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Scientific Advisory Committee on Nutrition

Carbohydrates and Health report

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and Health

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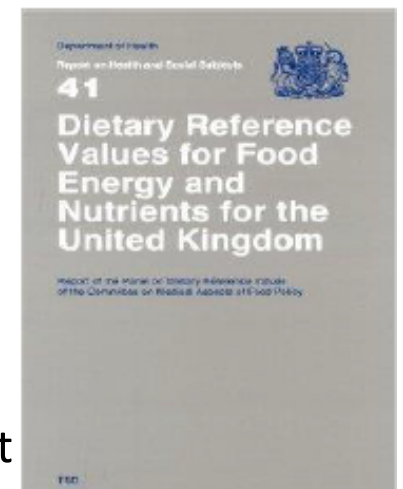
Outline

- Background to SACN report
- How the evidence was assessed
- Findings relating to sugar, sugar-sweetened beverages and fibre.
- Rationale for sugar recommendation and fibre DRV and changes to terminology
- Current intakes and key sources of NME sugar and fibre. Can we profile the high sugar or low fibre consumers?
- Likely health benefits accruing from sugar reduction and fibre increases.

The carbohydrate working group's terms of reference were:

- To review the evidence on dietary carbohydrate and
 - Colorectal health (colorectal cancer, bowel function, constipation);
 - cardio-metabolic health (CVD, type 2 diabetes and obesity);
 - oral health.
- To review the terminology, classification and definitions of types of carbohydrates in the diet.
- To review current dietary reference values (DRVs)*.

*The current DRVs were established in the 1991 COMA report



Evidence base



- Only prospective cohorts and RCTs
- No ecological or cross-sectional studies
- Study duration:
 - ≥ 6 weeks RCT
 - ≥ 1 year for RCTs on weight outcomes
 - ≥ 3 years cohort studies
 - Colorectal health: no limit on study duration
- In **healthy subjects** (without overt chronic disease)
- Over 600 publications included in this assessment
- Systematic Literature Reviews with Meta-analysis (where possible)

Carbohydrate-related exposures

Components:

Total carbohydrate and sugars, fructose (and HFCS), sucrose, lactose, glucose, starch, oligosaccharides, inulin, soluble fibres (including guar gum, psyllium, beta-glucans), non starch polysaccharides/dietary fibre

Dietary sources :

Cereal, fruit and vegetable fibre, wholegrain (wheat, oats, rice, rye), refined grains, table sugar and other extrinsic sugars (syrups), sweets, confectionary, chewing gum, cakes and biscuits, carbohydrate/sugar containing drinks, jams and spreads, honey, milled flour, fruit juice, smoothies and yogurt

Characteristics of components or sources:

Glycaemic index and load, food format (liquid vs. solid [including sugars-sweetened beverages]).

Consumption patterns (oral health)

Frequency versus quantity and timing of consumption

Cardio-metabolic outcomes

Incident fatal cardiovascular disease (CVD)

Incident non-fatal CVD

Acute coronary syndrome (ACS)

Ischaemic heart disease

Stroke diseases

Markers of CVD

- Incident hypertension and blood pressure
- Markers of vascular function
- Blood lipids (fasting and random)
- Markers of inflammation

Diabetes Mellitus

- Incident diabetes mellitus (type II)
- Incident impaired glucose tolerance
- Incident impaired fasting glucose

Markers of glucose tolerance / insulin resistance

- Glycaemic control, HbA1c
- Insulin resistance/sensitivity, HOMA
- Hyperinsulinaemia

Obesity

- Incident overweight and obesity
- Markers of obesity
- Markers of weight gain
- Markers of body composition
- Markers of distribution of fat

Energy intake and satiety

Colo-rectal and oral health health outcomes

Normal colo-rectal function:

- Faecal weight
- Intestinal transit time
- Faecal microflora
- Faecal short chain fatty acid content

Prevention of impaired function:

- Constipation
- Diarrhoea
- Irritable bowel syndrome
- Diverticular disease

Colo-rectal cancer

Dental caries (including tooth loss)

Periodontal disease

Tooth wear (including dental erosion)

Oral mucosal lesions (including oral cancer)

Grading the evidence

- Various grading systems considered (WCRF, GRADE, German Nutr Soc) and adapted
- *A priori* grading (and up/down-grading) criteria published
- Statements added: beneficial/adverse; biologically relevance at population level.

