Summing up the public health implications

Professor Judy Buttriss

27 February 2019

‘Nutrition & CVD: The Heart of the Matter’

COMA recommendations

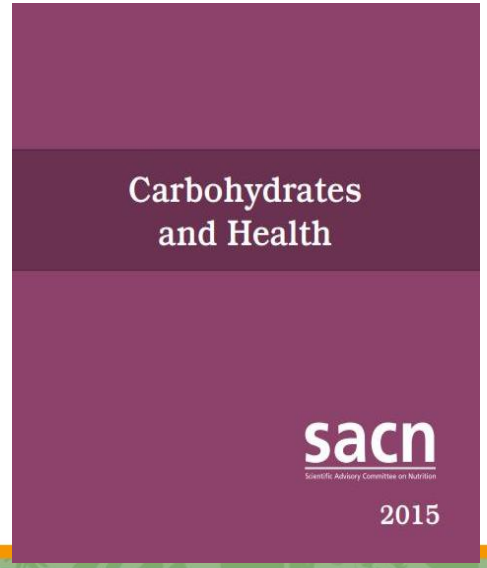
Nutrient	Recommendation
Fat	Reduce to 35% food energy
Saturates	Reduce to 11% food energy
Polyunsaturates	No further increase in average intake of n-6 fatty acids Increase long-chain n-3 fatty acids to 0.2 g/day (subsequently increased to 0.45 g/day)
Monounsaturates	No specific recommendations but ~13% food energy if other recommendations met
Trans fats	≤2% food energy
Total carbohydrates	~50% food energy
NMES	Reduce to 11% food energy
Dietary fibre	18 g/day NSP (~24 g/day AOAC fibre)
Sodium	Reduce to 6 g salt/day
Potassium	3.5 g/day

SACN Carbohydrates and Health (2015)

- Evidence strengthened that **high intakes of free sugars** are detrimental to several health outcomes. New DRV set.
- RCTs in adults indicate that changing the **proportion of energy consumed as sugars** has corresponding effects on energy intake (increase or decrease).
- **Sugars-sweetened beverages** associated with increased risk of type 2 diabetes in prospective cohort studies.
- **Strong evidence** from prospective cohort studies that **increased fibre intakes** (particularly cereal fibre and wholegrains) associated with lower risk of cardiometabolic disease. DRV **increased to 30g/day**
- **Total carbohydrate intake** appears to be neither detrimental nor beneficial to cardiometabolic health.
- SACN confirmed that **about 50% of energy should come from carbohydrate.**

Free sugars - average population intake should not exceed 5% of dietary energy

Dietary fibre (AOAC) - 30 g/day for adults



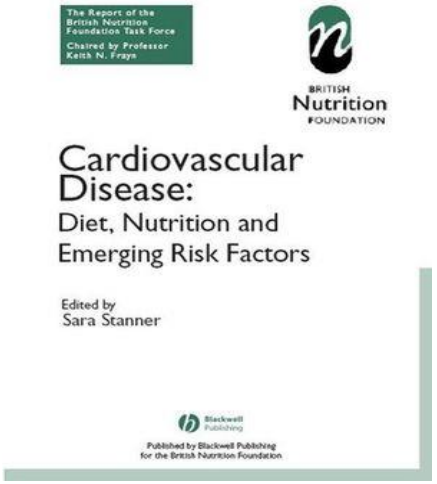
Classical and emerging risk factors

- Classical lifestyle risk factors (*e.g.* smoking, alcohol, obesity, physical inactivity) remain important. Mechanisms now better understood.
- Evidence has strengthened for the role of some previously 'emerging' risk factors (*e.g.* early life nutrition* and vascular dysfunction [e.g. role of fatty acid type]) in CVD risk and for links with specific dietary components.
- New risk factors e.g. gut microbiome.

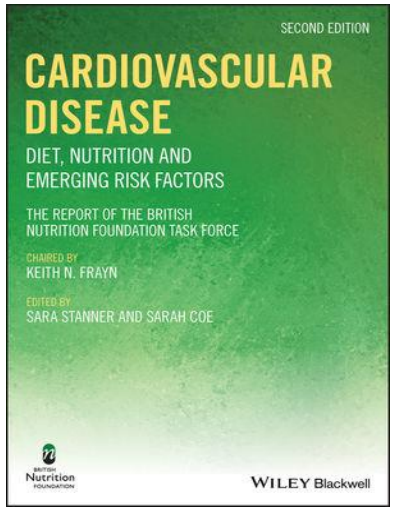
* EARLY LIFE NUTRITION

- Consistent evidence (cohort studies) linking maternal obesity & gestational diabetes with high risk of obesity, early onset diabetes and CVD in offspring.
- Lower birth weight & faster growth in childhood/adolescence consistently linked with higher risk of CVD in adulthood.

2005



2019



Why the debate around saturates?

Saturates raise blood cholesterol which increases CHD risk – the **'Diet-Heart hypothesis'**

vs.

"No association between saturates intake and risk of CHD" in meta-analyses of **cohort studies** (Siri-Tarino et al. 2010; Chowdhury et al. 2014)

For every 5% of dietary energy from saturates that is replaced by *n*-6 polyunsaturates, there is a 9-13% reduction in CHD events and 13-16% reduction in CHD deaths (Farvid *et al.* 2014). Systematic review and meta-analysis of prospective cohort studies.

