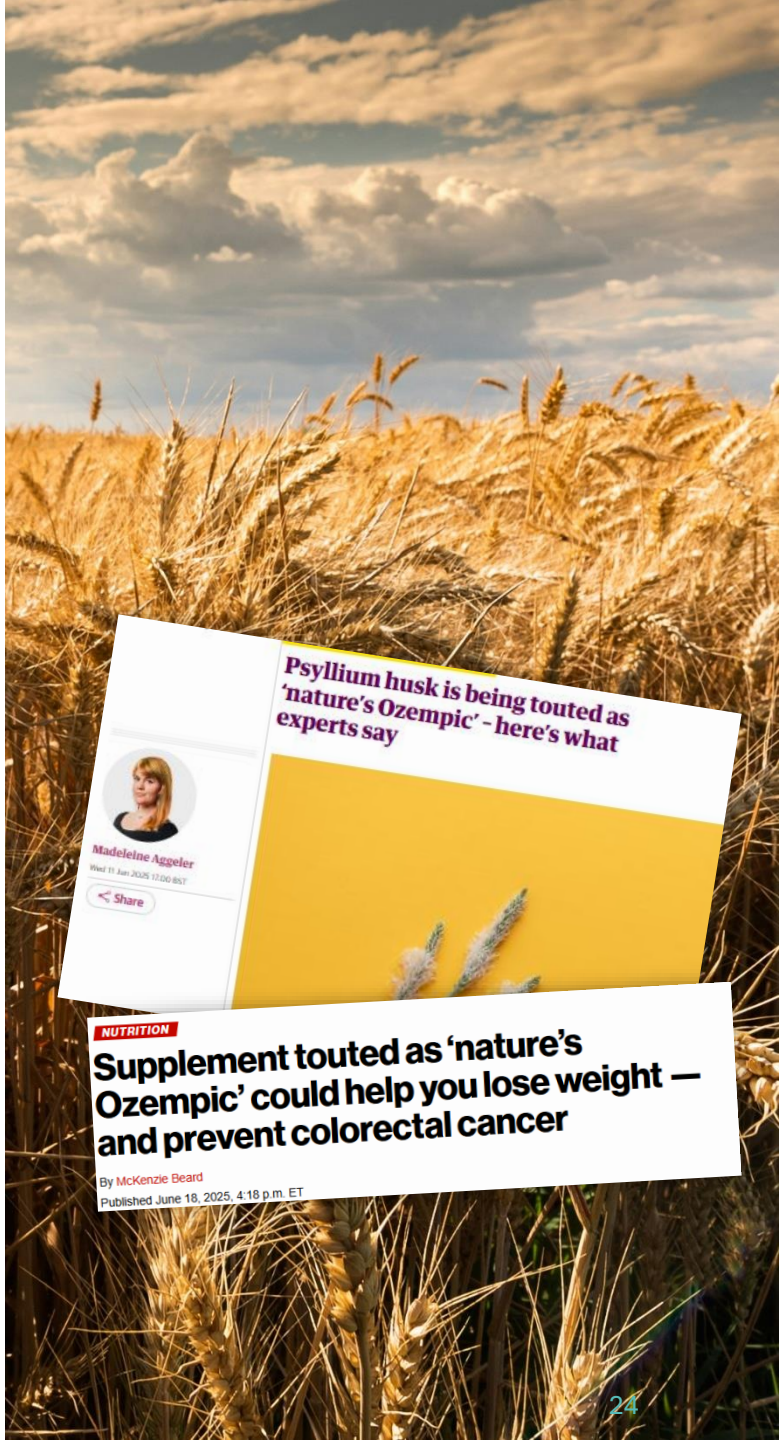
- Increased stool bulk & regularity (soluble and insoluble fibre can help)
- Fermentable fibres feed the gut microbiota When gut microbes ferment fibre, they produce gases and metabolites (like short-chain fatty acids) that help regulate colonic pH which can feed our own gut cells
- Improved microbial diversity associated with more fibre variety



