



Fresh start

A framework
for healthy and
sustainable diets
in the UK

Fresh start: A framework for healthy and sustainable diets in the UK — Situational analysis

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Other reports in this series:

Fresh Start: A framework for healthy and sustainable diets in the UK — Policy options review

Fresh start: A framework for healthy and sustainable diets in the UK — Recommendations for action

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Executive summary	4
Introduction	6
1. Fruit and vegetables	12
2. Potatoes, bread, rice, pasta and other starchy carbohydrates	18
3. Dairy and alternatives	24
4. Beans, pulses, fish, eggs, meat and other proteins	30
4.1 Meat and eggs	31
4.2 Fish	38
4.3 Pulses	42
5. Oils and spreads	46
6. Foods high in fat, salt and sugar	50
7. Alcohol	60
References	64

Executive summary

The government's Eatwell Guide to healthy eating has recently been revised to incorporate sustainability considerations. The new guidance recognises that shifting our eating patterns towards more sustainable foods and drinks benefits both the health and the environment of current and future generations. This is significant because poor diets are a major cause of illness in the UK (e.g. they account for 69% of the disability associated with heart disease and 51% of deaths from stroke). The external costs of the UK's food system are estimated at £120 billion per year, of which £45 billion is due to food consumption-related health costs; £30 billion is due to the degradation of natural capital such as soil, water and air pollution; and £13 billion is due to the loss of biodiversity.

Brexit presents a unique opportunity to re-think our approach to agriculture and food policy in the UK. In this report we assess how the foods and drinks we currently consume compare with the Eatwell Guide and with government alcohol drinking guidelines; we also assess their impacts on our health and the environment. We examine seven food and drink groups: fruit and vegetables; potatoes, bread, rice and other starchy carbohydrates; dairy and alternatives; beans, pulses, fish, eggs, meat and other proteins; oils and spreads; foods high in fat, salt and sugar; and alcohol. For each food group, we explore how prices have changed; whether the foods are produced domestically or imported; the associated health impacts; and the amount of water used and greenhouse gas emissions (GHG) released in production.

Are we eating what is recommended?

There is a broad mis-match between what we are currently eating and what we should be eating according to the government's recommendations and guidelines. For example:

- We do not eat enough fruit and vegetables. Less than one in 10 children meet the '5 a day' target.
- We do not eat enough fibre. Adult intakes are 40% lower than the target level.
- Around 64% of men exceed the maximum levels of red and processed meat per day. A third of the meat children eat is processed and more likely to be high in saturated fat and salt (e.g. sausages).
- Adults manage less than half of the recommended one portion of oily fish each week.
- We eat two to three times the maximum amount of added free sugars, primarily from soft drinks, fruit juice, chocolate, cakes, sugary cereals and biscuits.

In addition, half of all the food and drink consumed in the UK is 'ultra-processed', compared to a European average of 33%. The manufacture of these products uses processes and additives such as sugar, salt, fats and oils to enhance longevity, taste and sensory qualities to add profitability. These products exist across all food categories and are of concern because their unhealthy levels of sugar, salt, and fats contribute to our excess intakes of these nutrients.

How much does our food cost?

Unhealthy foods such as crisps and soft drinks cost less compared to healthier foods such as fish and mushrooms. This gap has widened over time to a three-fold difference in price. Fish has seen above-inflation prices; it is currently twice as expensive as beef and nearly five times more expensive than chicken. Households spend more on fruit and vegetables than on any other food type, despite eating less than is healthy. By contrast, alcohol has become cheaper. It is now 188% more affordable in supermarkets and off-licences than 20 years ago.

Where does our food come from?

Our self-sufficiency has been in decline since the 1980s and we now produce 60% of the food we eat in the UK. Most fruit and just under half of all vegetables are imported, particularly from Spain. Half of the UK's arable land is dedicated to cereal crops such as wheat and barley. Wheat is mainly used for flour and animal feed and barley for alcohol. We grow the bulk of the potatoes that we eat.

We are largely self-sufficient in fresh milk but over half of our cheese is imported from the EU. Most of the meat we consume is produced in the UK. While the amount of beef we produce has declined over recent years, the amount of poultry produced and eaten has increased. Most of the fish we eat is imported (e.g. cod, tuna and prawns). Most fish caught in UK waters (e.g. mackerel and herring) is exported to EU countries and the US.

We produce very small amounts of pulses, 75% of which are used for animal feed. Most pulses for human consumption are exported to Arabic countries, reflecting our low consumption. The beans in our baked beans are imported. We have increased our olive oil imports from the EU by six-fold since the 1990s.

We expect an increase in domestic production of sugar beet and lower prices in the next few years following the end of the EU sugar production quotas in 2017. Our largest food and drink manufacturing sectors include alcohol, non-alcoholic beverages and bakery products.

How does what we eat affect our health and the environment?

Areas where there is alignment between healthy eating and environmental objectives

Increasing our fruit and vegetable intakes would help to reduce the burden of non-communicable diseases such as cancers, stroke and heart disease. They are associated with lower GHG emissions than other foods although the water footprint depends on where they are grown.

Eating more fibre-rich starchy carbohydrates such as high fibre cereals and brown bread would help reduce the levels of cancer and cardiovascular diseases. These also have lower GHG emissions and are less water intensive than animal foods. However, our growing rice consumption is problematic because of its large water footprint compared to other starchy carbohydrates.

Eating less and better meat would be good for our health and the environment. Our high red and processed meat intake contributes significantly to our excess intakes of saturated fat and salt. It also increases the risk of colon cancer which is the third most common cancer in the UK. Meat products have the highest GHG emissions levels of all foods and are also associated with a large water footprint.

If we ate more pulses in place of meat, this would help to raise our fibre intakes, lower our saturated fat intakes and reduce the risk of diet-related diseases. It would also benefit the environment as pulses are responsible for lower GHG emissions and a smaller water footprint than meat. Pulses also add nitrogen to soil reducing the need for fertilisers.

Areas where there is less alignment between healthy eating and environmental objectives

Unhealthy products such as biscuits and soft drinks have low GHG emissions. Sugar has a relatively small environmental water footprint – half that of palm oil.

There are not sufficient fish stocks to allow everyone to meet the amounts recommended for health; the same applies globally. Farmed fish now accounts for 50% of all fish eaten globally, but unsustainable production methods harm wild fish and the environment through, for example, pollution and parasites.

The low risk drinking guidelines state that the risk of developing cancer starts at any level of regular drinking. Our average alcohol consumption has increased by almost 50% in the last three decades, with a parallel three-fold rise in alcohol-related deaths (e.g. from cancer and injuries). Alcohol GHGs account for 1.5% of total UK emissions. Wine has a large water footprint: each 125ml glass uses around 109 litres.

What can be done?

This report identifies a number of key food groups where co-benefits for health and the environment could be achieved if we were to meet the healthy eating guidelines. In a companion publication, *Fresh Start: a framework for healthy and sustainable diets in the UK – Policy recommendations*, we explore opportunities for policy action to support changes in the ways we produce, sell and consume our food and drink.

Introduction

The government's Eatwell Guide to healthy eating was revised in 2016 to incorporate sustainability elements by recognising that shifts towards sustainable diets can provide several co-benefits for the health and the environment of current and future generations.¹⁻³ Other guidelines for sustainable diets include WWF's Livewell Plates⁴ and the Department for Environment, Food and Rural Affairs' Green Food principles.⁵

Unfortunately, at present the vast majority of the population is failing to meet healthy eating recommendations, and poor diets are a major cause of illness in the UK. For example, they account for 69% of the disability associated with heart disease and 51% of deaths due to stroke.⁶ Our current diets are also having a negative impact on the environment. The external costs of the UK's food systems are estimated at £120 billion per year, of which £45 billion is due to food consumption-related health costs from conditions such as heart disease, cancer, obesity and dementia. Degradation of natural capital such as soil, water and air pollution is estimated to cost society £30 billion a year; and loss of biodiversity is estimated to cost £13 billion a year.⁷

Brexit presents a unique opportunity to re-think our approach to agriculture and food policy in the UK. In this report we assess how the food and drinks we currently consume compare with the Eatwell Guide and with government alcohol drinking guidelines; we also assess their impacts on our health and the environment.

Our report is part of a project that has brought together the health, environment and sustainable development communities to assess the situation and agree a common set of food policy measures that will contribute towards healthy and sustainable diets. The implications of these findings, along with recommendations for action, can be found in the accompanying document *Fresh start: A framework for healthy and sustainable diets in the UK – Policy recommendations*.

Definition of a sustainable diet

Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimising natural and human resources.¹⁵³

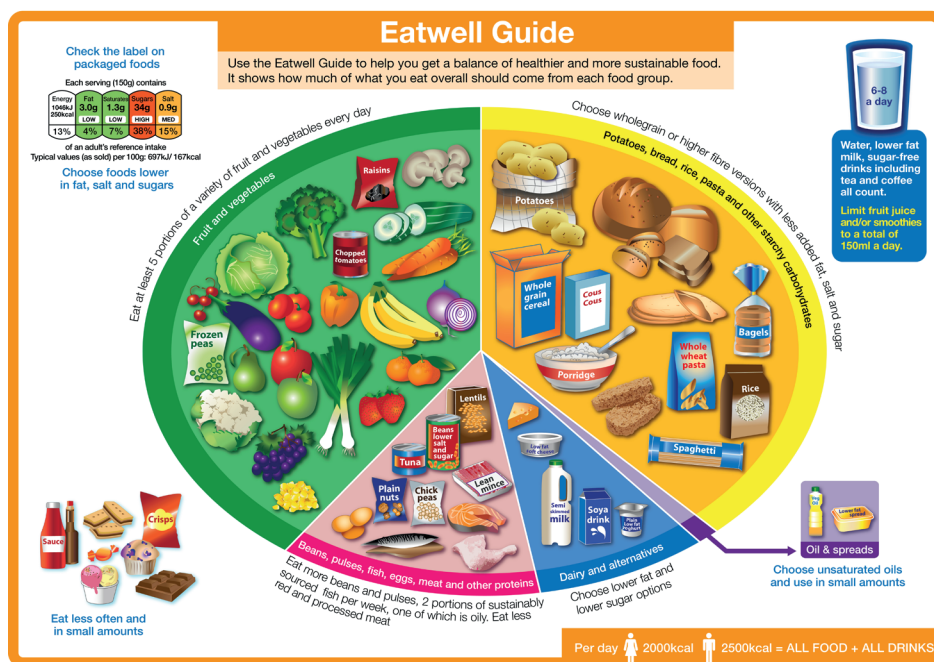
Structure of the report

This situational analysis examines the following seven food and drink groups,^a six of which are set out in the government's Eatwell Guide:

- Fruit and vegetables
- Potatoes, bread, rice and other starchy carbohydrates
- Dairy and alternatives
- Beans, pulses, fish, eggs, meat and other proteins
- Oils and spreads (palm oil was excluded as it has been examined in more detail elsewhere)⁸⁻¹⁰
- Foods high in saturated fat, salt and sugar
- Alcohol is not part of the Eatwell Guide but is included in this analysis in response to the publication of the revised 2016 Chief Medical Officers' (CMO) Low Risk Drinking Guidelines.¹¹

The analyses for each of the food groups are outlined in separate chapters. Where possible, data are consistently presented using the same dataset sources in order to ensure comparability. Additional sources are included where they are relevant. Each chapter begins with a summary, followed by assessments of the following five questions:

^a Hydration is not covered by the situational analysis.



Eatwell Guide

Main food groups:

Fruit and vegetables

Potatoes, bread, rice, pasta and other starchy carbohydrates

Dairy and alternatives

Beans, pulses, fish, eggs, meat and other proteins

Oils and spreads

Additional food and drink groups:

Foods high in fat, salt and sugar

Hydration

1. Are we eating what is recommended?

The report examines consumption patterns to assess: How much of these foods and drinks do people in the UK eat? Is it too much or too little in comparison with current dietary recommendations? Are people eating more now than previously, and are they likely to be eating more, or less, in the future?

Dietary recommendations for food are taken from the Eatwell Guide¹ and the scientific Dietary Reference Values for the population which underpin the guide.^{12–14} UK food consumption data are taken from the National Dietary Nutrition Survey. This represents actual consumption derived from dietary surveys.^{15,16} Alcohol consumption recommendations are taken from the CMOs' guidelines.¹¹ Consumption data are obtained from a variety of sources.

2. How much does our food cost?

Food and drink patterns are examined to assess: How have prices changed over time? Trends in average prices and the retail price index were mainly obtained for different food products from the Office for National Statistics, the Department for Environment, Food and Rural Affairs and the UK's largest supermarket, Tesco.

3. Where does our food come from?

Food and drink production and trade patterns are examined to assess: Where are these foods produced? Are they grown, manufactured and eaten in the UK or are they imported? UK food production data are primarily taken from the UK Department for Environment, Food and Rural Affairs (DEFRA) statistical databases.^{17,18} Projections in food production are taken from the international Organisation for Economic Co-operation and Development (OECD) databases.¹⁹

4. How does what we eat affect our health?

The report examines the impacts on health to assess: How is our health affected by over- or under-consumption of these foods and drinks? Owing to the diversity of health impacts associated with the consumption of different foods, various sources were used to examine the evidence on the impacts on health.

5. How does what we eat affect the environment?

The report looks at environmental impacts to assess: How does the production and consumption of these foods and drinks affect the environment? The environmental impact of growing, manufacturing, packaging, storing, transporting and preparing food has many different dimensions and is not simple to measure. Three main measures have been developed to assess different aspects of the environmental footprint: the carbon footprint, land use and the water footprint. This analysis focuses on carbon footprint and water footprint data which are more readily available.

Carbon footprint

The **carbon footprint** is a measure of greenhouse gas (GHG) emissions^b such as carbon dioxide, methane and nitrous oxide. It is usually expressed in equivalent tonnes of carbon dioxide (CO₂e). The carbon footprint is a major contributor to global warming. GHGs arise from all stages along the value chain, from land clearing and preparation to retail and packaging, consumption and waste. The agriculture sector accounts for around a quarter of global GHGs;²⁰ two-thirds of these emissions are due to the production of animal-based foods, especially the cultivation of high protein oil crops such as soya beans for animal feed.²⁰

GHG emissions are 'imported' and 'exported'. While around half of the food that we eat in the UK is imported, 62% of the GHG emissions associated with our food supply are located abroad.²⁰ On the other hand, the UK exports some of the food that it produces and manufactures, so giving rise to GHG emissions for foods that are consumed abroad. Thus, when it comes to monitoring progress towards GHG emissions targets, the amount of GHG emissions released through food production in the UK will be different to the amount that is associated with consumption of foods in the UK.

For our analyses, greenhouse gas (GHG) emissions are taken from a UK research study.³ Estimates of GHG emissions associated with consumption of 42 food groups were calculated using Life Cycle Analysis (LCA) compiled from the relevant literature in the UK and Europe.³

The environmental footprints of typical foods produced and consumed in the UK and globally are outlined in Figure 1 (GHGs of typical foods) and Figure 2 (GHGs of foods weighted by consumption).

^b A GHG is any gas in the atmosphere which absorbs and re-emits heat, thereby keeping the Earth's surface warmer than it would be otherwise, so contributing to global warming. The main GHGs are water vapour, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and ozone.

Water footprint

Freshwater is a limited global resource. Just 0.5% of the Earth's water is available as fresh water for human use (97% of the Earth's water is seawater, while 2.5% is frozen fresh water).²¹ The water footprint is the amount of fresh water used or degraded in the making of a product (in this case food). It is divided into three components: 'green water' from rainwater; 'blue water' sourced from surface or groundwater resources and used to irrigate crops; and 'grey water', which is fresh water required to assimilate pollutants (e.g. the nitrogen from artificial fertilisers, or domestic and commercial wastewater) to meet water quality standards.^{22,23,24} Blue and grey water are the most environmentally costly forms of water use.

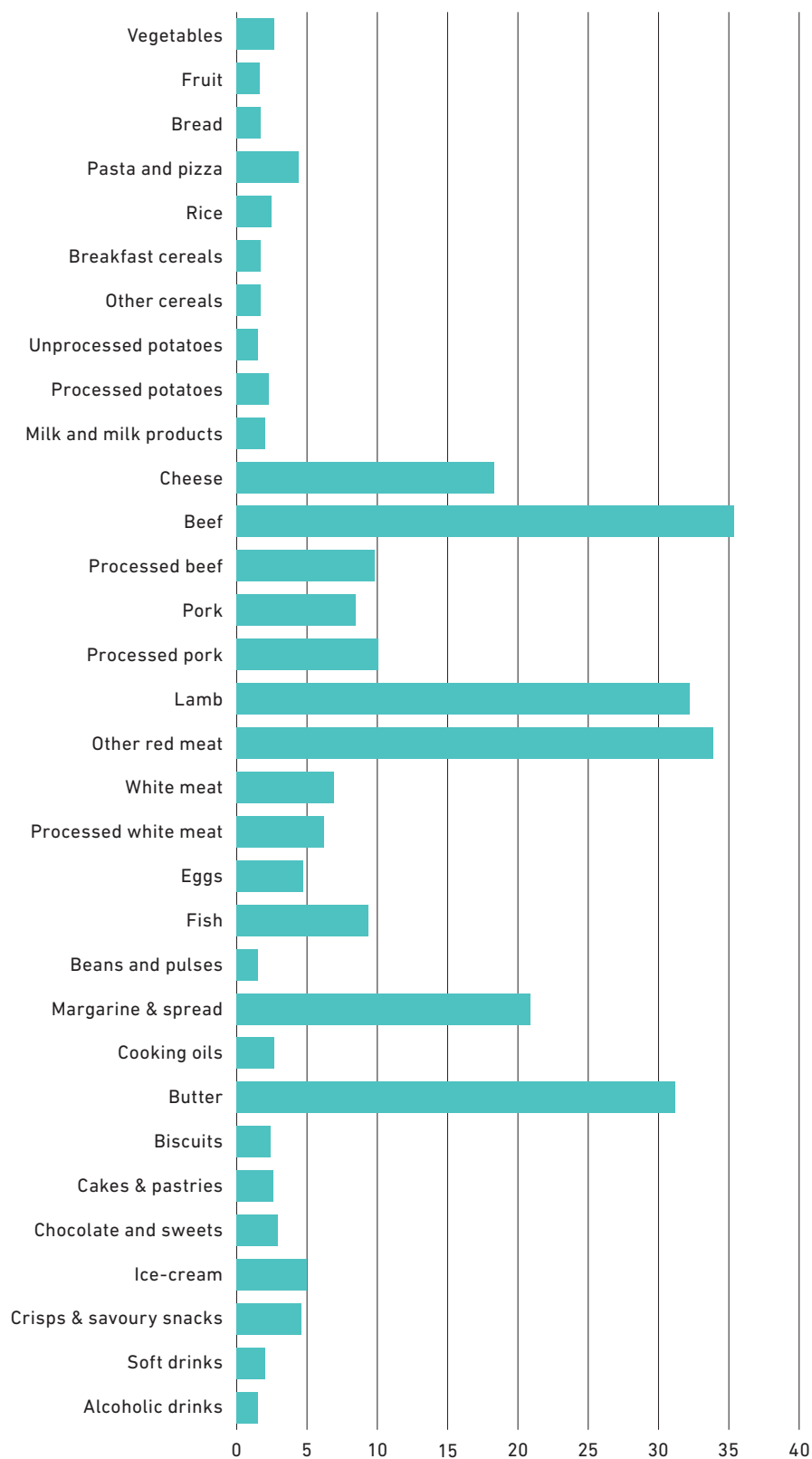
For our analyses water footprint data are taken from the statistical databases of the Water Footprint Network.^{23,25} These data refer to the production of food rather than the consumption. The water footprint is measured in litre/kilogram (or equivalent m³/tonne); the water footprints of common crops produced in the UK are illustrated in Figure 3.