RISK

1. Polyunsaturates
2. Monounsaturates
3. Carbohydrates (wholegrains)

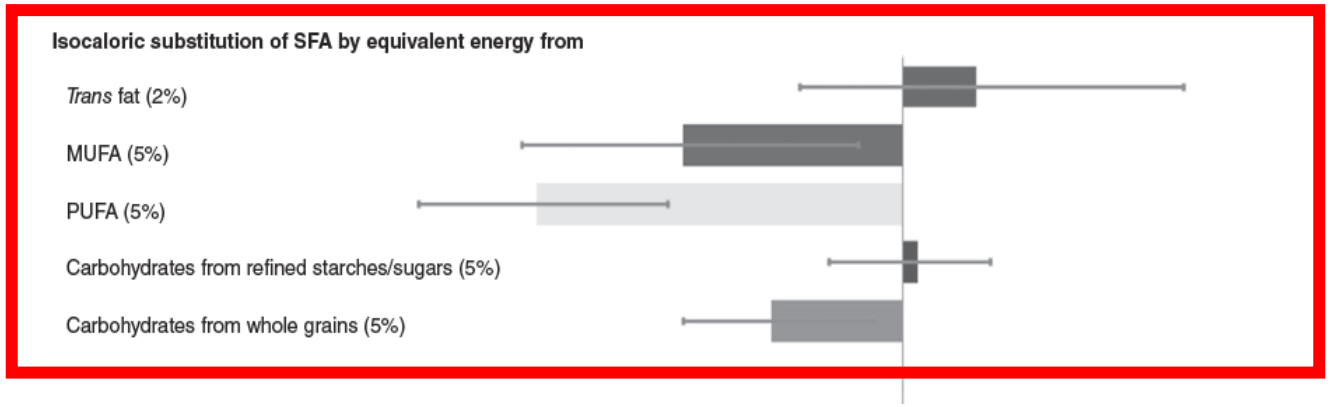
RISK

1. Trans fats
2. Refined starches or sugars

Type of substitution matters

Dietary cohort studies – methodological issues

The type of substitution matters



Li *et al.* (2015) change in CHD risk with isocaloric substitution. Two large prospective cohorts.

Meta-analysis of 11 **RCTs – 27% reduction in CVD events** in studies that **replaced saturated fats with PUFAs**, but not MUFAs, carbohydrates or protein (Hooper *et al.* 2015).

And 7-17% reduction in CVD events with lower intake of SFA compared with usual intake (Hooper *et al.* 2015).

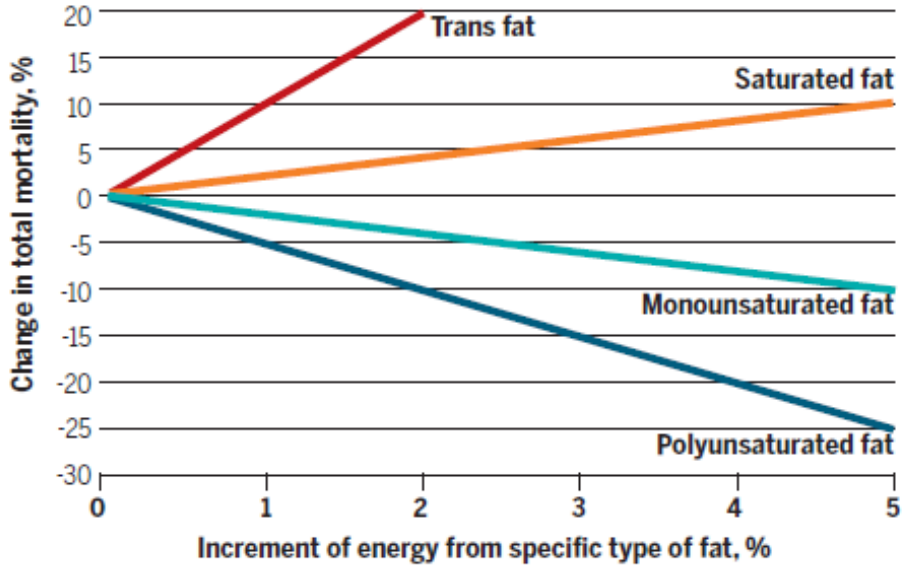
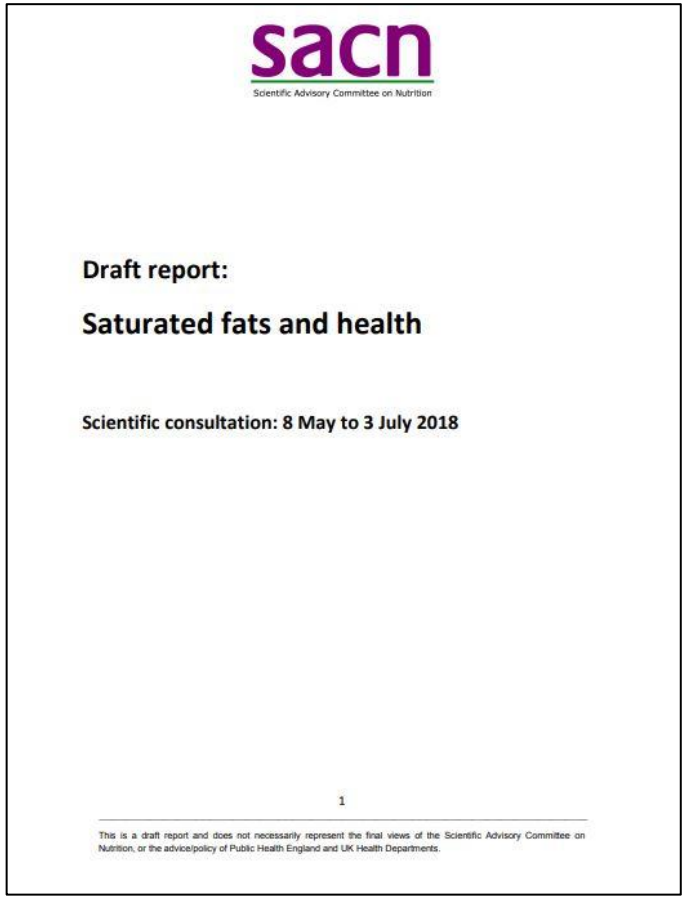


Fig. 2. Relation between increasing intakes of trans, saturated, unsaturated, monounsaturated, and polyunsaturated fatty acid (compared isocalorically with carbohydrate) in relation to total mortality. Data are based on 126,233 men and women followed for up to 32 years, with assessments every 4 years, as described in Wang *et al.* (*94*). The strong inverse association with polyunsaturated fatty acids was primarily due to N-6 polyunsaturated fatty acids; associations with N-3 polyunsaturated fatty acids were weaker.