Randomised controlled trials

Prospective cohort studies

Effect – Adequate evidence

Association – Adequate evidence

Effect – Moderate evidence

Association – Moderate evidence

Effect – Limited evidence

Association – Limited evidence

No effect - Adequate evidence

No Association - Adequate evidence

No effect – Moderate evidence

No Association – Moderate evidence

No effect – Limited evidence

No Association – Limited evidence

- No conclusion- insufficient evidence.
 - No conclusion- inconsistent evidence.
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Dietary Reference Values

- Need a more appropriate approach
 - Primary focus of DRVs relates to amounts of a nutrient needed to prevent deficiency of essential nutrients in a population
 - Is it right to assign a DRV to sugars intake?
 - Suggest use the term ‘Dietary Recommendation’ for components of the diet which are not essential, such as Free Sugars

Total Carbohydrate Evidence



- No consistent effect of total CHO on blood lipids
- No association of total CHO intake and risk of T2DM
- Higher CHO, lower fat diets more effective than lower CHO, higher fat at reducing BMI and weight when energy restricted
- No association of total CHO intake and energy intake

SACN's recommendation on total carbohydrate

- The dietary reference value (DRV) for total carbohydrate should be maintained at a population average of approximately 50% dietary energy.

Evidence base for conclusions on sugars:



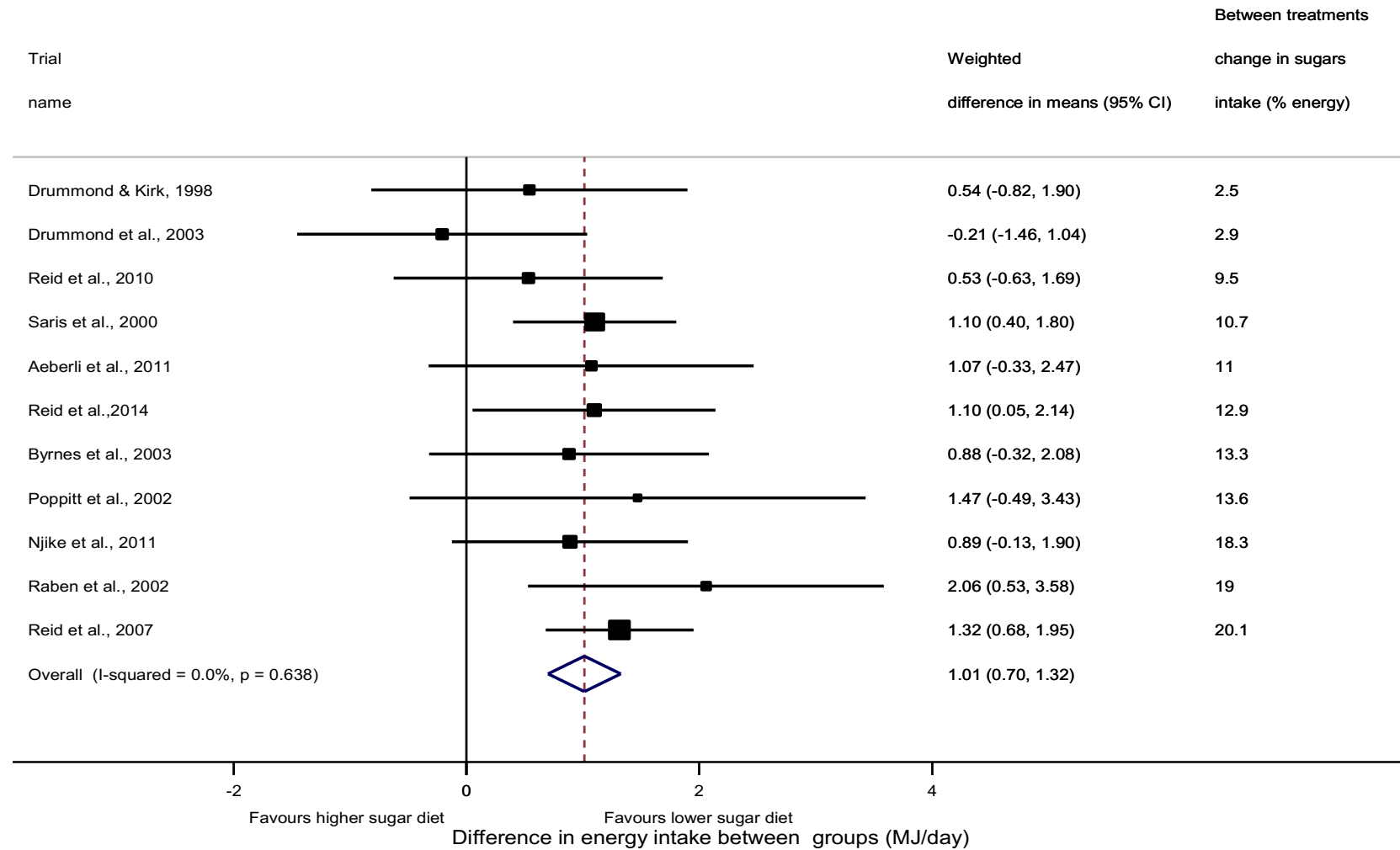
Prospective cohort studies indicate:

