UNIVERSITY OF ABERDEEN
The Rowett Institute

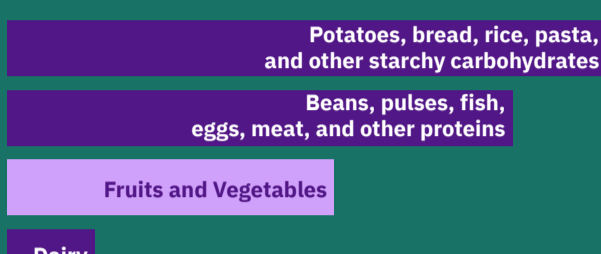# Healthy, sustainable and affordable food choices

Increasingly, food systems are challenged to provide healthy, sustainable, and affordable foods to address the high burden of dietary-related diseases worldwide and address the environmental impact of dietary shifts. This requires a different approach for dietary guidelines to consider nutritional quality, economic affordability, environmental impact, and cultural acceptability. In addition, from a consumer's perspective, identifying individual food products that are healthy, sustainable, and adequately priced could promote better shopping choices.

We performed a food-level analysis to identify food choices with the highest nutritional quality, the lowest greenhouse gas emissions (GHGE) and the lowest price. We used data from the National Diet and Nutrition Survey year 11 (2018/19) and the Nutrient databank with nearly 6,000 commonly consumed foods and drinks and prepared dishes in the UK.

We found that: [1]

The largest proportion of food considered the most nutritious, with a lower GHGE and price, was found in the food category of 'potatoes, bread, rice, pasta, and other starchy carbohydrates', whilst the smallest proportion was found in the category of dairy and alternatives.

Potatoes, bread, rice, pasta, and other starchy carbohydrates
Beans, pulses, fish, eggs, meat, and other proteins
Fruits and Vegetables
Dairy

Only 1/5 of all food and drinks included in the NDNS Nutrient bank are the most nutritious, with a lower GHGE and price.

12%

A large variation in nutritional quality, GHGE and price within each food group suggested significant scope for optimising "food swaps" to improve all three indicators.

Examples of most environmentally sustainable, nutritious, and affordable food products (e.g. those simultaneously scoring above the median for nutritional quality and below the median for GHGE and cost) include:

All bran type cereal, bagels wholemeal, couscous cooked, oat bran flakes, white muffins toasted, baked or roast potato slices

Courgettes sauteed, parsnip roast, cauliflower pakora, avocado pear flesh only, vegetable fingers breadcrumbs
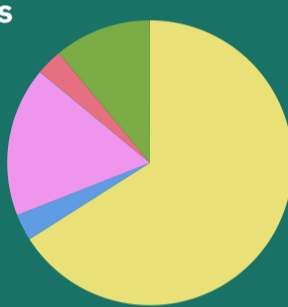
Beans blackeye canned, beansprouts fried, brown lentils or split boiled, sardine's brisling slid canned, hummus canned
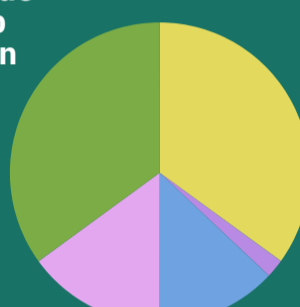
The relative proportions of the most nutritious, environmentally sustainable, and lowest-priced foods in each of the seven food categories were similar to those in the Eatwell Guide. But the category of 'fruit and vegetables' was much smaller in our food-based analysis, and the proportion of 'potatoes, bread, rice, pasta, and other starchy carbohydrates' became more prominent due to its generally lower prices and high nutritional value.

Our food-based analysis food group distribution

Eatwell Guide food group distribution

Potatoes, bread, and other starchy carbohydrates
Dairy and alternatives
Pulses, beans, fish, eggs, meat, and other proteins
Items that consumption should be limited
Fruits and vegetables
Oils and spreads

We investigated whether the current consumption of food items with the highest nutritional quality, lowest GHGE and lowest cost differs between demographic and socioeconomic population groups in the UK.

We found that:

Most of the calories consumed per day come from the food group dairy and alternative, followed by potatoes, bread, rice, pasta and other starchy carbohydrates, and then fruit and vegetables.

Those who are most deprived consumed significantly less of the foods that are most nutritious and have the lowest GHGE and cost.