SACN draft report ‘Saturated fats and health’ (2018)

Key findings

- Reducing intake of saturates reduces total and LDL-cholesterol and triglycerides, and reduces risk of cardiovascular events.
- RCTs show that replacing saturates with **polyunsaturates** or **monounsaturates** reduces total and LDL cholesterol, and total to HDL cholesterol ratio
- Replacing saturates with **polyunsaturates** also reduces risk of cardiovascular events (Hooper et al. 2015)
- Limitations in the available data mean that no conclusions can be drawn about the benefits on cardiovascular events of substituting saturates with **monounsaturates** or with **carbohydrate**.
- **Retained 11% energy** dietary reference value


sacn
Scientific Advisory Committee on Nutrition

Draft report:

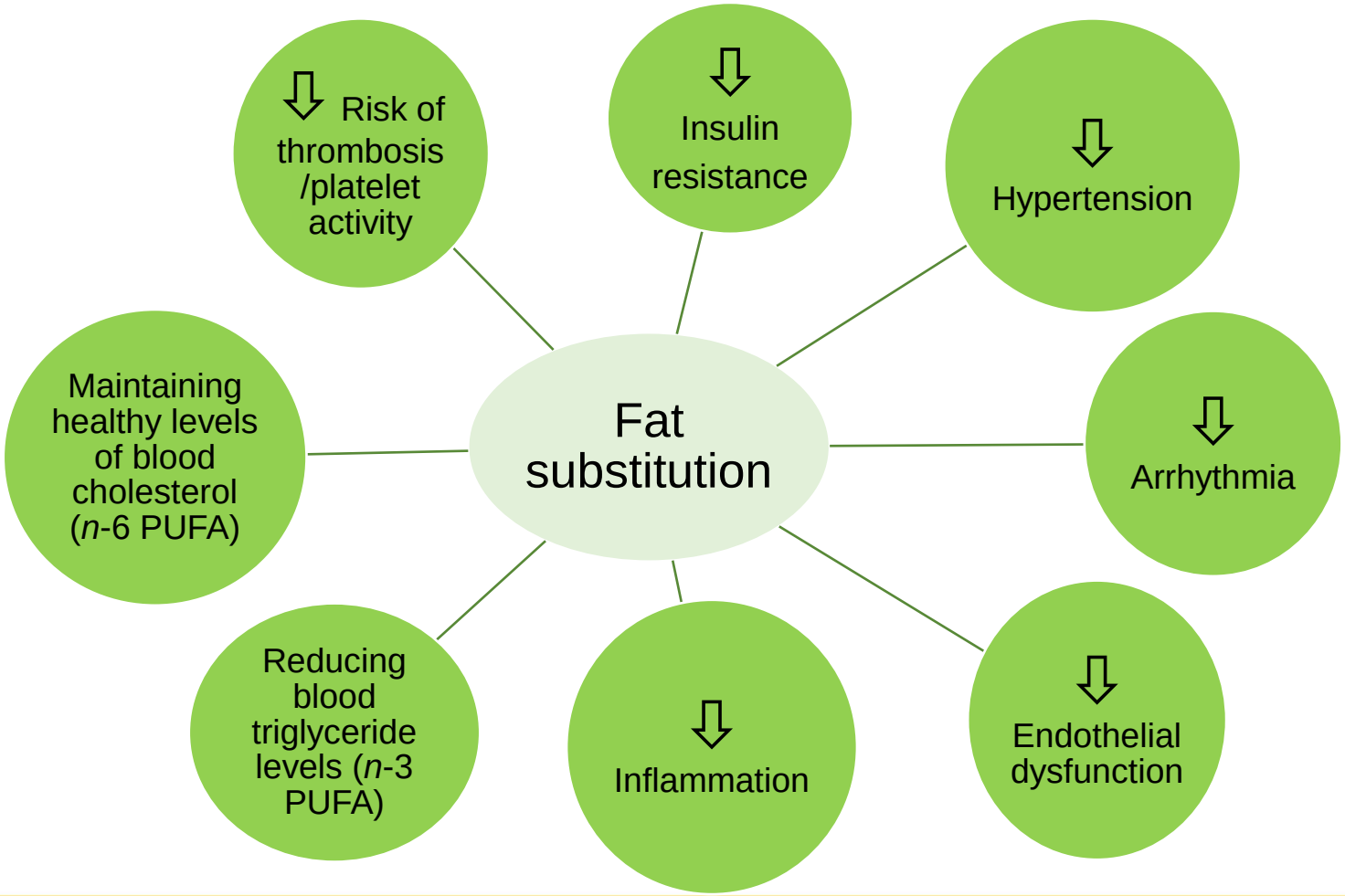
Saturated fats and health

Scientific consultation: 8 May to 3 July 2018

1

This is a draft report and does not necessarily represent the final views of the Scientific Advisory Committee on Nutrition, or the advice/policy of Public Health England and UK Health Departments.

Effects of changing type of fat on other risk factors?



Reaffirmation of importance of substituting saturated fatty acids with unsaturated fatty acids

Current intakes vs. recommendations - successes

	Average daily intakes in UK adults	Dietary Reference Value	Meeting the recommendation?
Carbohydrates (% food energy)	47.6%	50%	(✓)
Total fat (% food energy)	34.7%	35%	✓
Trans fatty acids (% food energy)	0.5%	2%	✓

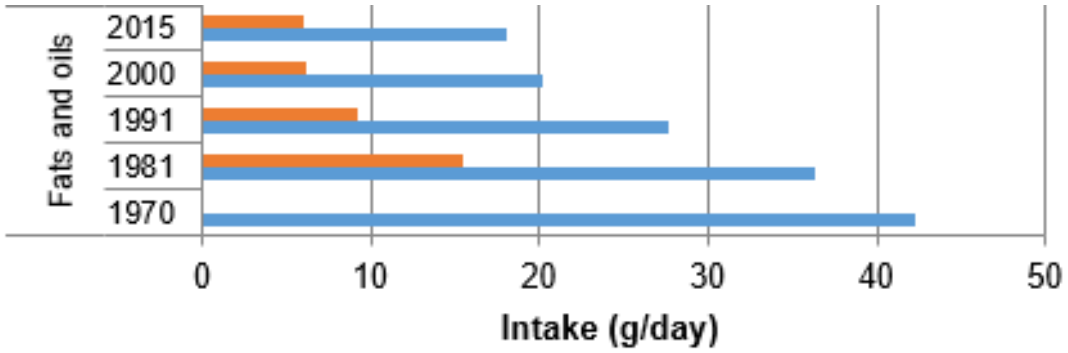
Data: National Dietary and Nutrition Survey Years 7&8 (2014/2015 & 2015/2016)

