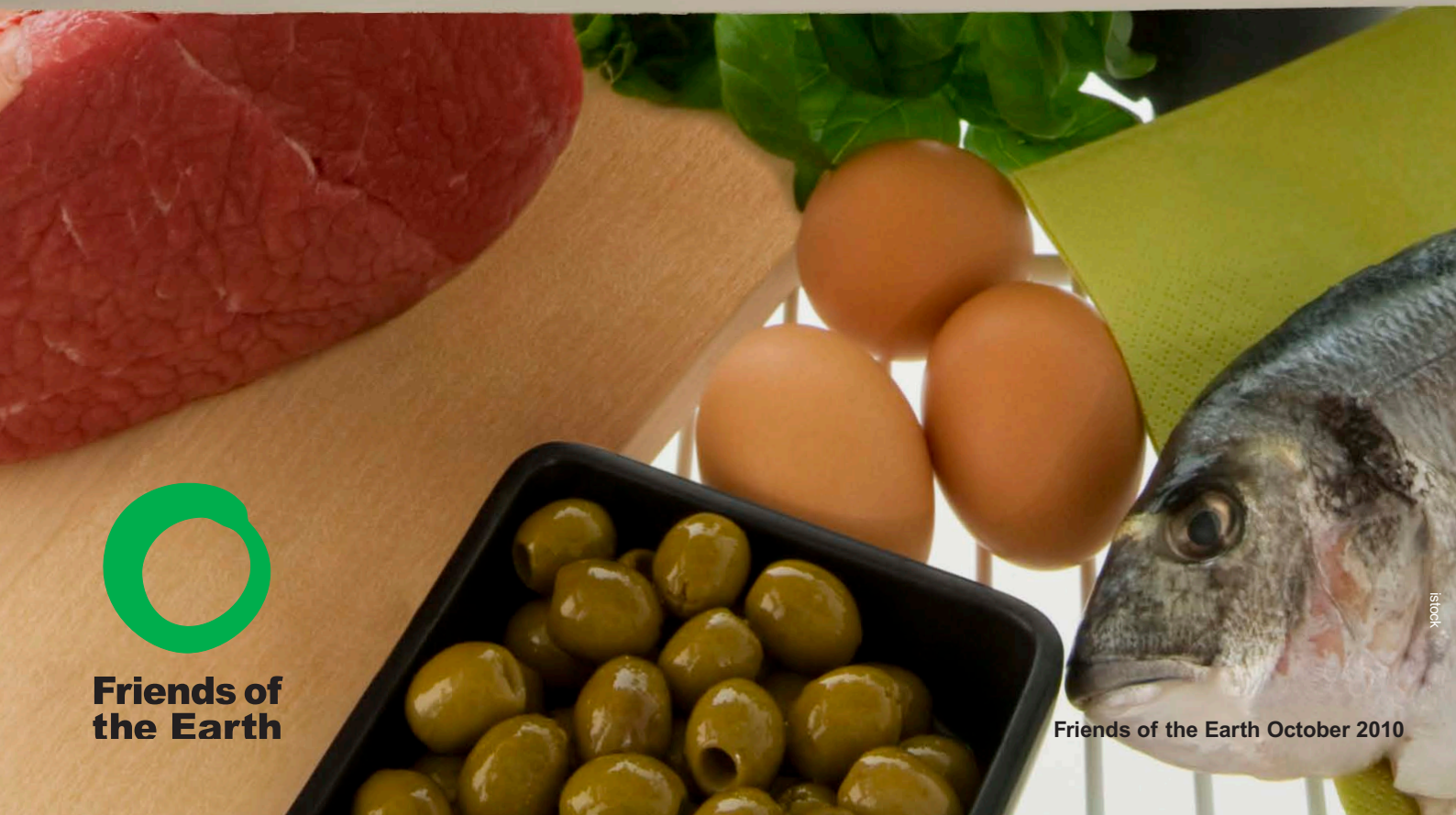
Healthy planet eating

How lower meat diets can save lives and the planet



Friends of the Earth

Friends of the Earth October 2010

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About this research

Having investigated the environmental implications of a range of dietary options in 2009's *Eating the planet?* report, Friends of the Earth commissioned Oxford University's British Heart Foundation Health Promotion Research Group to analyse their likely impact on:

- specific health conditions
- mortality figures
- NHS expenditure

The meat and dairy content of the diets investigated ranged from the high meat diets most common in western countries to a lower level of meat and dairy consumption that could be produced without eating into the planet's natural resources, while allowing consumption growth to sustainable levels in developing countries.

This report summarises the key findings of this analysis and presents a comprehensive literature review of existing studies on the health and environmental impact of meat consumption.

It concludes with a series of recommendations for healthy and sustainable diets and the policy shifts needed to drive changes.

Friends of the Earth October 2010

ACKNOWLEDGEMENTS

Research by Patricia Thomas. Modeling by Mike Rayner, Dushy Clarke and Pete Scarborough, British Heart Foundation Health Promotion Research Group, Department of Public Health, University of Oxford.

The key findings of this report are based on research by Oxford University: *Modelling the impacts of the Fair Less Meat diet.* This research, including the modelling and methodology, is available at www.publichealth.ox.ac.uk/bhfhprg/publicationsandreports

EXECUTIVE SUMMARY

We are producing and consuming increasing quantities of meat and dairy. This is taking its toll on the planet and on our health – and very little is being done to tackle it.

The livestock industry is one of the most significant causes of global environmental damage – generating a fifth of the world's greenhouse gas emissions. The UK's reliance on imported protein crops is also driving deforestation in South America. This is having a devastating impact on the people who've lived on the land for centuries.

Friends of the Earth and Compassion in World Farming's 2009 research *Eating the Planet?* showed that a move to lower-meat diets in the West would help protect natural resources and enable us to move away from factory farms and damaging intensive crop production.[1] It would also allow for fair global food distribution and nutritious diets for people in developing countries.

This new research reveals how this diet could deliver a fairer deal for people, animals and the planet and analyses its likely impact on the health of people in the UK. It also reviews existing evidence on the relationship between meat and dairy consumption and health. It outlines the action needed to transform the UK's food and farming sector into one that would work for people and the planet.

Key findings

Over the last 50 years the quantity of meat produced around the world has quadrupled while the global population has doubled.

We could prevent 45,000 early deaths and save the NHS £1.2 billion each year if we switched to diets that contain less meat in the UK.

Lower-meat diets could cut deaths from heart disease by 31,000, deaths from cancer by 9,000 and deaths from strokes by 5,000 each year.

There is clear evidence of a link between high meat diets and a higher incidence of bowel cancer and heart disease with some evidence of a link between high meat diets and other cancers, diabetes and obesity.

Processed meat is more damaging to health than unprocessed meats.

Grass-fed beef has nutritional advantages over grain-fed options.

The nutritional value of some meat has decreased as a result of modern farming methods. A standard supermarket chicken now contains significantly less protein and more than twice as much fat as in 1970.

Key recommendations

There is an undeniable need for widespread adoption of healthier and more sustainable diets and **more research is urgently needed** to identify the best mechanisms for change.

Existing healthy eating and environmental behaviour guidelines should be modified to include the benefits of eating less meat.

Clear standards should be introduced to ensure that meals paid for by taxpayers in schools, hospitals and care homes reflect environmental and health factors and reduce reliance on meat and dairy in menus.

The Government should **shift support from factory farming to the production of better-quality meat** and a healthier overall food production balance.

Grass-fed meat and dairy products are healthier and more planet-friendly than factory farmed options. They should be clearly labelled for consumers. This would help people make more informed food choices and stimulate the market for these products.

Friends of the Earth is calling on the Government to implement these changes within the framework of a **Sustainable Livestock Strategy.**

INTRODUCTION

Meat and dairy products form the centrepiece of most meals in the UK. Factory-style production and heavy subsidies have made them plentiful and cheap in Europe and America.

Our increasing consumption – of meat in particular – is prompting concern over the impacts on people's health and on the environment. But calls for changes to diets and farming methods have tended to produce a polarised and often ill-informed debate.

This report aims to throw fresh light on the stalemate. It does so by presenting evidence on the health benefits of switching to lower-meat diets.

A cultural challenge

There is little doubt about the science. In the West we eat far more meat than is necessary or healthy. Health experts say this is contributing to rising levels of chronic diseases such as coronary heart disease, cancers and strokes.