Global food systems increasingly rely on food processing to provide edible and safe foods, but ultra-processed foods are often of lower nutritional quality and energy-dense. Consumption of diets rich in ultra-processed foods causes excess energy intake and increased consumption of carbohydrates. It has been associated with a range of detrimental health outcomes such as mortality, cardiovascular diseases, hypertension, metabolic syndrome, overweight and obesity. [1]

Modelling studies indicate that halving the intake of processed and ultra-processed foods could lead to 22,000 fewer cardiovascular disease-related deaths by 2030. [2]

In our food-based analysis we found that: [3]

Ultra-processed and processed foods (on a per 100 kcal basis) had a lower nutritional quality, lower GHGE, and were cheaper than minimally processed foods, regardless of their total fat, salt and/or sugar content.

Interestingly, many foods that can be considered most nutritious and with a low GHGE and price are still processed or ultra-processed.

| Level of processing	All NDNS food and drink products	The most nutritious, and with a low GHGE and price
Unprocessed or minimally processed	20%	21%
Processed	32%	32%
Ultra-processed	48%	47%

Many ready meals can be classified as ultra-processed foods. The UK has one of the largest ready meal markets globally, with a market value of over £3.9 billion. [1] It is estimated that 88% of the UK adult population eat ready meals, with 2 out of 5 people eating them every week. [2] Furthermore, ready meals currently contribute almost 16% of the total annual GHGE from the UK food and drink sector. [3] In our NDNS analysis, we found 54 meals (with a ready meal and a home-made equivalent):

All ready meals, but especially animal-based ready meals, had significantly higher levels of free sugars and salt and lower protein levels than equivalent home-cooked meals.
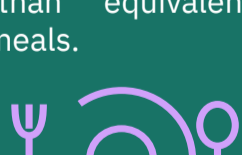
Generally, ready meals cost £0.30 per 100 g more than their equivalent home-cooked meals, and this difference was most pronounced for plant-based meals.

Ready meals had significantly higher GHGE than home-cooked meals, up to the supermarket shelf, especially oven cooking adding further GHGE.
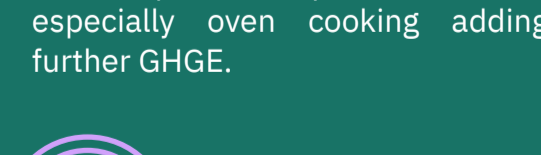
% of GHGE increase for different cooking methods:

Gas Stove
Electric stove
Microwave
Oven

0   5   10   15

Ready meals   Home-made meals
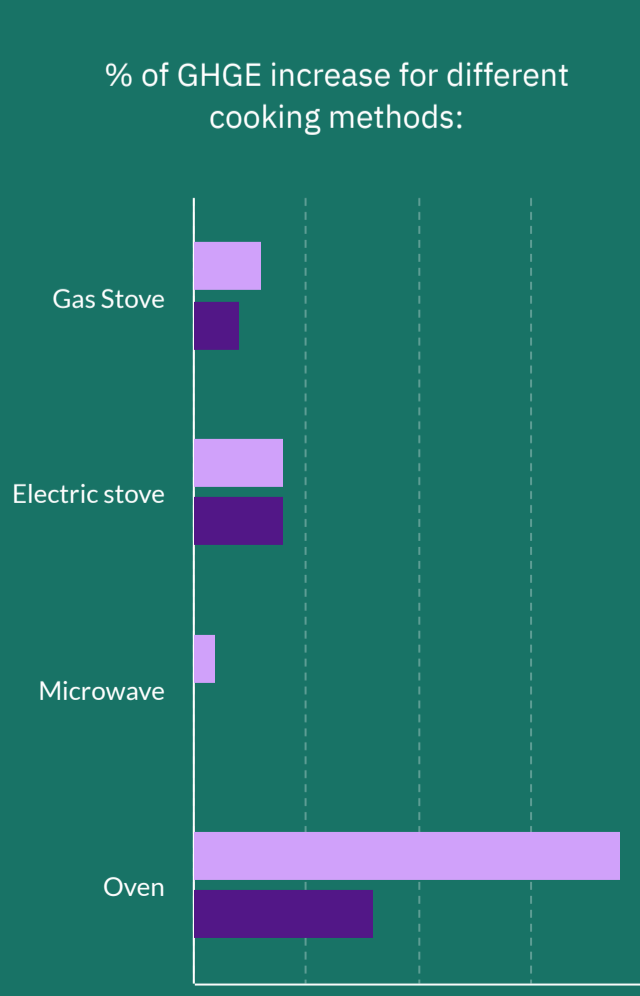
Animal-based oven-cooked ready meals had the highest GHGE and were the most expensive, whereas plant-based home-prepared meals cooked on the gas or electric stove had the lowest GHGE and cost the least.