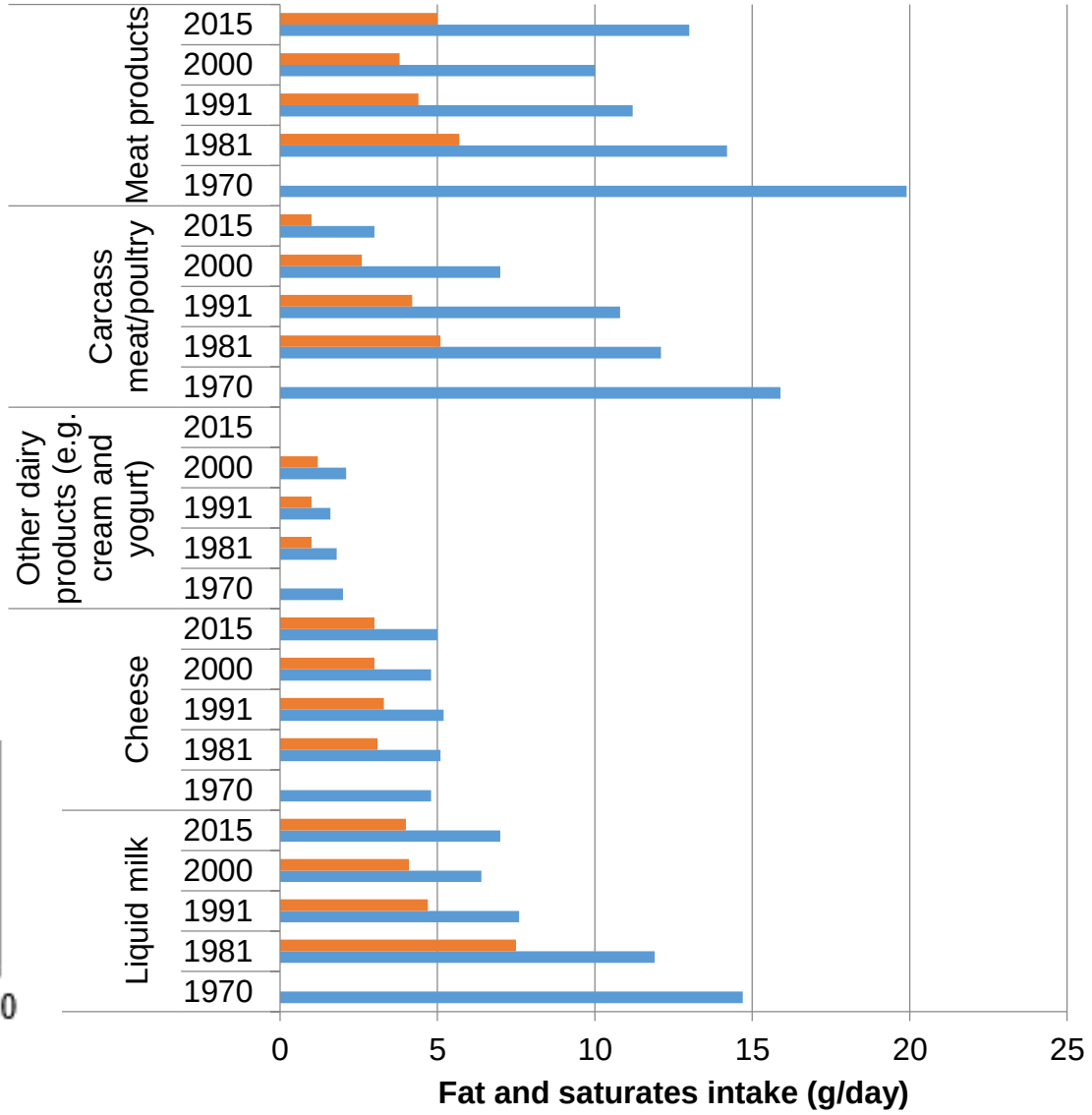
Current intakes vs. recommendations - challenges

	Average daily intakes in UK adults	Dietary Reference Value	Meeting the recommendation ?
Saturates (% food energy)	12.5%	11%	✘
Free sugars (% food energy)	11.7%	5%	✘
Fibre (AOAC, g/day)	19 g	30 g	✘

Trends in fat and saturated fat intakes

Saturated fat has fallen from above 16% of energy to below 12.5% since the 1980s. But intakes plateaued





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MAFF (1973, 1983, 1992)
Defra (2001, 2017)

Fibre has risen up the agenda

SACN: strong evidence from prospective studies – biologically relevant decrease in incidence of CVD, coronary events, stroke, type 2 diabetes (& colorectal cancer). Wholegrains & cereal fibre.

RCTs indicate that higher intake of specific types (e.g. oat bran and isolated beta-glucans) → lower total cholesterol, LDL-cholesterol and triacylglycerol concentrations, plus lower blood pressure.

Type and **variety** of fibre is important:

Some fibre types provide a substrate for the gut microbiota, increasing production of short-chain fatty acids which are thought to be advantageous *e.g.* soluble fibre (such as pectins and beta-glucans found in foods such as fruit and oats)

Nutrient, substance or food	Health claim
Beta-glucans	Maintenance of normal blood cholesterol concentrations
Oat beta-glucan	Oat beta-glucan has been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease

Micronutrients?

Antioxidant nutrients
Observational studies reported inverse associations with risk of CVD **BUT** trials have demonstrated no beneficial effects on CVD events.

Vitamin D
Plasma vitamin D inversely associated with vascular & non-vascular mortality. Large scale trials underway to explore relationship between vitamin D and CVD.

Folic acid
Supplements can reduce levels of circulating homocysteine (?independent risk factor for CVD) but trials of long-term (5 years) B vitamin supplementation haven't found benefit for CVD prevention.

Vitamins and minerals - evidence of low intakes in adults in the UK

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% males & females of different ages with intakes of micronutrients below lower reference nutrient intake (LRNI)

	Females 19-64	Females 65-74	Females 75+	Males 19-64	Males 65-74	Males 75+
Vitamin A	10	7	10	16	6	5
Riboflavin	14	7	13	6	1	3
Folate	6	3	8	3	0	3
Iron	27	8	12	2	0	2
Calcium	11	11	10	7	0	4
Magnesium	11	11	27	14	6	22
Potassium	23	22	34	11	4	16
Iodine	15	6	9	9	2	4
Selenium	47	57	76	25	34	39
Zinc	8	3	12	7	5	8

Data: National Dietary and Nutrition Survey Years 7&8 (2014/2015 & 2015/2016)

Latest trends in UK micronutrient intake (2008-2017)

A significant downward trend in intakes of most vitamins and minerals (including folate and potassium) for most age groups, plus an increase in the proportion of people with low intakes.