Other impacts on sustainability

Land is a limited global resource which is used for a variety of often-competing purposes such as human homes and settlements, agriculture, industry and infrastructure, and protecting natural ecosystems.²⁶ The **land use footprint** assesses the area of land required to produce a standard amount of product. Agriculture accounts for around 40% of the total land area globally, with three-quarters of this land dominated by animal-based foods. The global cropland footprint associated with the UK's food supply is rising: it increased by 23% between 1986 and 2009.²⁰ In 2008, two-thirds of this cropland footprint was located abroad.²⁰ Land use change (such as when forests are cleared for agricultural use) is a major driver of GHG emissions. For example, global land use change emissions account for 40% of the GHG emissions embedded in UK-consumed food.²⁰

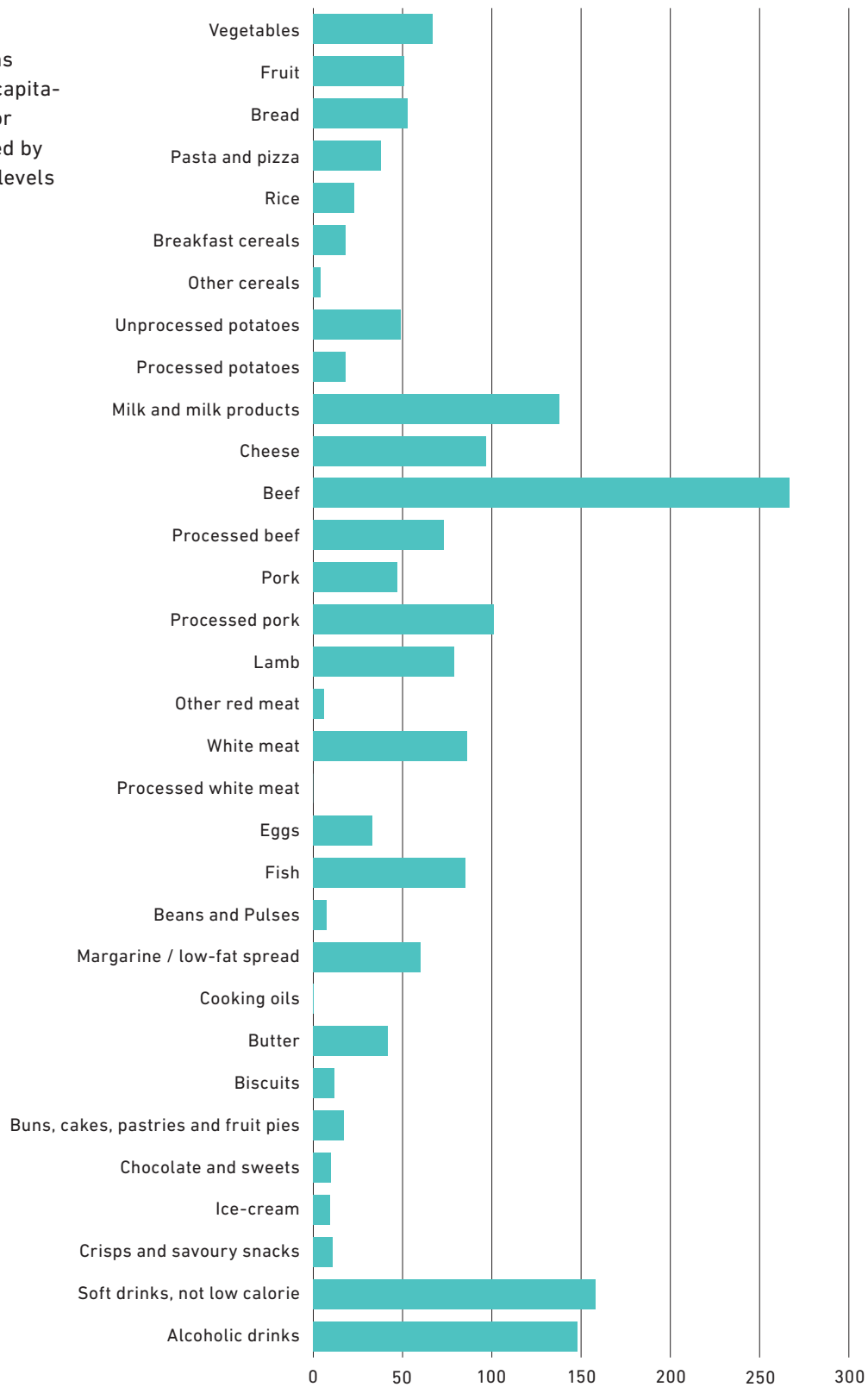
In addition to the above, the food system has impacts on other aspects such as animal welfare, biodiversity, the flow of nitrogen and phosphorus, and food waste. However, these aspects were not considered as part of this report.

Figure 1
GHG emissions
(kg CO₂e per kg)
of typical foods
consumed in the UK



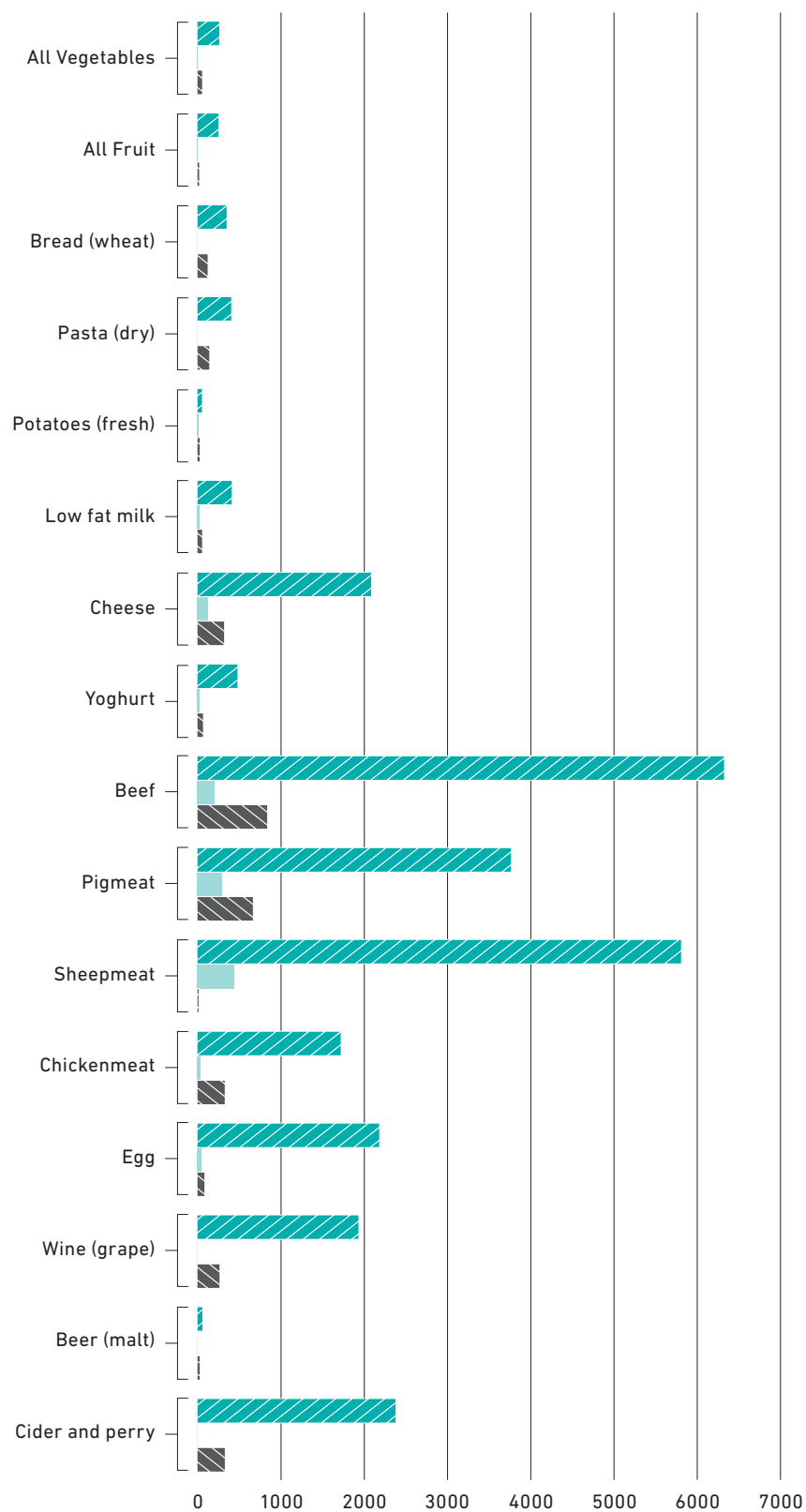
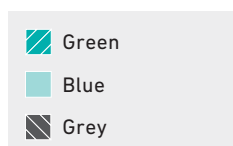
Source: Green,
Milner and
Dangour et al
(2015)³

Figure 2
GHG emissions
(kg CO₂e per-capita-
year) for major
foods weighted by
consumption levels
in the UK



Source: Green,
Milner and
Dangour et al
(2015)³

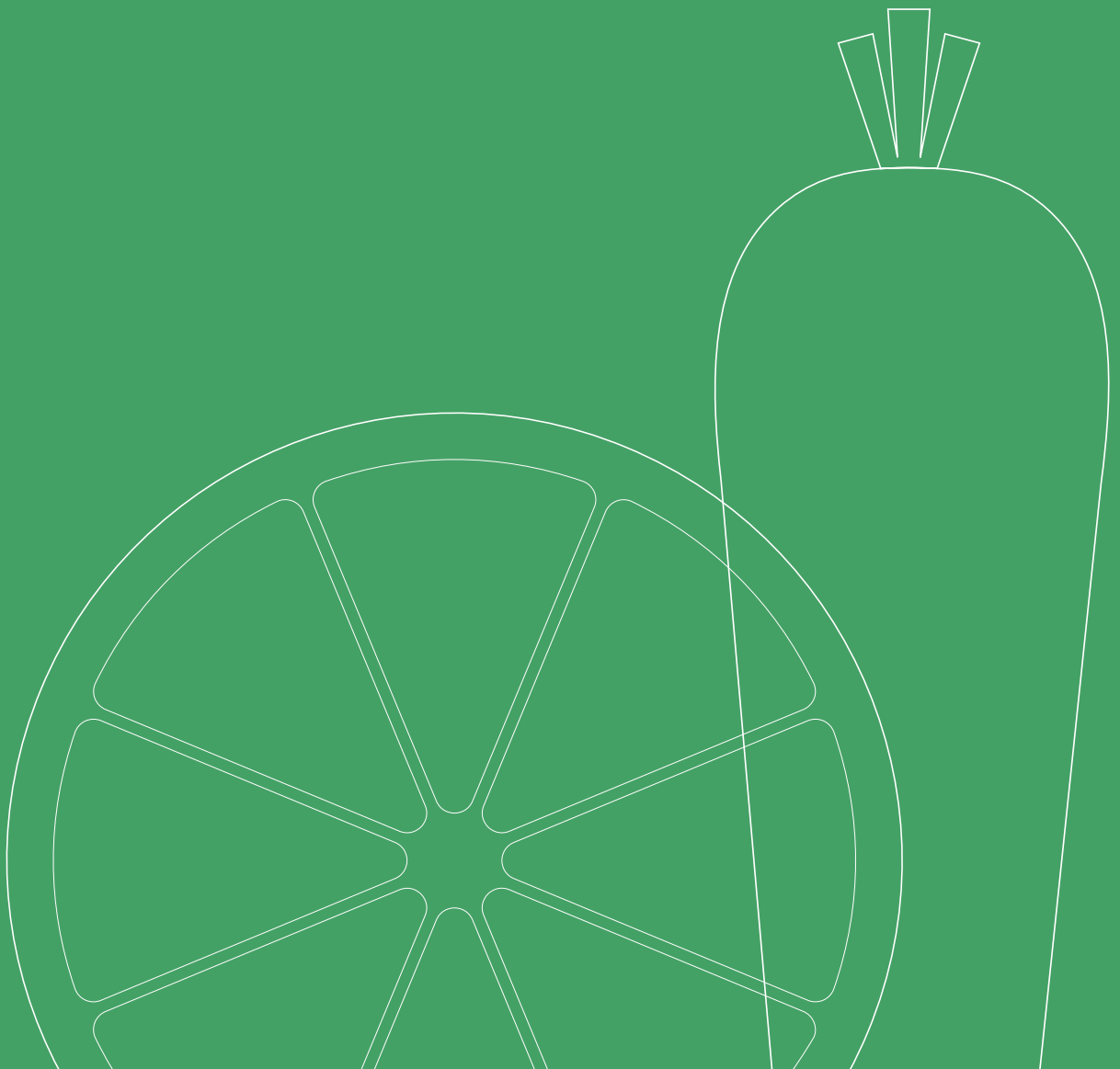
Figure 3
Water footprint
(litre/kg) of crops
produced in the UK,
1996 – 2005



Source:
Mekonnen
and Hoekstra
(2010)^{25,27}

1

Fruit and vegetables



Summary

Are we eating what is recommended?

- The Eatwell Guide recommends that adults and children eat at least five 80 gram portions of a variety of fruits and vegetables each day. They are important sources of fibre and numerous vitamins and minerals.
- Fruit and vegetable consumption in the UK is very low. Adults eat an average of four portions per day, while less than one in 10 children reach the '5 a day' target.
- People from lower income groups consume significantly less fruit and vegetables than those from higher income groups.
- Fruit and vegetable consumption in the UK has increased over the last 20 years, mainly due to an increase in fruit consumption.
- Fruit juice consumption has increased, particularly in the age group four to 10 years where it has almost doubled in 15 years. Children in this age group now drink more fruit juice than they eat either whole fruit or vegetables.

How much does our food cost?

- Households in the UK spend more on fruit and vegetables than any other food type, despite the fact that consumption levels are lower than is healthy. Seasonal variations in the price of fruit and vegetables are smaller now than 20 years ago due to increased imports and refrigeration technology.

Where does our food come from?

- The quantity of fruit and vegetables grown in the UK has declined over the last 15 years. Most fruits and nearly half of all vegetables are now largely imported from Spain and the Netherlands. Domestic production of vegetables now accounts for 58% of total supply in the UK compared to 81% in 1990. The equivalent figures for fruit production are 11% in 2014 compared to 19% in 1990.

How does what we eat affect our health?

- Fruit and vegetables are an important source of dietary fibre, vitamins and minerals. They provide protection against coronary heart disease, stroke, some cancers and all-cause mortality.

How does what we eat affect the environment?

- Fruit and vegetables consumed in the UK on the whole are associated with much lower GHG emissions than other goods, especially red meat (Figure 1).
- In general, robust and field-grown produce such as brassicas, root vegetables, tubers and firm fruits such as apples, generate relatively low emissions per unit of product compared to produce that is fragile or grown in protected conditions (e.g. salads, tomatoes and berries).
- Fruit and vegetables grown in the UK generally have small water footprints because of the high levels of rainfall. However, as the majority of fruit consumed in the UK is imported, the water footprints of these foods lie elsewhere.
- Processed, concentrated fruit and vegetable products are associated with a larger water footprint. For example, tomato ketchup has a water footprint two and a half times bigger than fresh tomatoes. Fruit juices have almost double the water footprint of the equivalent whole fruit.

Are we eating what is recommended?

The Eatwell Guide recommends eating at least five portions of a variety of fruit and vegetables each day. A portion is equivalent to 80 grams or one apple, banana, pear, orange or other similar sized fruit; three heaped tablespoons of vegetables; a dessert bowl of salad; 30 grams of dried fruit (counts as a maximum of one portion) or a small 150 millilitre glass of fruit juice or smoothie (counts as a maximum of one portion a day).

Fruit and vegetable consumption in the UK is low. Adults eat an average of four portions per day and only 31% eat the recommended five portions of fruit and vegetables a day. The picture is of particular concern in secondary school children (aged 11 to 18 years) who consume an average of 2.7 portions a day with less than one in 10 reaching the '5 a day' target.²⁸

Scarborough et al³⁰ modelled a typical UK diet to assess the changes that would be required to meet the UK's new sugar and fibre recommendations.²⁹ They found that in order to meet all the Eatwell Guide recommendations in full, the consumption of fruit and vegetables by adults would need to increase by 54%, from the current average of four portions per day to 6.9 portions per day.

There is a clear age trend in consumption patterns. Vegetable consumption increases with age, while fruit juice consumption decreases. Primary school age children drink more fruit juice than they eat either fruit or vegetables. Fruit and vegetable consumption also changes with income. Mean total fruit and vegetable consumption was significantly less in lower income groups compared with higher income groups, with the exception of adults aged 65+ years.¹⁵

Over the last decade, fruit juice consumption has increased, particularly in the age group four to 10 years where it has almost doubled. This is of concern as the government recommends limiting fruit juice consumption to a maximum of 150 millilitre/day due to the high free sugars content.²⁹

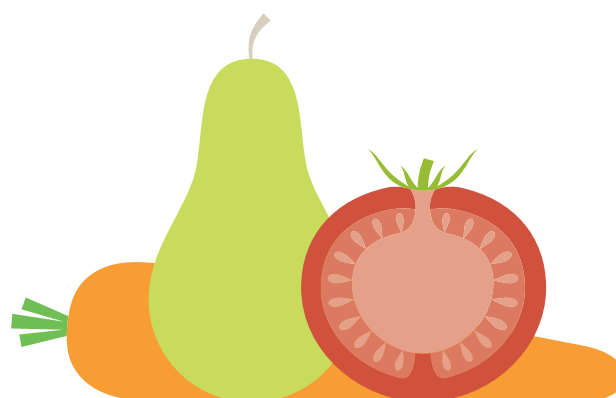
How much does our food cost?

According to analyses of Kantar data, households in the UK spend more on fruit and vegetables than on any other food product in the shopping basket. In 2013, vegetables (including potatoes) topped the average household's food and drink expenditure list at £17.17 per month followed by £14.43 on fruit.³¹ Wine, milk and spirits were among the other products in the top five. However, despite these levels of expenditure, consumption levels of vegetables and fruit are lower than recommended.

While there were large seasonal variations in the price of fruit and vegetables in the past, increasing imports and advances in refrigeration technology mean that there is now less seasonal price change. For example, a kilogram of tomatoes cost £2.00 in April 1990, but had dropped to £1.00 by July 1990. In April 2016, the price of a kilogram of tomatoes was £2.00 but was still £2.00 in July 2016.³² This also illustrates how little the price of tomatoes has increased over 25 years.

90%

of secondary school children
do not reach the recommended
'5 a day' target of fruit and
vegetable consumption



Where does our food come from?

The horticulture sector receives the smallest amount of agricultural subsidies in the UK.¹⁷ Vegetable production in the UK is much greater than fruit production. Over the last 20 years or so, there has been a decline in domestic vegetable production from a high of 3,272,000 tonnes in 1992 to 2,658,000 tonnes in 2013. Domestic fruit production has remained relatively stable at around 400,000 tonnes per year.³³ As Figure 5 illustrates, the predominant form of horticultural production is vegetables grown outdoors.¹⁸

Most fruit and just under half of all vegetable supply in the UK is currently imported (Figure 6). Domestic production of vegetables now accounts for 58% of total supply in the UK compared to 81% in 1990. The equivalent figures for fruit production are 11% in 2014 compared to 19% in 1990.³³

Twenty-four countries accounted for 90% of fruit and vegetable supply in the UK in 2014 (including the UK which supplied 23%).¹⁷ Most imported fruit and vegetables come from Spain. In 2014, Spain accounted for 30% of fresh vegetable imports, mainly tomatoes and lettuces. The Netherlands accounted for 28%, mainly tomatoes and sweet peppers, while the Irish Republic accounted for a further 7%, mainly mushrooms and tomatoes. Spain accounted for 19% of fruit imports to the UK in 2014, mainly citrus fruit, peaches and nectarines. South Africa accounted for 12%, mainly grapes and apples, while the Netherlands accounted for 7%, mainly pears and strawberries.

Global fruit and vegetable production is on the increase with output growing at an annual rate of 3%.³⁴ World production growth has largely been driven by area expansion in Asia, especially China, which has emerged as the world's largest fruit and vegetable producer, with global output shares of about 20% for fruit, and more than 50% for vegetables.

How does what we eat affect our health?

The recommendation of the Eatwell Guide is to eat at least five portions of a variety of fruit and vegetables each day. Currently, only 30% of adults, 9% of children aged 11-18 years and 41% of the elderly reach this recommendation (see figure 4).²⁸ Furthermore, primary school age children now drink more fruit juice than they eat either fruit or vegetables, which means that they are consuming sugar in the form of fructose but without the beneficial fibre of the fruit.

There is evidence that fruit and vegetables are protective against the risk of coronary heart disease,³² stroke,^{36,37} cardiovascular mortality and all-cause mortality.^{38,39} There is some evidence that consuming fruit and vegetables might decrease the likelihood of many cancers, as well as weight gain and obesity.⁴¹ Modelling studies show that around 33,000 deaths per year would be avoided if UK dietary recommendations were met. Over 15,000 of these would be due to increased consumption of fruit and vegetables.^{42,43}

A number of components and functional aspects of fruit and vegetables are thought to be responsible for their beneficial effects on health. These include the soluble fibre, potassium, folate and antioxidant content, as well as their low glycaemic load and potential role in weight management.

Fruit and vegetables are major sources of dietary fibre. A high fibre diet has been associated with a lower incidence of cardiovascular diseases, coronary events, stroke and type 2 diabetes mellitus, colon and rectal cancers, overweight and obesity.^{29,41}

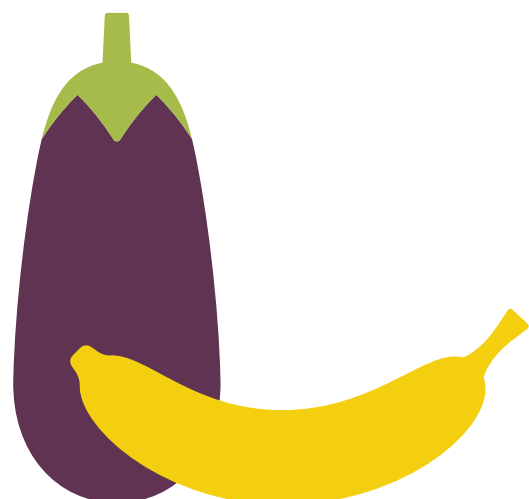
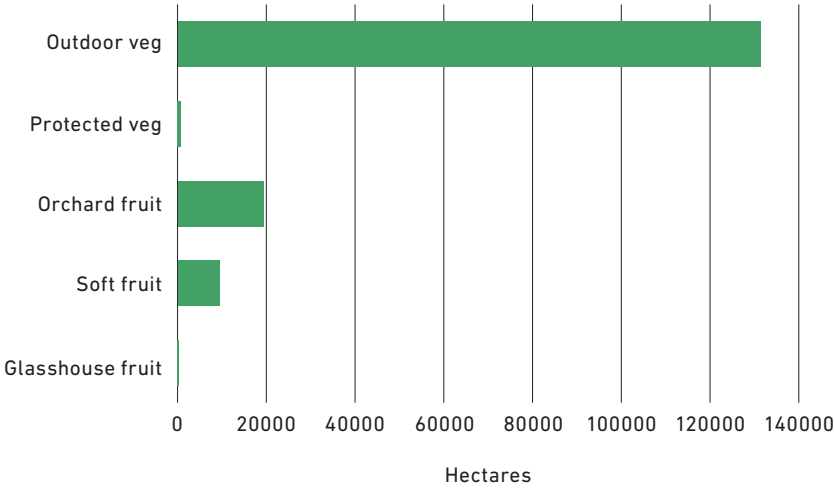


Figure 4
Consumption of '5 a day' portions of fruit and vegetables in the UK, 2015 – 2016

Fruit and vegetables	Portions per day	% achieving 5 a day (g)
Children (11-18 yrs)	2.9	9
Adults (19-64 yrs)	4.1	30
Elderly (65+ yrs)	4.6	41

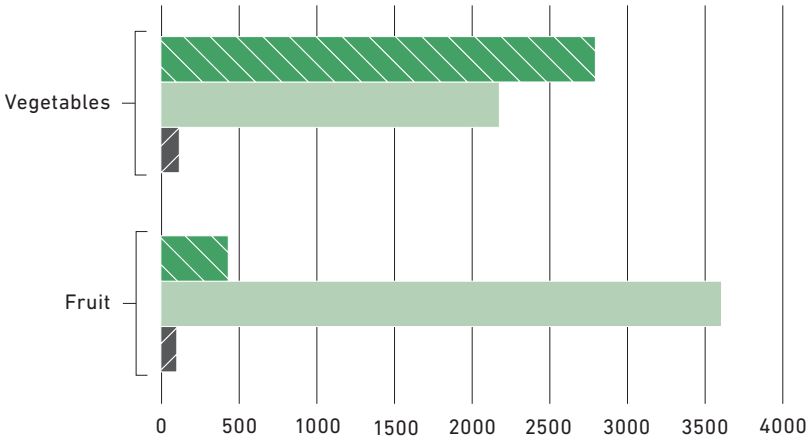
Source: NDNS consumption data ²⁸

Figure 5
Horticulture production (hectares) in the UK, 2014 – 2015



Source: DEFRA horticulture statistics ³³

Figure 6
Production, imports and exports of fruit and vegetables (thousand tonnes) in the UK, 2014



Source: DEFRA horticulture statistics ³³

How does what we eat affect the environment?