Such findings have led to calls for nutritional advice to be revised to encourage a reduction in total meat intake and discourage meat and dairy that is high in fat – particularly saturated fat – and salt. Instead, small amounts of better-quality fresh lean meat would be recommended.[2]

Yet such thinking is not reflected in any UK Government guidelines or advice on healthy eating. Changing our concept of an average healthy diet is proving a challenge.

In the UK there tends to be an all-or-nothing approach to meat eating, with little recognition or understanding of the concept of a low-meat diet. It's telling that, while people who eat no meat are identified and identifiable – as vegetarians – there is no commonly accepted term for people who eat meat only a few times a week.

Attempts to raise awareness of the benefits of lower-meat diets and to change diets have proved controversial. In the media the issue has been over-simplified and distorted.

For example, in October 2009 climate change expert Lord Stern observed that the environmental impact of a meat diet was higher than that of a vegetarian diet. His comment was interpreted in reports as "people will need to turn vegetarian if the world is to conquer climate change".[3]

Similarly, in January 2009 a plan to reduce the amount of meat served in hospitals to healthier and more sustainable levels was included in an NHS carbon reduction strategy.[4] The proposal focussed on reducing meat, rather than cutting it out entirely, and sourcing local produce, but was reported as a "removal" and a "ban" on meat and was criticised in the media.[5] The plan was subsequently scrapped.

Ironically, we are more prepared than ever to throw meat away[6]. Historically regarded as an indicator of affluence and, for many, a treat, meat is now artificially cheap and plentiful. The growing quantities wasted suggest that, along with other food groups, meat has become a throwaway commodity.

So our attitudes towards meat are complex. What is clear is the damage that increasing consumption is doing to the environment and people.

Environmental and social damage

Meat and dairy production – now responsible for a fifth of global greenhouse gas emissions – is predicted to double by 2050.[7] This is incompatible with the need to cut emissions by at least 80 per cent in the same period to prevent the worst effects of climate change.[8]

UK factory farms are also driving deforestation and ruining lives overseas. Vast areas of forest and wildlife in South America are being cleared to grow the protein needed to quickly bulk up millions of animals each year. This is forcing local people off their lands and into hunger and poverty.

Cattle farm in the Brazilian Amazon

An alternative

There is already evidence that consuming less meat would be good for the environment and would help feed a growing population.

In 2009 Friends of the Earth and Compassion in World Farming published *Eating the planet?*, a groundbreaking report which demonstrated that we can feed a growing global population without destroying the world's natural resources or relying on factory farms – and we don't need to give up meat.

The modelling in *Eating the Planet?* showed that by adjusting our diets we could feed a global population predicted to be 9 billion by 2050. Rearing animals for food uses far more land, energy and water than growing crops to provide people with the same number of calories. A diet containing no more than three portions of meat each week would take pressure off the land and the climate.

The diet outlined in *Eating the Planet?* would mean a significant reduction in meat eating in the West, yet it would allow for more meat to be eaten in developing countries where there are high levels of malnutrition. There are as many obese people in the West as there are malnourished people in poorer countries: the health and justice arguments for changes to food production and distribution are as compelling as the environmental imperatives.

This report adds to the evidence by presenting modelling on the impact of a lower-meat diet on people's health and NHS budgets. It also reviews:

- evidence of the health impacts of high meat and dairy consumption
- the difference between good and bad meat
- examples of healthy alternative eating advice and plans.

Eating less meat is not a silver bullet that will deliver healthy eating and living. But a growing body of evidence shows that we should get the majority of our nutrients from fresh fruits and vegetables, whole grains and pulses, with only small amounts of meat, dairy and fish as additional sources of protein. Recommendations on fish consumption when stocks are under threat are beyond the scope of this report but are covered by Greenpeace and Sustain.[9] [10]

Such a diet has many benefits including:

- reducing the livestock industry's environmental impact – including on climate change
- improving the health and wellbeing of people in the UK, and indeed the rest of the world
- reducing the burden of diet-related disease on the NHS
- helping to create a thriving and planet-friendly UK farming sector.

This report sets out what the Government needs to do to encourage healthy and sustainable diets and food production.

Grasping these opportunities would transform the UK into a model for healthy, sustainable food production and consumption that, if adopted by the rest of the world, would help ensure a fair share of the world's food resources for everyone.

HOW MEAT CONSUMPTION HAS RISEN OVER THE LAST 50 YEARS

Over the last fifty years there has been a dramatic rise in global meat consumption with the growth in the global livestock population far outstripping that of the human population.

Between 1961 and 2008 the world population increased by a factor of 2.2,[11] but total meat consumption quadrupled – from 71 million tonnes to 280 million tonnes – and poultry consumption increased 10-fold – from 9 million tonnes to 91 million tonnes.[12]

According to the most recent data on meat eaten per person – from 2002 – the United States leads the developed world in meat consumption with each American eating an average 125 kg of meat a year. Per capita meat consumption in Europe averaged 74 kg, while the average UK citizen consumed 80 kg[13] – equivalent to 1,400 pork sausages each year, or nearly four a day.

Demand is also growing in some developing countries as a result of rising incomes and a growing urban middle class,[14] although it is still well below European and US levels. Meat consumption in China, for example, has gone from an average of 20 kg per capita in 1980 to 52 kg in 2008.[15] Although in India meat consumption has grown by 40 per cent in the 15 years to 2007, it is still 40 times less than average consumption in the UK.

Between 1961 and 2008 the consumption of dairy products has doubled – from 344 million tonnes to 693 million tonnes.[16] Dairy products are a good source of protein and a major source of calcium in the West. Dairy can also be high in fat and saturated fat. However in response to public health campaigns to encourage lower total fat and saturated fat in the daily diet, there has been a substantial switch to consuming more low-fat products over the last 20 years.

The abundance of meat and dairy in our diets is seen as an indication of our increasing affluence and as a triumph of the modern animal husbandry and livestock farming practices. These developments allow us to produce staggering amounts of meat and milk on relatively small parcels of land, and, because animal foods are rich in protein, as a boon to human health.

But the World Health Organization (WHO) is among many organisations to suggest that in the West we now consume considerably more protein than is considered necessary or optimal for health.[17] At the same time it is clear that the population explosion in livestock has not eased world hunger. In fact, with nearly a billion people starving, a question mark hangs over how rational, or ethical, it is to feed such a large proportion of edible grains and proteins to animals.

It is only recently that we have begun to quantify the human health and environmental consequences of this exponential growth in livestock production and consumption. The Friends of the


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Earth reports *Eating the Planet?*[18] and *What's Feeding Our Food?*[19] show that these burdens are both increasing and unsustainable and there are now numerous pressing reasons for adopting a lower-meat diet.

Compared to growing crops for direct consumption, rearing animals for food uses large areas of agricultural land, vast quantities of water and significant amounts of energy. It is a cause of deforestation and land use change, generating greenhouse gas emissions and destroying valuable carbon sinks and wildlife habitat. The livestock industry is also a significant drain on energy resources: growing grain for livestock requires large energy inputs in terms of fertilisers and pesticides. It is also a significant source of pollution.[20]

The economic burden of animal food consumption is also high because of the large amounts of grain that need to be grown to feed farmed animals.[21] One kilogram of intensively-reared beef requires up to 10 kg of animal feed.[22]

The global spread of intensive farming has led to a major increase in the diversion of cereals and other grains away from the human food chain and into animal production. For instance, today 97 per cent of the soymeal and 40 per cent of cereals produced worldwide are used for animal feed.

Animals' feeding requirements mean that livestock uses 70 per cent of all available agricultural land, and uses 8 per cent of the global human water supply.[23] With growth in demand for livestock products set to continue, more land and more water – and more food that could be consumed directly by humans – is being turned over to feeding livestock, further exacerbating the associated impacts.

Because of all these inputs, the contribution of animal farming to the production of greenhouse gases and climate change is substantial. The United Nations Food and Agriculture Organization (FAO) estimates it is responsible for 18 per cent of global greenhouse gas emissions – including 9 per cent of man-made global carbon dioxide (CO_2) emissions and 37 per cent of anthropogenic methane.[24]

These are excesses – in pollution and resource use – that the world cannot support over the long term. But environmental excesses are not the only impact of rising livestock consumption.