Blood folate levels

- Decreased significantly for all age/sex groups, and increased proportion of population with levels indicating risk of anaemia (19 percentage point increase in 11-18 year olds and 9 percentage point increase in adults).
- Increased proportion of women aged 16-49 years with blood folate concentration below threshold for increased risk of NTD pregnancy (approx. two-thirds vs. almost 90%)
- Folate intake dropped to below the RNI (girls 11-18y)

Evidence of low intakes of **magnesium** and **potassium** in adolescents and adults.

Vitamin D: Average blood vitamin D level lowest from January to March (19% children 4-10 years, 37% children 11-18 years, 29% adults with levels indicating risk of deficiency)

Data: **National Dietary and Nutrition Sur**vey Years 1-9 (2008/2009 – 2016/2017): Time trend and income analyses (2019)

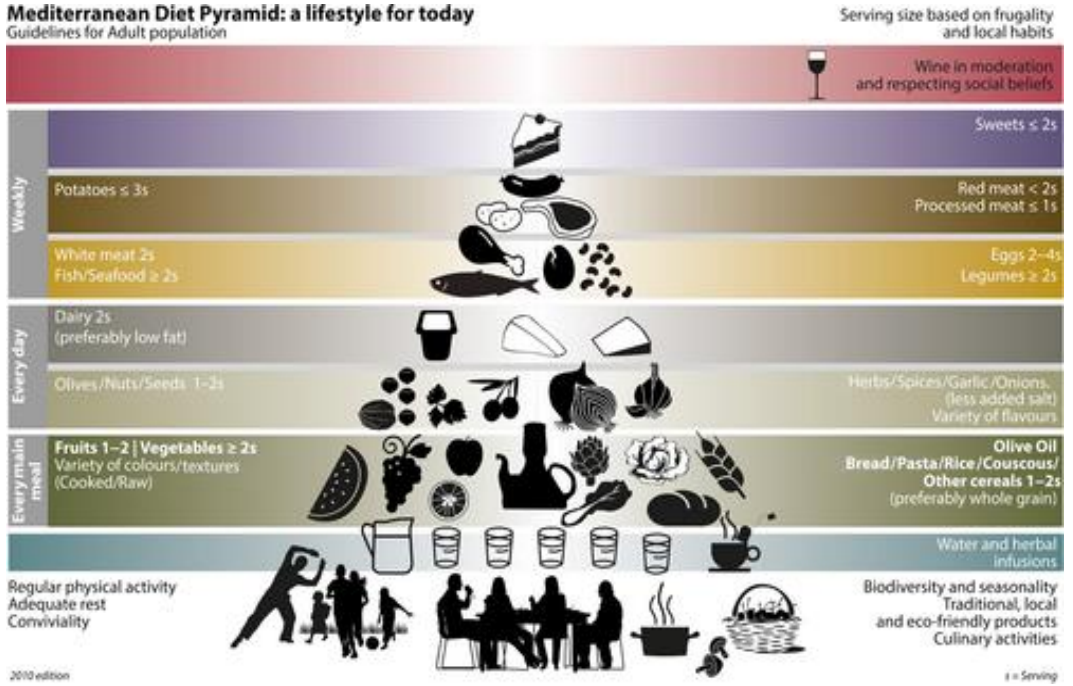
Change in emphasis - dietary patterns

DASH diet (US)

- Low in sodium and saturates and high in potassium, calcium, magnesium, fibre and protein.
- Plenty of fruit, vegetables, wholegrains, low-fat dairy products, poultry, fish, beans, and nuts, while limiting foods high in saturates as well as confectionery and sugars-sweetened beverages.

Plant-based dietary patterns associated with **~20% lower risk of CVD and type 2 diabetes.**
Characterised by higher intakes of fruit and vegetables, legumes, wholegrain cereals and fish and poultry.
(Section 13.5.4, p327)
PREDIMED – RCT – **30% decrease in CVD events.**

Mediterranean diet - 10% decrease in CVD incidence or mortality - prospective (Sofi *et al.* 2010)



Foods and diets vs single nutrients

Dietary pattern approach, outcomes not always as anticipated:

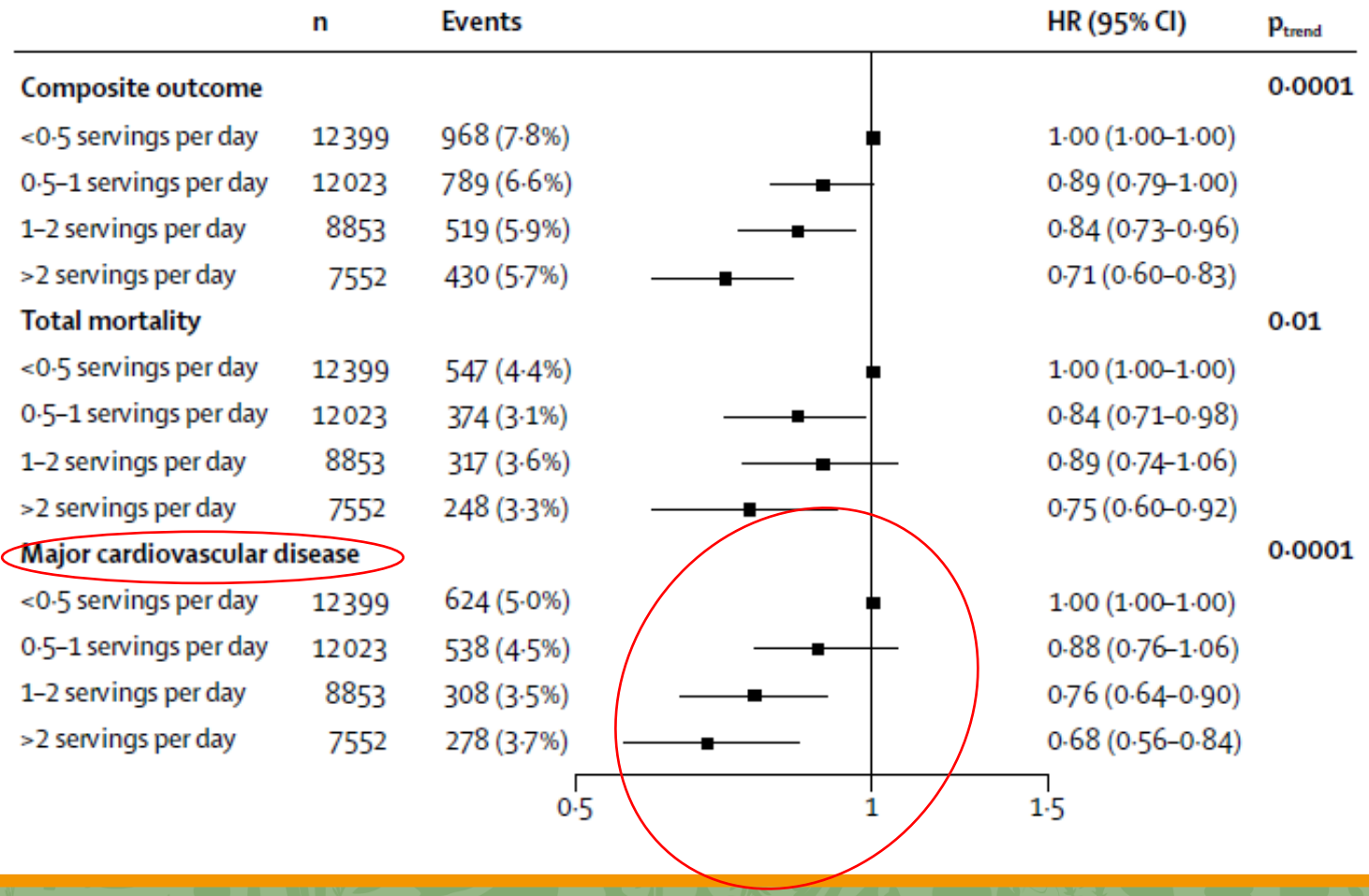
- DASH diet – low fat dairy products (Sacks et al 2001).
- DASH diet – benefits for blood lipids also reported for higher fat dairy (Chiu et al 2016). Cross-over RCT.
- Caerphilly prospective cohort study – lower systolic BP in milk drinkers (Livingstone et al 2013).
- Evidence from meta-analyses of prospective cohort studies: no significant increase in RR for CHD in high vs. low milk. (see Givens 2017)
- Dose response meta-analyses – suggest incremental CVD benefits with milk, yogurt and possibly cheese. Emerging evidence on possible mechanisms from RCTs. (see Givens 2017)
- Matrix effects proposed (Thorning et al 2017) – dairy matrix vs single nutrient – further work needed.
- Prospective PURE study (Dehghan et al. 2018).