Health benefits of fibre – Weight management

Weight management and satiety

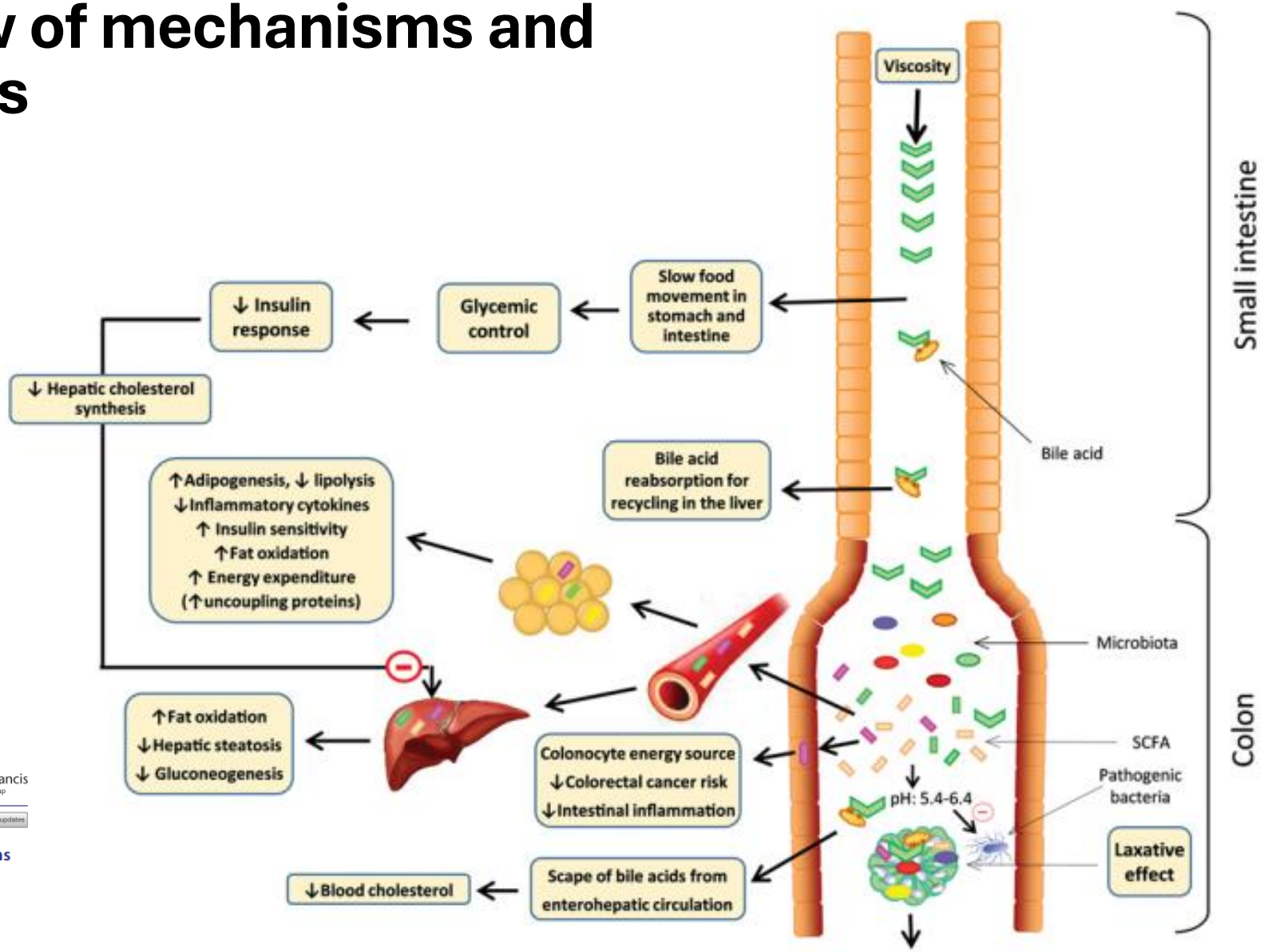
- Fibre increases fullness
- Supports calorie control without restriction focus
- Higher fibre foods take longer to chew and can delay gastric emptying leading to prolonged periods of satiety
- Psychological benefits: focusing on inclusion of foods rather than restriction.
- During weight loss counselling, encouraging people to eat more of the right things rather than overly restrict can be very empowering
- A 2023 review of 136 studies of specific fibres demonstrated that viscous fibres – alginates, guar gum and oat fibre consumed chronically (rather than acutely) had the largest effect of appetite suppression over time.
- Non-viscous fibre and fermentable fibres had less impact on appetite.



Mah et al 2023. The effect of extracted and isolated fibers on appetite and energy intake: A comprehensive review of human intervention studies

The role of dietary fibers in regulating appetite, an overview of mechanisms and weight consequences

Acetate; Propionate; Butyrate.



