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Healthier and more sustainable diets: what do we know, how can we eat more sustainably and what are the future research and policy needs?

Media summary

What was the context for this review?

- The global food system is a major driver of climate change and other forms of environmental change.
- Agriculture accounts for about a third of global greenhouse gas emissions (GHGE), which contribute to global warming by trapping heat in our atmosphere, as well as over a third of global land use and the majority of freshwater (approximately 70%) used worldwide.
- While it is widely recognised that we need to transform how we both produce and consume foods to promote better human and planetary health, there is substantial debate about the dietary changes that can help us to achieve this.
- We reviewed scientific studies to identify the main principles of a healthier and more sustainable diet, including the key synergies, differences and trade-offs in the research literature that should be considered when making recommendations in what is a rapidly evolving area.

How was the research done?

- We searched the scientific literature and identified 29 studies from high-income countries (e.g. the UK) published within the last 10 years that met our search criteria. These studies looked at the impact of different diets as a whole, instead of focussing on changes to single foods in isolation (e.g. meat or dairy products).
- These studies used a variety of approaches to define what a healthier and more sustainable diet should (and should not) contain.
- While some studies looked at the potential environmental and health benefits of shifting diets to align better with current healthy eating guidelines, others modelled theoretical diets, or tried to find diets that were more sustainable from among those which people were already eating.
- All studies included in the review estimated the environmental impact of different diets using at least one indicator, such as the associated GHGE, or land or water use.
- Although GHGE tends to be the most common way to estimate the environmental sustainability of diets, we went beyond this to analyse studies that looked at other environmental indicators, such as land and water footprints, as well as broader aspects of sustainability, including the cost and cultural acceptability of diets. Some studies considered the effects on several environmental aspects together, and in some cases also the potential health benefits of dietary changes.

What are the main findings from this review?

- We found that shifting towards diets that align more closely with healthy eating guidelines, including less meat and higher amounts of plant-derived foods, is likely to offer environmental benefits (e.g. ~20-50% lower GHGE and land use across the studies we reviewed) and improve population health. This shift includes diversifying the choice of protein providing foods in our diet in favour of more plant-derived sources, including beans and other pulses (e.g. chickpeas, lentils), nuts, seeds, and nutritious plant-based meat alternatives (e.g. those based on soya or mycoprotein) that are not high in fat, salt or sugar.
- One study found that following the healthy eating recommendations in the Eatwell Guide (the UK's healthy eating guidance) more closely would lower GHGE of current UK diets by 30%,

and slightly reduce water use by 4%, as well as improving health of the population (7% lower mortality risk). This supported findings from earlier analysis of the Eatwell Guide, which found that if everyone in the UK ate a diet in line with the Guide this would reduce the environmental impact of diets by a third on average (45% for GHGE, 4% for water use and 49% for land use) and reduce the number of new cases of heart disease, stroke, cancer and type 2 diabetes in the UK (see Carbon Trust 2016 and Cobiac et al. 2016).

- The suggested direction of changes for dairy foods and eggs were inconsistent in some of the studies we reviewed, including an analysis of 52 hypothetical 'optimised' dietary scenarios. Optimisation is a modelling technique used to identify dietary patterns that meet nutritional recommendations, while also lowering environmental impact, and minimising the need for changes to the current diet (see figure below). We found that milk and yogurt (33%) and eggs (29%) increased in about a third of the optimised scenarios we analysed. This might be because of trade-offs between the important nutrients provided by dairy foods (e.g. calcium and iodine) and eggs relative to their environmental impact.
- For example, dairy foods and eggs were only fully removed from optimised diets when the modelling imposed large reductions in GHGE of between 50 and 70%.
- Overall, it appears possible to 'optimise' diets to reduce GHGE by a large amount (e.g. by up 80%) and meet nutritional recommendations, but this leads to diets containing only a small number of foods, or requiring large changes to current consumption patterns. So, while theoretically possible, such diets would not be culturally acceptable or even feasible to adopt. In contrast, diets optimised for more moderate GHGE reductions (30-40%) required smaller and more achievable shifts in current consumption patterns of populations.
- We found that less healthy foods that are high in fat, salt and/or sugar (e.g. cakes, biscuits, pies and pastries), and also alcoholic and non-alcoholic beverages, accounted for a large amount of the environmental impact of current diets in some countries (e.g. in studies in the Netherlands and Australia). However, these foods and drinks are often overlooked in studies attempting to define more sustainable diets, including recent global analyses.