Association of dairy intake with cardiovascular disease and mortality in 21 countries from five continents (PURE): a prospective cohort study

(Dehghan et al. 2018)

PURE = Prospective Urban Rural Epidemiology study

- 136,384 individuals (35-70 years) from 21 countries; 10,567 events recorded over an average of 9 years.
- In contrast to current dietary guidelines, greater dairy consumption (milk and yogurt in particular) associated with lower risk of mortality and cardiovascular disease.
- Dose response for CVD, in particular, with whole milk products. 2 servings a day (compared to none) linked to a **16% reduction in CVD risk**. Not stat sig with mixture of whole and low fat. **No benefit with butter, cheese.**
- "Dairy products should not be discouraged and perhaps even be encouraged in low-income and middle-income countries where dairy consumption is low".



Foods vs. nutrients

1. Milk and milk products

Suggestion that presence of other (health promoting) constituents in dairy food matrix may influence effect of saturates on health.

- Not all saturates raise cholesterol; matrix effects proposed

Saturated fats, dairy foods and health: A curious paradox?

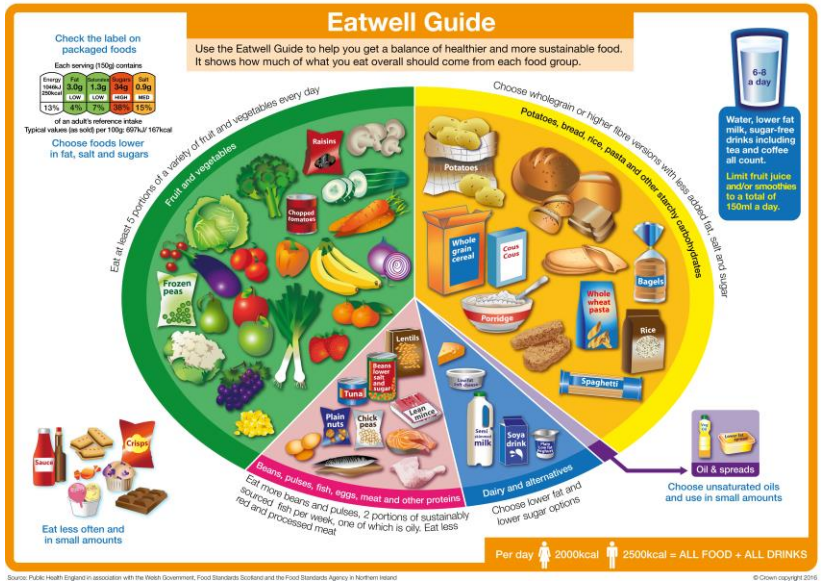
D. I. Givens
Institute of Food, Nutrition and Health, University of Reading, Reading, UK

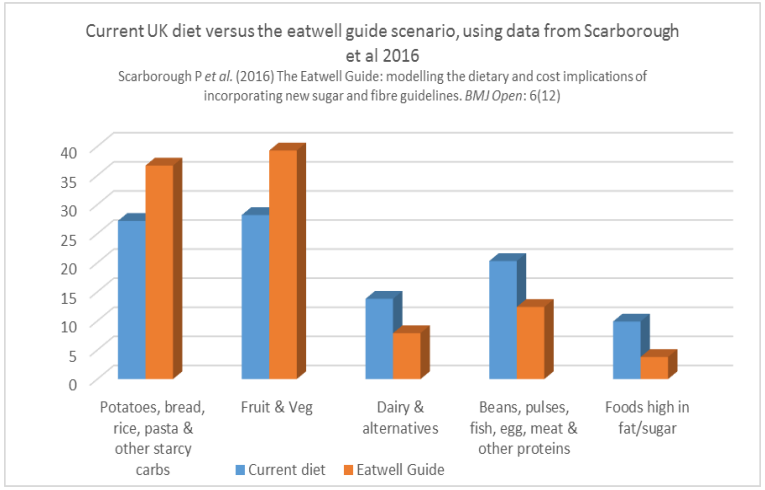
Am J Clin Nutr. 2017 May;105(5):1033-1045. doi: 10.3945/ajcn.116.151548. Epub 2017 Apr 12.