GHG emissions

As can be seen in Figure 1, fruit and vegetables consumed in the UK on the whole have much lower GHG emissions (per kilogram consumed) compared to other foods, especially red meat.

In general, robust and field-grown produce such as brassicas, root vegetables, tubers and firm fruits such as apples, generate relatively low emissions per unit of product. However, there are exceptions to these generally low environmental impacts. Produce that is fragile (salads and berries), grown in protected conditions (hot-housed tomatoes or cucumbers), or requires refrigerated and rapid transportation (salad, green beans, mange touts, berries from the Southern hemisphere) is more GHG intensive.⁴⁴ Vegetable production typically leads to more GHG emissions than fruit, but this is still a fraction of the emissions for animal produce.

While foods that are both locally grown and in season are likely to have a lower environmental impact than the same foods produced overseas (e.g. British green beans compared with Kenyan imported beans in June), in the colder months produce that is in-season overseas may have a smaller footprint than equivalents produced locally in heated greenhouses (e.g. Spanish versus British tomatoes). The energy costs of storing locally produced foods beyond their natural growing season using refrigeration, freezing or canning, can be higher than the energy costs of shipping in foods that are in season somewhere else.⁴⁴

Water footprint

Currently, the agricultural sector accounts for about 85% of global freshwater consumption.²¹ The global average water footprint of vegetables is 322 litre/kilogram, of which 43 litre/kilogram is blue water and 54 litre/kilogram is grey water.²⁷ The average amount of water used in vegetable production in the UK is low in comparison to other foods (Figure 3). It is less than 5% of that used to produce the equivalent weight of beef and 16% of that to produce chicken.

The water footprint varies, however, across different types of vegetables and production regions. The form in which vegetables are consumed also determines their water footprint. For example, the global average water footprint of fresh or chilled tomatoes is 214 litre/kilogram, but peeled tomatoes are 267 litre/kilogram, while tomato ketchup is 534 litre/kilogram. This is largely due to the differences in concentration.

The global average water footprint of fruit is bigger than vegetables, standing at 967 litre/kilogram, of which 147 litre/kilogram is blue and 93 litre/kilogram is grey water.²⁵ Again, there are big differences between fruits, the method of crop production and the production area.

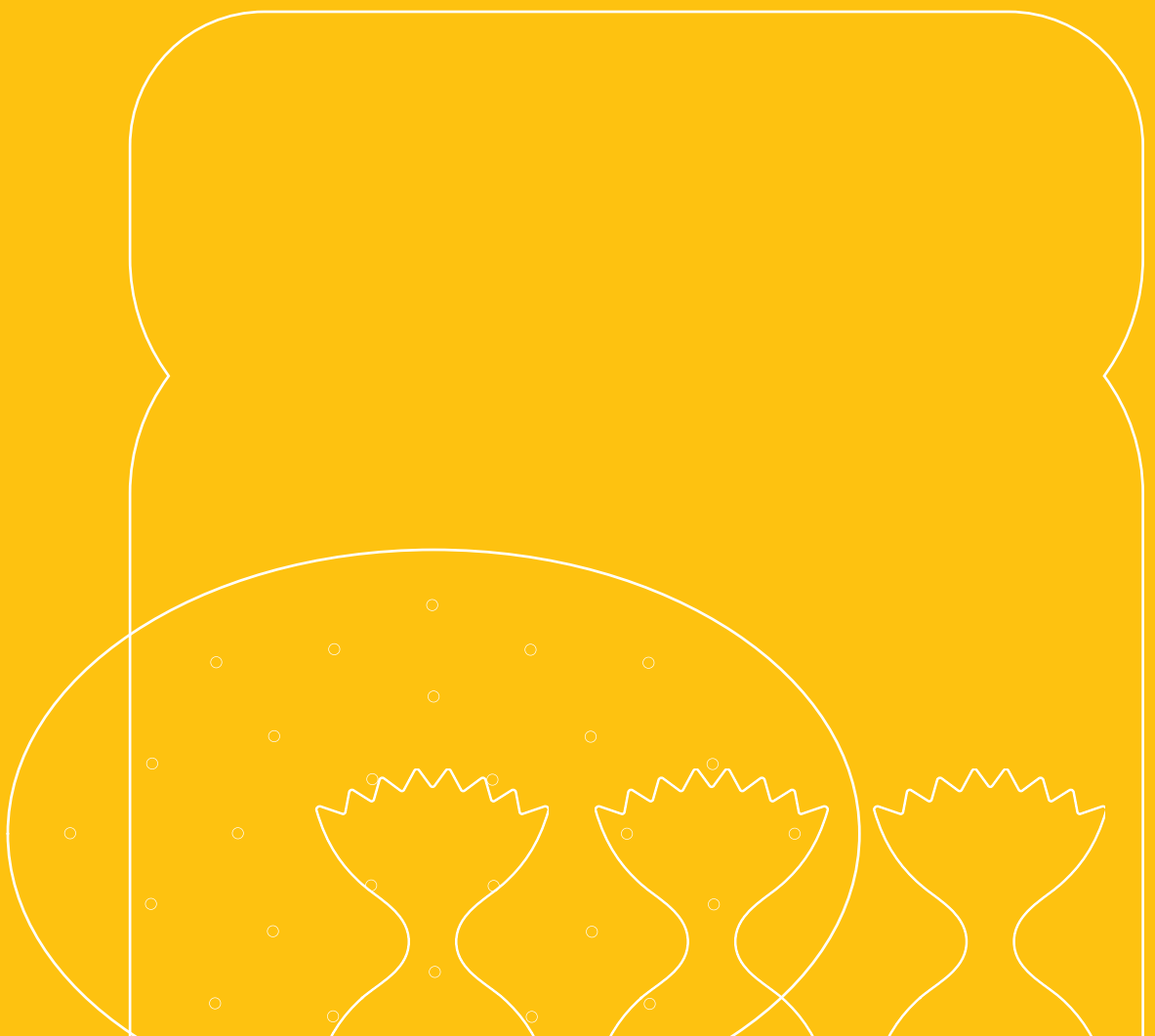
Much of the fruit consumed in the UK is not grown in the UK so the water footprint impacts are felt elsewhere. Of the fruits that are grown in the UK, the water footprint tends to be smaller compared to the global average. UK-grown fruit, however, is only available when in season, unless it has been refrigerated to extend shelf-life, which has a cost in terms of GHG emissions and energy.

Fruit juices typically have a larger water footprint than their whole fruit equivalent. For example, the global average water footprint for orange juice is 1018 litre/kilogram compared to 560 litre/kilogram for whole oranges.⁴⁵



2

Potatoes, bread, rice, pasta
and other starchy carbohydrates



Summary

Are we eating what is recommended?

- Carbohydrates, including starchy and whole grain foods, should make up around one-third of the food we eat, equivalent to around 50% of our total dietary energy. Recent revisions to carbohydrate recommendations lowered the maximum sugar intakes from 10% to 5% of total dietary energy and increased the target dietary fibre intake from 24 grams to 30 grams per day.
- Adult fibre intakes are 40% lower than the target level. Current consumption of foods within the starchy carbohydrates group would need to increase by 69% in order to meet the new dietary fibre goals.
- There is currently a mis-match between the starchy foods that are commonly consumed and those whose consumption needs to be increased on health grounds. The most commonly consumed sources of starchy foods by children and adults in the UK are refined cereals such as pasta, rice and pizza, followed by white bread and potatoes cooked in fat.

How much does our food cost?

- The prices of potatoes and bread have risen steadily over the last 30 years in keeping with inflation, but have started to decline more recently.

Where does our food come from?

- Just over half of the croppable area in the UK is planted as cereal crops, predominantly wheat and barley. Wheat production has increased in recent years and exports now outweigh imports. Wheat is largely used for flour and animal feed. Barley is mainly used for brewing and distilling.
- Potato production in the UK remains stable, although exports are higher than imports and only 77% of potatoes supplied in the UK are now home grown.
- All rice consumed in the UK is imported, primarily from Asian countries.

How does what we eat affect our health?

- A low fibre diet has been associated with a higher incidence of cardiovascular diseases, coronary events, stroke, type 2 diabetes and colorectal cancers.

How does what we eat affect the environment?

- GHG emissions of plant-based starchy foods are generally low relative to animal-based food products.
- Emissions vary by degree of processing; for example, unprocessed potatoes are associated with 1.5 kilograms of CO₂e/kilogram consumed, while processed potatoes are associated with 2.3 kilograms of CO₂e.
- Rice has a particularly large water footprint compared to other starchy staples. For example, the global water averages for rice are 2,494 litre/kilogram compared to 1,849 litre/kilogram for dry pasta.
- As the rice consumed in the UK is imported, the impacts of the associated water footprint are experienced elsewhere.

Are we eating what is recommended?

The Scientific Advisory Committee on Nutrition's (SACN) 2015 report on carbohydrates and health led to revised recommendations that the population increases its consumption of starchy carbohydrates and high fibre foods such as cereals, wholegrains and potatoes. SACN kept its recommendation that total carbohydrate intake should be maintained at an average population intake of approximately 50% of total dietary energy (this translates into around one-third of the food we eat on the Eatwell Guide).¹³ However, the following changes to sub-categories of carbohydrates underpin the recommendation to increase consumption of starchy carbohydrates:

- A reduction in maximum sugar intake levels from 10% of energy from added sugars to 5% of dietary energy from free sugars. The difference should be replaced by high fibre and complex carbohydrates.¹³
- An increase in the dietary reference value for dietary fibre for adults and adolescents to 30 gram/day (from approximately 24 gram/day), with proportionate age-specific targets for children.

People in the UK currently consume two to three times the recommended amount of sugars (see Section 6) and less than the recommended amount of dietary fibre.²⁸ A study which modelled a typical UK diet based on current food consumption patterns, found that intakes of starchy carbohydrates would need to increase by 69% in order to meet the new dietary fibre goals in addition to all the other recommendations of the Eatwell Guide in full.⁵⁰ The most significant increases were identified for brown and wholemeal bread (from a current average consumption level of 33 gram/day to 83 gram/day), potatoes (from 91 gram/day to 173 gram/day) and high fibre breakfast cereals (from 20 gram/day to 52 gram/day). The most commonly consumed source of cereals and starchy foods by children and adults in the UK are pasta, rice and pizza, followed by white bread and potatoes.^c Children eat most potatoes in the form of chips, roasted potatoes or potato products.¹⁵

There is currently a mis-match between those starchy foods which are commonly consumed and those whose consumption needs to be increased on health grounds. The Eatwell Guide advises people to choose higher-fibre, wholegrain varieties such as wholewheat pasta or brown rice. Refined cereals that are low in fibre and potatoes cooked in fat are more commonly consumed by children and adults. Pasta, rice and pizza, chips and white bread together provide 23% of the total energy intake for children aged four to 10 years compared to 8% from brown bread, high fibre breakfast cereals and potatoes (non-fried).¹⁵ The equivalent figures for 11-18 years are 26% and 7%, and for adults 20% and 8%, respectively. The elderly (65 years and over) have a more even balance between refined starchy foods (providing 13% of total energy) and higher fibre starchy sources (providing 12% of total energy).⁴⁶

c All composite dishes in the NDNS Nutrient Databank have been disaggregated into their constituent ingredients. E.g. only the starchy component of pizza is counted in this section.



How much does our food cost?

The prices of two commonly consumed starchy staples – potatoes and bread – have risen steadily over the last 30 years in keeping with inflation, but have started to decline more recently. UK household purchases of fresh potatoes have also declined. In 2013, purchases were 27% lower than 10 years previously.⁵¹ Currently, only 37% of the market value of potatoes is for fresh potatoes (at a price of £0.85 per kilogram) while 30% is in the form of crisps (at a price of £6.79 per kilogram), and 15% in the form of frozen chips (at £1.32 per kilogram).⁵¹

Where does our food come from?

The Utilised Agricultural Area (UAA)^d of the UK is 17.1 million hectares, covering 70% of the total UK land area.¹⁸ Just over half (51%) of croppable area is planted as cereal crops. Wheat and barley are the predominant cereal crops at 1.8 and 1.1 million hectares respectively. Potatoes are grown on a much smaller area (115,000 hectares), which has declined from 133,000 hectares in 2011.¹⁸

The UK wheat yield has been increasing in recent years and now stands at 8.8 tonnes/hectare, the highest it has been in the past 25 years.¹⁸ The harvested production of wheat was 16.4 million tonnes with a value of £2 billion in 2015. Wheat is mainly used for flour production and animal feed.⁵²

Exports of unmilled wheat generally exceed imports, although levels are affected by challenging growing conditions, as is the demand for imports for milling and feed wheat. In 2015 imports fell to 1.7 million tonnes, and exports grew to 2 million tonnes, resulting in a return to a positive trade gap for the first time since 2011. The main markets for exports were Spain (33%), the Netherlands (17%) and Portugal (15%) by volume.¹⁸ Currently, 85% of wheat sent to mills in the UK is home-grown compared to a low of 69% in 2013.⁵³

Barley grown in the UK has increased in recent years after a long decline. The main markets are malting, brewing and distilling.

Although the area of land planted with potatoes has decreased since the 1960s, yields have increased leading to little change in overall potato harvests.⁵¹ We produced around 6 million tonnes of potatoes in 2016. The largest proportion of the planted area grown is intended for use in the pre-pack (fresh) market, around 35%. Potatoes grown for the processing sector make up the second largest area, with 30% of the total area in 2015. This area has increased from 28% of plantings in 2014, in line with a rising consumer demand for processed potato products.⁵¹ During 2017, we exported around 300 tonnes and imported around 950 tonnes of potatoes, approximately 70% of which were processed.⁴⁷ The majority of fresh potatoes come from France, and the majority of processed potato products and seed imports are from the Netherlands. Fresh potato exports are mainly to Ireland and Spain.

All rice consumed in the UK is imported. It primarily comes from Asian countries such as India, Cambodia, Thailand and Pakistan.⁴⁰

51%
of croppable area in
the UK is planted as
cereal crops

^d UAA is made up of arable and horticultural crops, uncropped arable land, common rough grazing, temporary and permanent grassland and land used for outdoor pigs. It does not include woodland and other non-agricultural land.

Figure 7
Trend in the retail price index of potatoes, bread and all items (food and non-food) in the UK, 1987-2015

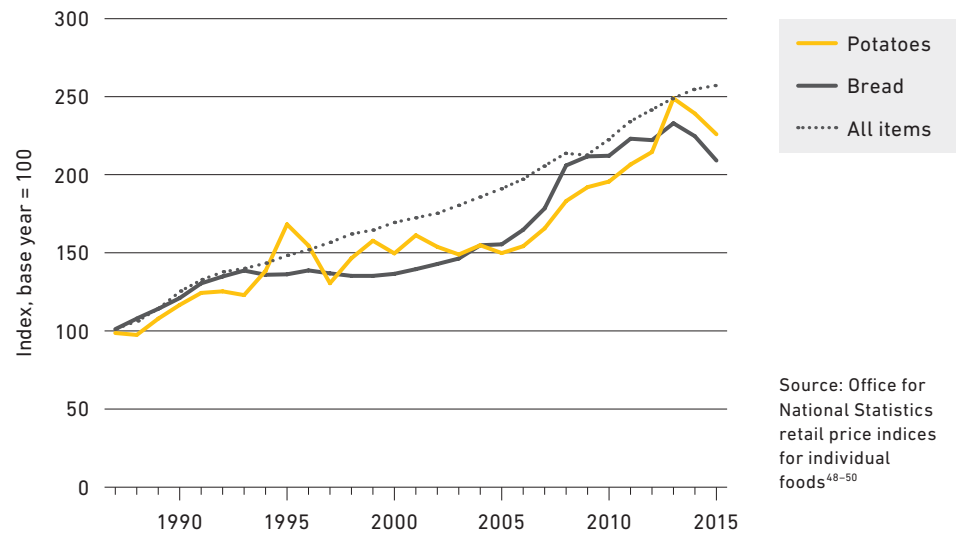
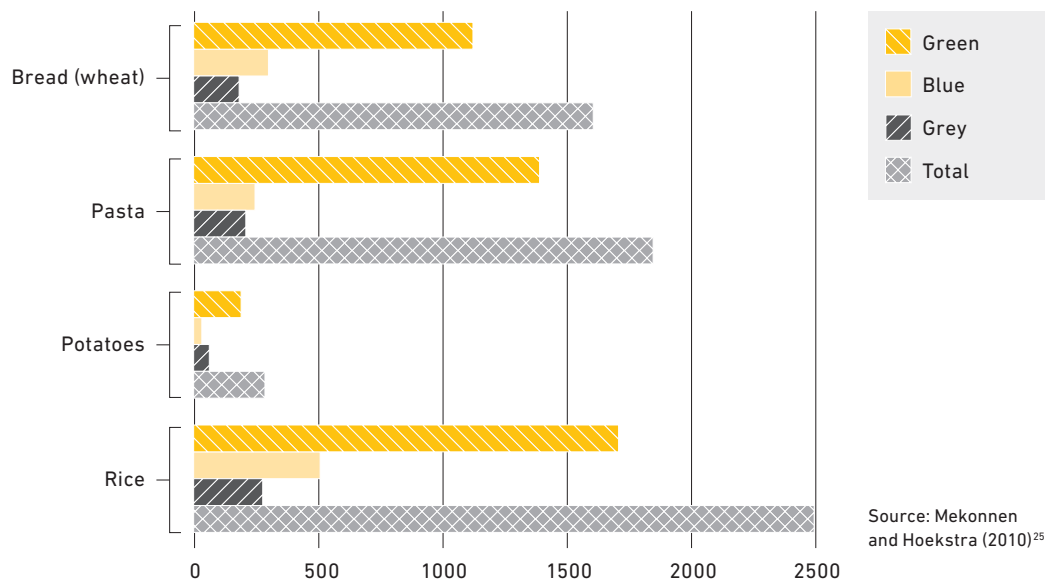


Figure 8
Water footprint per tonne of crop produced in the UK (litre/kg) 1996-2005



How does what we eat affect our health?

The Eatwell Guide advises consumption of higher-fibre, wholegrain varieties of starchy foods such as wholewheat pasta, brown rice and potatoes with skins left on. This is because wholegrain food contains more fibre than white or refined starchy food, and often more of other nutrients.¹ The Eatwell Guide also notes that people need to take care when using fats to cook and serve starchy food, because they can increase the calorie content.

However, people's intake of starchy foods in the UK is mostly in the form of refined pasta, rice, pizza and white bread. Children eat most potatoes in the form of chips, roasted potatoes or potato products.¹⁵ This results in starchy foods that are lower in fibre and higher in fat, providing nearly three times more of the total energy intake of children compared to starchy foods that are higher in fibre.

Fibre consumption levels in adults are 40% below the target intake levels, with similarly low consumption trends in other groups.¹⁵ SACN's comprehensive evidence review concluded that diets rich in dietary fibre are associated with a lower incidence of cardiovascular diseases, coronary events, stroke and type 2 diabetes, colon and rectal cancer.¹³ In addition, randomised controlled trials indicate a beneficial effect of dietary fibre on constipation, on decreasing intestinal transit times and on increasing faecal mass.¹³

How does what we eat affect the environment?