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REVIEW

The role of dietary fibers in regulating appetite, an overview of mechanisms and weight consequences

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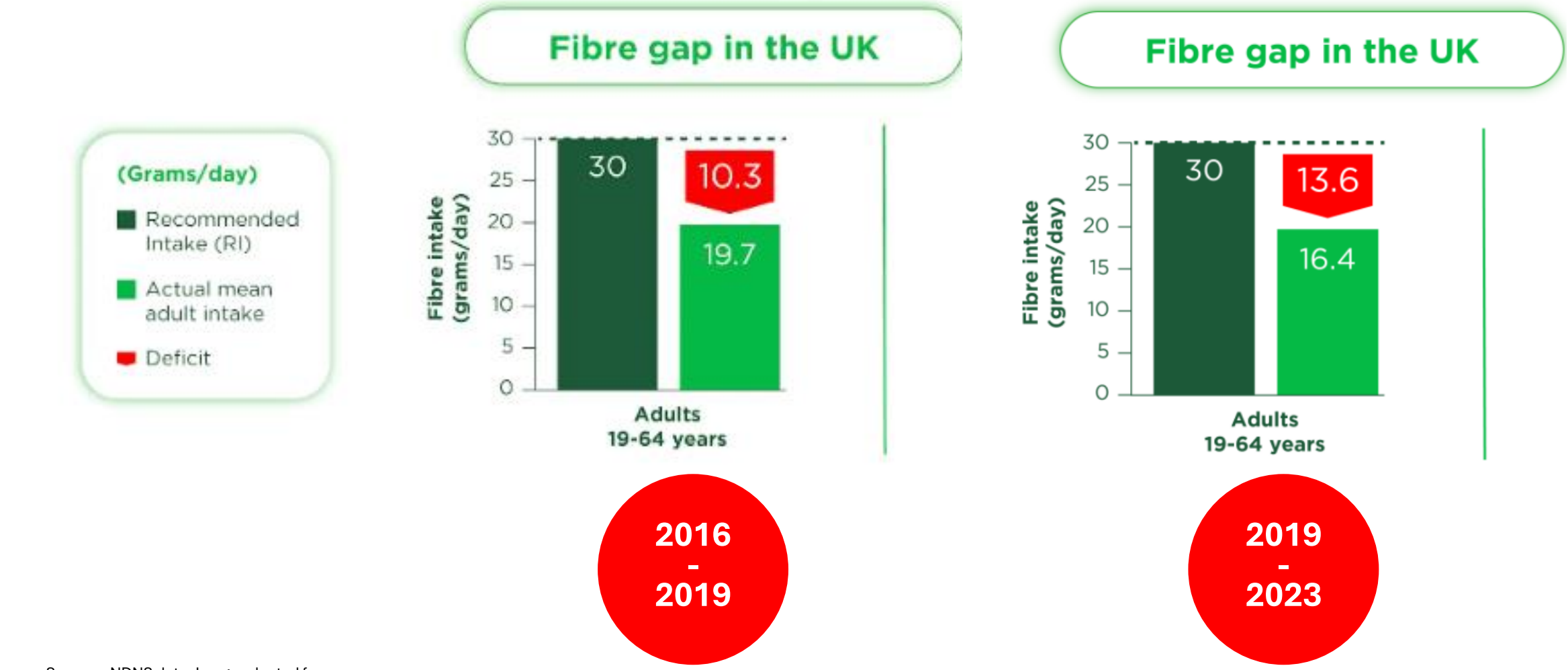
Department of Community Nutrition, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

Key take homes from fibre Health benefits

- High fibre foods have been linked to many health benefits with a 9% risk reduction in non-communicable diseases for every 7g per day fibre intake increase
- Fermentable and functional fibre feeds the gut microbes, which produce beneficial anti-inflammatory acids with benefits to both colonocytes and metabolic functioning
- Increasing fibre intake is associated with lower health risks, insoluble fibre benefits gut functioning/ stool bulking
- Soluble fibre may help reduce appetite as well as improving gut functioning

Fibre gap and challenges

Fibre Gap – is it getting worse?