- higher consumption of sugar and sugar-containing foods drinks is associated with a greater risk of dental caries (10 studies)
- greater consumption of SSBs is associated with increased risk of type 2 diabetes (around a 20% increase in risk for each 330ml/day increase in SSB consumption) (5 studies)

Randomised controlled trials (RCTs) indicate:

- in adults, increasing or decreasing the percentage of total dietary energy as sugars when consuming an *ad libitum* diet leads to a corresponding increase or decrease in energy intake (11 studies)
- in children and adolescents, consumption of SSBs, as compared with non-calorically sweetened drinks, results in greater weight gain and increases in body mass index (3 studies)

Meta-analysis of RCTs looking at effect of higher versus lower sugar consumption on energy intake



Sugars Sweetened Beverages and Health risks

- An association between greater sugars-sweetened beverage consumption and higher incidence of type 2 diabetes mellitus (RR=1.07, 95% CI 1.05, 1.08 for each 100ml/day increase)
- Sugars-sweetened beverages and BMI
 - Effect
 - Limited evidence
 - The direction of the effect demonstrates that greater consumption of sugars-sweetened beverages is detrimental to health
- Sugars containing foods and drinks – substantial evidence of increased risk of dental caries

SACN's recommendations: **sugars**

- The definition for 'free sugars'* be adopted in the UK.
- The Dietary Recommendation for **free sugars** should be set at a population average of around **5% dietary energy** for age groups from 2 years upwards.
- Consumption of **sugars-sweetened beverages**, by children and adults, should be **minimised**.
- Relevant to **energy intake, weight gain** (children), **dental caries, T2DM Risk** (adults)

*Sugars added to food, and naturally present in honey, syrup and fruit juice

Reduction in free sugar intake in relation to energy intake

- With the proposed reduction in the population intake of free sugars, their contribution toward recommended total carbohydrate intake should be replaced by starches, sugars contained within the cellular structure of foods and, for those who consume dairy products, by lactose naturally present in milk and milk products.
- The complete replacement of energy derived from free sugars by these carbohydrate sources would **only** apply to those people who are a **healthy BMI** and **in energy balance**.
- In those who are overweight, the reduction of free sugars should be part of a strategy to decrease energy intake and should not be replaced by an alternative carbohydrate (or other macronutrient).

Recommendations on dietary fibre :

- AOAC Based definition rather than Englyst
- Include Resistant Starch and Oligosaccharides
 - But need evidence of physiological benefit to the person in order that it can be considered as fibre
 - Example is Polydextrose – laxation threshold around 90g/d, does have ‘beneficial’ effects on appetite at doses of around 20g/serving but 90g polydextrose is not equivalent to 90g cereal fibre

Recommendations on dietary fibre :