GHG emissions

GHG emissions of plant-based starchy foods are generally low relative to animal-based food products, as can be seen in Figure 1. Within this category, emissions vary by degree of processing; for example, unprocessed potatoes are associated with 1.5 kilogram of CO₂e/kilogram consumed, while processed potatoes are associated with 2.3 kilogram of CO₂e.³

Water footprint

Globally, the largest share of the water footprint for crop production is led by wheat, maize and rice. As can be seen in Figure 8, the water footprint of rice is much greater than for other forms of starchy staples across all freshwater types. For example, the global water averages for rice are 2,494 litre/kilogram compared to 1,849 litre/kilogram for dry pasta.⁴⁵ This is particularly problematic where rice is grown in water scarce regions of countries such as China, Pakistan and India.⁵⁴

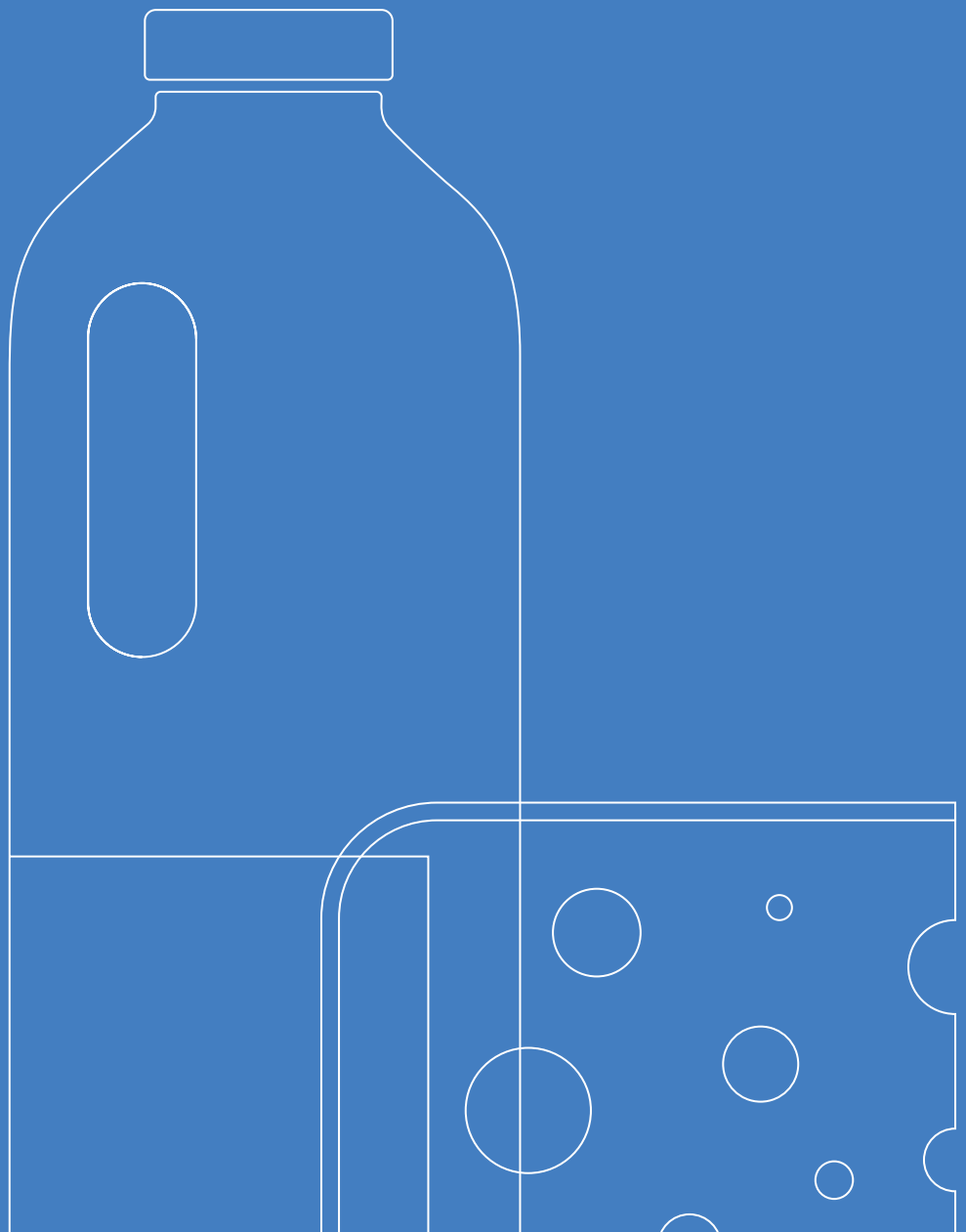


2,500

litres of water is used to grow one kilogram of rice – much higher than other forms of starchy staple

3

Dairy and alternatives



Summary

Are we eating what is recommended?

- The Eatwell Guide advises people to have some milk and dairy food (or dairy alternatives) every day; low fat varieties are encouraged.
- The recommendations state that saturated fat intake should be reduced to less than 11% of food energy and that total fat intake should be 35% of food energy. These are being reviewed by the Scientific Advisory Committee on Nutrition.
- Currently, the average intake of saturated fat exceeds the recommendation in all age groups.
- Milk is the main source of dairy foods in the UK. Over the last decade there has been a switch from whole milk to lower fat milk following recommendations, but those aged four to 10 years still get 30% of their saturated fat intake from milk and its products.
- While overall milk and cheese consumption has fallen, there has been a significant increase in yoghurt consumption. The most popular types of yoghurts are sweetened and higher in fat and sugar than plain yoghurt.

How much does our food cost?

- Milk prices on the supermarket shelves have dropped slightly in recent years. The fall in the farmgate price of milk has been more significant.

Where does our food come from?

- The UK is the third-largest milk producer in the EU after Germany and France, and the tenth-largest producer in the world. While the total number of cows has fallen, yield per cow has increased by 93% since 1975, resulting in an increase in milk production.
- The majority of milk produced in the UK is for domestic use.
- Just under half of the UK milk supply is for liquid milk consumption and the remainder is processed (largely for cheese).
- There is little overseas trade in liquid milk, but considerable trade in processed products. More cheese is imported into the UK than produced here. World milk production is projected to increase, particularly in Asia.

How does what we eat affect our health?

- Milk and milk products are significant sources of calcium and protein in the UK diet. However, they are also major sources of energy and saturated fat, especially for children. Intakes of energy and saturated fat currently exceed recommended levels.
- A worrying trend is the increasing consumption of yoghurts, many of which are high in sugar; current sugar intakes are two to three times the target intake levels.
- High energy, sugar and saturated fat diets are associated with increased risk of obesity, coronary heart disease and stroke.

How does what we eat affect the environment?

- The GHG emissions associated with the consumption of milk and milk products are higher than most forms of animal meats except beef.
- A significant proportion of the environmental impact of consuming milk is felt abroad, in countries from where feed for dairy cattle is imported.
- Milk produced in the UK has a relatively small water footprint compared to other products such as meat. However, processed milk products have a larger water footprint; for example, the water footprint of processed cheese is five times that of milk.

Are we eating what is recommended?

The majority of people in the UK get their main source of dairy products in the form of milk.¹⁵ The Eatwell Guide advises people to have some milk and dairy food (or dairy alternatives) a day, but notes that some dairy food can be high in fat and saturated fat.¹ The recommendation is to choose lower-fat options such as 1% fat or semi-skimmed milk. This advice is currently being followed and all age groups (including children aged from four to 10 years) consume a greater quantity of lower fat forms of milk than whole milk.⁴⁶ Overall consumption of milk has fallen, however, except in primary school age children. Adults, for example, drink over one-third less milk now than they did 10 years ago. Cheese consumption has also dropped significantly. In adults it declined from 24 gram/day in 2001 to 15 gram/day in 2009.^{16,46}

While people drink less milk and eat less cheese, consumption of processed milk, especially in the form of yoghurt, has steadily increased since the 1970s. Over the last decade, adults and the elderly have quadrupled their consumption of yoghurt, fromage frais and other desserts. Between 2000 and 2009, consumption of these products increased from 6 to 27 gram/day in adults and 8 to 36 gram/day in people over 65 years.^{16,46} Sweetened yoghurts are increasingly eaten. For example, the most popular yoghurt in the UK is Müller Corner which contains an average of 25 grams of sugar per serving.⁵⁵ In 2013 this leading brand accounted for 15% of total yoghurt market share with sales of £250 million.⁵⁶ Sweetened yoghurts contain much higher quantities of energy, saturated fat and sugar compared to plain yoghurt.³¹

How much does our food cost?

The retail price of milk is still relatively affordable, standing at 43 pence/litre in July 2016.⁵⁸ In the last few years, however, the farmgate price of milk has seen a significant decline, although this has not been passed on to the consumers. There are several reasons for the decline in farmgate milk prices. Firstly, UK dairy farmers are competing in a global market and supply is exceeding demand. In addition, the European Union lifted its quotas on the amount of milk that farmers could produce at the end of March 2015. To add to this, there has been a Russian ban on EU imports, including milk, and a collapse in demand from China for dairy products.⁵⁹

25g
of sugar per serving
in the most popular
brand of yoghurt in
the UK – with yoghurt
now one of the
highest sources of
sugar in children's diets

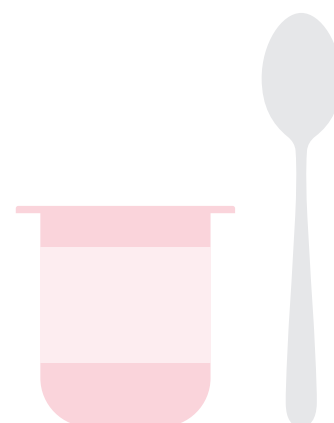
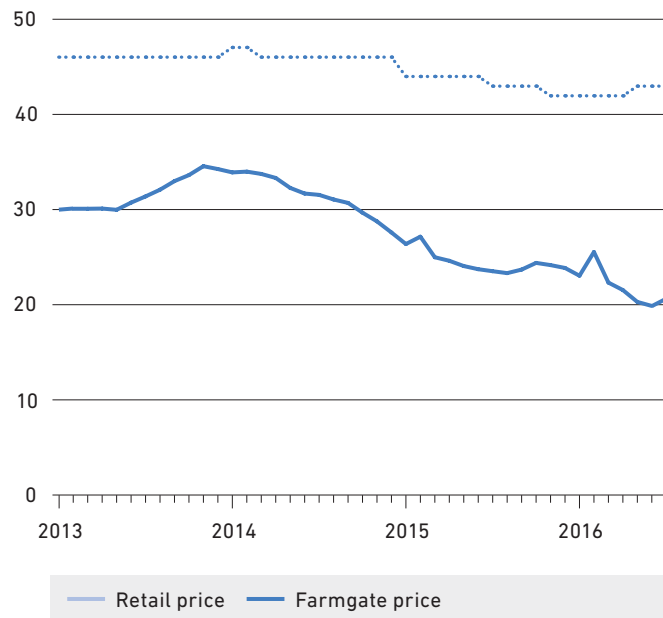


Figure 9

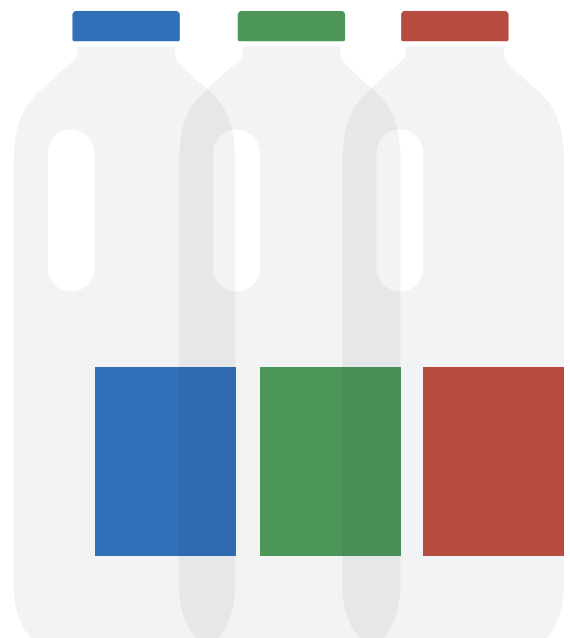
Trend in farmgate and retail prices of milk (pence per litre) in the UK, 2013-2016



Source: Office for National Statistics
Retail Price Indices
for individual foods⁵⁰

One third

less milk is drunk by adults now
compared to ten years ago



Where does our food come from?

The UK is the third-largest milk producer in the EU after Germany and France, and the tenth-largest producer in the world.⁶⁰ Milk accounted for 17.8% of total agricultural output in the UK in 2014, and was worth £4.6 billion in market prices. The total number of UK dairy cows has fallen from 2.6 million in 1996 to 1.9 million in 2015, which represents a 27% reduction.⁶⁰ Yield per cow has increased by 93% since 1975, however, resulting in an increase of domestic milk production. The UK produced 15 billion litres of milk in 2015.¹⁸ Just under half (46%) of all milk supply (including imports and excluding exports) is for liquid milk consumption and the remainder is processed (largely for cheese).

There is little overseas trade in liquid milk, but considerable trade in processed products. Only 3% of all UK produced milk was exported in 2014, while the rest was for domestic use.⁶⁰ A small amount (221,000 litres) was imported in 2014.⁶⁰

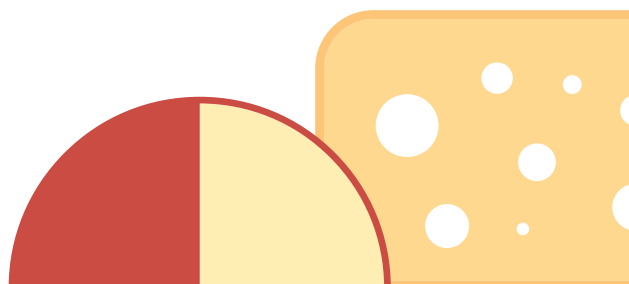
The picture is different for cheese. In 2014, 416,000 tonnes of cheese was produced in the UK and 469,000 tonnes was imported. Only 134,000 tonnes was exported.⁶¹ Most imported cheese is 'speciality' cheese from France and Germany; however, about one-third of it is cheddar cheese mainly imported from Ireland.

The number of dairy producers has declined as the size of the dairy herd has contracted. In 2014 there were 13,815 registered dairy producers in the UK compared to 35,741 in 1995, a 61% reduction.⁶⁰ There is some evidence to suggest that dairy production is becoming more intensive. A survey carried out in 2012 found that 31% of farms maintained a traditional grazing system with no forage-feeding indoors during the summer, whereas 38% of farmers indicated that all their milking cows received some feeding indoors during the summer.⁶² A system of housing dairy cows for 24 hours a day while they are lactating was implemented by 8% of farms, whereas 1% of farms did not house their cows at any time of the year. Herd sizes were significantly larger within systems that feed indoors. The study concluded that traditional all-summer grazing is no longer the predominant system adopted by dairy farmers and that other systems such as all-year-round indoor feeding and continuous housing are becoming more prevalent in Britain.

While production of milk has declined in Europe since 1992, production in China, Pakistan, India, Brazil and New Zealand has increased considerably.⁶⁰ World milk production is projected to increase by 23% by 2024 compared to 2012 – 2014, the majority of which will come from Asia.¹⁹

469

thousand tonnes
of cheese was
imported into the
UK, with only 134
thousand tonnes
exported



How does what we eat affect our health?

Milk and milk products are major sources of calcium in the population's diets, closely followed by cereal products. Milk and milk products account for 47% of calcium intakes in children aged between four and 10, 35% of intakes in children aged 11-18 and 35% of intakes in adults under 65 years.⁶³ Most people currently meet and exceed the reference nutrient intakes for calcium. However, some children aged between 11 and 18 years (12% of boys and 19% of girls) are failing to meet the lower reference nutrient intakes of calcium.⁶³ Calcium is important for building strong bones and teeth. Lack of calcium may lead to rickets in children and osteoporosis in adults.

Milk and milk products are also significant sources of energy and saturated fat in the UK diet. This is particularly the case for children. Those aged four to 10 years get 31% of their saturated fat intake from milk and its products. Current recommendations on consumption of saturated fat are based on the Committee on Medical Aspects of Food report, which recommended that the intake of saturated fats should be reduced to less than 11% of food energy and that total fat intake should be 35% of food energy.¹² Currently, the average intake of saturated fat exceeds this recommendation in all age and sex groups. For example, mean saturated fat intake for adults aged 19-64 years was 12.6% of food energy.¹⁵

One trend that could negatively affect health is the increasing consumption of sugar-sweetened yoghurts. Yoghurt is now one of the highest sources of sugar in children's diets.¹⁵

The Scientific Advisory Committee on Nutrition is currently reviewing the evidence for the relationship between saturated fats and health.⁶⁴

How does what we eat affect the environment?

GHG emissions

Milk and milk products are associated with relatively high quantities of GHG due to the enteric fermentation of dairy cows, which are ruminating animals. When consumption levels are taken into consideration, the GHG emissions associated with the consumption of milk and milk products are among the highest of all foods consumed in the UK (see Figure 2).³

The overall contribution of global milk production, processing and transportation to total GHG emissions is estimated at 2.7%. This figure only includes emissions associated with milk production, processing and transportation of milk and milk products.⁶⁵

Water footprint

Milk produced in the UK has a relatively small water footprint compared to other products such as meat and alcohol. However, among dairy products the water footprint of processed cheese is particularly large when compared to liquid milk or yoghurt (Figure 3). For example, milk has an average global water footprint of 1054 litre/kilogram compared to 5060 litre/kilogram for cheese (Figure 3).

A note on breastfeeding

The Eatwell Guide does not apply to children under the age of two years, but the way that small children are fed affects both their health and the environment. Breastfeeding protects against infections and is better for longer-term health, yet less than half of all mothers (43%) are breastfeeding their babies at two months after birth.¹⁵⁴ Formula milk has an environmental impact through the large water footprint and high GHGs associated with milk production, processing, packaging and transport. In addition, associated products such as tin for cans, plastic for bottles and teats, labels and printing for marketing and distribution, and sterilisers have environmental impacts.¹⁵⁵

4

Beans, pulses, fish, eggs, meat
and other proteins



4.1 Meat and eggs

Are we eating what is recommended?

- The Eatwell Guide recommends that adults and children should eat no more than 70 gram/day of red and processed meat. Adult intakes average at 62 gram/day. Consumption in men is particularly high, with 64% eating more than recommended.
- There has been an increase in meat-eating over the last decade, largely due to higher white meat consumption, especially chicken. Children aged 11-18 years, for example, have seen a 21% increase in consumption of chicken and turkey dishes over the last decade.
- One-third of the meat that children consume is processed in the form of mince, sausages, kebabs, burgers, meat pies and breaded chicken, which are particularly high in fat and salt.
- Meat contributes to the over-consumption of saturated fat and salt in the diet. It provides 20-24% of saturated fat intake for UK adults and 19-28% of sodium intake.
- A modelling study estimated that current adult intakes of red and processed meat would need to reduce to 15 gram/day to meet all the Eatwell Guide recommendations in full.

How much does our food cost?

- Less healthy types of meat (those high in salt, sugar and fat) have increased in price more slowly compared to healthier forms of meat. For example, between 2002 and 2005 the price of beef rump steak rose by 77% compared to a 53% rise for sausages.

Where does our food come from?

- Production of red meat in the UK has declined over the last 20 years while poultry meat production is increasing, part of a longer term upward trend since the late 1970s.
- Most of the meat and eggs (more than 80%) that we eat come from the UK. Meat imports, with the exception of poultry, come mainly from European Union countries.

How does what we eat affect our health?

- Meat is an important source of a number of nutrients in the British diet, such as protein and iron. However, it also contributes to the over-consumption of saturated fat and salt.
- Excessive consumption of red and processed meat increases the risk of colorectal cancer, the third most common cancer in men and women in the UK.
- The Eatwell Guide does not provide any specific recommendations for total meat consumption, but other European countries have recommended maximum limits of 500 gram/week on health and sustainability grounds.

How does what we eat affect the environment?

- Agriculture is the major source of nitrous oxide and methane emissions in the UK. The majority of these emissions (e.g. 87% of methane) arise from the digestive processes of ruminant animals such as beef cattle.
- As a result, the environmental impact of eating beef is high. It produces more than four times the quantity of GHG emissions per kilogram than poultry.
- There is some evidence that well-managed, less intensive grass pasture farms may be associated with a smaller GHG footprint as a result of grassland soil carbon sequestration.
- The bulk of the water footprint of a live animal is made up of the indirect footprint of the feed; other components include the direct footprint of drinking and service water.
- Beef produced in the UK has a large water footprint: it is more than three times greater than for chicken, twenty times larger than for cereals and six times larger than for pulses.
- The consumption of meat in the UK has an environmental impact outside the UK because substantial amounts of oil crops grown for animal feed are imported.

Are we eating what is recommended?

The Eatwell Guide recommends that adults and children should eat no more than 70 gram/day of red and processed meat; there is currently no recommendation for the consumption of eggs.¹ Adult intakes of red and processed meat average at 62 gram/day.⁶⁶ However, consumption in men is particularly high, averaging at 77 gram/day.⁴⁶ Overall around 64% of men eat more red and processed meats than recommended, while 33% of women and 43% of children aged 11-18 years exceed the recommended quantities.^{1,31}

Much of the meat that we consume is processed and particularly high in fat and salt. One-third (30%) of the meat that children and adults eat is processed in the form of sausages, burgers and kebabs, pastries and meat pies, and breaded chicken and turkey.^{e,15} There is no clear pattern in total meat or red meat consumption between different income groups.

The average daily consumption of meat and meat products (including non-meat components) has increased over the last decade (see Figure 10). On average, adults now eat more meat compared to previously.¹⁵ The increase is largely due to higher white and red meat consumption. Children aged 11-18 years, for example, have seen a 21% increase in consumption of chicken and turkey dishes over the last decade. Currently around one-third of all children's white meat consumption is in the form of 'coated chicken and turkey'.⁴⁶

A study which modelled a typical UK diet based on current food consumption patterns, estimated that current adult intakes of red and processed meat would need to reduce to 15 gram/day to meet all the dietary recommendations in full.³⁰

How much does our food cost?

There are huge variations in the price of meat depending on the quality and type. In general, red meat is more expensive than white meat, though the cut of the meat and mode of production will have a bearing. The average retail price per kilogram in March 2017 was £7.02 for beef, £8.19 for lamb and £3.82 for pork,⁶⁷ while chicken was the cheapest at £2.94.⁶⁸

The price of meat to consumers in the UK has risen over the last two decades and particularly for red meat such as lamb and beef. The price of chicken, on the other hand has risen proportionately less (Figure 11).