Studies into human health are beginning to show that, in the same way that excess fat and excess sugar in the diet can be detrimental to health, excess meat consumption can have profoundly negative consequences for our health including higher rates of heart disease, stroke, cancer, and premature death.

At the same time it is becoming clear that all meats are not the same in terms of their impact on health. As the science has become more sophisticated and begun to differentiate between fresh meat and that which is preserved or highly processed, data now shows that the greatest negative impact on health comes from consumption of the latter.

Defining 'meat'

In terms of sheer volume of raw materials and goods, modern farmers and food producers are highly productive. Human beings have made substantial gains in health and longevity thanks to this productivity.[25] However this abundance has not benefitted mankind universally – 925 million people worldwide are undernourished due to lack of access to good food in sufficient quantities.[26]

In addition, much of the abundance we enjoy is in the form of high fat, high sugar foods which are energy intensive to produce[27] and also damaging to health.[28]

Rising rates of obesity and chronic diet-related diseases suggest that in the midst of this abundance means we have 'forgotten' how to discriminate. Science is helping us to relearn this skill. We now understand the difference between healthy and unhealthy (or 'good' and 'bad') fats and carbohydrates and this knowledge has been incorporated into healthy eating guidelines.

Just as there are 'good' and 'bad' fats and carbohydrates it is increasingly becoming acknowledged that there are also 'good' and 'bad' meats.

In very early studies of meat intake little distinction was made between different types of meat, indeed 'meat' has no common definition in scientific research. More recent studies, however, have begun to make important distinctions between fresh and preserved/processed meats and between red and white meats.

In general, the term 'red meat' refers to beef, lamb and pork; as a broad category it includes both fresh and processed/preserved meats. 'White meat' is less well defined but in scientific research usually refers to poultry and sometimes fish.

In the scientific literature and in this report, processed and preserved meat are defined as any meat preserved by smoking, curing or salting, or with the addition of chemical preservatives, for example bacon, salami, sausages, hot dogs or processed deli or luncheon meats (including some white meats such as turkey and turkey ham). This type of meat often contains a number of harmful substances including heterocyclic amines, polycyclic aromatic hydrocarbons,[29] and N-nitroso compounds[30] formed in the high temperature cooking of meat. The nitrate and nitrite preservatives added to processed meats are also known precursors to N-nitroso compounds (see *All Meat is not the same*, page 15).

NEW RESEARCH

THE HEALTH IMPACTS OF EXCESS MEAT CONSUMPTION

The health effects of reduced meat consumption are becomming well established in the scientific literature. As the study populations themselves have become larger and as the methodology of such studies has become more sophisticated, the weight of the evidence has grown. A valuable picture has emerged of how the balance of meat and dairy and other foods in our diets can act to improve or harm health.

Much of the early data on diet, lifestyle and health came from studying vegetarian lifestyles. Other data comes from long term observational studies which look at what people eat and what diseases they develop over time. Still more comes from intervention studies where people who are suffering from a chronic illness or who are at high risk of illness are switched to more plant-based diets.

Such data highlights the health properties of a diet high in fruits, vegetables, unrefined grains and pulses and moderate amounts of meat equivalents such as soy. Studies show that those who eat little or no meat and dairy are often healthier than the general population.[31]

However, it is a mistake to place too narrow an interpretation on these studies. There is firstly a tendency, particularly in older studies, to group all vegetarians and vegans together even though there are important differences in nutrient intake between a strict vegan diet, a strict vegetarian diet, a lacto-ovo-vegetarian diet (which allows milk and eggs) and a lacto-ovo-pesce vegetarian diet (which allows dairy, eggs and fish). In addition to eating few or no animal products, vegetarians and vegans also tend to practice other healthy activities that contribute to their overall level of health, including taking more exercise and smoking less.

Yet studies show that excess meat in general, and preserved and processed meats in particular, can add high amounts of fat, saturated fat and salt to the diet. The most important health impacts of excess fat and sodium include increased risk of heart disease, stroke and cancer, as well as an increased incidence of obesity and premature death.

In contrast, diets where plant-based elements dominate are associated with lower body weight,[32] greater longevity[33] and a lower rate of certain chronic diseases especially diabetes, heart disease, and some cancers.[34]

The cost to the NHS of diet-related illness is estimated to be twice that of car, train and other accidents and more than double that of smoking.[35] Diet-related illnesses, however, can be prevented. It has been estimated that the NHS could save around £6 billion a year if the excesses and inadequacies in our current diets could be addressed in the same proactive way adopted to address the health impacts of smoking. New modelling carried out by Friends of the Earth shows that widespread adoption of lower-meat diets could prevent 45,000 deaths and save the NHS £1.2 billion each year – see graph 1B.

This requires strong, clear, unambiguous guidance from health and food policy makers. As the data on the harmful effects of consumption of excess meat continues to amass, the case becomes stronger for a thorough re-evaluation of healthy eating guidelines.

How would reducing meat consumption improve health?

New research carried out by Oxford University's British Heart Foundation Health Promotion Research Group for Friends of the Earth used the DIETRON modelling system to analyse the health implications of a range of diet scenarios.[36] It concluded that switching from current diets to a diet that contains two or three meat meals each week and a small amount of dairy each day would prevent 45,361 deaths each year (see graph).

TABLE 1: CHANGE IN COST TO THE 2006/07 NHS BUDGET (baseline 2007 UK diet)

Disease	Current diet trends	Less Meat	Fair Less Meat
CHD	+£0.05bn	-£0.57bn	-£0.80bn
Stroke	+£0.00bn	-£0.07bn	-£0.10bn
Cancer	+£0.02bn	-£0.20bn	-£0.30bn
Total	**+£0.07bn**	**-£0.85bn**	**-£1.20bn**

A NOTE ON THE DIETS

These diet scenarios are based on Friends of the Earth and Compassion in World Farming's 2009 report *Eating the planet?* which analysed different diet options and farming methods to assess their impact on global food production and the feasibility of feeding the estimated population in 2050 – nine billion.

'CURRENT DIET TRENDS' reflects the level of meat and dairy that will be eaten in the UK if trends around increasing consumption are projected into the future.

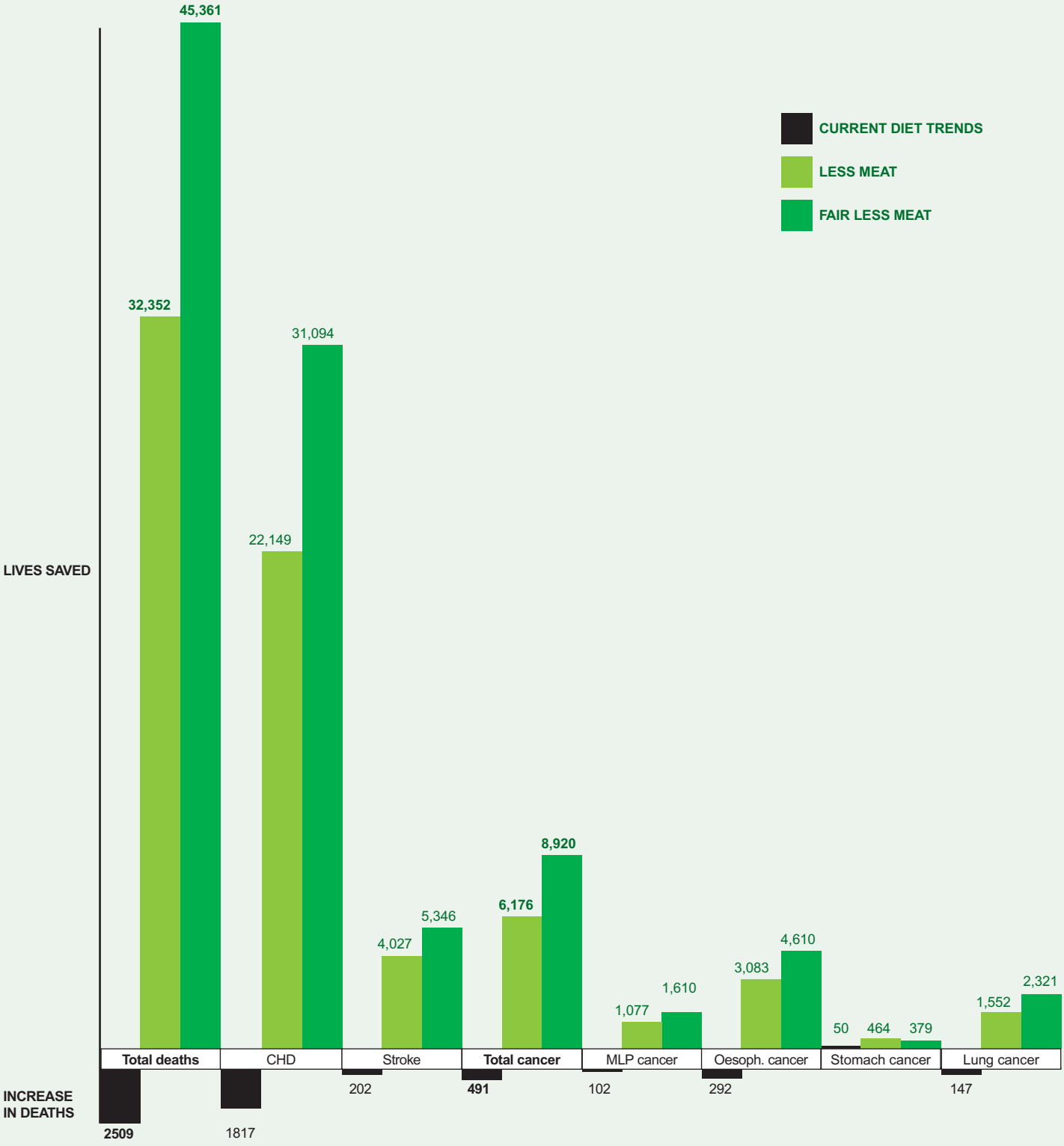
'LESS MEAT' is based on satisfying growing food and nutritional demands with a lower meat diet with 30 per cent of protein from animal products.