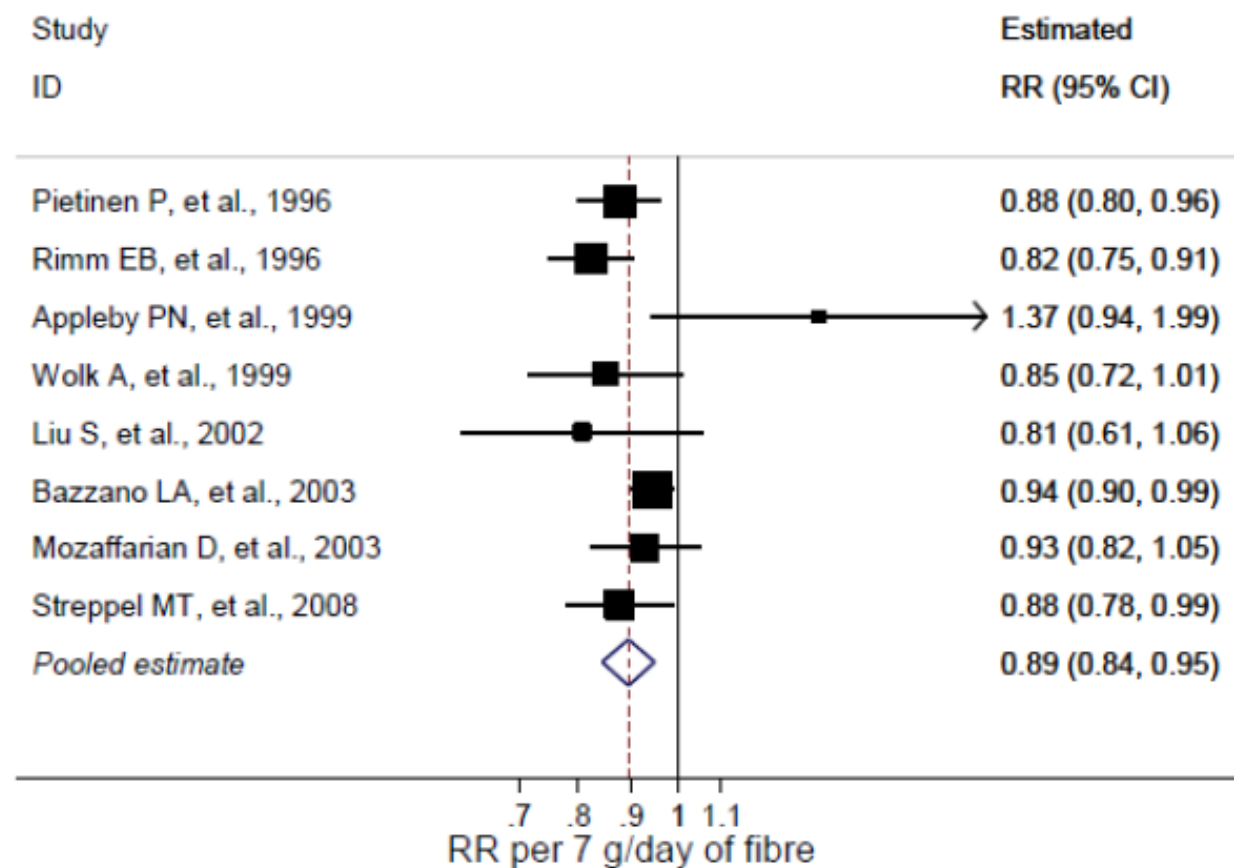
- The definition of dietary fibre should be broadened
- For adults the DRV for the average population intake of dietary fibre should be 30g/day

- For children the average population intake should be:

age group	2-5	5-11	11-16	16-18
fibre g/d	15	20	25	30

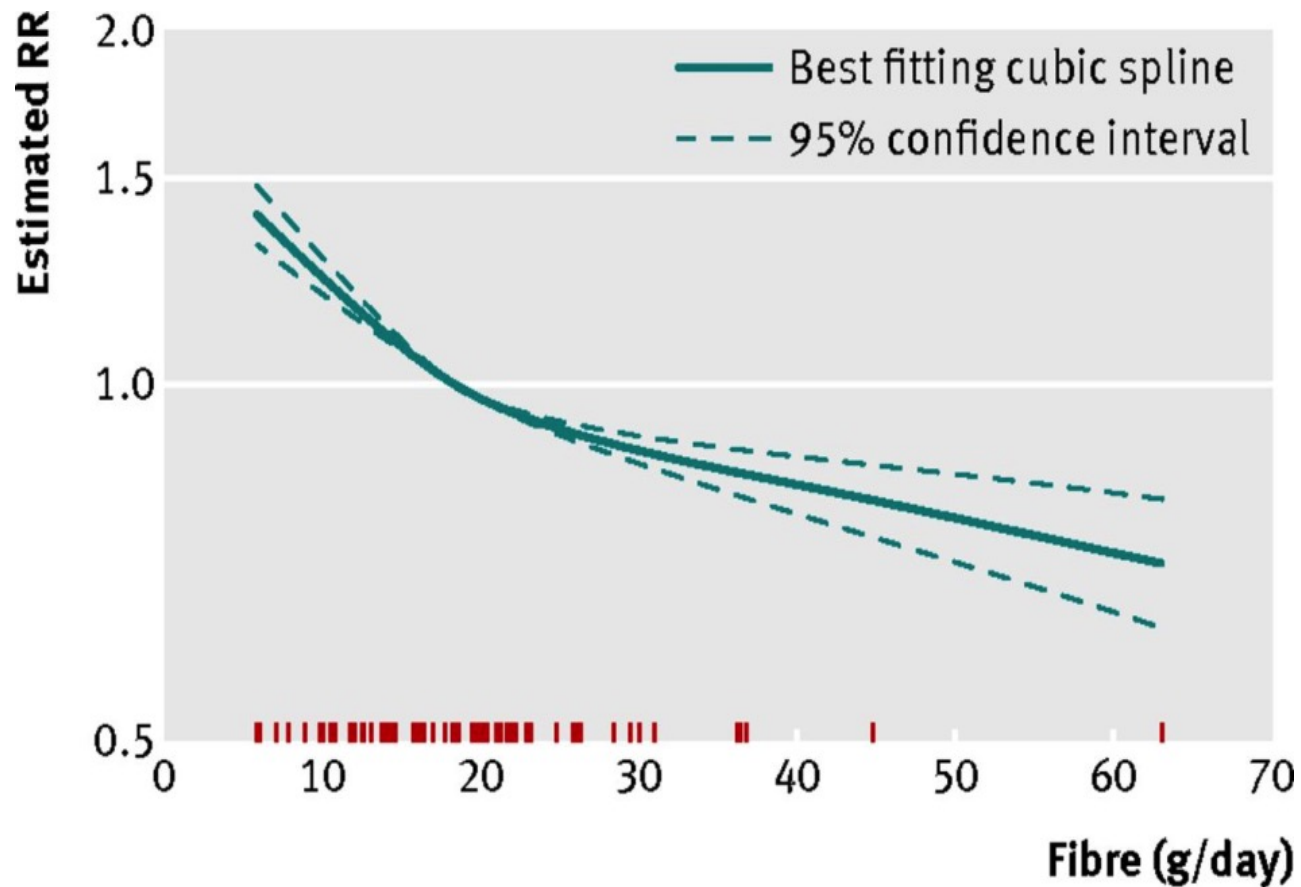
- Dietary fibre intake should be obtained from a variety of food sources.