The prices of meat classified as less healthy^f have risen substantially less than the prices of healthier types of meat over the last 13 years. In general, processed meats such as meat pies, bacon, sausages, beef burgers, pork pies and ham have experienced lower price rises in comparison with many unprocessed meats. For example, between 2002 and 2005, beef rump steak rose by 77% compared to a 53% rise for sausages.⁷²

e Based on the NOVA food classification of industrial food processing.¹⁵²

f The 'healthiness' of food is defined using the Food Standards Agency's nutrient profiling model based on energy, saturated fat, total sugar, sodium, fibre, protein; and fruit, vegetable and nut content.

Figure 10
Mean adult
consumption of
meat and meat
products (grams/
day), 2000 – 2014

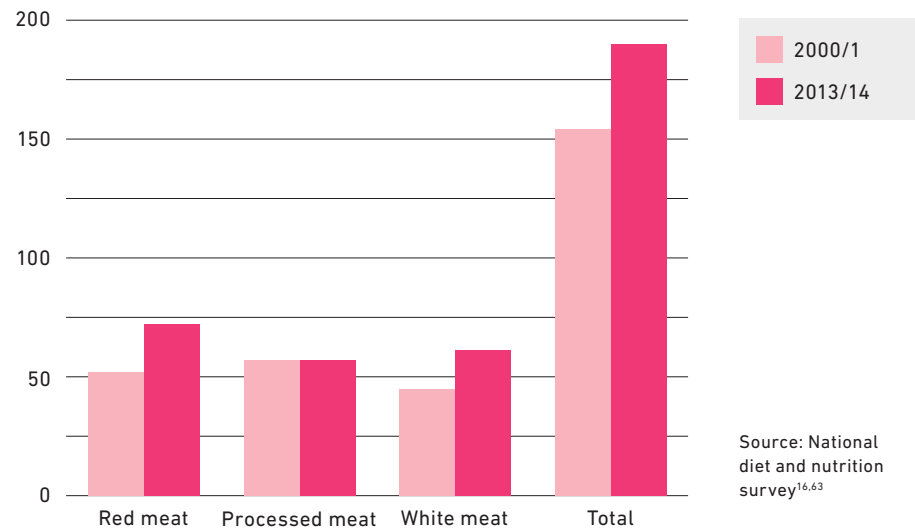


Figure 11
Trend in the retail price
index of meat in the UK,
1987 – 2016

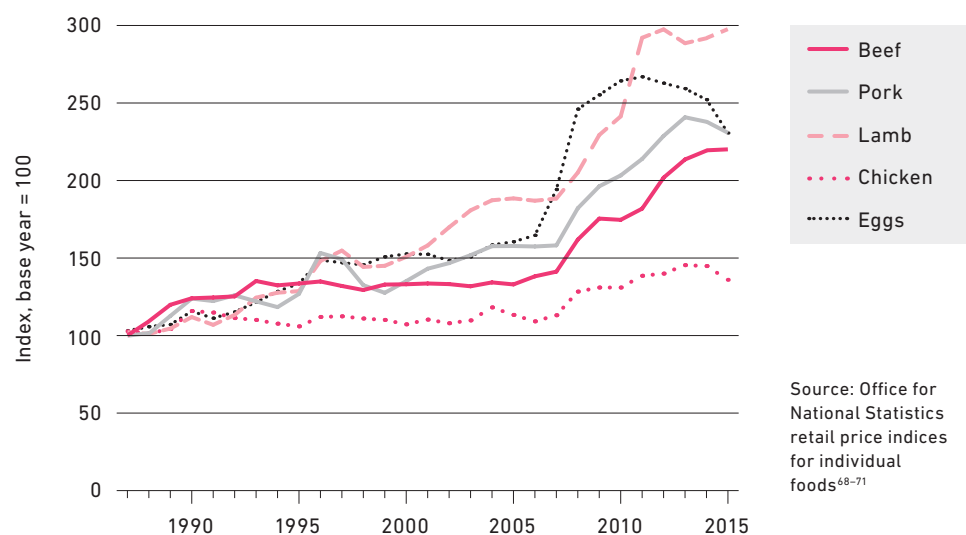
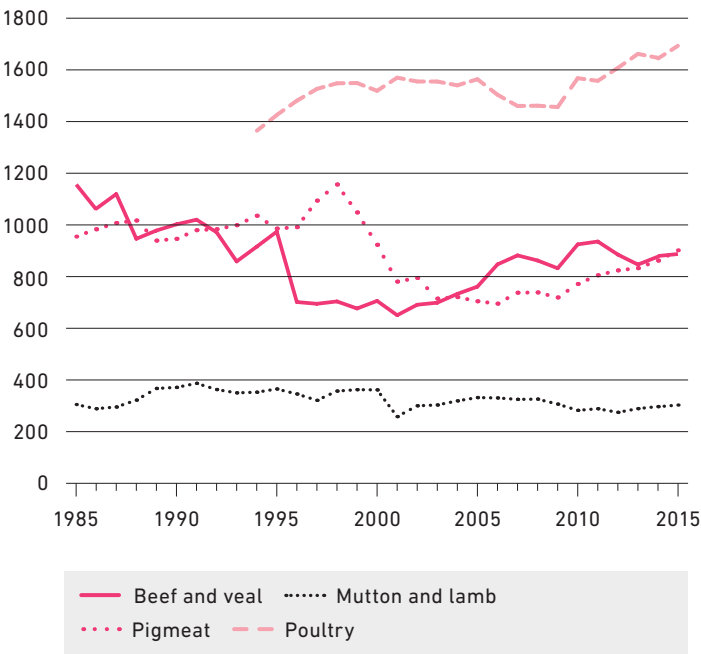
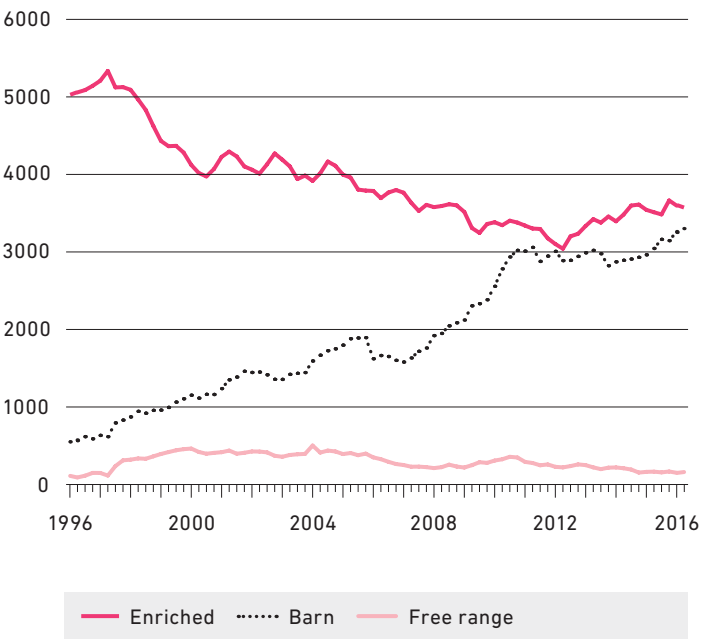


Figure 12
Trend in meat
production (thousand
tonnes) in the UK,
1990 – 2015



Source: Department
for Environment,
Food and Rural
Affairs^{73,74}

Figure 13
Trend in egg packing
throughput (thousand
cases) by production
system in the UK,
1996 – 2016



Source: Department
for Environment,
Food and Rural
Affairs⁷⁹

Where does our food come from?

In the UK, red meat production has decreased while poultry meat production has increased (Figure 12). There was a downward trend in red meat production through much of the 1990s. Since 2002 there has been a slight upward movement but levels remain lower than those in the early 1990s.

The total number of cattle and calves in the UK now stands at almost 9.7 million.⁷⁵ There has been a steady decline in cattle numbers over the last 20 years, reflecting a concern about the profitability of beef production. Rising costs are not being covered by adequate returns from the marketplace. This has been compounded by a series of severe external shocks – including the Bovine Spongiform Encephalopathy (BSE) crisis and Foot and Mouth Disease (FMD) outbreaks in the 2000s which have impacted on the marketplace and producers' finances.⁷⁶ As a result, many producers are losing money.

In contrast, since 1990 there have been large increases in the production of poultry meat in the UK, part of a longer term upward trend since the late 1970s.¹⁸

Egg production has also increased over the last two decades from a total of 5.7 million cases of eggs^g packed in 1996 to over 7 million in 2016.⁷⁷ An EU ban on battery cages came in to effect on 1st January 2012. Egg producers were required to provide hens with larger and more comfortable cages, which included nesting and scratching areas that allowed more natural behaviour.⁷⁸ As a result, eggs produced from hens in enriched colony systems (intensive cages pre-2012) have decreased and accounted for only 51% of the total throughput in 2016 compared to 44% of eggs from free range hens.⁷⁷

While only about half (54%) of all food is produced and consumed within the UK, the majority of meat and eggs are produced and consumed in the UK.¹⁸ Figures range from 92% for mutton and lamb, 87% for poultry, 85% for eggs, 81% for beef and veal and 62% for pork.

Most imported meat comes from European Union countries with the exception of mutton, lamb, and poultry meat products. In 2014, 92% of imported bacon and ham, and 62% of pork came from three European countries (Denmark, the Netherlands and Germany), 68% of veal and beef came from the Irish Republic, and 74% of poultry meat came from four European countries (the Netherlands, Poland, the Irish Republic and Germany).¹⁸ Most poultry meat products, however, are imported from outside the EU; namely from Thailand (38% of imports) and Brazil (13% of imports).

Since the ban on exports of meat during the outbreak of FMD in 2001, exports have been much lower than their pre-2001 levels, though they have gone up in recent years. Again, exports go mainly to other European Union countries. Between 2011 and 2014, the UK was a net exporter of lamb and mutton. France was the destination for 54% of exports in 2015, with 12% going to Germany and 9% going to the Irish Republic.

Global meat production rose by almost 20% over the last decade, led by growth in poultry and pigmeat. However, over the next decade, global meat production will expand at a slower rate and is projected to increase by 12% to 357 million tonnes/year in 2025.¹⁹ A much smaller increase (4.2%) is expected in Europe and much of this increase will be in poultry production.

Globally almost 11% of meat output will be traded.¹⁹ Although developed countries are still expected to account for slightly more than half of global meat exports by 2024, their share is steadily decreasing relative to the base period. Brazil's share of global exports is expected to remain stable at around 21%, contributing to a quarter of the expected increase in global meat exports of the projection period. Trade policies remain one of the main factors driving the outlook and dynamics in the world meat markets. The implementation of various bilateral trade agreements over the outlook period could diversify meat trade considerably.¹⁹

^g There are 360 eggs in one case.

How does what we eat affect our health?

Meat is an important source of some essential nutrients for people living in the UK, including some vitamins and minerals, particularly iron. It provides 18-21% of iron intake for children aged 11-18 years and adults.¹⁵ It is also the main source of protein in meat eaters aged four and above. Protein intakes in the population are well above the Recommended Nutritional Intake levels.¹⁵

On the other hand, meat contributes to the over-consumption of saturated fat and salt in the diet. It provides 20-24% of saturated fat intake for UK adults aged 19 years and over and 19-28% of sodium intake overall.¹⁵ Currently the UK population consumes more than the recommended levels of saturated fat and salt.¹⁵

Consumption of red and processed meats is associated with a raised risk of colon cancer,^{80,81} the third most common cancer in men and women in the UK.⁸² Processed meats have been classified by the WHO as “carcinogenic to humans” owing to the convincing links with colorectal cancer, while red meat has been classified as probably carcinogenic to humans.⁸¹ WHO estimates that each 50 gram portion of processed meat eaten daily increases the risk of colorectal cancer by 18%.⁸¹ Greater consumption of red and processed meat also raises the risk of cardiovascular disease, stroke and type 2 diabetes.⁴¹

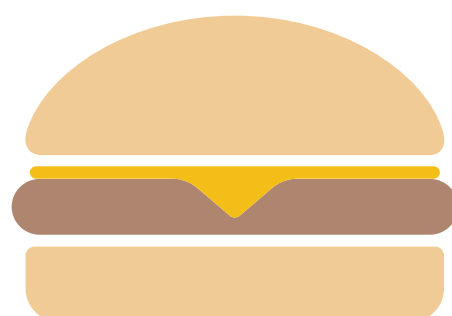
The Eatwell Guide does not provide any specific recommendations for total meat consumption, but other European guidelines (Holland and Germany) have recommended limiting total meat consumption to around 500 gram/week,^{h,83} just over half the current average male consumption in the UK. Researchers have estimated that eating meat no more than three times a week would prevent 45,000 deaths a year, and save the NHS £1.2 billion annually.⁸⁴

The use of antibiotics on livestock on a routine basis contributes to the serious and growing threat of antimicrobial resistance. Evidence of the relationship between antimicrobial use in animal husbandry and bacterial resistance in humans is mounting.⁸⁵

^h Dutch guidelines recommend that a person should consume no more than 500 grams of meat per week. Of that, no more than 300 grams should be red meat. German guidelines recommend 300-600 gram/week of lean meat or low fat sausage.

£1.2bn

per year could be saved by
the NHS if the UK population
ate meat no more than three
times a week



How does what we eat affect the environment?

GHG emissions

Agriculture is the major source of both nitrous oxide and methane emissions in the UK, accounting for approximately three-quarters of total nitrous oxide emissions and half of all methane emissions in 2014. Almost 87% of methane emissions from agriculture arise from enteric fermentation (digestive processes) in ruminating animals with manure management practices accounting for the remaining 13%. Between 1990 and 2014, methane emissions from agriculture are estimated to have fallen by 16%, mainly as a result of decreasing livestock numbers, particularly cattle.¹⁸

Beef consumed in the UK produces more than four times the quantity of GHG emissions per kilogram than white meat (poultry) and more than eight times the quantity for eggs (Figure 1).³ The analysis does not take account of land use, however.

There is some evidence that well-managed, less-intensive grass pasture farms may be associated with a lower GHG footprint as a result of grassland soil carbon sequestration. However, the degree of soil carbon sequestration will depend on other factors such as the age of the grassland and whether or not carbon equilibrium has been achieved (carbon sequestration diminishes in older grasslands), whether or not the land is arable or zero tilled (arable land sequesters less carbon), and whether or not nitrogen-based manures are used (nitrogen dioxide may offset the gains of the carbon sequestration).⁸⁶

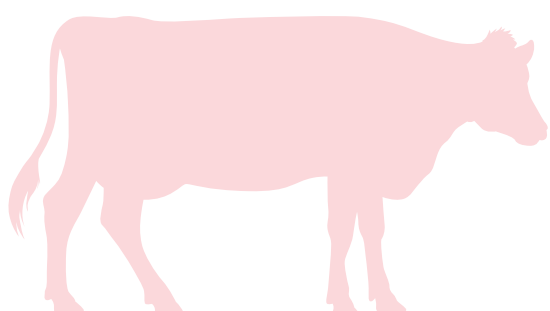
Water footprint

The water footprint of a live animal consists of two different components: the indirect water footprint of the feed and the direct water footprint related to the drinking water and service water consumed. Most of the water used along the supply chain of animal products takes place in the growing of feed. Consumers are largely unaware of the link between animal products and freshwater consumption, because of the complexities involved.²⁷

The water footprint of beef produced in the UK is more than three times greater than for chicken production²⁷ and bigger than for all other forms of meat (see Source: Green, Milner and Dangour et al, 2015).² The water footprint related to animal feed takes by far the largest share (99%) in the total water footprint of beef.⁸⁷ Animal products generally have a larger water footprint than crop products per kilogram, calorie or protein. The average water footprint per calorie for beef is twenty times larger than for cereals and starchy roots and six times larger than for pulses.⁸⁷

2000%

– the average water footprint per calorie for beef is twenty times larger than for cereals and starchy roots



4.2 Fish

Are we eating what is recommended?

- The Eatwell Guide recommends the consumption of at least two 140 gram portions of fish a week, including a portion of oily fish.
- Fish consumption is extremely low in the UK. Adult intakes average at just under half a portion (56 grams) of oily fish and less than a full portion (112 grams) of white fish per week.

How much does our food cost?

- Fish is an expensive source of protein and has seen above-inflation price rises compared to the average household basket in recent years.
- The cost of fish per kilogram is currently double that of beef and nearly five times the price of chicken. This is likely to be an important factor in low consumption rates.

Where does our food come from?

- Sea fishing produces most of the domestic supply of fish in the UK. The overall quantity of landings (live weight) increased between 2004 and 2014 though the size of the UK fishing fleet and number of sea fishermen has declined.
- Over the last 20 years, there has been a gradual decrease in the quantity of cod and haddock caught by UK fishermen but an increase in mackerel and herring landings.
- The UK is a net importer of fish. Imports are highest for cod, salmon and tuna. Virtually all tuna consumed in the UK is from abroad, mainly from Mauritius, the Seychelles and the Philippines.

How does what we eat affect our health?

- Fish consumption, particularly oily fish, decreases the risk of cardiovascular disease and may be beneficial for foetal development.

How does what we eat affect the environment?

- Globally, farmed fish produced through aquaculture has risen from 7% of fish for human consumption in the 1970s, to around half of consumption today.
- Aquaculture faces a number of environmental challenges including conversion of agricultural land to ponds, excessive use of groundwater, contamination, pollution, and fish feed requirements.
- GHG emissions from fish consumed in the UK are about one-third those of beef consumed. This is partly due to the low consumption of fish.
- Average water footprint levels for farmed fish and seafood are approximately 30% lower than those for chicken, 60% lower than pig meat and 80% lower than beef.

Are we eating what is recommended?

The Eatwell Guide recommends the consumption of at least two 140 gram portions of fish a week, including a portion of oily fish. However, consumption of fish is extremely low in the UK. Adult intakes average at 56 grams of oily fish per week (under half a portion) and 112 grams of white fish (less than a full portion) per week.⁴⁶ As a result, the majority of adults (83%) and over 93% of children eat less fish than recommended. In the younger child group, the most common type of fish eaten is white fish coated or fried including fish fingers. Fish consumption is also associated with a social gradient. The elderly from lower income quintiles eat less oily fish compared with the highest income quintiles.¹⁵ There has been a slight increase in the overall amount of fish eaten in the UK, but adults and children consume less oily fish compared to 10 years ago (Figure 14).^{15,16}

How much does our food cost?

Fish is expensive in comparison to other animal products. For example, the average price of white fish fillets (£14.20/kilogram) is double the current price for beef (£7.46/kilogram) and nearly five times the price of chicken (£2.82/kilogram).^{69,88,89} Between 2007 and 2015 the price of fish rose by 28%, which was higher than inflation and the average for the household basket.¹⁷ The high price of fish is likely to be a major reason for the low levels of consumption in the UK.

Where does our food come from?

The supply of fish to the UK includes landings from sea fisheries, aquaculture, catches from inland fisheries, and imports. Sea fishing produces most of the domestic supply (708,000 tonnes in 2015).⁹⁰ The UK aquaculture industry is much smaller and produced nearly 178,000 tonnes of fish in 2012,⁹¹ which was dominated by salmon production in Scotland.

In recent years, stocks of some fish have become seriously depleted. The EU manages the sea fishing industry by setting quotas to Member States for each type of fish and fishing area.ⁱ Since 2003, the quotas for depleted stocks have been subject to control measures that restrict the number of fishing days at sea per annum. As a result, the quantity of cod and haddock caught by UK fishermen has decreased by over 60% between 1996 and 2015.⁹⁰ On the other hand, landings of mackerel (and to a lesser degree herring) have increased significantly.⁹⁰

The UK is a net importer of fish, with imports exceeding exports. In 2016 we imported 717,000 tonnes of fish, led by cod, tuna, shrimps, prawns, and salmon from Iceland, China, Denmark and Germany. A growing amount of cod, however, is being sourced from UK aquaculture. Virtually all tuna consumed in the UK is from abroad, mainly Mauritius, the Seychelles and the Philippines. We exported a total of 444,000 tonnes of fish in 2016. The UK's main exports are salmon, mackerel and herring which are exported to France, the Netherlands, and the USA.^{90,92}

Global fish production is projected to rise by almost 13% over the next decade with developing countries, particularly Asia, continuing to drive the expansion of fish production, trade and consumption. With capture fishery production relatively static since the late 1980s, aquaculture has been responsible for the growth in the supply of fish for human consumption. Whereas aquaculture provided only 7% of fish for human consumption in 1974, this share has increased to around half today and will surpass capture fishing by 2023.^{19,93}

The UK could not produce enough domestic fish for everyone to meet the recommended amounts for health. Similarly, from a global perspective there is simply not enough fish in the world for everyone on the planet to consume fish in line with the recommendations.⁴⁴

i The EU sets a Total Allowable Catch or TAC (corresponding to a particular harvesting rate), and enforces technical measures (mainly mesh sizes and minimum landing sizes) each year, based on independent scientific advice. Once a TAC is agreed for each stock and fishing area it is allocated as quotas to Member States in accordance with fixed percentages based on historic fishing rights.