'FAIR LESS MEAT' assumed a fair distribution of nutritionally sufficient diet that allows for meat 2 or 3 times each week and some dairy each day.

In place of the contribution of meat and dairy, the 'Less Meat' and 'Fair Less Meat' diets include more fruit and vegetables, and an increase in the amount of starchy carbohydrates. These changes, in combination with a reduction in saturated fat from meat and dairy and a reduction in salt from processed meats, are responsible for the predicted changes in health outcomes displayed in graph 1b and table 1. With a reduction in food waste and more fair food distribution and diets, this scenario would feed the world and allow for planet-friendly farming methods.[37]

GRAPH 1B: CHANGE IN ANNUAL MORTALITY BY CAUSE

(baseline 2008 average UK diet)



HOW MEAT CONSUMPTION AFFECTS HEALTH

Cancer

The relationship between diet and cancer has become increasingly clear over the last few decades. Cancer is responsible for 7.4 million deaths globally each year, about 13 per cent of all deaths.[38] The WHO estimates that 30 per cent of cancers in the developed world (and 20 per cent in developing countries) are caused by dietary factors. In the UK it is estimated that 26 per cent of cancers could be prevented by altering diet.[39]

Colorectal cancer

The relationship between diet and cancer is particularly strong for colorectal (bowel) cancer. In 2005 a European study involving more than a half a million people found that, amongst people who regularly ate more than two portions of red and processed meat a day, the risk of developing bowel cancer was 35 per cent higher than for those who ate less than one portion a week.[40]

The conclusions of this study are in line with the results of three meta-analyses,[41] [42] [43] which show a 20-30 per cent increased risk of bowel cancer in those eating 100-120 g/day of red meat and up to 50 per cent increased risk of bowel cancer in those eating 25-30 g/day of processed meat.

The broadest and most authoritative report on the link between meat and bowel cancer, however, comes from the World Cancer Research Fund (WCRF) which, over the last decade, has forensically reviewed all the available studies to date on the possible relationships between meat and dairy intake and cancer.[44]

The WCRF report found convincing evidence that eating more than 500 g of red meat each week significantly raised the risk of bowel cancer. In particular eating 150 g of processed meat a day (equivalent to three sausages or three rashers of bacon) increases the risk of developing bowel cancer by 63 per cent. The report went on to recommend limiting overall consumption of red meat to between 300 g (11 oz) - 500 g (18 oz) a week – equivalent to around 2 ounces daily – very little if any of which should be processed meat. This compares to the current UK level of consumption of around 190 g (6.6 oz) each day, according to the latest National Diet and Nurition Survey.[45]

How meat intake causes cancer is still not completely understood. There is, for example, no strong association between high fat intake and bowel cancer risk independent of meat intake.[46] One Swedish study, for instance, found that women consuming the highest amounts of full-fat dairy products had a significantly lower risk of bowel cancer,[47] and a randomised trial found that switching to a low-fat diet offered no significant protection against the disease.[48]

Instead it has been suggested that the contaminants and additives such as nitrates in processed meat may be influential (see page 15).

The heme iron component of red meat (see page 23) is also associated with the generation of free radicals, highly reactive molecules that can cause the kind of cellular damage and mutations known to influence cancer and other diseases.

Any or all of these mechanisms may come into play, and even though the mechanisms are not fully understood, the strength of the evidence was such that the WCRF recommendation to limit red meat was quickly incorporated into UK Department of Health guidelines, as well as being recommended in a recent Cabinet Office report on food policy.[49]

Although the evidence is strongest for colorectal cancer, other cancers have also been associated with high-meat diets.

Breast Cancer

A 2006 study which followed more than 90,000 premenopausal women for 12 years[50] found that, compared with those who eat three or fewer servings per week, women eating three to five servings of red meat weekly have a 14 per cent higher risk of a hormone-dependant breast cancer, while those eating more than five servings a week have a 42 per cent increased risk.

Two of the largest studies so far, the pan-European EPIC study[51] which followed more than 300,000 women and the US AARP Diet and Health study[52] which followed more than 188,000 women, have also found that that those who eat the most saturated fat have a small increased risk of breast cancer.

There are several ways in which meat intake could affect breast cancer rates. Some observers suggest it is the result of increased fat intake from red meat and dairy.[53] It has also been suggested that high dietary fat intake may increasing circulating levels of oestrogen and other hormones.[54] The association between dietary fat and breast cancer, however, remains controversial[55] and not all studies show a link.[56]

Stomach and Bladder Cancer

Some,[57] but not all,[58] data links meat intake with bladder and stomach cancer and this, research suggests, may be related less to fat and more to the additives and contaminants in many red meat products.

In a 2010 study of over 300,000 men and women, those whose diets had the highest amount of total dietary nitrite (from all sources including meat), as well as those whose diets had the highest amount of nitrate plus nitrite from processed meats, had a 29 per cent increased risk of developing bladder cancer.[59] (For more on additives in processed meat see page 15).

Dairy and cancer

Links between dairy products and cancer are less conclusive. The WCRF found that data for the relationships between milk and dairy products and cancer was either "too sparse, too inconsistent, or the number of studies too few to allow conclusions to be reached".[60]

Some components of dairy products have been linked to specific cancers but it is not clear what would make one person more vulnerable than another. For example, high levels of galactose, a sugar released by the digestion of lactose in milk, have been linked to ovarian cancer. The association is not absolute, but in a recent analysis of 12 studies, which involved more than 500,000 women, high intakes of lactose – equivalent to that found in three cups of milk per day – were associated with a modestly higher risk of ovarian cancer, compared to those with the lowest intakes.[61] The study did not find any association between overall milk or dairy product intake and ovarian cancer.

Likewise, some researchers have hypothesised that modern industrial milk production practices have changed milk's hormone composition in ways that could increase the risk of ovarian and other hormone-related cancers.[62] More research, however, is needed to confirm this.

The Western diet relies on milk as a major source of calcium. In men a diet high in calcium has been implicated as a risk factor for prostate cancer.[63]

In a 1998 Harvard study men who drank two or more glasses of milk a day were almost twice as likely to develop advanced prostate cancer as those who didn't drink milk at all.[64] The association, however, appeared to be with calcium itself, rather than with dairy products in general.

Another more recent analysis of the same group of men found that those with the highest calcium intake – at least 2000 mg a day; well in excess of daily recommended levels – had nearly double the risk of developing fatal prostate cancer as those who had the lowest intake (less than 500 mg per day).[65] But again, more study is needed to confirm this finding.