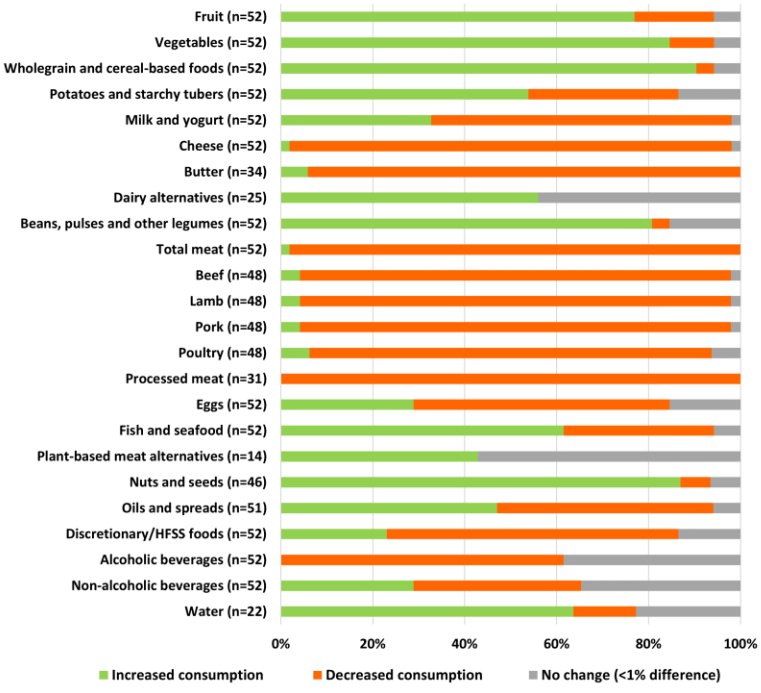

Figure 1. Proportion of 'optimised' dietary scenarios suggesting an increase, decrease or no change in food and drink groups versus current consumption patterns (n=52 scenarios).

- We also reviewed more novel approaches to identifying healthier and more sustainable dietary patterns and found that these supported the above findings from studies focusing on optimisation scenarios and compliance with healthy eating guidelines.
- This included two 'cluster analysis' studies. These studies grouped people from European populations (including the UK) according to their existing diet to identify subgroups whose diets

were considered to be 'more sustainable', without making assumptions about the foods that the diet should (or should not) contain. Individuals in the 'more sustainable' clusters (18-23% of the overall population) ate diets representing the best compromise between potentially conflicting environmental, nutritional and economic goals. On average, they ate less meat and more plant-derived foods, but relatively similar amounts of milk, cheese, and eggs to current diets. This suggests that achieving a more sustainable diet does not necessarily require exclusion of entire food groups.

- Two other studies attempted to 'score' individual diets according to a set of criteria (sustainable diet index), which attempts to balance multiple environmental, nutritional and socio-cultural (e.g. cost, acceptability) considerations. People with higher diet scores had a lower estimated environmental impact and cost, a higher diet quality, and a lower risk of mortality and chronic diseases compared to the overall average for the sample. Diets with higher scores generally contained fewer animal-derived foods (e.g. red and processed meat, seafood) and more plant-derived foods (e.g. fruit and vegetables, legumes and nuts, cereals).

How can we achieve a healthier and more sustainable diet?

- Diets that are truly more sustainable need to consider not only good nutrition and a lower environmental impact, but also the right balance of foods (and drinks) that is affordable and culturally acceptable, so that dietary changes are fair and achievable for everyone in society, including those on low incomes. There is no ideal 'one-size-fits-all' solution to such a complex problem, but there are some actions that we can all take that are likely to benefit both our health and that of our planet.
- We recommend that shifting to a plant-rich diet that aligns more closely with government healthy eating guidelines (the Eatwell Guide in the UK) is a sensible direction of travel that is likely to improve the environmental and health impacts of our current diets, while research in this area continues to evolve.
- This type of diet is based on foods that are familiar to the UK public, and can still include some meat, dairy, fish and eggs, and so is likely be more culturally acceptable than diets that exclude animal-based foods completely.
- While switching to a vegetarian or vegan diet may deliver large reductions in GHGE (e.g. up to 83% in one study) and land use compared to our current diets, this could increase dietary water footprints slightly (by 2-3%).
- Also, diets that cut out animal-based foods altogether are unlikely to be widely adopted, as only a small proportion of the UK public currently follows a vegetarian (about 4%) or vegan diet (1%).
- Excluding animal-based foods (meat, milk, fish and eggs) from the diet could risk compromising intakes and/or bioavailability (how well a nutrient is absorbed and used by the body) for some important vitamins and minerals that we rely on our diet to provide (e.g. iron, zinc, iodine, vitamins A and B12).
- Animal-based foods currently make a notable contribution to average intakes of iron (29%), calcium (47%), iodine (61%), zinc (53%), magnesium (29%), selenium (61%), riboflavin (54%) and vitamin A (37%) among UK adults aged 19-64 years old. If appropriate plant-based sources of these nutrients are not included in the diet, cutting out animal-derived foods could be a cause for concern for groups where there is already evidence of low intakes and status of some micronutrients. For example, almost 1 in 10 UK girls aged 11-18 years are thought to have iron deficiency and anaemia.
- It is important that recommendations around which foods should substitute for animal-sourced products in the diet doesn't simply focus on protein, but also recognises the other important vitamins and minerals provided by these foods to ensure that intakes do not suffer as dietary patterns shift in line with dietary guidelines.