Whole dairy matrix or single nutrients in assessment of health effects: current evidence and knowledge gaps.

2. 'Antioxidant hypothesis' – relationship with the fruit & veg rather than extracted micronutrient components

Moving towards a more plant-based diet

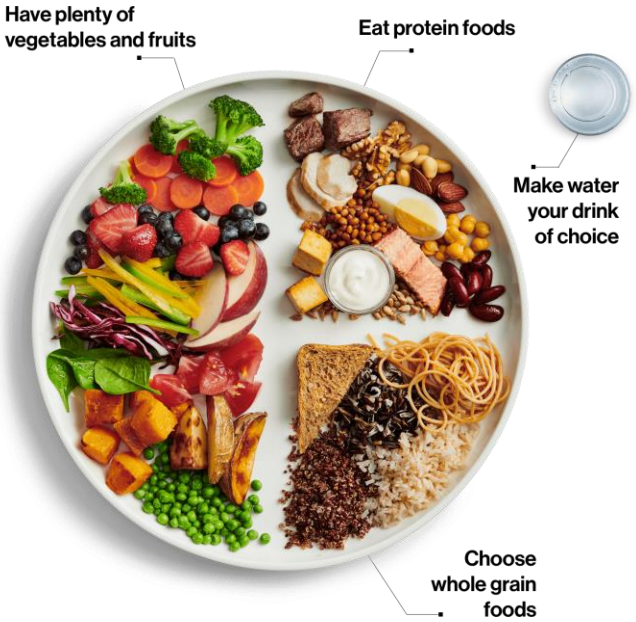




Changing from the 'average' UK diet to the *Eatwell* diet would avert **17.9 million DALYs** (disability adjusted life years) over the lifetime of current population (Cobiac *et al.* 2016)

And reduce GHG emissions by around 20% (Carbon Trust 2015)

Canada's Food Guide



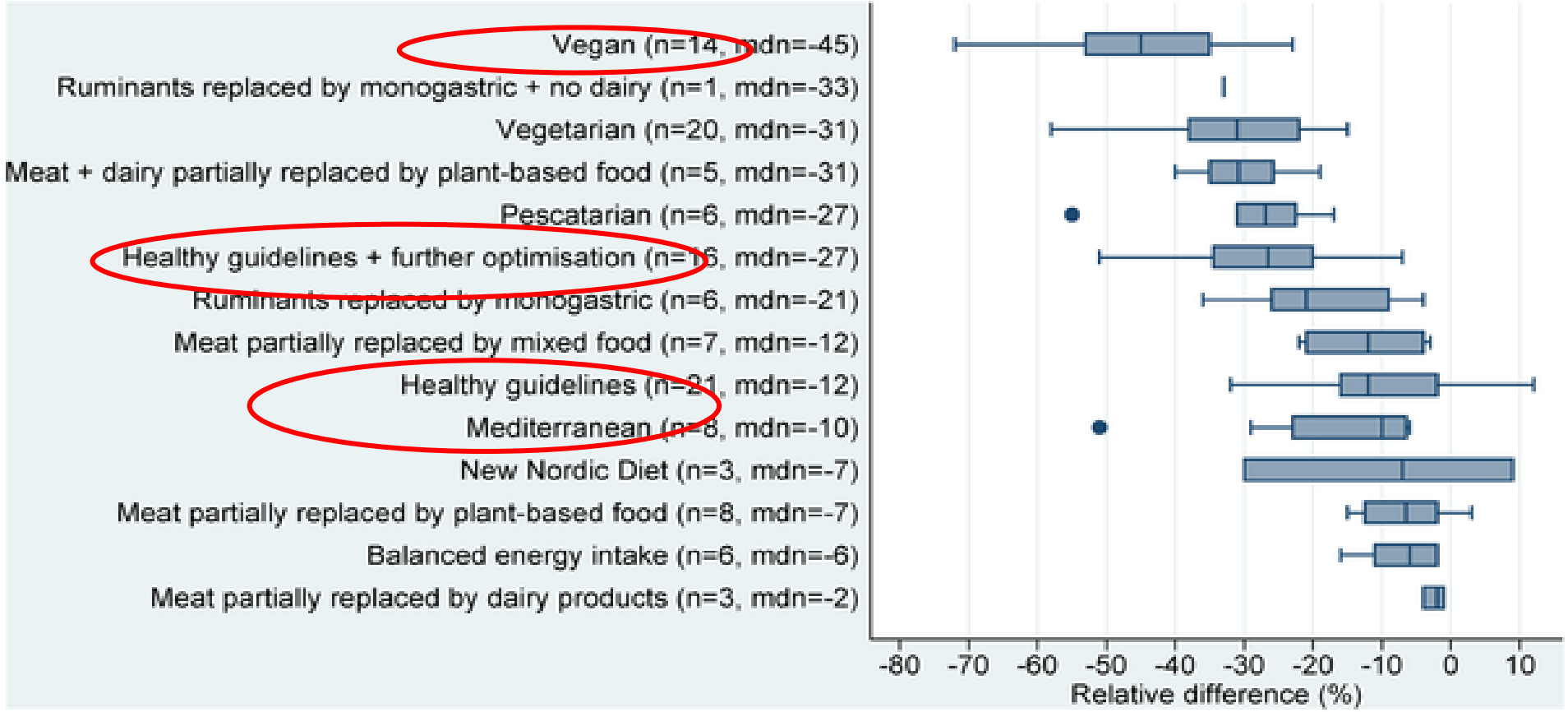
Going forward

Grand challenge: providing a sustainable food supply for the world's growing and more prosperous population in the face of climate change.