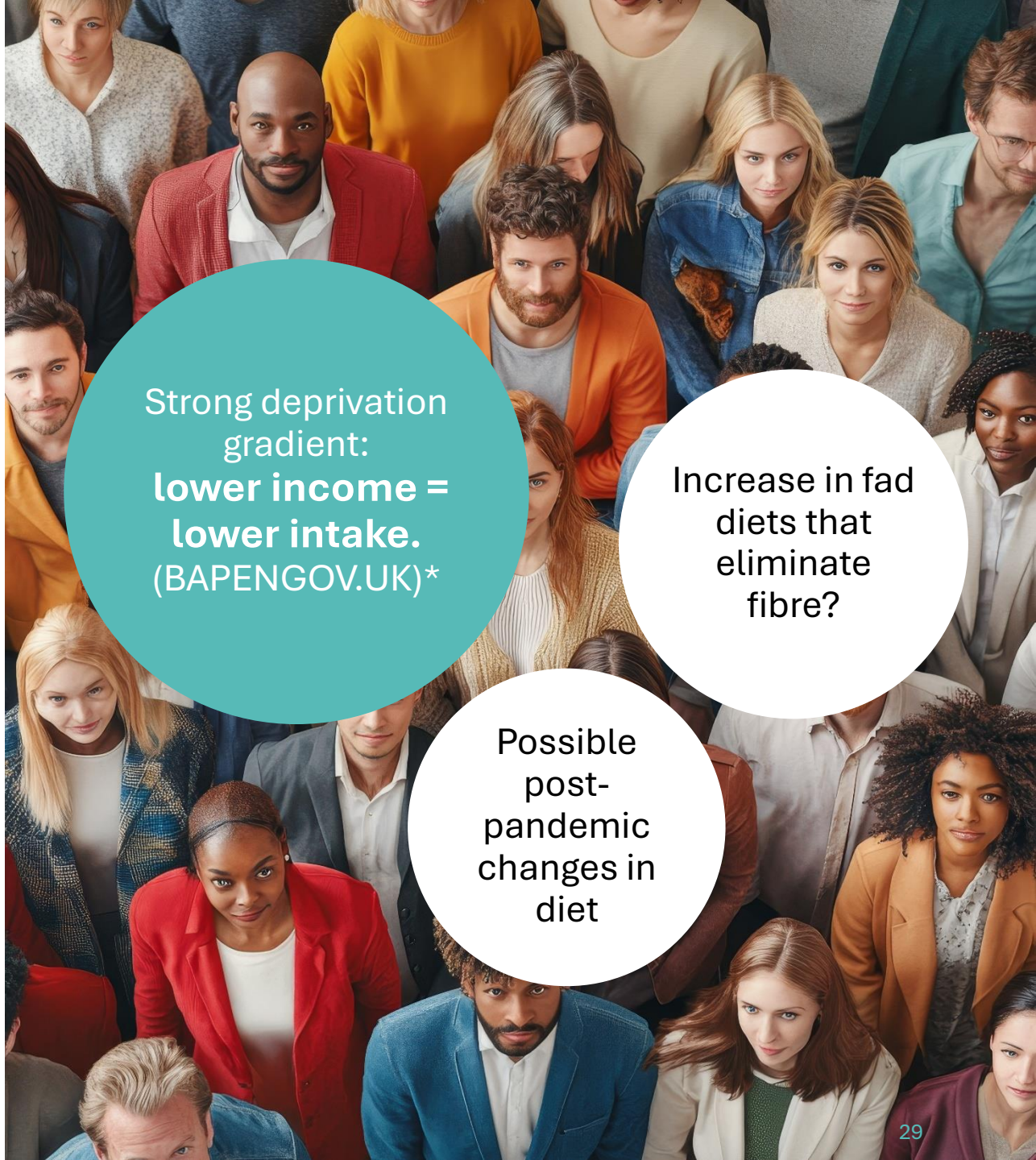
Source – NDNS data. Image adapted from
https://www.danoneactivia.co.uk/gut-science-hub/gut-health/what-is-fibre/