Meta-analysis of cohort studies: fibre intake and CHD risk



Risk of CVD with increasing levels of total fibre intake (similar plots for other disease outcomes)

Threapleton et al. 2013c BMJ 347, f6879

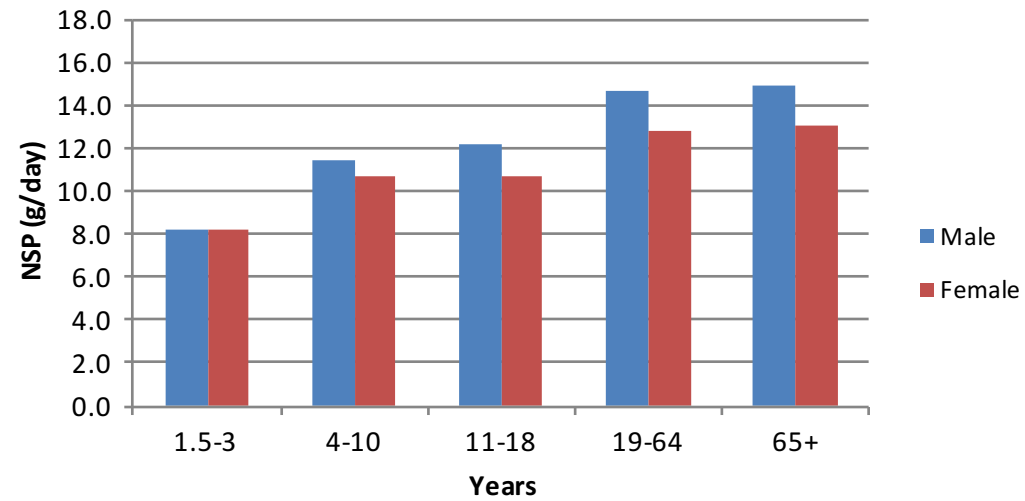


How do the recommendations compare with current intakes?

- Fibre – currently lower than the COMA recommendation (18g NSP – 24g AOAC)
- Sugars – NMES currently 12-15% energy
 - Approx 13% population \leq 5%