Sustainable food supply	Measures and metrics
Nutrient dense	Nutrient profiling
Affordable	Affordability, value chain
Cultural and societal value	Context of patterns of use
Planet friendly (environment)	Land, water, energy, greenhouse gas emissions

Drewnowski (2018)

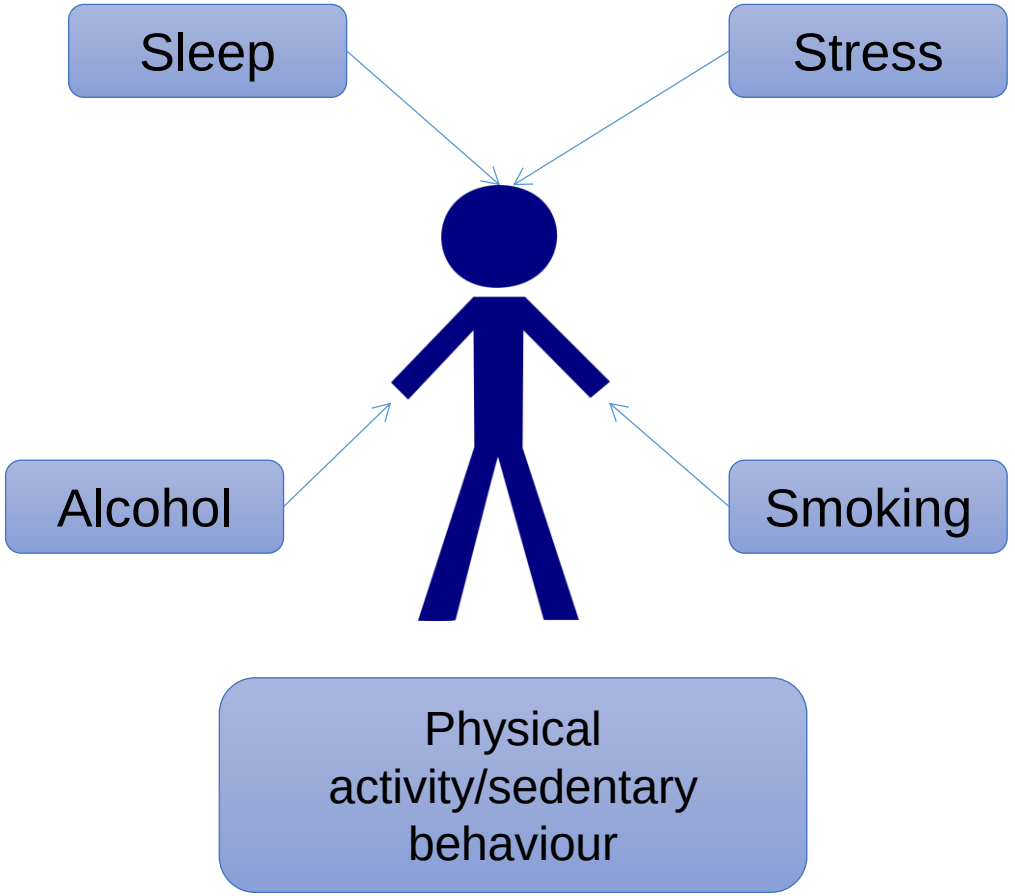
Going forward



Aleksandrowicz L, Green R, Joy EJM, Smith P, Haines A (2016) The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review. PLOS ONE 11(11): e0165797. https://doi.org/10.1371/journal.pone.0165797
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0165797

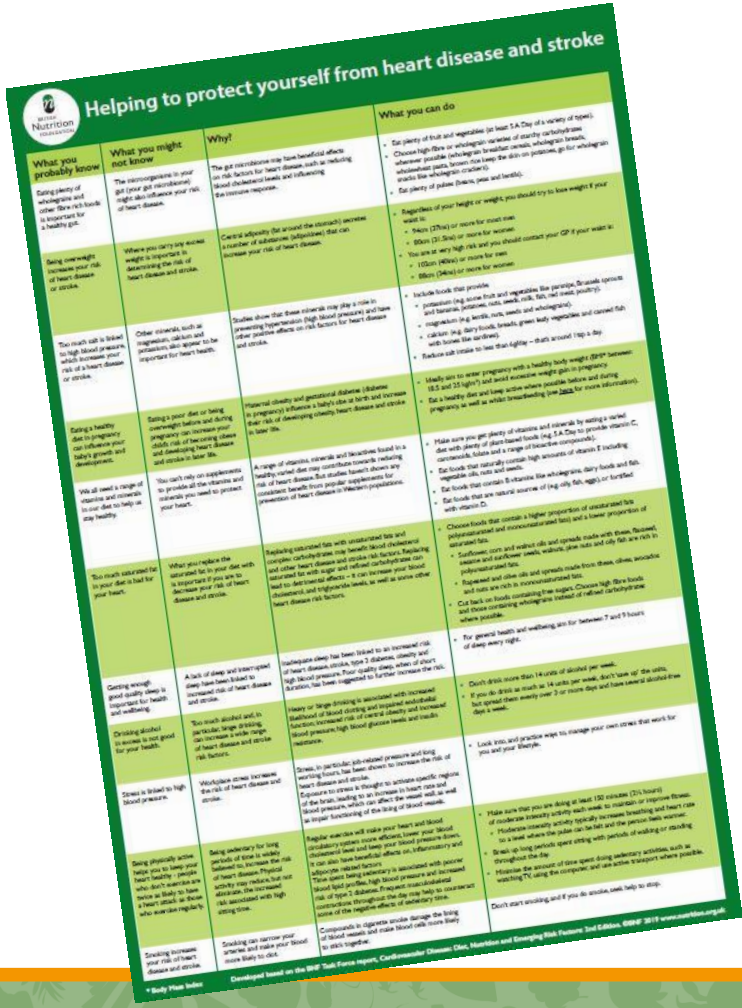
Green *et al.* 2015, modelling using NDNS:
if average diets conform to **WHO dietary recommendations,** GHG emissions would reduce by **17%.**

Other lifestyle factors



Practical tips …

- Diet & weight pre/during pregnancy
- Quality sleep
- Stress management
- Diet
- Body weight
- Alcohol



Take home messages 1

- Our new Task Force report supports existing UK dietary and lifestyle recommendations for CVD prevention. However, understanding of the mechanisms by which such factors may influence CVD risk, via established and more emerging risk factors, has improved considerably since the last edition.

- Despite recent controversy, the consensus scientific view supports a beneficial effect of reducing dietary saturated fat and replacement with unsaturated fat. However, the food matrix should be considered when giving dietary advice.

Take Home messages 2

- The importance of dietary patterns over and above individual macronutrients is increasingly recognised, with a remarkable consistency in associations between healthy dietary patterns and decreased disease risk. This is important in the context of an ageing population and the need to reduce risk of other conditions such as cancer and dementia.

- Healthy dietary patterns are typically characterised by:
  - higher consumption of vegetables, fruit, wholegrains, low-fat dairy products, seafood, nuts, seeds, legumes
  - lower intakes of fatty/processed meat, refined grains, sugar-sweetened foods and beverages, salt, saturated fat.

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