Fibre gaps and challenges

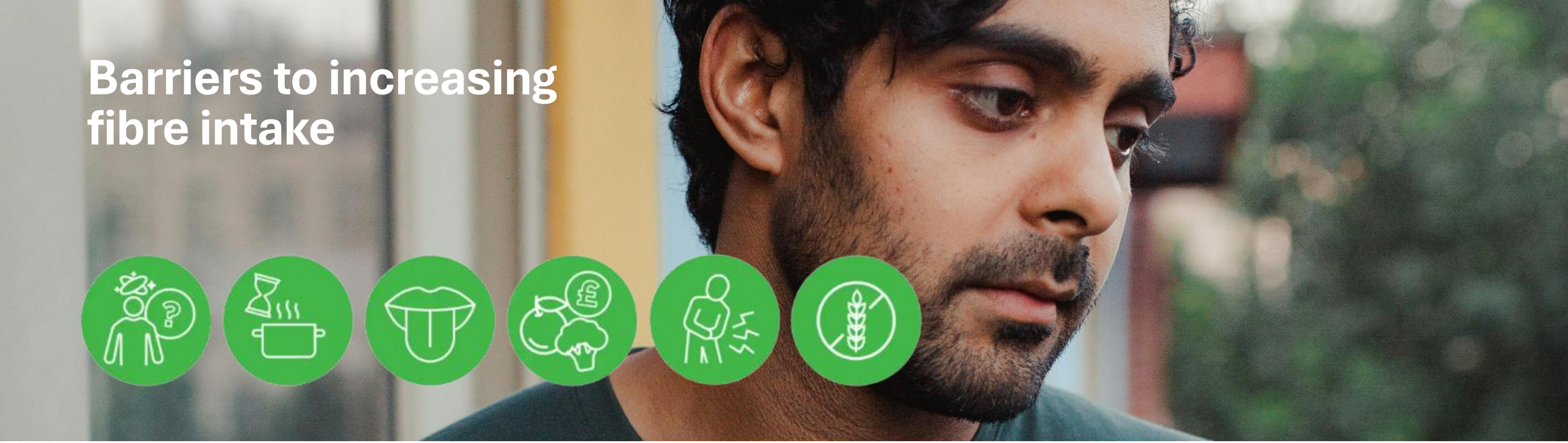
Age Group (y)	NDNS 2016–2019	NDNS 2019–2023
1.5–3	10.4 g/day	12.5 g/day
4–10	14.3 g/day	14.5 g/day
11–18	16.0 g/day	15.4 g/day
19–64	19.7 g/day	16.4 g/day
65–74	19.7 g/day	16.9 g/day
75+	17.3 g/day	16.4 g/day

- The latest NDNS (2019–23) shows 96% of adults and 11–18 year-olds do not meet fibre targets, and most children fall short too GOV.UKBAPEN.
- 4% of UK adults are currently meeting the fibre recommendations
- Socioeconomic disparities in fibre intake
- Most children also below age-appropriate targets.

*** Important: methodological implication – shifted to a different assessment tool in 2019 (Intake24) therefore current data not directly comparable to previous NDNS data**



Barriers to increasing fibre intake



- Knowledge (quantity, foods and benefits)
- Perceived inconvenience
- Taste and preferences
- Cost
- Concern about side effects
- Dietary restrictions (e.g. gluten free or low carb/ low sugar)

- Specific patient groups have varied fibre needs e.g. gut disorders, paediatrics, elderly
- Nuance in fibre recommendations with appropriate modifications to fibre types can help people meet fibre requirements – the importance of a dietitian!

What drives food choices?