Cancer protective foods

Certain diets, for instance those with high intake of fruits and vegetables, are cancer protective. Eating beans, peas or lentils at least twice a week has been associated with a 50 per cent lower risk of bowel cancer compared to those who never eat these foods,[66] whereas the risk of developing the disease increases for those people who have a low-fibre diet.[67]

Studies have found that people who eat the most fruit and vegetables can lower their risk of cancer by around 25 per cent compared to those who eat the least.[68] [69] [70] Specifically, including plenty of fruit and vegetables in the daily diet has been shown to reduce the risk of mouth, oesophageal and laryngeal cancers by around a third[71] [72] and the risk of lung cancer by around a quarter.[73]

The ongoing pan-European EPIC study has found a similar protective effect on mouth, oesophageal and lung cancers,[74] [75] as well as some types of stomach cancer.[76] But it has also found that fruit and vegetables are unlikely to reduce the risk of breast, prostate, ovarian or kidney cancers.[77] [78] [79]

Healthy fats, such as those found in oily fish may be protective. In one study the risk of bowel cancer decreased by 30 per cent amongst people who ate one portion or more of fish which contain essential fatty acids every other day compared to those who ate fish less than once a week (this study also linked low fibre intake to development of the disease).[80] However not all studies show a generalised benefit from increased essential fatty acid consumption for all types of cancer.[81] [82] Many trials, however, use supplements in isolation rather than fresh fish as part of a balanced diet, and this may affect outcomes.

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Heart disease and stroke

The relationship between excess meat and dairy and cardiovascular disease (CVD, collectively heart disease and stroke) has been linked to the high amounts of sodium and saturated fats in many of the meat and dairy products we consume.

It may come as no surprise that there is a strong link with sodium. High blood pressure is a major risk factor for coronary heart disease and stroke. While there are many risk factors for high blood pressure, high intake of sodium, a component of salt, is one of the most convincing.[83] This is an area that has been generally well studied, and it has been shown that reducing salt intake can also reduce the risk of Coronary Vascular Disease (CVD).[84]

However, until recently sodium in relation to meat intake has not been given much focus.

In 2010 the Harvard School of Public Health conducted the first systematic review and meta-analysis of the worldwide evidence for how eating unprocessed and processed red meat relates to the risk of heart disease, stroke and also diabetes.[85] The researchers identified and analysed 27 quality studies involving more than 1,200,000 people from 10 countries on four continents.

The researchers identified two reasons for the raised CVD risk. While both types of meat contained similar amounts of fat, the amount of sodium in processed meats was four times that of fresh meat. Processed meats also contained 50 per cent more nitrate preservatives.

The results showed that, on average, a 50 g (1.8 oz) daily serving of processed meat was associated with a 42 per cent higher risk of developing heart disease and a 19 per cent higher risk of developing diabetes. In contrast, eating unprocessed red meat was not associated with risk of developing these diseases. Too few studies evaluated the relationship between eating meat and risk of stroke to enable the researchers to draw any conclusions.


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Data on fat and its relationship to heart disease is less clear. Several major studies[86 87 88] have found no link between total fat intake and important health outcomes such as heart disease, cancer and even weight gain.

Fat is an essential nutrient and the body requires a balanced spectrum of dietary fats to be healthy. Fat is a major source of energy and aids the absorption of the fat-soluble vitamins A, D and E. It's important for proper growth and development and cell and nerve function. Fats are an especially important source of calories and nutrients for infants and toddlers.

However, not all fats are the same in terms of their impact on health and total fat intake is probably less important to heart health than the relative balance of specific fats such as saturated and unsaturated fats and the presence of trans fats[89] (see *Heart-protective foods*, page 12 for more on fats).

Research has shown, for example, that saturated fat can raise blood levels of "bad" low density lipoprotein (LDL) cholesterol, and that elevated LDL is a risk factor for heart disease and stroke. Because of this, most of us are advised to limit our intake of fatty meat, butter and full-fat dairy products – our main dietary sources of saturated fat.

In 2010 an analysis that combined the results of 21 previous studies, and which included a total of nearly 348,000 adults followed for between 5 and 23 years, found no conclusive evidence that higher saturated fat intakes led to higher risks of heart disease or stroke.[90] However, this analysis has been critiqued for having major flaws that have been pointed out in subsequent peer correspondence and articles.[91]

In the UK the trend for our overall intake of saturated fats is going down, but our intake is still too high (from 12.6-14.6 per cent of daily calories for adults when the ideal level is lower than 10 per cent). At least 48 per cent of the saturated fat in the UK diet comes from

Heart-protective foods

Heart health, like all health, is dependent on a balanced intake of nutrients and it is likely that the rise in meat consumption in the West may have occurred at the expense of heart-protective foods such as wholegrains, fruits and vegetables.[98 99 100]

One of the largest and longest studies into health and dietary habits followed 110,000 American men and women for 14 years. Those with the highest intake of fruits and vegetables (eight servings or more a day) were 30 per cent less likely to have had a heart attack or stroke compared to those with the lowest intake (less than one-and-a-half servings a day). [101]

A later meta-analysis which included this US data along with several other long-term studies in the US and Europe, found that people who ate more than five servings of fruits and vegetables per day had roughly a 20 per cent lower risk of coronary heart disease[102] and stroke,[103] compared with those who ate less than three servings per day.

Essential fatty acids (EFAs) may also be protective. The UK Government now recommends a minimum intake of 1 per cent of energy from linoleic and similar omega-6 polyunsaturated fats (found in large amounts in vegetable oils such as sunflower and corn oils), and 0.2 per cent of energy from alpha-linolenic and similar long chain omega-3 polyunsaturated fats (found in large amounts in fish but also in vegetable oils such as rape seed oil).[104] This recommendation comes after decades of research showing that higher levels of EFAs can reduce the risk of CVD, and other diseases.

A recent analysis by researchers at Harvard School of Public Health provided substantial evidence from randomized clinical trials that substituting polyunsaturated fattty acids (PUFAs) for some of our daily saturated fat can reduce this risk by up to 19 per cent.[105] For every 5 per cent increase in PUFA consumption, coronary heart disease risk was reduced by 10 per cent. This effect has been noted elsewhere.[106]


istock

A more specific dietary intervention, substituting saturated fats with long chain omega-3 fatty acids, has been shown to lower the incidence of heart disease in several trials.[107 108 109] These findings warrant further investigation, but as a rule the Western diet consumes omega-6 fatty acids to excess while levels of omega-3 are generally deficient. Replacing some meat in the diet with more vegetables, wholegrain, pulses and oily fish, may help rebalance fats in the diet by raising intakes of PUFAs and long chain omega-3 fatty acids.

meat and dairy products[92] which are also the major sources of dietary cholesterol. Unlike the cholesterol that the body makes from exposure to sunshine, dietary cholesterol can raise levels of cholesterol in the blood,[93] which in turn is a risk factor for atherosclerosis. Because the body can make its own cholesterol, we have no real need of 'extra' cholesterol from our food.[94] A lower-meat diet could healthily meet our needs for fat, without adding extra cholesterol which we do not need.

Over the past several decades, the food industry has reduced the amount of saturated fat in many products, and the public has reduced the amount of saturated fat in its diet. But there has been a wide variation in the types of nutrients that have replaced this saturated fat. For example, in many products saturated fats were replaced with trans fats, which are also a particular high risk for heart disease.[95 96] Saturated fat has also been replaced by increased consumption of refined carbohydrates, i.e. sugars which are also highly important risk factors for heart disease.[97]

Obesity

Obesity is on the rise in the UK and throughout the world (including in developing countries where others are starving),[110] and while there are suggestions that this rise is linked with higher intake of meat and dairy products, evidence is mixed. Some meat and dairy products can be high in calories and the WCRF suggests that the evidence linking the consumption of large amounts of high calorie foods with overweight and obesity is 'probable' while the evidence linking meat and dairy consumption itself with overweight and obesity is 'limited and inconclusive'.[111]

There are significant overall differences in weight between those who eat meat and those who don't. In a 2006 analysis of the literature on diet and obesity, 29 out of 40 studies showed that non-meat eaters weighed significantly less than meat-eaters. This was observed in both males and females and across various ethnic groups.[112] Generally speaking, non-meat eaters also had healthier lifestyle habits such as more exercise and less smoking, and this may have influenced this outcome. However, the authors note that, in some of the studies reviewed, even when meat eaters and

Obesity

non-meat eaters had similarly healthy lifestyles the differences in weight remained.