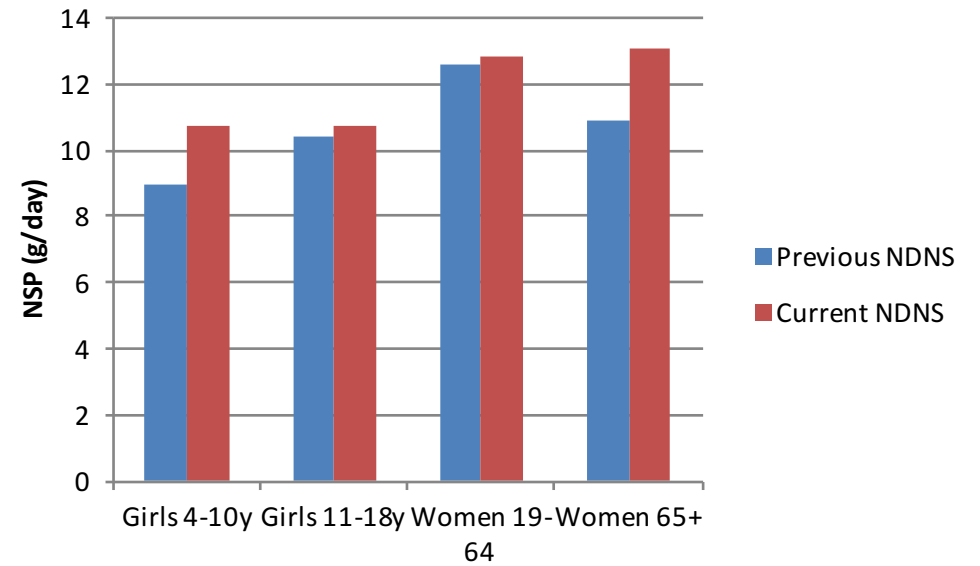
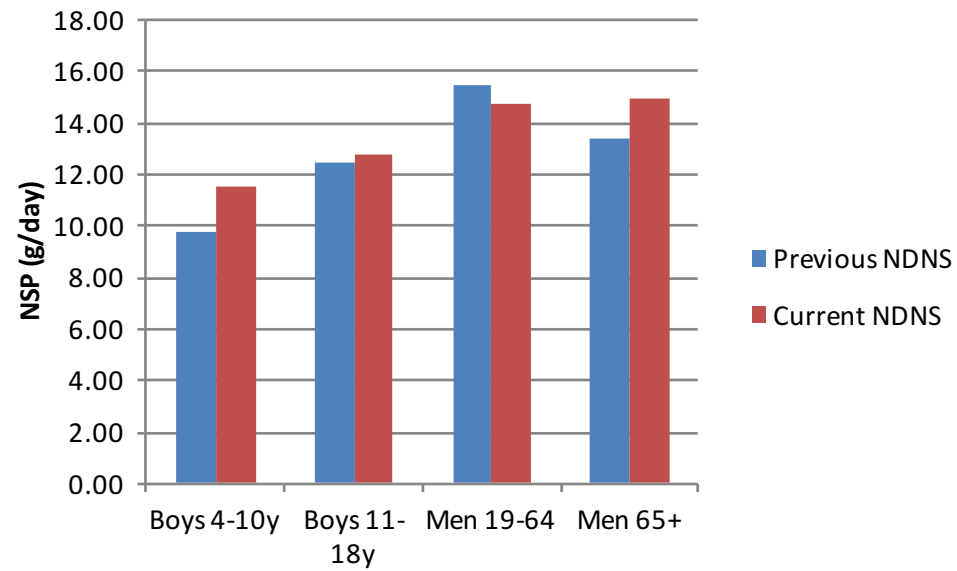
Current fibre intakes

Daily fibre intakes from the NDNS



	1.5-3	4-10	11-18	19-64	65+
Male	8.2	11.5	12.2	14.7	14.9
Female	8.2	10.7	10.7	12.8	13.1

Trends in Fibre intakes



Current Sugars intakes

Table 2. A comparison of current intakes (g/day) with the new recommendations for free sugars

Age	Recommended maximum free sugars* intake (also see Table 1)	Current intakes of free sugars* in males, g/day	Current intakes of free sugars* in females, g/day
4-6 years	No more than 19g/day	63g (4-10 years)	58.5g (4-10 years)
7-10 years	No more than 24g/day		
From 11 years, including adults	No more than 30g/day	84g (11-18 years) 68.4g (19-64 years) 58.5g (65+ years)	63.9g (11-18 years) 49.2g (19-64 years) 46.2g (65+ years)

* expressed as non-milk extrinsic sugars; data from Bates et al 2014

Example of diet meeting recommendations

Table 3. Sample diet plans providing an average of approximately 2000kcal (8400kJ)