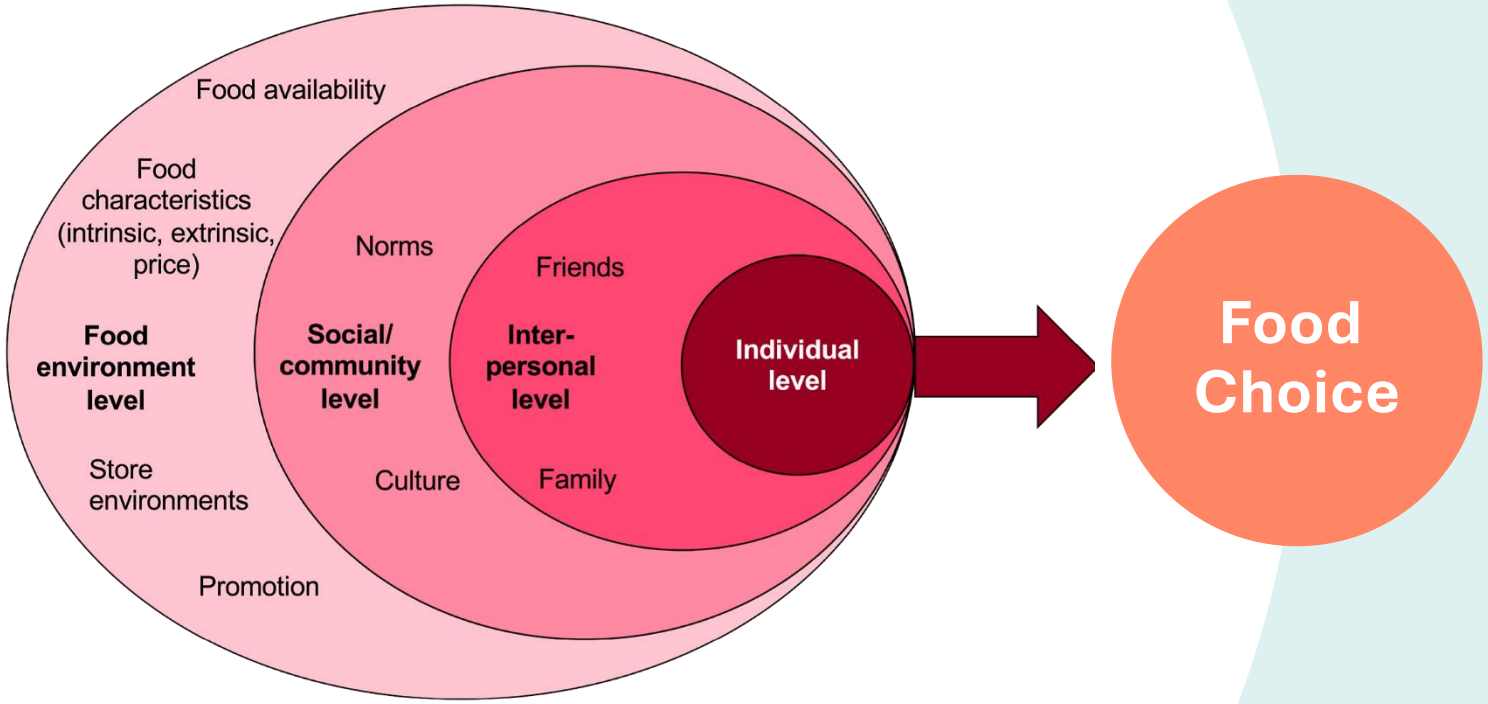


Fig. 1. Conceptual analytical framework according to the socioecological model, based on [11–13].

Review article

Understanding food choice: A systematic review of reviews

Fredrik Fernqvist [a], Sara Spendrup [a,*], Richard Tellström [b]

[a] Department of People and Society, Swedish University of Agricultural Sciences, PO Box 190, 234 22, Lomma, Sweden
[b] SLU Future Food, Swedish University of Agricultural Sciences, PO Box 7082, 750 07, Uppsala, Sweden

Food choice is complex and influenced by many factors

- Knowledge
- Availability (stronger predictor in lower socio-economic groups)
- Price promotion for less healthy foods
- Gender (females more open to plant-based eating)
- Eco-labels e.g. organic (females and younger adults)
- Retail environment (longer shelf life, lack of accountability)
- Consumers more receptive if risks are individualised than general messaging
- Convenience

Key take homes from fibre gaps and challenges:

- Only 4% of UK adults meet fibre recommendations
- Food choice is multi-faceted
- Socio economic status is a large driver of food choice
- Retail environment favours less healthy food promotion
- Perceptions that healthy eating is expensive
- Consumers perceive organic as healthy can be overwhelmed by labelling on other health factors

Practical strategies to increase fibre

Assessing and increasing fibre intake

Assessing fibre intake

- Crude assessment – are they including fruit, veg, wholegrains and legumes in their diet, if so how many portions
- Dietary recalls & FFQs
- Use of tracking apps
- Use dietary recalls or food-frequency tools; consider digital tools (e.g., Intake24, health and fitness apps)
- Be wary of AI driven apps as these are unlikely to give accurate nutrition analysis at this time.