In another analysis comparing 55,459 healthy women with omnivourous or vegetarian diets who were part of a prospective breast cancer study, 40 per cent of omnivorous women were overweight, compared to 29 per cent of semi-vegetarians and vegans, and 25 per cent of lacto-ovo vegetarians.[113]

Results from a study of 37,875 healthy men and women participating in the pan-European EPIC study – the largest single study of Western vegetarians and vegans to date – found that after adjusting for age, mean body mass index (BMI) was significantly highest among meat eaters (24.4 in men, 23.5 in women) and lowest in vegans (22.4 in men, 21.9 in women). Individuals who consumed no meat as well as fish eaters had comparable mean BMI which fell in between the other groups.[114] BMI is not a particularly sophisticated measurement, but it provides a rough estimate of a person's 'fatness' or 'thinness' based on calculations of height and weight. The 'normal' range for BMI falls between 18.5 and 25.

Diabetes

Excess body weight is the most important risk factor for diabetes. Although it is common to think of diabetes as a disease associated with high intake of unrefined carbohydrates, several studies now show that high intake of meat, which contains no carbohydrate, increases the risk of diabetes. A 2009 meta-analysis found that high total meat intake increased type-2 diabetes risk 17 per cent above low intake, high red meat intake (around 120 g per day) increased risk 21 per cent, and high processed meat intake (around 50 g per day) increased risk 41 per cent.[115]

The reasons for this increased risk are not yet clear. One possibility is the pro-oxidant properties of heme iron, found only in animal products. High dietary intake of heme iron as well as high body stores of iron have previously been associated with increased diabetes risk in multiple studies,[116] [117] whereas dietary non-heme iron (found only in plant foods) was protective. Heme iron from fish and poultry has also been associated with diabetes risk[118] (for more on heme iron see page 23).

Premature death

Chronic disease increases the risk of premature death. There is evidence that a high intake of meat may make this more likely and Friends of the Earth's recent modelling supports this (see page 8).

A 2009 study from the London School of Hygiene and Tropical Medicine[119] explored the health and environmental impacts of lower meat consumption. It found that reducing consumption by 30 per cent could reduce the greenhouse gas emissions from livestock production as well as reducing the number of people who die each year from heart attacks by 17 per cent (around 18,000 individuals in the UK). The authors linked this reduction in mortality to a reduction in saturated fat intake.

Also in 2009, in the largest study of its kind, researchers at the US National Cancer Institute assessed the association between meat intake and risk of death among more than 500,000 individuals, aged 50 to 71 years old. They found that older people who eat large amounts of red meat and processed meats faced a greater risk of early death from heart disease and cancer.[120]

Participants were followed for 10 years. Compared to those who ate the least red meat, and after adjusting for other risk factors such as smoking, family history of cancer and high body mass index, men who ate the most red meat had a 22 per cent higher risk of dying of cancer and a 27 per cent higher risk of dying of heart disease. For women the figures were 20 per cent and 50 per cent respectively.

In relation to death from all causes, the researchers estimated that 11 per cent of deaths in men and 16 per cent of deaths in women could be prevented if people decreased their red meat consumption to around 5 ounces per week – a little less than that recommended by the WCRF.

Preliminary results from a European study of vegetarians and non-vegetarians, however, presented different findings.[121] The study looked at the diets of 55,000 British meat eaters and vegetarians. The mortality of people in both categories in these studies is low compared with national rates and overall mortality rates did not differ significantly between those who ate meat and those who did not. Vegetarians had 11 per cent higher mortality from all cancers, 13 per cent higher mortality from stroke, and 10 per cent higher mortality risk from all other causes, but a 7 per cent reduced mortality from all circulatory diseases and 25 per cent lower risk of death from heart attack. The authors suggest this is due to lower levels of cholesterol in the blood.

For all causes of death combined, earlier comparative studies such as the Health Food Shoppers Study[122] and the Oxford Vegetarian Study[123] also found almost identical mortality amongst those who did and did not eat meat.

Why the data should be so conflicting is unclear. The US study however involved a significantly larger study population and this may have given it greater power to detect differences between the two dietary regimes, such as the wide range of different meat consumptions and the impact of red versus white meat and fresh meats versus processed meats. However, the omnivores in the European study may also have been generally more health conscious than average.

ALL MEAT IS NOT THE SAME

Preserved and processed meats

A study conducted by researchers from the US National Cancer Institute found a link between stomach cancer and the consumption of heterocyclic amines in cooked meats. The researchers found that those who ate their beef medium-well or well-done had more than three times the risk of stomach cancer than those who ate their beef rare or medium-rare. They also found that people who ate beef four or more times a week had more than twice the risk of stomach cancer as those consuming beef less frequently.[124]

This was, admittedly, a very small study. However in a much larger study of nearly half a million people in the US, heterocyclic amines were also found to increase the risk of colorectal, liver, lung, and oesophageal cancers in those with high intakes of red meat compared to those with the lowest intake.[125] Based on 2500 calories a day, high intake in this study would equate to around 157 g or 4.5 ounces per day and low intake would be around 25 g, or 1 ounce per day. It was estimated that reducing meat intake in line with the lowest intake levels could prevent 9, 35, 10 and 33 per cent of colorectal, liver, lung and oesophageal cancers respectively.

There is also data linking the red meat consumption and PhiP – the most abundant heterocyclic amine in cooked meat – and an increased risk of bladder cancer.[126]

Red meat is not the only problem. The production of heterocyclic amines (HCAs) can be more concentrated in grilled chicken than in beef.[127] One study from New Zealand that investigated levels of HCAs in meat, fish and chicken found the greatest contributor of HCAs to cancer risk was chicken.[128] This could explain why the consumption of chicken has also been linked to colon cancer: a 1998 study examined the eating habits of 32,000 adults for six years and found that those who avoided red meat but ate white meat regularly had a more than three-fold increase in the disease.[129]

Preserved meats are also very high in salt. In the UK, most meat and dairy consumption is in the form of processed foods (e.g. cheese, bacon, ham, sausages, and ready meals) and 40 per cent of the salt in the UK diet comes from these meat and dairy products.[130] High salt intake, as previously noted, is one of the clearest dietary causes of high blood pressure.[131]

In a recent study by Harvard researchers into the link between meat intake and CVD, the researchers found that while fresh and processed meats contained similar amounts of fat, the amount of sodium in processed meats was four times that of fresh meat. Processed meats also contained 50 per cent more nitrate preservatives. It was these risk factors, the researchers said, which linked higher intakes of processed meat to higher risk of CVD.[132]

As Table 2 below shows there are significant differences in the nutrients in fresh and processed meats.

Processed meat contains less protein per 100 g than fresh meat. The fat and sodium content of processed meat compared to their fresh counterparts is also significantly higher: a pork sausage, for example, has nearly three times more fat and more than 14 times the sodium of a grilled pork steak.

TABLE 2: FRESH VERSUS PROCESSED MEAT

	Mean daily intake+		g/100 g++		mg/100 g++	
	Men	**Women**	**Protein**	**Fat**	**Iron**	**Sodium**
FRESH MEAT						
Pork steaks**			32.4	7.6	1.10	76
Pork loin chops**	no data	no data	29.9	15.7	0.70	70
Pork diced casseroled***			31.7	6.4	1.00	37
Total per day (week)	**19 g (133 g)**	**9 g (63 g)**				
PROCESSED MEAT						
Bacon*	18 g	10 g	23.8	26.9	0.80	1680
Pork Sausages**	21 g	12 g	14.5	22.1	1.10	1080
Total per day(week)	**39 g (273 g)**	**22 g (154 g)**				

\+ Source: NDNS, 2008 [133]
++Source: McCance & Widdowson, 2002 [134]
* lean and fat, grilled
** lean only
***streaky, grilled

This table highlights selected pork products only, but these differences hold true for most types of fresh versus processed meat products. It seems clear that adjusting our diets to eat less but better quality meat could make a substantial difference to protein, salt and fat intake without sacrificing nutritional adequacy.

The differences make a compelling case for the nutritional advantage of less but better quality meat in the diet.