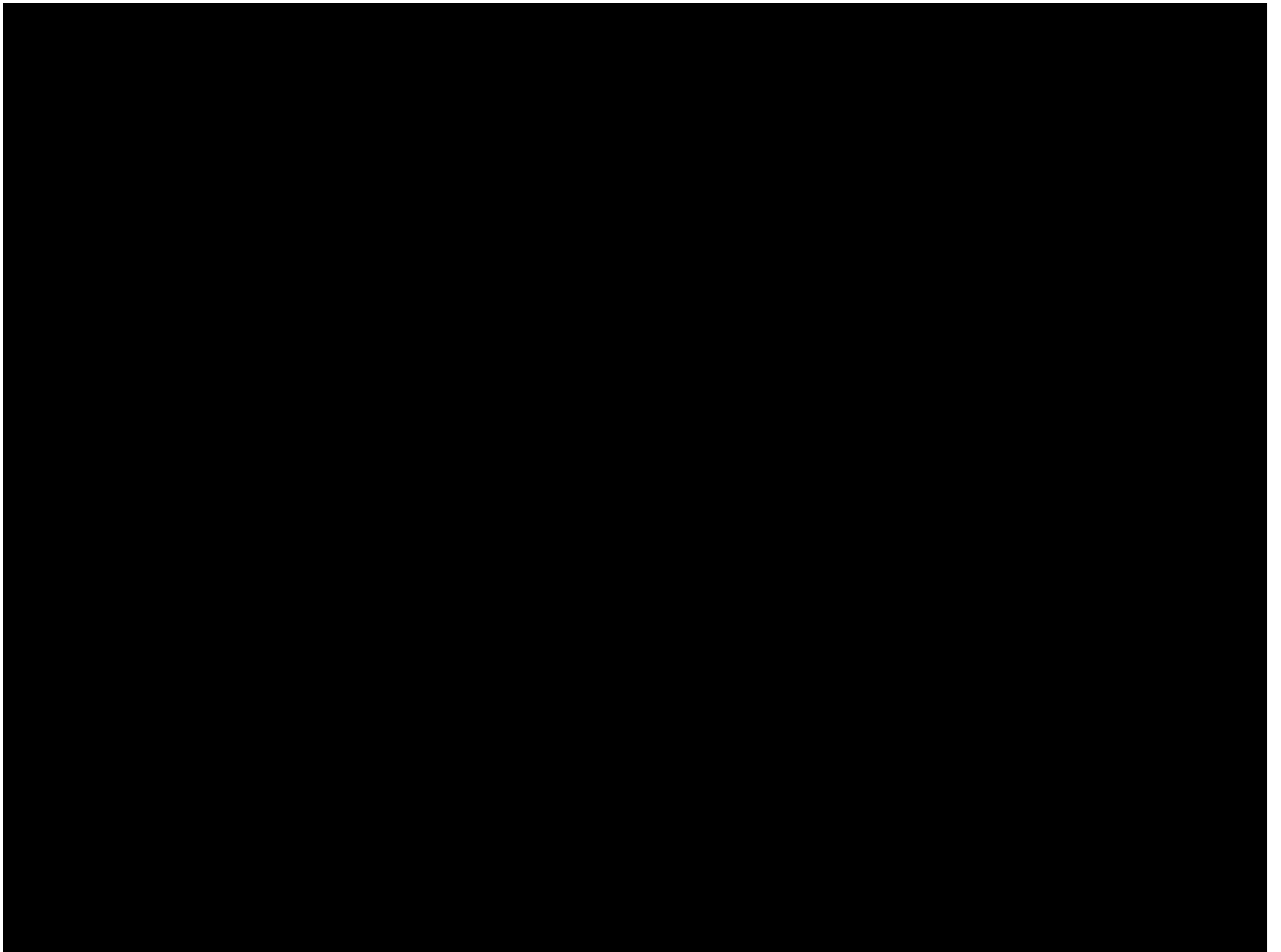
	Day 1	Day 2
Breakfast	2 slices of granary toast with peanut butter, skinny latte, 150ml fruit juice	Half can of reduced sugar baked beans, slice of wholemeal toast, skinny latte
Lunch	Chicken and whole wheat pasta salad, dried apricots	Tomato soup, ham salad sandwich, wholemeal bread
Evening meal	Baked salmon, new potatoes, broccoli and kale	Lean steak and vegetable stir fry with noodles
Drinks and snacks (8-10 glasses of fluids a day – water, no calorie/very low calorie drinks, unsweetened tea/coffee with milk)	Smoothie made with skimmed milk, low fat plain yogurt and frozen berries 2 chocolate digestives	Low fat plain yogurt, berries, pumpkin seeds 30g plain crisps
Free sugars, % energy	5.6%	4.0%
Fibre, g	32.6g	41.1g