Figure 14
Trend in mean consumption
(gram/day) of fish
and fish dishes, UK
adults aged 18-65

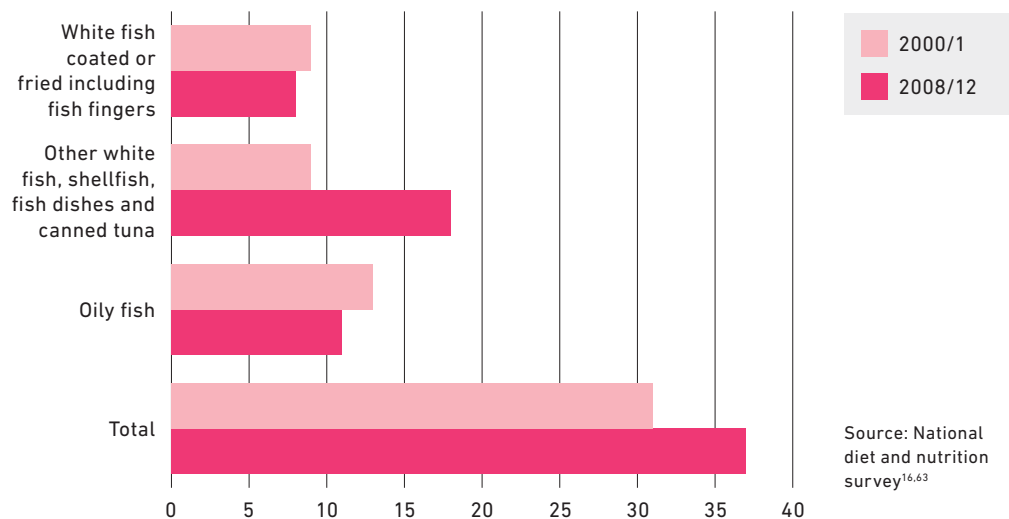
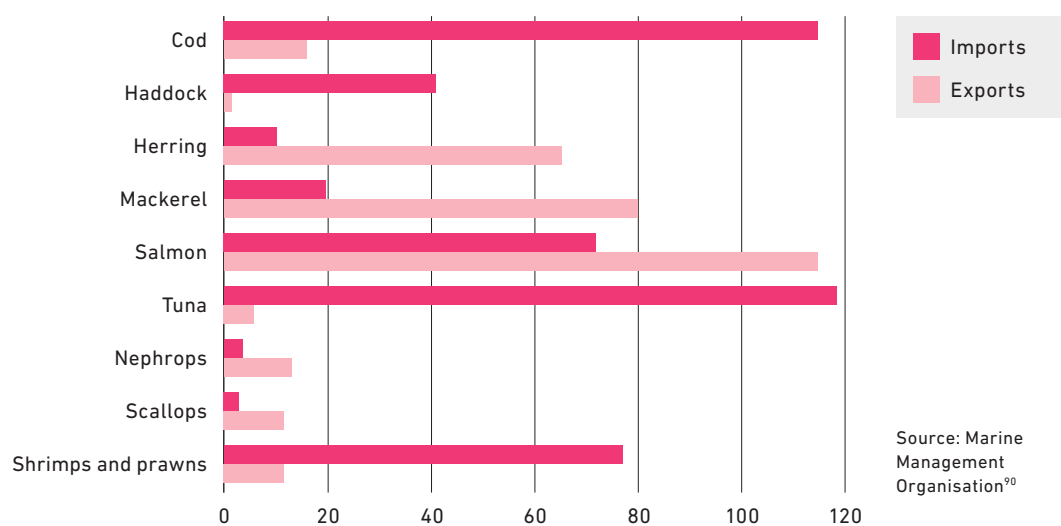


Figure 15
UK imports and exports (thousand tonnes) by key fish species, 2015



How does what we eat affect our health?

The Eatwell Guide recommends the consumption of at least two portions (140 grams each) of fish a week, including a portion of oily fish. The consumption of fish – especially oily fish – is well below the recommendation. Oily fish consumption is less than half the recommended intake in adults and only 10% of recommended intakes in children.⁴⁶ The Scientific Advisory Committee on Nutrition reviewed the evidence on health and fish consumption.⁹⁴ It concluded that the evidence suggests that fish consumption, particularly of oily fish, decreases the risk of cardiovascular disease. There is also evidence that increased fish consumption might have beneficial effects on foetal development.

How does what we eat affect the environment?

Stocks of many fish species have almost been exhausted from over fishing, which also damages the wider marine ecosystem. North Sea cod stocks plummeted by 84% between the early 1970s and 2006 and were close to total collapse. This led the Scottish Government, the EU Fisheries Council and industry to agree and implement a 'Cod Recovery Plan', and stocks recovered to healthy levels in 2017.^{95,96} The North Sea herring stock collapsed in the 1970s and was closed to fishing for several years. It subsequently recovered and although it fell back in the mid-1990s, it has again been rehabilitated and herring is being fished sustainably. Stocks of mackerel, haddock, plaice and sole are also now being fished at sustainable levels.⁹⁰

As noted above, the share of aquaculture to the global fish supply has increased from around 7% in the 1970s to 50% today. While aquaculture can help to ease pressure on wild fish stocks, unsustainable aquaculture has been linked to a variety of environmental problems.^{97,98,99} These include:

- Conversion of agricultural land to ponds.
- Excessive use of groundwater and other freshwater supplies for filling ponds.
- Destruction of mangrove, wetlands, and other sensitive aquatic habitats by aquaculture projects.
- Fish feed requirements: some farmed carnivorous fish, such as salmon and tuna, are fed with wild capture fish which can deplete wild fish reserves further. Tuna fish farming can require up to 20 kilogram of wild fish to produce 1 kilogram of tuna, while 1.68 – 4.9 kilogram of wild fish is required for every 1 kilogram of salmon produced.
- Contamination: organic waste accumulation on the seabed under sea pens can result in localised degraded water quality, sea lice and other disease transfer.
- Escapees: escaped farmed fish can interbreed with wild fish of the same species, resulting in genetic dilution, spread of disease and competition with wild fish for resources.
- Pollution: a range of potentially toxic chemicals are used in marine aquaculture operations.
- Animal welfare: fish welfare can suffer in intensely farmed environments leading to problems such as disease and sea lice (and associated environmental contamination as described above).

GHG emissions

Greenhouse gas emissions of fish consumed in the UK are about one-third of red meat consumed (see Figure 1). However, this is partly due to the very low consumption of fish.

Water footprint

Estimated global water footprint levels for farmed fish and seafood are generally lower than those for meat products. Global water footprint levels in 2008 were approximately 1,974 litre/kilogram for farmed fish compared to 2,872 litre/kilogram for chicken, 5,224 litre/kilogram for pig meat and 10,244 litre/kilogram for beef.¹⁰⁰

20kg
of wild fish is
needed to produce
1 kg of tuna

4.3 Pulses^j

Are we eating what is recommended?

- The Eatwell Guide recommends eating more pulses such as beans, peas and lentils as alternatives to meat because they are very low in fat, and high in fibre and protein. One 80 gram portion of pulses can also count towards the '5 a day' fruit and vegetable target.
- In 2015, the government increased the recommended fibre intake levels to 30 gram/day for adults. Consumption levels of fibre are currently 40% below these target intake levels.
- People in the UK eat very few pulses. While data on consumption trends is limited, current data suggest intakes average 10-14 gram/day, primarily in the form of baked beans.

How much does our food cost?

- Information on trends in the price of peas and beans to the UK consumer are not available from the Office of National Statistics. However, prices taken from retailers illustrate that the price of peas and beans per 100 grams are considerably lower than fish, beef, and chicken.

Where does our food come from?

- Production of pulses in the UK is relatively small and had been in slight decline over the last 20 years until 2015. Land-use for pulses increased in 2015 due to new Common Agricultural Policy greening measures, but the majority of the increase was for animal feed.
- The majority of beans grown in the UK are exported, while those that are not exported are generally used for animal feed.
- Baked beans are not a variety grown in the UK: these 'navy' beans are imported from elsewhere.

How does what we eat affect our health?

- Pulses are a rich source of several nutrients including protein, dietary fibre, B vitamins and minerals such as iron. Increased fibre intakes are associated with a lower risk of cardio-metabolic disease and colorectal cancer.

How does what we eat affect the environment?

- Pulses help reduce agricultural greenhouse gas emissions by adding soil nitrogen, thereby reducing the need for nitrogen fertilisers. This is important because synthetic nitrogen fertiliser manufacture accounts for 20 - 40% of the total GHG emissions associated with growing field crops.
- The GHG footprint of pulses is generally small. The water footprint of pulses is around four to 12 times greater than for fruit and vegetables, but two to four times smaller than for red meat.

^j Pulses are a subgroup of legumes. They are plant food from the Leguminosae family (commonly known as the pea family) and include all types of beans, peas and lentils.¹⁰⁶

Are we eating what is recommended?

The Eatwell Guide urges people to eat more beans, peas and lentils as alternatives to meat because they are naturally very low in fat, and high in fibre, protein, vitamins and minerals.¹ These foods can also count as one of the five recommended portions of fruit or vegetables per day, although current intakes fall short of the 80 gram daily portion. Globally the consumption of pulses in both developed and developing countries has been in decline.¹⁰¹ There are limited data on the amount of pulses consumed by people in the UK.

Consumption levels in the population are very low in comparison with meat. Intakes of pulses average 11 gram/day in children and 14 gram/day in adults aged 18-64, and 10 grams in adults over 65 years.¹⁵ A study which modelled a typical UK diet based on current food consumption patterns, estimated that adult consumption of pulses would need to increase almost two-fold, from 14 gram/day to 26 gram/day in order to meet the Eatwell Guide's recommendations in full.¹⁰² There is no comparative data available from previous surveys in the UK so it is not possible to ascertain whether consumption patterns are changing.

Although data are limited, it is generally assumed that the majority of beans and pulses that people eat in the UK are in the form of baked beans, which are 'navy' beans and not grown in the UK. Heinz is the leading provider of baked beans in the UK and reports that it sells 1.5 million cans every day.¹⁰³ The small proportion of pulses that are grown and consumed domestically are used for mushy peas and in manufacturing products such as soups and stews.¹⁰⁴

How much does our food cost?

Information on trends in the price of peas and beans to the UK consumer are not available from the Office of National Statistics. Prices taken from the Tesco on-line shopping site illustrate that the price of peas and beans per 100 grams are considerably lower than for fish, beef, and chicken (Figure 16).

Where does our food come from?

The UK grows three main types of dry harvested pea: marrowfat, blue and yellow peas. Marrowfats are largely used to make mushy peas but also exported at high value. Blues are primarily micronised for the pet food industry and incorporated into winter foods like soups and stews. Yellows cover a minimal area in the UK.¹⁰⁴ Winter and spring harvested faba or field beans are also grown.

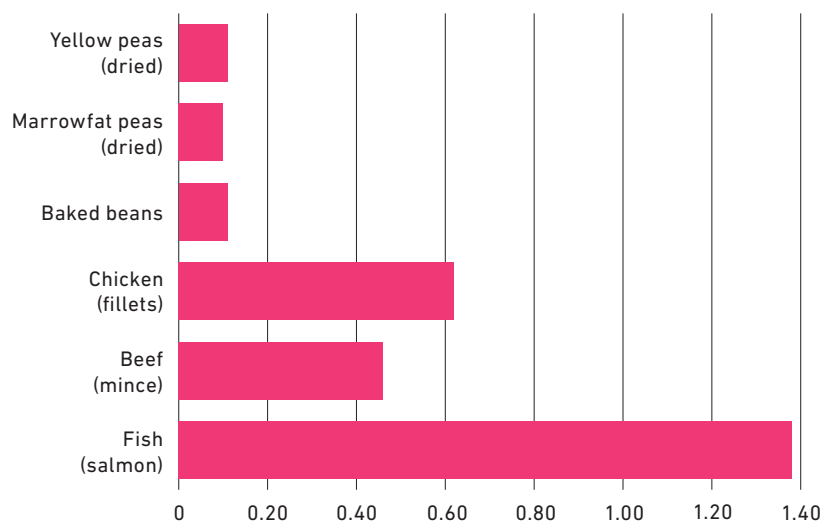
Production of pulses in the UK is relatively small and has declined a little over the last 20 years. In 2014, 138,000 hectares were growing pulses in comparison to 275,000 hectares in 2001.¹⁰⁴ There was a significant jump to 105,000 hectares in 2015 due to reform of the Common Agricultural Policy introducing greening measures, but the majority of the increase was for animal feed.¹⁸

The majority of the pulse crop (half to three-quarters) produced in the UK is destined to be animal feed, with the remainder grown for human consumption.¹⁰⁴ Most of the pulses grown for human consumption, however, are exported. UK peas and beans command international market share through quality and traceability.¹⁰⁴ Exported pulses primarily go to Egypt and other Arabic countries in North Africa. Export markets are growing: exports to Japan have increased from the UK by 250% in five years.¹⁰⁴

40%

less fibre is eaten
in the UK than
target intake levels

Figure 16
Price of pulses and
meat (£ per 100g) in
the UK, 2016



Source:
Tesco groceries,
November 2016¹⁰⁵

One 80 gram

portion of pulses counts towards the
'5 a day' fruit and vegetable target



How does what we eat affect our health?

Pulses are a rich source of several nutrients including protein, dietary fibre, B vitamins and minerals such as iron, zinc, calcium and magnesium.^{106,107} SACN and the Eatwell Guide recommend consuming more pulses as a route to increasing dietary fibre intakes and reducing meat-based protein foods in the diet.^{1,14} Increased fibre intakes are associated with a lower risk of cardio-metabolic disease and colorectal cancer.¹³

How does what we eat affect the environment?

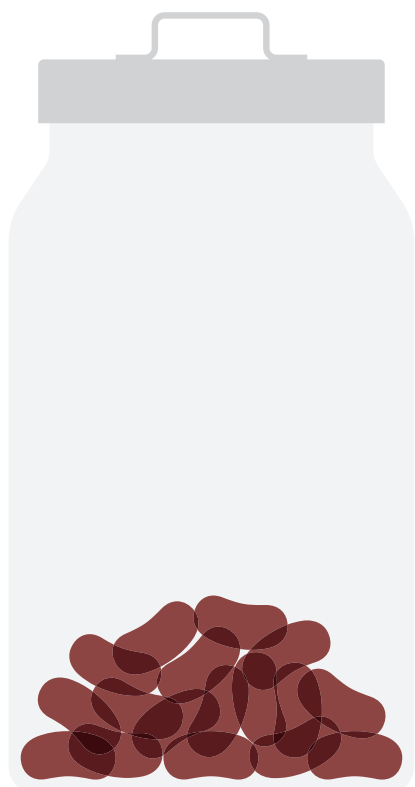
GHG emissions

Pulses have *Rhizobia* in their root nodules which fix atmospheric nitrogen, so the plants do not require organic nitrogen fertiliser. Because they add nitrogen to the soil they also reduce the need for synthetic nitrogen fertilisers for other crops grown on the same land. This is particularly important as synthetic nitrogen fertiliser manufacture accounts for 20 - 40% of the total GHG emissions associated with growing field crops.¹⁰⁸

Pulses used to be fed extensively to livestock in the UK, which reduced the need to import animal feed. The crop size is now too small to supply feed reliably throughout the year, however, and the reliance on imported feedstock has grown.¹⁰⁴ Beans and pulses consumed in the UK have a low level of GHG emissions (Figure 1), partly because the quantity consumed is so low.³

Water footprint

At an average of 4,055 litre/kilogram, the water footprint of pulses is around four times greater than for fruit (962 litre/kilogram) and 12 times greater than for vegetables (322 litre/kilogram) but 2-4 times smaller than for red meat (beef 15,415 litre/kilogram, sheep 8,763 litre/kilogram).¹⁰⁹ As pulses consumed in the UK are primarily imported, the water footprint associated with their production takes place elsewhere.



1/2 to 3/4
of the UK's pulse crop is
destined to be animal feed

5

Oils and spreads



Summary

Are we eating what is recommended?

- The UK dietary reference values for consumption of all fats is no more than 35% of daily calorie intake. Within this, saturated fats should form no more than 11% and trans fats no more than 2% of daily calories.
- The UK population is currently meeting the total fat and the trans fat dietary targets. However, saturated fat intakes exceed the maximum intake levels in all age groups.
- To support the Daily Reference Values, the Eatwell Guide advises people to choose unsaturated oils (usually from plant sources) and to use them in small amounts.
- The population has reduced the amount of oils and spreads in the diet over the last 10 years, though butter consumption has remained static. Olive oil use appears to have increased dramatically with food supply now 10 times greater than in 1990.

How much does our food cost?

- The price of butter, margarine and cooking oils rose by 42% between 2007 and 2015. Margarines and low-fat spreads are about half the price of butter per kilogram.

Where does our food come from?

- A large variety of cooking oils are available to consumers in the UK (olive oil, sunflower oil, vegetable oil and rapeseed oil among others) while palm oil (a saturated fat) is commonly found in processed foods and is estimated to be present in half of foods in UK supermarkets. Most vegetable oils are imported from Asia and Europe.
- Concern about the link between trans fats and coronary heart disease has led to the reformulation of margarine which has resulted in substantially lowered trans fat content.

How does what we eat affect our health?

- Excess intakes of saturated fat found in products such as butter, palm oil, margarine and processed foods increase the risk of obesity, coronary heart disease and stroke.
- Fats of all types contain more than twice as many calories (9 kcal/gram) as proteins or carbohydrates (4 kcal/gram). Eating too much fatty food greatly increases the likelihood of overweight and obesity, raising the risk of hypertension, type 2 diabetes and some cancers.

How does what we eat affect the environment?

- Margarine and butter have much higher GHG emissions than cooking oils. Butter production is associated with nearly as much GHG as red and processed meat.
- The water footprint of olive oil production (14,431 litre/kilogram) is extremely large in comparison with other fats and oils such as butter (5,553 litre/kilogram) and rapeseed (4,215 litre/kilogram).
- As many vegetable oils consumed in the UK are largely imported, the environmental impact is experienced abroad. Thus, consumers in the UK indirectly contribute to water stress in Spain and the destruction of forests for palm oil production in Asia.

Are we eating what is recommended?

The SACN recommendation for overall consumption of all fats is no more than 35% of daily calorie intake. Within this, saturated fats should form no more than 11% and trans fats no more than 2% of daily calories.¹¹⁰ The UK population is currently meeting the total fat and the trans fat dietary targets. However, saturated fat intakes exceed the target levels in all age groups.⁶⁶ The Eatwell Guide recommendation is to choose unsaturated oils (usually from plant sources) and to use them in small amounts. All age groups in the UK population have reduced the amount of oils and spreads in their diet over the last 10 years.¹⁵ In contrast, butter consumption (saturated fat) has remained stable, though much less butter is consumed than other types of fats and oils. Olive oil in the food supply appears to have dramatically increased from 6,864 tonnes in 1990 to 41,463 tonnes in 2000 and 60,686 tonnes in 2013.¹¹¹

How much does our food cost?

The price of butter, margarine and cooking oils rose by 42% between 2007 and 2015.¹⁷ Margarines and low fat spreads are about half the price of butter per kilogram.^{112,113}

Margarines and low-fat spreads are about half the price of butter per kilogram



Where does our food come from?

A large variety of cooking oils are available to consumers in the UK. These include olive oil, sunflower oil, vegetable oil, corn oil and rapeseed oil among others. Palm oil is used in a large number of products, particularly processed foods, and is estimated to be present in half of foods and non-foods in UK supermarkets.¹⁰ The production of vegetable oils worldwide is projected to increase over the next decade.¹⁹

Most vegetable oils are imported. Asia is the largest producer of fats and oils, responsible for 54% of global production in 2015, mainly due to production of palm oil which surpassed soybean oil in the mid-2000s. Indonesia is the world's largest producer, followed by China, Malaysia and India.¹¹⁴ Countries such as Malaysia and Indonesia are continuing to increase their acreage of palm trees and to replace older palm trees with higher-yielding varieties.¹¹⁴

Olive oil imports to the UK have risen significantly over the last few decades. In 2014 the share of UK imports in the global olive oil market stood at 3.8%, while in 1990 it was just 0.6%.¹¹⁵ Olive oil supplied to the UK comes from Spain, Italy, Germany and Greece. Households now use far more olive oil than previously. Around half of UK households currently use olive oil compared to 31% in 2001.¹¹⁵ Overall household consumption of olive oil is now 10 times greater than in 1990.

Margarine has been around for roughly 150 years and is manufactured by mixing a blend of oils with water and using emulsifiers to facilitate the blending. Until the 1980s margarines contained 10-20% trans fats.¹¹⁶ Since then, however, production methods for margarines and spreads have altered due to concerns about the link between trans fats and the risk of coronary heart disease. This has led to the reformulation of many margarines and spreads to make them much lower and virtually free of trans fats.¹¹⁶

How does what we eat affect our health?

The UK recommendation for overall consumption of all fats is no more than 35% of food calorie intake. Within this, saturated fats should form no more than 11% and trans fats no more than 2% of food calories.¹² Government advice, therefore, is to replace saturated fats (like butter and products containing palm oil) with unsaturated or polyunsaturated fat.¹¹⁷

The average UK population intakes for total fat and trans fat are within the maximum limits recommended by government. However, saturated fat intakes exceed the maximum limits recommended for all age groups.¹⁵

Fats of all types contain more than twice as many calories (9 kcal/gram) as proteins or carbohydrates (4 kcal/gram). Eating too much fatty food greatly increases the likelihood of overweight and obesity, putting up the risk of hypertension (high blood pressure), type 2 diabetes and some cancers.^{117,118}

Excessive intake of saturated fats can raise Low Density Lipid (LDL)-cholesterol levels, increasing the risk of cardiovascular diseases such as coronary heart disease and stroke. Trans fats raise LDL-cholesterol and lower High Density Lipid (HDL)-cholesterol which means they lower protection against disease.¹¹⁹ Evidence suggests trans fats pose a greater risk to cardiovascular health than saturated fats.¹¹⁹ They have no known nutritional benefits, but are used for deep-frying fast foods and increasing shelf-life for pastries, cakes and biscuits.



How does what we eat affect the environment?

GHG emissions

Margarine and butter have much higher GHG emissions than cooking oils. Butter production, in particular, is associated with nearly as much GHG as red and processed meat (see Figure 1).