Red meat versus white meat

The term 'red meat' refers to beef, lamb and pork; as a broad category it includes both fresh and processed/preserved meats. 'White meat' is less well defined but in scientific research usually refers to poultry and sometimes fish.

The healthiest meats are lean meats – regardless of their colour. With regard to blood cholesterol levels, there is no particular advantage to eating lean white instead of lean red meat.[135] Comparison of diets that include lean red meat and lean white meat (in preference to more fatty meats) show similar benefits.[136]

In the UK, intake of 'unhealthy' red meats has dropped over the last few decades while poultry consumption has doubled.[137] But intensively reared poultry meat, fed on a diet of maize and soy, has become increasingly fatty over the last 40 years.

Recent data from researchers at London Metropolitan University has shown that a typical supermarket chicken today contains 2.7 times as much fat as in 1970 and 30 per cent less protein.[138] Just 16 per cent of a chicken is now protein, compared with almost 25 per cent 35 years ago. As a result an average serving of chicken contains almost 50 per cent more calories than it used to. Organic chicken had slightly more protein and 25 per cent less fat, but was still a great deal fattier and less meaty than chickens in the past.

The study also found that between 1980 and 2004, levels of the omega-3 fatty acid DHA in conventionally reared chickens fell by 85 per cent between 1980 and 2004, while omega-6 – the overabundance of which in our diets has been linked to diseases like cardiovascular disease, cancer, and inflammatory and autoimmune diseases[139] – increased by 260 per cent.

Grass-fed beef

Similar fatty changes have taken place in red meats. Studies comparing the meat of intensively reared (ie grain fed and mainly housed) cattle with that from grass-fed animals suggest that the diet and lifestyle of livestock – for instance, whether the animal is grazed or fed on high protein artificial feed, whether it gets exercise in a field or is confined to a barren feedlot – can make a substantial difference to the composition and balance of fats in its meat.

More than a dozen studies have now found that grass-fed cattle have a more desirable, higher ratio of the omega-3 to omega-6 essential fatty acids.[140] The meat of grass-fed animals also has higher levels of beneficial conjugated linoleic acid (CLA), as well as lower overall levels of fat than grain-fed animals.

One large and very recent study published in the Journal of Animal Science[141] found that sirloin steaks and minced beef from grass-fed beef cattle had lower total fat levels than those from grain-fed cattle, almost four times as much omega-3 and slightly less omega-6 as grain-fed animals. The meat from grass-fed animals also had almost twice the level of CLA.

Grass-fed farming fits well into the proposal that we should be eating less but higher quality meat. With grass-fed animals, herd sizes are naturally limited to what the land can support, which means we cannot over produce. Farming within environmental limits reduces overall production levels compared to factory farming methods and has the knock-on effect of encouraging more optimum consumption levels. As part of a mixed farming system, grazed animals contribute to, rather than detract from, the health of the surrounding land.[142]

The relatively small amounts of essential fatty acids that could be derived from grass-fed meat in a reduced meat diet may be insufficient on their own to affect cardiovascular health, but the right balance between omega-3 and omega-6 is particularly important for heart health.[143] The more high-quality food we have in our diets, the greater the likely synergistic effect on health.

CALLS FOR CHANGE

In the last year or so government agencies throughout the world have begun to make broad recommendations for diets that meet our nutritional needs without exhausting the limited resources of the planet.

In 2001, with the publication of its Third Assessment Report[144] on climate change the Intergovernmental Panel on Climate Change (IPCC) concluded that "a shift from meat towards plant production for human food purposes, where feasible, could increase energy efficiency and decrease greenhouse gas emissions".[145]

In 2009 the Swedish Government made a series of recommendations for cutting greenhouse gas emissions which included eating less meat. It noted: "From a health perspective, there is also no reason to eat as much meat as we do today".[146]

Also in 2009 in the medical journal the Lancet, members of an international collaboration of scientists coordinated by the Wellcome Trust suggested that there would be considerable health benefits from food and agriculture strategies aimed at reducing greenhouse gas emissions.[147]

In the US, nutritional recommendations are for around 6 ounces (160 g) of meat or meat equivalent per day and are accompanied by copious information on what healthy meat equivalents are. It should be noted that this recommended intake is still substantial, though represents a significant reduction on average daily US intake of around 8 ounces per day of meat and poultry.

In an editorial accompanying the analysis, Margaret Chan, Director General of the World Health Organisation (WHO) offered the opinion that "reduced consumption of animal products in developed countries would bring public health benefits."[148]

In 2010 a major report into sustainability and resource use compiled by the International Panel for Sustainable Resource Management for the United Nations Environmental Programme (UNEP)[149] noted that the only way to feed the world while reducing climate change is to switch to a less meat heavy diet." A substantial reduction of impacts", it said, "would only be possible with a substantial worldwide diet change".

Commenting on the report Achim Steiner, Executive Director of the UNEP, said that on reviewing all the available scientific evidence "...two broad areas are currently having a disproportionately high impact on people and the planet's life support systems - these are energy in the form of fossil fuels and agriculture, especially the raising of livestock for meat and dairy products". He added that ordinary consumers can help fight climate change by eating less meat.

In the UK there are no official recommendations for reducing meat. The expert body on nutrition, the Government's Scientific Advisory Committee on Nutrition (SACN), only advises that: "Lower consumption of red and processed meat would probably reduce the risk of colorectal cancer... it may be advisable for intakes of red and processed meat not to increase above the current average (70 g/day) and for high consumers of red and processed meat (100 g/day or more) to reduce their intakes".[150]

However, the mounting evidence on the health and environmental benefits of meat reduction suggest that it is at the very least on the table for debate. In 2009 the Sustainable Development Commission (SDC), which advises the UK government on sustainability issues, recommended that reducing consumption of meat and dairy products was amongst the changes "...likely to have the most significant and immediate impact on making our diets more sustainable, in which health, environmental, economic and social impacts are more likely to complement each other".[151]

A 2009 UK government report, *Securing Food Supplies up to 2050*,[152] notes that it is not enough to cut meat production unless we also address meat consumption. That same year Lord Nicholas Stern, author of the influential 2007 Stern Review on the Economics of Climate Change, gave an interview to *The Times* newspaper in which he warned that 'business as usual' scenarios would lead the world into economic and environmental disaster.

One such scenario was our habitual consumption of meat: "I think it's important that people think about what they are doing and that includes what they are eating." He added: "Meat is a wasteful use of water and creates a lot of greenhouse gases. It puts enormous pressure on the world's resources. A vegetarian diet is better."[153]

In 2010 Sir Liam Donaldson, the UKs Chief Medical Officer, noted in his Annual Report[154] that meat and dairy contribute substantially to global greenhouse gas emissions and to chronic diseases such as obesity, diabetes and heart disease. Commenting on his report he said:

"Our diet is warming the planet. It is also damaging our health. Changing our diet is difficult, but doing so would both help slow climate change and bring significant health benefits...[reducing the UK's consumption of animal products by 30 per cent by 2030] would reduce heart disease by 15 per cent – a substantial reduction – and it would prevent 18,000 premature deaths every year... These are contentious matters but they need to be openly debated and options weighed up."[155]

Tracking what we eat

Producing dietary guidelines that quantify the notion of 'less meat' is not straightforward. In fact it is extremely difficult to find any public body that will put its head above the parapet and provide quantitative advice.

Food advice used to be based primarily on nutrient intake. The UK Government has devised guidelines for what it considers adequate levels for mineral and vitamin intakes in the population; these are known as Daily Recommended Values (DRVs).[156] These represent the minimum daily intake of specific nutrients considered adequate to avoid deficiency in the majority of the population.

Although useful for nutritionists they are nearly incomprehensible for lay individuals. This is because people don't shop for or cook or eat nutrients; they eat food. In acknowledgement of this fact today's dietary advice is usually 'food based' and conveyed through visual representations such as food pyramids and food plates. In the UK our food based guidelines come in the form of the Eatwell Plate.[157]

This pie chart, visualised as a food plate, represents what proportions of our daily calories should come from each of five food groups. These proportions are:

- Bread, rice, potatoes, pasta and other starchy foods: 33 per cent
- Fruit and vegetables: 33 per cent
- Milk and dairy foods: 15 per cent
- Meat, fish, eggs, beans and other non-dairy sources of protein: 12 per cent
- Foods and drinks high in fat and/or sugar: 8 per cent

Several studies allow us to measure how well we are doing as a nation against these recommendations, and against the Government's DRVs. The largest of these is the National Diet Nutrition Survey (NDNS) which has been conducted regularly since 1997. The latest NDNS figures are for 2008/2009.[158] The Family Food Survey[159] also provides useful data.