Potential health benefits

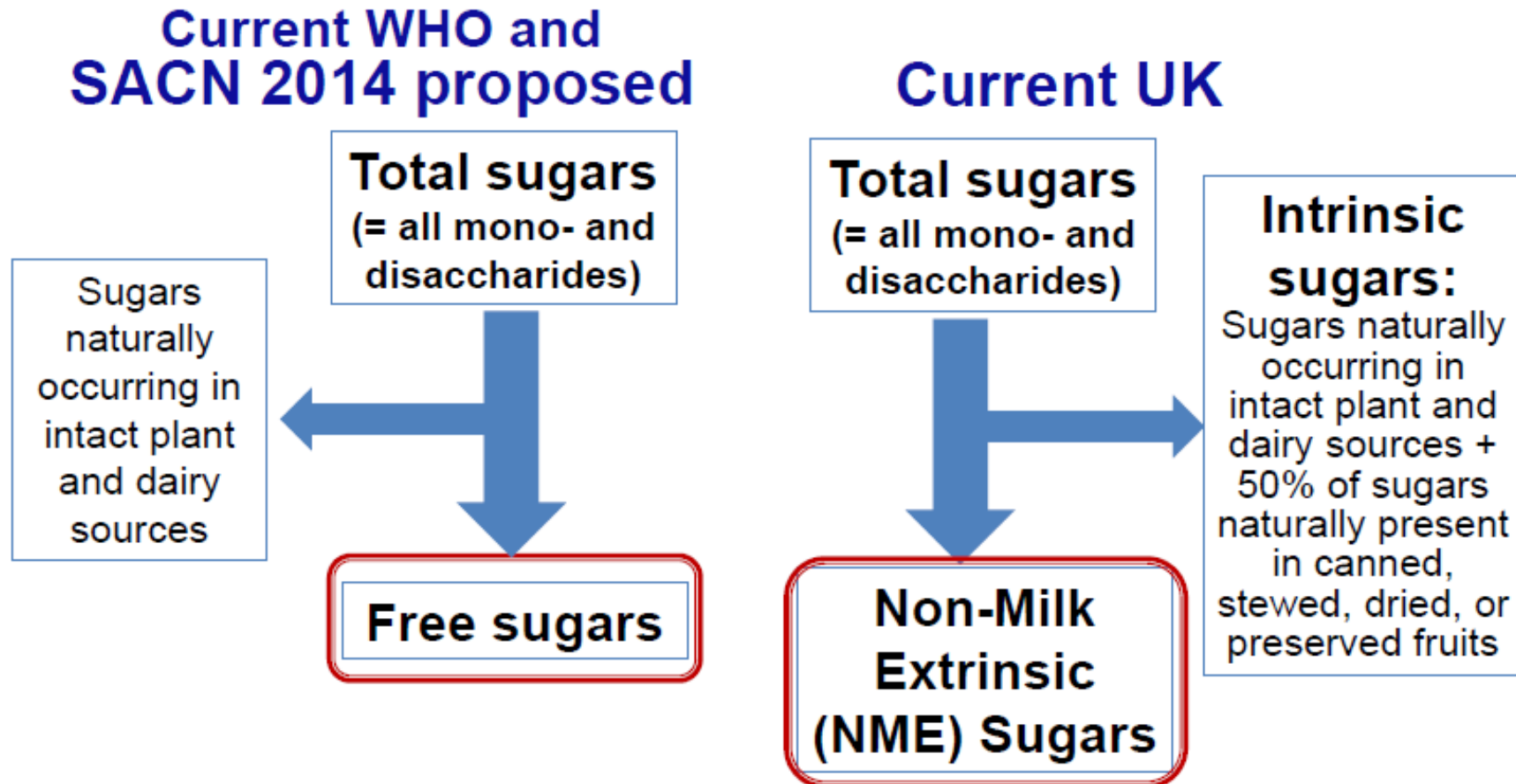
- Increase Fibre – benefits linked to reduced risk of cardiovascular disease, improved intestinal health/reduced disease risk
- Decrease Sugars – improved oral health and reduced tooth decay, reduced risk of type 2 diabetes (linked to sugary drinks), reduced risk of increase BMI and increased energy intake

Next steps?

- PHE develop policy initiatives
- Food industry –
manufacturers/retailers/caterers reformulate,
reduce sugars, sugar replacements
- Consumer attitudes / expectations



Sugars terminology



'Free' and NME sugars include sugars added by manufacturers or consumers and naturally occurring in honey, syrups, and fruit juices or extracts