Gradual increase to reduce discomfort

- Increase 3–5 g every few days.
- Pair with 1.5–2 L water daily.
- Choose a variety of fibre sources.
- Monitor GI symptoms; adjust quantity/ fibre types as needed

Label reading exercise

Table of Nutritional Information

	Per 100g
Energy	1171kJ
	278kcal
Fat	6.6g
of which saturates	0.6g
Carbohydrate	42.0g
of which sugars	3.8g
Fibre	5.3g
Protein	10.0g
Salt	0.88g

Typical values (cooked as per instructions)	per 100g
Energy	215kJ
	52kcal
Fat	0.6g
Saturates	<0.5g
Carbohydrate	6.6g
Sugars	3.9g
Fibre	4.4g
Protein	2.7g
Salt	<0.5g

Source of fibre

≥ 3g fibre per 100g

≥ 1.5g fibre per 100kcal

High fibre

≥6g fibre per 100g

≥3g fibre per 100kcal

Bread

- 5.3g fibre per 100g and
- 1.9g fibre per 100kcal

Vegetables

- 4.4g fibre per 100g and
- 8.5g fibre per 100kcal

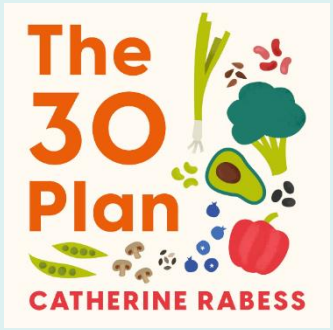
What does adding 7g of fibre per day look like in the UK?

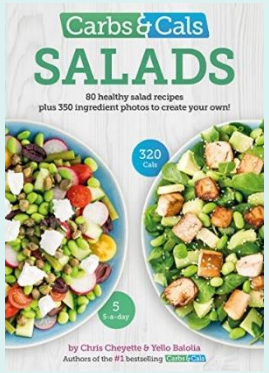
Food option	Quantity	Fibre (g)	Estimated cost	Supermarket
Chia Seeds	21g	7g	£0.23	Tesco
Mixed Nuts	100g	~6g	£1.20	Tesco
Frozen Mixed Berries	250g	~6.5g	£0.75	Tesco
Hummus	150g	~7.5g	£0.72	Sainsbury
Wholemeal Pitta Bread	2 pittas	~11g	£0.16	Sainsbury
Hovis Seed Sensations Bread	4 slices	~6.8g	£0.85	Tesco
Baked Beans (own brand)	200g	~9.3g	£0.30	Sainsbury
Tinned Lentils (1/2 can drained)	133g	~5.9g	£0.28	Sainsbury
Red Split Lentils	50g	~8.5g	£0.10	Sainsbury
½ Lentil Ready Meal	225g	~10.3g	£1.63	Sainsbury
High-Fibre Bran Cereal	30g	~7g	£0.12	Sainsbury
Muesli (standard)	90g	~7g	£0.40	Tesco
Weetabix Crunchy Bran	35g	~7.7g	£0.28	Tesco
Frozen Mixed Veg	160g	~7.2g	£0.26	Tesco

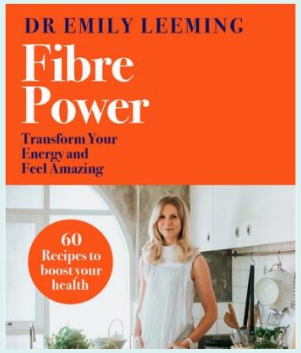
Practical guidance for helping patients increase their fibre

Books

- Catherine Rabess: The 30 plan
- Cheyette and Balolia: Salads
- Emily Leeming: Fibre Power







Web resources

- Activia recipes: Activia Yoghurt Recipes
- British Heart Foundation high fibre recipes

Practice what you preach

Make sure you have a good understanding of

- How to cook wholegrains
- What happens to chia when you soak it
- What it is like to drink psyllium (tip - drink it fast!)
- Using chia or psyllium to thicken soups, sauces and gravies
- What pulses work best with what dishes (e.g. chickpeas in chicken, lentils in mince, butter beans with pasta etc)

Case studies

Case study 1:
Lifelong low fibre eater with food aversions

Case: Female, 32 years old

Referral: Self-referred as concerned about meeting fibre requirements

Since childhood has had a strong sensory aversion to fruit and vegetables and finds that as an adult, despite knowing the reasons that she should eat these, can not bring herself to do it.

Highly motivated to meet fibre requirements as has read about the risks of low fibre diet and has 2 small children.

Feels it is unlikely that will be able to overcome aversion to eating actual fruit or vegetables but wants to achieve a higher fibre intake via other means.