Water footprint

The water footprint of olive oil production (14,431 litre/kilogram) is extremely large in comparison with other fats and oils such as butter (5,553 litre/kilogram) and rapeseed (4,215 litre/kilogram).²⁵ Spain is the largest producer and exporter of olive oil, and olive orchards have expanded over the last 20 years. Most of these olive orchards are irrigated rather than rainfed. This has led to an increased national water footprint for olive oil production from 9,918 litre/kilogram in 1997 to 13,313 litre/kilogram in 2008.¹²⁰ The water footprint of rainfed orchards is greater than the water footprint of irrigated orchards due to the lower yield of rainfed orchards, however.

As vegetable oils consumed in the UK are largely imported, the environmental impact is experienced abroad. The environmental impacts of palm oil have been described elsewhere, and the government has since committed to minimising these impacts through sustainable imports and sourcing.⁸⁻¹⁰ The large water footprint of olive oil is not felt in the UK, but elsewhere, especially in Spain from where most olive oil is imported. Most of the Spanish exports originate in the Southern and Southeast regions, which include the most water-stressed basins. Thus, consumption of olive oil by people in the UK is contributing to water stress in Spain.²⁷

50%
of UK households currently
use olive oil compared to
31% in 2001 – contributing
to water stress in Spain

6

Foods high in fat, salt and sugar



Summary

Are we eating what is recommended?

- Current intakes of sugar in the population are two to three times higher than the maximum recommended limits of 5% energy intake; all age groups exceed the maximum saturated fat intake target; and salt intakes are similarly in excess of the maximum limit.
- Half of all the food and drink consumed in the UK is “ultra-processed”, compared to a European average of 33%. These value-added products exist across all food and drink categories and are of concern because their unhealthy levels of added sugar, salt, and fats contribute to our excess intakes of these nutrients.
- The Eatwell Guide includes a separate category of foods high in fat, salt and sugars (HFSS) with products such as chocolate, cakes, biscuits, full-sugar soft drinks, butter and ice-cream. It stipulates that these unhealthy foods are not needed in the diet, and if eaten at all they should be consumed infrequently and in small amounts.
- This chapter includes an analysis of the contribution of seven unhealthy HFSS products identified in the Eatwell Guide to the population’s excessive intakes of sugar, saturated fat and salt.
- Around a third of sugar in the diet of 11-18 year olds comes from soft drinks alone. Adults and the elderly are also drinking more soft drinks than 10 years previously.
- Six HFSS products (biscuits; buns, cakes, pastries and fruit pies; butter; chocolate confectionery; ice-cream and savoury snacks) contribute 25% of the total saturated intake of children aged 11-18 years, while savoury snacks alone contribute 4% of total salt intake.

How much does our food cost?

- While on average UK food prices rose between 2002 and 2012, HFSS products were consistently lower in price in comparison with most other food groups.
- The absolute difference in price between more healthy foods (e.g. fish, mushrooms) and less healthy foods (e.g. crisps, chocolates) has widened over time. In 2012, more healthy foods were approximately three times more expensive than less healthy foods.

Where does our food come from?

- The EU sugar market is expected to grow by an estimated 15% over the next decade. This is a result of reforms to the CAP sugar regime prompted by falls in the price of EU sugar, and increases in production of sugar beet and high fructose corn syrup.
- The largest food and drink manufacture sectors by product type are beverages (worth £6.1 billion) and bakery (worth £3.6 billion).
- Soft drinks are among the UK’s top 10 food and drink exports.

How does what we eat affect our health?

- The UK population is eating too much sugar. Consuming too many sugary foods can lead to weight gain, which in turn increases the risk of heart disease, type 2 diabetes, stroke, dementia and some cancers. It is also linked to tooth decay.
- Obesity is a significant problem. Treating obesity and its consequences alone currently costs the NHS £5.1 billion every year. A reduction in sugar intake could save the NHS around £500 million every year.
- High intakes of saturated fat lead to increased risk of coronary heart disease, stroke and cardiovascular disease. Salt raises blood pressure (hypertension), which causes cardiovascular disease and dementia.

How does what we eat affect the environment?

- GHG emissions of commonly consumed HFSS products such as biscuits, cakes and pastries, savoury snacks and soft drinks are low compared to other foods.
- Owing to the high levels of consumption in the population, soft drinks are associated with some of the highest GHG emissions of all foods consumed in the UK.
- Sugar has a particularly small environmental water footprint compared to other less healthy raw ingredients. Its water footprint is around one-third that of butter and half that of palm oil.
- Chocolate stands out as having one of the largest water footprints of any product. On average, a milk chocolate bar weighing 100 grams will use 1,700 litres of water compared to 174 litres per 100 grams of pizza, and 79 litres per 100 grams of bananas.

Methods

A set of seven foods have been selected for the section on unhealthy HFSS products. These products are commonly eaten by people in the UK and are included in the HFSS category in the Eatwell Guide. In addition, data are available through the NDNS. The products are:

1. Biscuits
2. Buns, cakes, pastries and fruit pies
3. Chocolate confectionery
4. Ice-cream
5. Savoury snacks
6. Soft drinks, not low calorie
7. Sugar confectionery

Are we eating what is recommended?

Half of all the food and drink consumed in the UK is “ultra-processed”, compared to a European average of 33%. These ultra-processed foods are “industrial formulations manufactured almost entirely from sugar, salt, fats and oils, starches and many substances derived from foods but not normally used in kitchens, and additives used to imitate the sensory qualities of natural foods or disguise undesirable qualities of the final product”.¹²¹ In contrast to minimally processed food such as pasteurised milk and dried pasta, ultra-processed foods are highly profitable due to their value-added attributes. These include being designed to be durable, accessible, convenient, hyper-palatable, and ready-to-eat or heat.¹²¹

Ultra-processed foods are found across all the food groups and include soft drinks; sweet or savoury packaged snacks; meat pies, hot dogs, coated chicken and fish products; ‘instant’ noodles and ready meals; and ‘fruit’ yoghurts and milk drinks.¹²¹ In recognition of the increasingly processed nature of our overall diets, the Eatwell Guide recommends that people use food labels to choose food and drink options with lower levels of saturated fat, salt and/or sugar.¹

The Eatwell Guide also includes a separate category of foods high in fat, salt and/or sugar (HFSS food) which it describes as products that are not needed in the core diet such as “chocolate, cakes, biscuits, full-sugar soft drinks, butter and ice-cream.”¹ These unhealthy foods are not included in the central part of the guide that shows the proportions of the main food groups that form a healthy, balanced diet. The recommendation is that if HFSS foods are eaten at all, they should be consumed infrequently and in small amounts.

Despite this advice, the UK population is consuming considerable quantities of unhealthy HFSS foods, and the percentage of sugar, fat and salt contributed by seven HFSS products alone is excessive. Children are particularly high consumers. On average, a child aged between four and 10 years consumes 208 gram/day of seven HFSS products; this is down from 336 gram/day in 2001. The equivalent amount of the seven HFSS products for teenagers (11-18 years) is 335 gram/day, down from 389 grams in 2001. For adults (19-64 years) the consumption of the seven HFSS foods has risen to 190 gram/day from 172 grams in 2001.^{46,16}

Between 2007 and 2015, low income households increased their purchases of unhealthy HFSS foods more than any other food groups. Over this period, these households increased their purchases of cakes and pastries (6%), confectionery (4%) and processed meat products (1.5%), while significantly reducing consumption of healthier foods such as fish (-18%) during this period.¹⁷ Adults and the elderly in the general population have also increased their consumption of high calorie soft drinks during the same period.^{16,46}

Sugar

HFSS products contain a lot of sugar. As Figure 17 illustrates, six HFSS products contribute 58% of the total sugar intake of children aged from 11-18 years in the UK. A third is attributable to drinking high calorie soft drinks. This is equivalent to five and a half cans of soft drinks per week. The picture is similar for other age groups with adults and people of 65 years and over drinking more soft drinks than the previous decade.

Overall, there is a trend among UK consumers to shift towards lower calorie drinks. This is exemplified by consumption of bottled water, which has increased from just under 2,000 million litres in 2010 to more than 2,500 million litres in 2015.¹²²

Saturated fat

A similar pattern emerges for saturated fat intake. Five HFSS products contribute nearly one quarter (22%) of the total saturated fat intake of children aged from 11-18 years (see Figure 18). If other HFSS foods are included (e.g. butter, pizza, fried chicken, burgers, kebabs and sausages), the contribution rises to nearly half (49%).

Salt

Salt intake comes from a broad range of foods in the UK diet with pasta, rice, pizza and white bread making up 23% of the total intake among 11-18 year olds.¹⁵ Nevertheless, HFSS products contain disproportionate amounts of salt. For example, savoury snacks contribute 4% of total salt intake alone while burgers, kebabs, sausages, meat pies and pastries contribute a further 8%.

How much does our food cost?

A UK study of 94 food and drinks analysed price changes between 2002 and 2012. While on average food prices rose during this period, HFSS products were consistently lower in price in comparison with all other food groups with the exception of starchy foods (bread, rice, potatoes, pasta etc.).¹²³ The study applied the Food Standards Agency's nutrient profile to classify foods as 'more healthy' (e.g. grapefruit, mushrooms, yoghurt, fish) and 'less healthy' (e.g. crisps, ice-cream, chocolates, sausages). It found the absolute difference in price between the nutrient profile categories widened over time. By 2012, more healthy foods were approximately three times more expensive than less healthy foods. The mean price was £2.50 for less healthy items and £7.49 for more healthy items.¹²³

Half

of all the food and
drink consumed in the
UK is ultra-processed

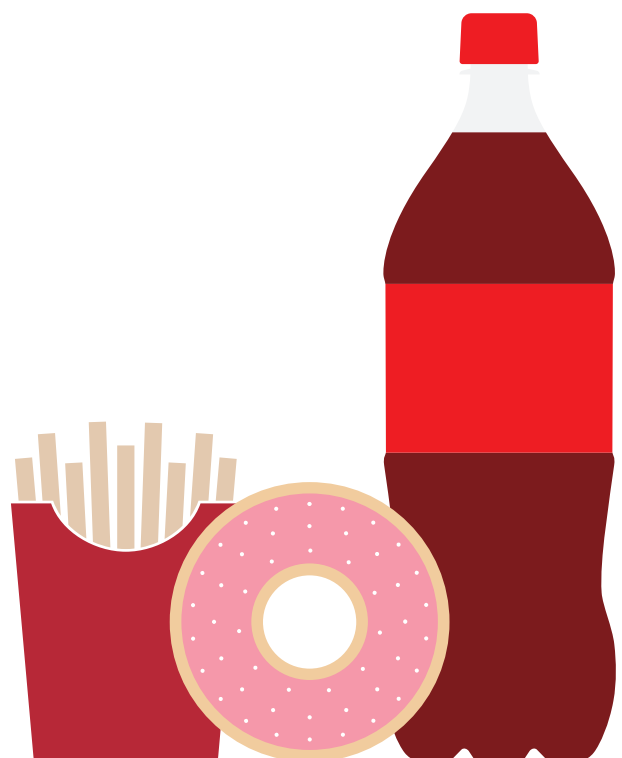


Figure 17
Contribution (%)
of HFSS and other
foods to sugar
intake of 11-18 year
olds in the UK

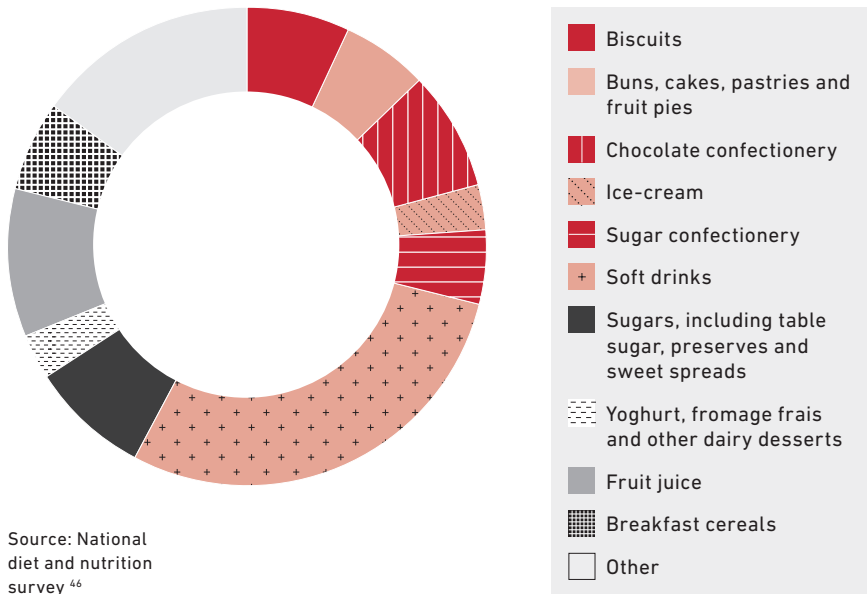


Figure 18
Contribution (%)
of HFSS and other
foods to saturated
fat intake of 11-18
year olds in the UK

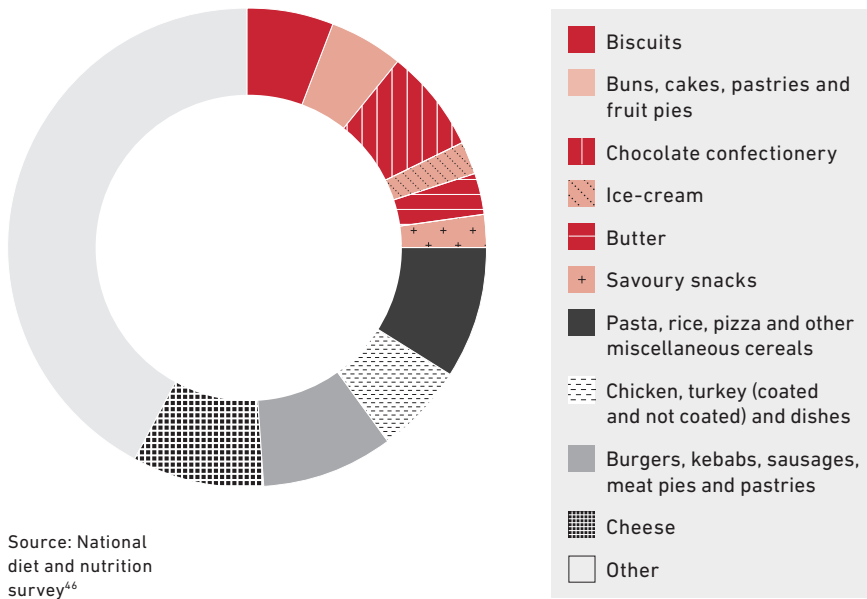


Figure 19
Contribution (%)
of HFSS and other
foods to sodium
intake of 11-18 year
olds in the UK

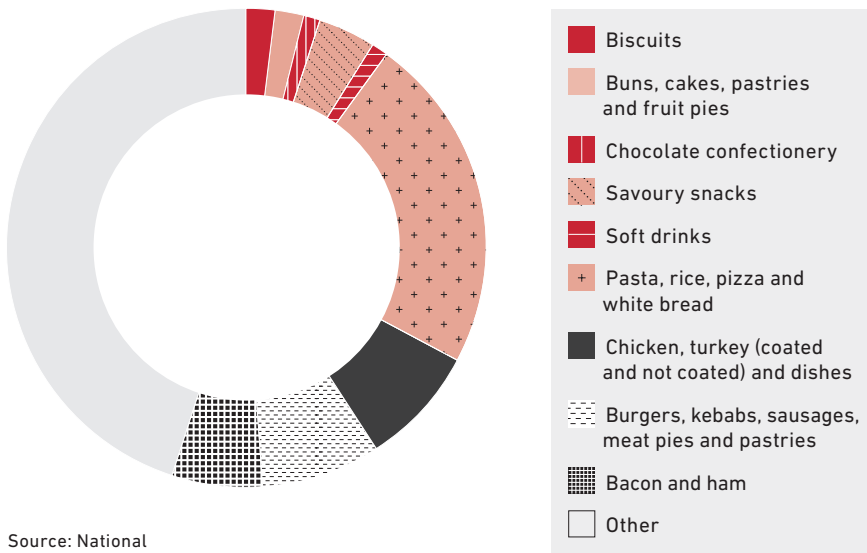
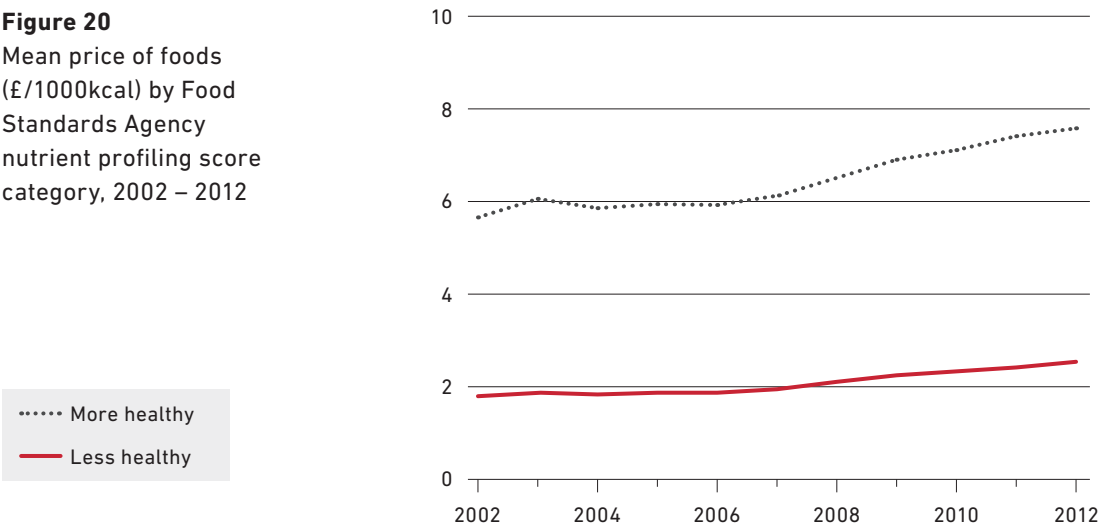


Figure 20
Mean price of foods
(£/1000kcal) by Food
Standards Agency
nutrient profiling score
category, 2002 – 2012



Where does our food come from?

Sugar production

Sugar is a key ingredient in the manufacture of HFSS foods. The UK uses around 2,318 tonnes of sugar each year. Just over 50% (1,200 tonnes) of this sugar is produced from domestically-grown sugar beet, and refined by British Sugar.¹²⁴ The remaining 1,117 tonnes is imported as sugar cane, and processed by Tate & Lyle. Until recently, sugar production in the UK has been controlled by the Common Agriculture Policy (CAP) sugar regime. This regime was originally designed to protect EU sugar producers through a combination of import tariffs, minimum price guarantees, production quotas, and export subsidies.¹²⁵ However, the sugar regime has undergone a series of reforms to liberalise the sector, with an end to production quotas in 2017. Collectively, these reforms are expected to grow the EU sugar market by an estimated 15% over the next decade¹²⁵ as a result of:

- Substantial drops in the EU commodity price of sugar (these were kept significantly above world market rates under the old sugar regime);¹²⁵
- Increased production of sugar beet following the abolishment of quotas (UK yields have already increased by 25% in the last decade);^{126,125} and
- Trebling of high fructose corn syrup production once the old regime cap, which previously limited it to about 5% of all EU sugar production, is removed.¹²⁵

A further potential growth driver for the UK's sugar market could arise from Brexit if the UK abolishes the existing EU import tariffs associated with the CAP.¹²⁴

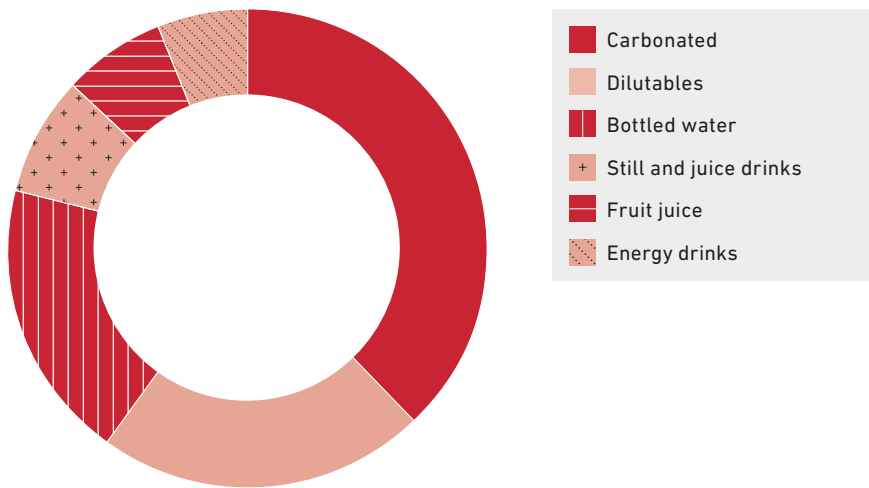
HFSS products

HFSS products are produced by the UK's food and drink manufacture sector, which contributes about one-quarter (£27 billion) of the agri-food sector Gross Value Added (GVA). Food and drink manufacture comprises around 9,000 enterprises employing 411,000 people across the UK. The largest food and drink manufacture sectors by product type are beverages (worth £6.1 billion) and bakery (worth £3.6 billion).¹⁷ The production of soft drinks, as an example of a commonly manufactured HFSS product in the UK, is examined in more detail.