How can we eat a diet that is more in line with the Eatwell Guide?

- The **Eatwell Guide** is the UK's healthy eating guidance, which shows the proportions of the main food groups that make up a healthy diet and provides advice on making healthy food and drink choices.

- Following the Eatwell Guide more closely means shifting the balance of what we eat to include more plant-based foods, such as vegetables, fruit, beans and other pulses, and wholegrain foods, while limiting foods high in fat, salt and/or sugar (e.g. cakes, biscuits, pies and pastries), and rebalancing our choice of protein-providing foods towards plant sources.
- It has been estimated that only 0.1% of the UK population adheres to all 9 of the Eatwell Guide recommendations, and only about 30% adhere to at least five of these. Therefore, increasing adherence to this type of dietary pattern requires substantial shifts in our eating habits.
- Meat is a good source of protein and provides essential vitamins and minerals but we should aim to diversify our choice of protein-rich foods, in line with the Eatwell guidelines, by eating more beans and other pulses, nuts, and other nutritious plant-based sources of protein (e.g. soya-based or mycoprotein-based meat alternatives, or tofu) that are not high in saturated fat or salt.
- With regard to fish, the advice is to eat at least two portions of fish per week, one of which should be an oily fish (such as salmon or mackerel) and choose options from sustainably managed sources (e.g., products with the blue MSC logo).
- Reducing the amount of food that we waste is another key part of making our diets more sustainable, whatever type of diet we choose to eat. Although food waste accounts for as much as one-tenth of global GHGE, many of us in the UK don't make the link between food waste and climate change.

What are the main recommendations in the review for future research and policy in this area?

- We found that studies tended to focus on GHGE as an indicator of environmental sustainability. Future studies should consider multiple environmental impacts beyond GHGE (especially water footprint), as well as the economic and social aspects of sustainability (e.g. cost, cultural acceptability, fairness to producers).
- Future research would benefit from the availability of more consistent and representative data sources (e.g. locally-relevant environmental data) to help ensure comparisons can be made more easily across different studies.
- The environmental impact of foods can vary widely, depending on where (and how) they are produced. For example, a kilogram of beef produced by the 10% of least efficient producers globally requires 50-times more land, and releases 12-times more greenhouse gases, than for a kilogram of beef from the 10% of most efficient producers. So, accounting for this variation between producers can help to balance the potential local versus global impacts of large-scale dietary changes.
- The method for assessing dietary intakes is an important consideration that will have a bearing on results, such as whether dietary surveys, household food purchasing data or food balance sheets are used. Decision makers should be aware of the strengths and limitations of each approach.
- Greater collaboration between researchers from different specialities (e.g. nutrition, health sciences, environmental sciences, economics) could help improve consistency in how research is conducted and bring balance and insight to how studies are designed and how findings are interpreted. For example, the recent UK Research and Innovation 'Transforming food systems' call is supporting interdisciplinary research into interventions that will transform the UK food system.
- Too often, nutritional quality is not considered in judgements about the environmental impact/sustainability of foods and diets. Methods to assess the environmental impact of foods (such as life cycle assessment) should reflect their nutrient content, and the overall nutritional contribution that foods make to the diet. For instance, providing the GHGE of a food relative to its nutritional content (e.g. GHGE per kcal or per mg of a nutrient), rather than just according to its weight (e.g. GHGE per kg), would allow environmental and nutritional trade-offs of foods to be balanced more accurately.
- More consideration should be given in plant breeding programmes to the overall nutritional profile of staple foods, such as rice, wheat and maize, and how this could be improved, including the bioaccessibility and bioavailability of micronutrients (i.e. how well they are

digested, absorbed and utilised by the body) present in plant-derived foods, either naturally or via fortification.

- We need more information on what the potential barriers and motivators are for shifting towards healthier and more sustainable diets, including for different groups in the population (e.g. those living on lower incomes). It is important to consider not only the environment and health, but also what is affordable and culturally acceptable for people of different ages and incomes, to make sure recommendations are achievable and equitable for both consumers and producers in the food system.
- There is a need to think about the potential 'unintended consequences' of changing diets in high-income countries such as the UK, so that any local environmental or health benefits do not come at the expense of greater 'outsourced' environmental impacts in other countries globally.
- One size won't fit all. There is a need to identify healthier and more sustainable dietary patterns that also reflect the diversity of current dietary habits, and which are tailored to the nutritional, economic, and cultural needs of different population sub-groups.

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