Diet history:

Breakfast: toast with jam or honey x 2 slices

Snack: tea and biscuit

Lunch: sandwich e.g. from lunch shop (Pret, Costa etc) or ready meal (needs to be convenient)

Afternoon: peppermint tea and sometimes another biscuit

Evening meal: pasta dish with bolognaise or pesto (beef or chicken) or chicken and potatos, takeaway once per week e.g. curry with rice and naan once per week or fish and chips, out for dinner once every two weeks e.g. steak restaurant or pub meal.

Fluid: 2-3 cups black tea with milk and 1 cup of peppermint tea

Case study 1:
Lifelong low fibre eater with food aversions

Consultation:

- Discussed reasons for not eating fruit and vegetables and if there are any exceptions to this.
- Discovered that a limited range of blended fruit or vegetables are acceptable e.g. smoothies or vegetables in a pasta sauce although would prefer to not know that they are in there.
- Doesn't want to eat the same thing every day.
- Will eat baked beans and open to trying chickpeas and lentils.
- Open to wholegrains and fibre supplementation.

Plan (over 2-3 appointments we discussed and implemented the following):

- Discussed adding a fruit smoothie to breakfast (would only agree to frozen cherry smoothie), made with s/skim milk for calcium
- Change to high fibre bread
- Swap to oatcakes rather than biscuits
- Education on wholegrains and label reading to help identify higher fibre options for bread/ pasta/ crackers etc
- Ask partner to roast vegetables e.g. carrot, peppers and celery and blend into pasta sauces (use smoothie maker or stick blender)
- Change to oat porridge with chia seeds or high fibre toast for breakfast
- Add in psyllium husk drinks
- Consider adding pulses to pasta dishes
- Try baked beans with high fibre toast for lunch
- Add chia seeds to sauces

Case study 2:
GI symptoms on increasing fibre intake

Case: Male, 45 years old,

Referral: has completed some “gut health” testing and been advised to increase fibre intake and variety, especially advised to add more “prebiotic” fibre.

After following this guidance managed to increase fibre intake but has developed bloating, constipation, flatulence and abdominal discomfort as a result.

Bowels: type 2 stool (BSFS), once every other day, can feel incomplete, takes a long time to open bowels

Testing: colonoscopy returned normal results, Coeliac blood testing returned normal results. No family history of GI disorders. No red flags.

Diet history:

Breakfast: high fibre gut health muesli plus 2 tablespoons of chia, flax and sunflower seed mix sprinkled on top

Snack: oat and seed bar (store bought, with added “gut fibres”)

Lunch: plant based with beans/ lentils/ chickpeas, wholegrain rice and 2 servings green vegetables

Afternoon: dark chocolate 2 squares

Evening meal: 4-5 different types of vegetables, lean protein (meat, fish or plant based) and wholewheat pasta

Fluid: 1 coffee and 2 cups of green tea daily plus 1-2 additional glasses of water.

Case study 2:
Gi symptoms on increasing fibre intake

Consultation:

- Discussed that symptoms could be linked to slow gut transit, this could be linked to increasing fibre too quickly without adequate fluid.
- Asked about common vegetables: included onion, garlic, broccoli, spinach, peppers, carrot, tomato, green beans and peas.
- Reassured that fruit is not “high sugar” and should be included
- Discussed the different fibre types including fermentable fibre and osmotic fibres.
- Asked about bowels before changed diet, was type 5-6 every day with complete evacuation.

Plan:

- Add in 2 portions of fruit with higher fructose or polyols per day, e.g. mango, grapes, stone fruit, kiwi, add to or replace snacks
- Increase fluid to meet requirements
- Consider changing to a more soluble fibre breakfast e.g. overnight oats with seed mix so fibre already hydrated before eating
- Education on loading fermentable fibres – list of high fructan and GOS foods provided to reduce quantity in meals e.g. reduce onion and garlic if eating beans
- Once bowels more regular again we used a 3-day reintroduction protocol for the different fructan and GOS fibres to identify any specific triggers
- Able to increase fructans and GOS as these were moving more quickly through the gut

Key take homes

- Most (UK) adults fall short on fibre
- Fibre benefits multiple health outcomes
- Practical, gradual increases work best
- When counselling patients to increase fibre, it is important to be explore barriers and have detailed practical knowledge of how to overcome these
- Understanding and explaining the way different fibres work in the gut can be crucial to personalising fibre recommendations and achieving fibre targets.

Thank you

CityDietitians