Beverages (including alcohol, soft drinks and water) is the largest manufacturing group, accounting for 30% of food and drink manufacture GVA.¹⁷ The majority of beverage manufacture in the UK (4.8 billion out of a total of 6.3 billion GVA) is attributable to alcohol.¹⁷ Nevertheless, soft drink manufacture is an important part of the UK economy. In 2015, a total of 13,253 million litres of soft drinks were produced in the UK¹²² and soft drinks are among the UK's top 10 food and drink exports.¹²⁷

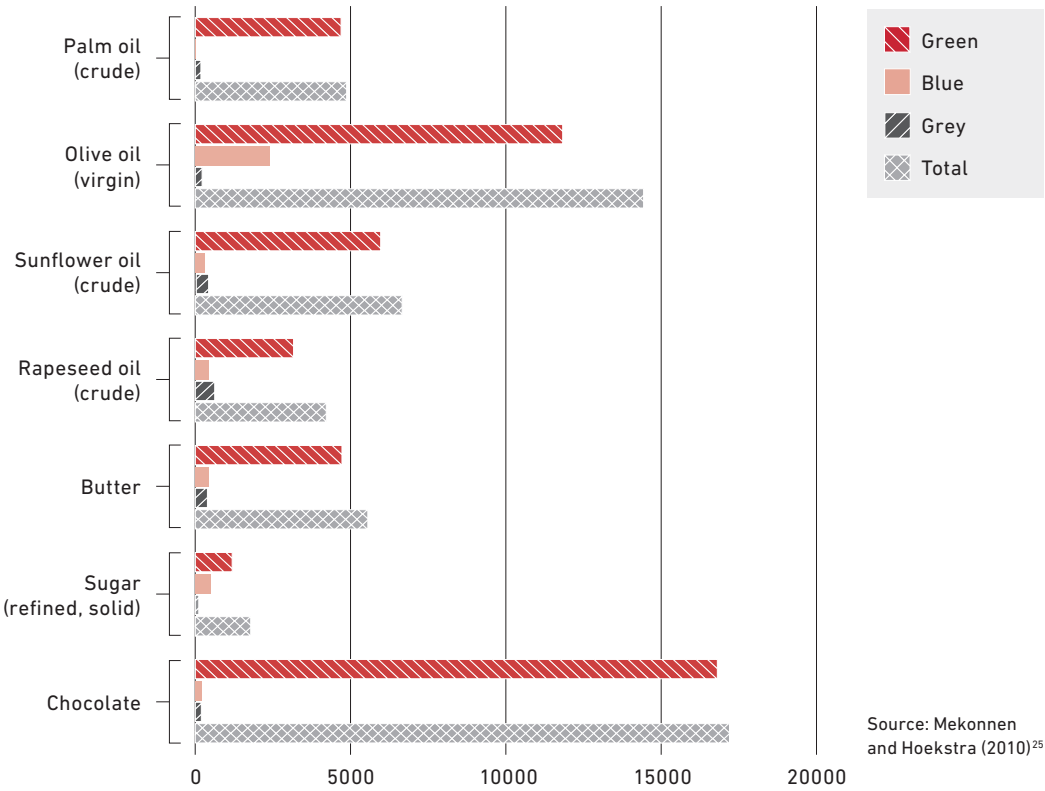
As Figure 21 illustrates, carbonated drinks are the most common form of soft drink produced, followed by dilutables and bottled water. The British Soft Drinks Association claims that there has been an overall 16% reduction in sugar intake through soft drink consumption since 2012. They further report that 58% of all soft drinks sold in the UK are now no- or low-calorie (0-20 kcal/100 millilitre).¹²²

Figure 21
Types (%) of soft
drinks manufactured
in the UK, 2016



Source: British Soft
Drinks Association¹²²

Figure 22
Global water
footprint
(litre/kg) of
fat and sugar
ingredients
used in food
manufacture,
1996 – 2005



Source: Mekonnen
and Hoekstra (2010)²⁵

How does what we eat affect our health?

The fact that over 50% of the food and drink we eat is ultra-processed is of concern, because the availability and consumption of these foods is associated with obesity. A recent study of 19 European countries by Monteiro et al calculated that each percentage increase in the household availability of ultra-processed foods at the national level was associated with a 0.25 percentage increase in the prevalence of obesity.¹²¹

Sugar

People across the UK are eating too much sugar, which negatively impacts on health. SACN recommended that the population average intake of free sugars should not exceed 5% of total dietary energy.¹³ Just 5% of children aged 11-18, and 13% of adults over 19 meet this target. Current intakes of sugar are nearly three times higher than the 5% maximum recommended level in school-aged children and teenagers (13.5% to 14.2% of energy intake) and around twice the maximum recommended level in adults (11.7% of energy intake).²⁸ High sugar intake is associated with deprivation. The NDNS found higher sugar intakes in adults in the lowest income group compared to all other income groups.¹⁵ Consumption of sugary soft drinks was also found to be higher among adults and teenagers in the lowest income group.

Consuming too many foods and drinks high in sugar can lead to weight gain,²⁹ which in turn increases the risk of heart disease, type 2 diabetes, stroke, dementia and some cancers. It is also linked to tooth decay.^{29,128,129} The UK has some of the highest levels of overweight and obesity in Europe. For example, in England, 68% of men, 58% of women and one-third of children aged five to 11 are overweight or obese.¹³⁰ Treating obesity and its consequences alone currently costs the NHS £5.1 billion every year.¹³¹ Children living in the most deprived areas are twice as likely to be obese than those in the least deprived areas.¹³⁰ Deprived groups also experience a higher prevalence of tooth decay and associated health consequences.¹³¹

The SACN report also recommended that consumption of sugar sweetened drinks should be minimised by both adults and children. Meeting these recommendations within 10 years would not only improve an individual's quality of life but could save the NHS, based on a conservative assessment, around £500 million every year.¹³¹

Saturated fat

Current recommendations on consumption of saturated fat are based on the Committee on Medical Aspects of Food report, which recommended that the intake of saturated fat should be reduced to less than 11% of food energy and that total fat intake should be 35% of food energy.¹² Currently, the average intake of saturated fat exceeds this recommendation in all age and sex groups. For example, mean saturated fat intake for adults aged 19-64 years was 12.6% of food energy.¹⁵ Higher intakes of saturated fat lead to increased risk of cardiovascular diseases such as coronary heart disease and stroke.¹²⁸

Salt

In 2003, the Scientific Advisory Committee on Nutrition (SACN) recommended that salt intakes should not exceed 6 gram/day for adults.¹⁴ SACN also set proportionally lower recommended intakes for children. NDNS data show that average salt intake exceeds these maximum limits. For all age and sex groups, except for girls aged seven to 10 years, mean salt intake was higher than the recommended maximum intake.¹⁵

Salt raises blood pressure. Raised blood pressure (hypertension) is the major factor in cardiovascular diseases such as strokes, heart failure and heart attacks, the leading causes of death and disability in the UK.^{14,128,129} There is also evidence of a link between raised blood pressure and vascular dementia.^{132,129}

£5.1bn
is spent by the NHS
every year treating
obesity and its
consequences

How does what we eat affect the environment?

GHG emissions

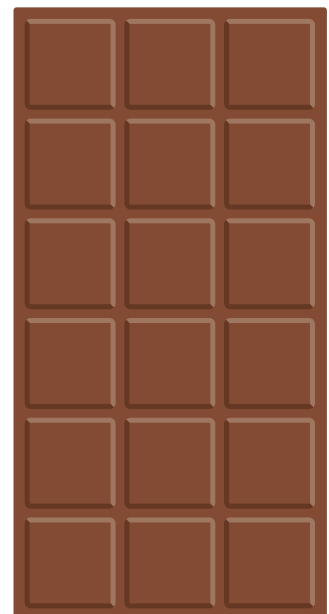
The food manufacturing sector, which produces HFSS foods, is the second biggest emitter of GHGs within the UK's food and agriculture sector, accounting for 8 tonnes CO₂e/year. Farming and fishing is the largest contributor, estimated at 56 tonnes CO₂e/year, with the fertiliser and catering sectors in joint third place at 3 tonnes CO₂e/year each.¹⁷ Food and drink manufacturing emissions have been on a downward trend since 1999.¹⁷

The GHG emissions of raw ingredients for HFSS foods such as sugar and plant-based fats are relatively low, compared to other primary crops.³ As a consequence, GHG emissions of commonly consumed HFSS products such as biscuits, cakes and pastries, savoury snacks and soft drinks are similarly low compared to other foods (see Figure 1).³ However, whilst the emissions associated with soft drinks are low, after per capita per year consumption levels are taken into consideration in the UK (158 CO₂e), soft drinks are associated with some of the highest GHG emission rate of all foods (Figure 2). This is because of the high and rising consumption levels of soft drinks in the UK. Around half of these GHGs will be emitted in developing countries from Africa, the Caribbean and Pacific from where around 50% of UK sugar is currently imported.

Water footprint

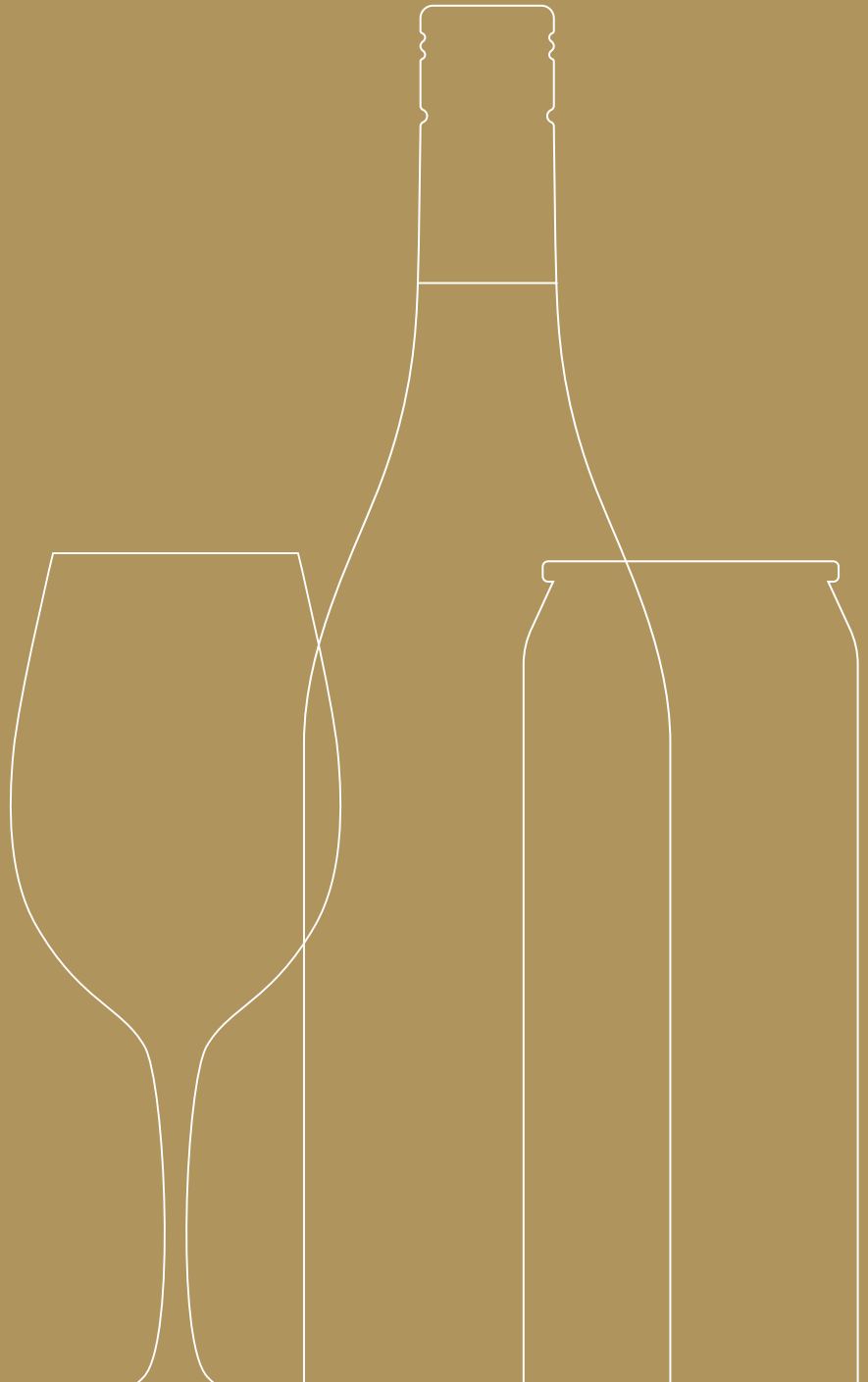
The water footprint of some of the common ingredients found in HFSS products is shown in Figure 22. As a raw ingredient, refined sugar has a particularly small environmental water footprint. Chocolate stands out as having one of the largest water footprints as a manufactured ingredient. On average, a milk chocolate bar weighing 100 grams will use 1,700 litres of water compared to 174 litre/100 gram of pizza, and 79 litre/100 gram of bananas.^{25,109} The impact of the water footprint depends on where the water is taken from and when, and will be more significant for crops grown in water-scarce regions.²²

1,700
litres of water is used
to make a single 100g
chocolate bar



7

Alcohol



Summary

Are we drinking within the government guidelines?

- The Eatwell Guide and recent Chief Medical Officers' (CMO) drinking guidelines advise that alcohol is very high in calorie content, and should be limited to no more than 14 units per week for men and women.
- 31% of men and 16% of women exceed the low risk drinking guidelines.
- Around 85% of the adult population in the UK consumes alcohol. Alcohol consumption among adults in the UK has increased by almost 50% in the last three decades, with a concomitant threefold rise in alcohol-related deaths.

How much does alcohol cost?

- Alcohol has become increasingly affordable. The price of alcohol increased by 24% between 2007 and 2015, which is lower than for healthier products such as fruit (31%) or fish (35%).
- About a quarter of UK household food and drink expenditure is now on alcohol.
- In 2016, the UK Government froze duty rates on beer, spirits and cider and as a result these drinks have become more affordable.

Where does the alcohol we drink come from?

- The majority of wine consumed in the UK is imported from elsewhere. Among the top countries of origin are Australia, the USA, France, Italy and Spain.
- Most beer consumed in the UK is produced domestically and supplemented by imports from Europe.
- The manufacture of alcohol contributes £4.8 billion to the UK economy, which represents 24% of total food and drink manufacture.

How does the alcohol we drink affect our health?

- The CMOs' guidelines acknowledge that there is no level of drinking that can be considered 'safe' in relation to the risk of cancer.
- In 2014/15, there were 333,000 estimated admissions in England where an alcohol-related disease, injury or condition was the primary diagnosis or there was an alcohol-related external cause. This was 32% higher than in 2004/05.
- Nearly half of alcohol admissions were for cardiovascular disease, 19% were for mental and behavioural disorders and the remainder were for other conditions such as alcoholic liver disease, cancer and injuries.
- Figures for 2014 put the annual cost of alcohol at £21 billion – more than 1% of GDP. Of this, £3.5 billion was a direct burden on the NHS.

How does the alcohol we drink affect the environment?

- GHG emissions for alcohol are high. One study estimated that consumption of alcohol in the UK accounted for 1.5% of the UK's total greenhouse gas emissions.
- Alcohol has a relatively average water footprint compared to other foods. Each 125 millilitre glass of wine, for example, has an average global water footprint of 109 litres, while a 250 millilitre glass of beer uses 74 litres of water.

Are we drinking within the guidelines?

The consumption of alcohol by adults in the UK is causing harm. Guidance on low-risk drinking was revised by the UK Chief Medical Officers in 2016.¹¹ The new guidelines urge regular drinkers (both men and women) to consume no more than 14 units per week; to limit the total amount of alcohol drunk on any occasion; and for women to avoid drinking altogether just before and during pregnancy. The guidelines also advise that there are no safe drinking levels for reducing cancer risk.¹¹

Around 83% of the adult population in the UK consumes alcohol.¹³³ Of this number, 31% of men and 16% of women drink in excess of 14 units of alcohol per week.¹³³

Alcohol consumption among adults in the UK has increased by almost 50% in the last three decades, with a concomitant threefold rise in alcohol-related deaths.^{134,135} Total adult consumption per head peaked in 2004 at 9.7 litres, falling to 7.4 litres in 2015.¹³⁶ The same trend is observed in underage drinking. Around two-fifths (38%) of English 11-15 year olds have tried alcohol,¹³⁷ while in Scotland, the figure is 32% for 13 year olds and 70% for 15 year olds.¹³⁸ In both countries, however, there is evidence that rates are falling, having peaked around 2002 – 2003.¹³⁸

How much does alcohol cost?

The price of alcohol increased by 24% between 2007 and 2015. This is lower than average food and drink price increases (27%) and much lower than for some healthier products such as fruit (31% price rise) or fish (35% price rise).¹⁷ Households in the UK now spend about a quarter of their household food and drink expenditure on alcohol.¹⁷

The price of alcohol is largely influenced by two types of tax: Value Added Tax (VAT) and Excise Duty. VAT is currently charged at 20%.¹³⁹ Excise Duty is a tax payable once alcohol is released for consumption onto the UK market. The rate varies and is based on alcohol content (beer, spirits) or volume (wine, cider).¹⁴⁰

In 2008, a duty escalator was introduced by the UK Government under which rates were subject to an annual increase of 2% above the rate of inflation. This was subsequently reversed in the 2016 Budget, when it was announced that duty rates on beer, spirits and cider would be frozen with a small increase in the duty on wine.¹⁴¹ The policy objective was to help “pubs, which are important community assets that encourage responsible alcohol consumption.”¹⁴¹ The expectation of the Government was that as a result of the Excise Duty changes, alcohol consumption would rise by 2018/19 by 1.8% for beer, 1.4% for spirits and 1.1% for cider.¹⁴²

Cheap alcohol is widely available throughout the UK as retailers frequently discount and promote alcoholic products. Alcohol from supermarkets and off-licences is now 188% more affordable than 20 years ago, while the affordability of wine and spirits has gone up by 131%.¹⁴³ This encourages the excessive consumption of alcohol.¹⁴⁴

Where does the alcohol we drink come from?

Beverages are the largest food and drink manufacturing group with a Gross Value Added (GVA) of £6.3 billion in 2013.¹⁷ Alcoholic beverages contributed £4.8 billion to the GVA, which represents 24% of total food and drink manufacture.¹⁴⁵ Alcohol products also dominate the UK's top 10 food and drink exports: whisky (first), beer (third), wine (sixth), and gin (seventh). Notable export growth in recent years has been driven by emerging markets such as Brazil, Russia and China.^{127,146}

The majority of still wine consumed in the UK is imported from elsewhere; the top three countries of origin are Australia, the USA and France. Sparkling wine consumption is led by wines imported from Italy, France and Spain.¹⁴⁵

The UK is the second largest beer producing nation in the EU after Germany, and has the highest number of breweries.¹⁵⁶ In 2016 the UK produced 43.7 million litres of beer and imported a further 10.6 million litres (primarily from the EU and Mexico). Around 5.9 million litres were exported, of which two thirds went to the EU.

Threefold increase in alcohol-related deaths since the 1980s

How does alcohol affect our health?

Alcohol kills thousands of people every year. In 2015, there were around 9,000 alcohol-related deaths registered in the UK.¹⁴⁷ Alcohol-related death rates in the UK have not changed much in recent years and the rate in 2015 (14.2 people/100,000) remains higher than that observed in 1994 (9.1 people/100,000).¹⁴⁷ Alcohol-related death rates for women were significantly higher in 2015 than 1994. The majority of alcohol-related deaths in the UK were among males in the 55-64 years age group from Scotland and the North of England.

Alcohol can affect health in a variety of ways, and alcohol-related hospital admissions are increasing.¹⁴⁸ In 2014/15, there were 333,000 estimated admissions in England where an alcohol-related disease, injury or condition was the primary diagnosis or there was an alcohol-related external cause. This was 32% higher than in 2004/05.¹⁴⁸ Over half the admissions were men (65%) who were most likely to be in the 55-74 years age group. Nearly half the admissions were for cardiovascular disease, 19% were for mental and behavioural disorders and the remainder were for alcoholic liver disease, cancer, diseases of the nervous system, unintentional and intentional injuries, toxic effect of alcohol, digestive diseases, respiratory infections, and pregnancy and childbirth.¹⁴⁸

Alcohol can have a particularly detrimental effect on the unborn child. A range of lifelong conditions, known under the umbrella term of Foetal Alcohol Spectrum Disorders, can occur due to drinking alcohol during pregnancy. The risks of low birth weight, preterm birth, and being small for gestational age may all increase in mothers drinking above 1-2 units/day during pregnancy.¹¹

Alcohol contains sugar and accounts for around 10% of the adult UK population's daily intake of sugar.¹⁵ High consumption of sugar is associated with obesity and a range of other non-communicable diseases including diabetes (see chapter 6).

Among the wider harms to society, alcohol misuse is linked to domestic violence, child abuse, family breakdown, crime and disorders, unemployment and losses in workforce productivity.¹⁵⁷

Figures for 2014 put the annual cost of alcohol at £21 billion, which is more than 1% of GDP. Of this, £3.5 billion was a direct burden on the NHS.^{134,135}

How does the alcohol we drink affect the environment?

GHG emissions

GHG emissions of alcohol based on consumption are extremely high (see Figure 2). One study estimated that consumption of alcohol in the UK accounts for 1.5% of the UK's total greenhouse gas emissions.¹⁴⁹ Consumption stage emissions (e.g. refrigeration at home or in pubs and restaurants) are responsible for about 38% of the total, while transport contributes a further 26% and packaging accounts for 13%.

Water footprint

Alcohol has a relatively average water footprint compared to other foods (see Figure 3). The impact of the water footprint depends on where the water is taken from and when. For example, a 125 millilitre glass of wine has an average global water footprint of 109 litres; this ranges from 90 litre/glass for wine from France to 195 litre/glass for wine from Spain. Beer production is associated with a smaller water footprint than wine: a 250 millilitre glass of beer (from barley) uses 74 litres of water.^{150,151} If water used in a product comes from a place where water is already scarce, the consequences can be significant.²²



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