Certain important components of our daily diet are unbalanced in a way that can feed into chronic ill health.

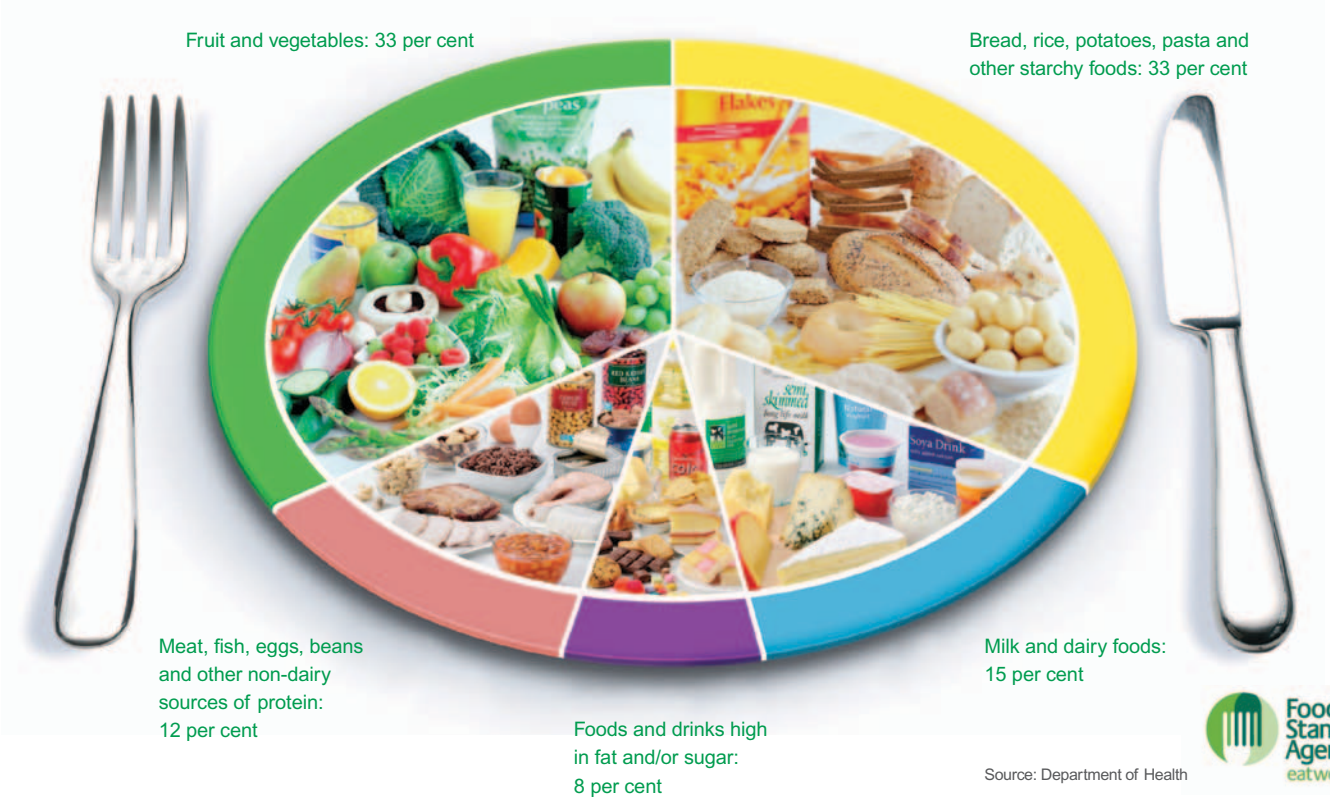
Data from the NDNS provides some useful snapshots about our consumption:

Meat and dairy

Current data suggests that our daily meat intake is increasing and that it currently accounts for 17-18 per cent of daily calories for those aged 11 to 18 years and for adults – approximately a third more than the 12 per cent recommended by the Eatwell Plate.

At the same time our intake of milk and milk products has gone down.

THE EATWELL PLATE



Protein

Our protein intake is consistently above recommended levels – on average 78 g per day against a recommended 50 g. That's around 50 per cent more than we need. Approximately half (51 per cent) of this comes from our meat and dairy intake, while only 22 per cent comes from cereals and cereal products.

Saturated fat

We need very little saturated fat in our diet. The official suggested level is for no more than 10 per cent though some experts suggest this is too high.[160] The NDNS survey showed levels at 12.8 per cent of food energy for adults, 12.9 per cent for those aged 11 to 18 years, 13.6 per cent for those aged four to 10 years and 15 per cent for toddlers. Nearly half of all saturated fat in the adult diet comes from meat and dairy products, on average 26 and 22 per cent respectively.

Sodium

Meat and dairy account for the largest share of our daily sodium intake. On average 36-38 per cent of this is from dairy and 28 per cent from meat and meat products.

Carbohydrates and fibre

An overreliance on meat in the diet can mean that other foods get squeezed out. It is probably no coincidence then that levels of fruit and vegetable intake are low with only 33 per cent of women and 37 per cent of men achieving the 5-a-day (400 g) level for fruits and vegetables. Allied to this is a low intake of dietary fibre. On average we are eating 14 g per day against the recommended level of 18 g.

Eating less meat in favour of a diet which is rich in fruits, vegetables, wholegrain and pulses is one way to tackle the existing nutritional imbalances in our daily diets and as already illustrated may have a protective effect against several important chronic diseases which have become all too commonplace in modern society.

We eat what we are told

Advertising plays a significant, yet rarely healthy, role in shaping our daily diets. Healthy eating guidelines tell us that we should eat more wholegrains and pulses, plenty of vegetables and fruit, while keeping salt fat and sugar to a minimum. But the food advertising we are exposed to presents an entirely different message.

A great deal more money is spent advertising foods that contain sugar, fat and salt – foods that should make up only a minute proportion of our diets – than is spent on fresh, healthy foods.[161] What is more, studies show that exposure to food adverts changes our behaviour and makes us eat more – even when we are not hungry. In one 2009 series of studies involving children and adults, children consumed 45 per cent more snack foods when exposed to food advertising than when they were not. Adults consumed more of both healthy and unhealthy snack foods following exposure to snack food advertising than when they were exposed to non-food ads.[162] A 2009 review by the FSA also cited "reasonably strong evidence" that food promotion influences children's brand preferences and the types of food they choose.[163]

In 2010 the Journal of the American Dietetic Association[164] published an analysis of food advertising on primetime TV. It showed that a 2,000-calorie diet consisting entirely of advertised foods would contain 25 times the recommended amount of sugar and 20 times the recommended amount of fat, but less than half of the recommended amount of vegetables, dairy, and fruits. The researchers found that sugar and fat in a TV diet was so excessive that, on average, eating just one of the advertised food items would provide more than three times the recommended daily servings (RDS) for sugar and two and a half times the RDS for fat for the entire day.

Similarly, in 2007 researchers in the UK collected and compared data on the nutritional content of the foods advertised in 30 most widely-read weekly magazines.[165] The study published found that over a quarter of the food adverts (25.5 per cent) were ready-meals, sauces and soups which tend to be high in salt and sugar. More of these adverts were found in magazines with a higher proportion of women readers or readers of a lower social class. In contrast, very few of the ads (1.8 per cent) were for fruit and vegetables and these were mainly in high-end magazines. This suggests that not only can advertising promote unhealthy eating, it can also serve to reinforce socio-economic food and health inequalities.

HOW MUCH IS 'LESS' MEAT?

While there has been a shift from focusing on single nutrients to a more food-based approach, nutritional guidelines still fall short of the kind of clear advice against which average people can measure – and adjust – their own intake.

The Eatwell Plate, for example, quantifies its guidelines for meat or dairy intake through the size of the pie wedges. But for consumers, phrases like 'eat more' or 'eat less' or 'eat plenty' can be meaningless as are recommendations for 'high', 'moderate' and 'low' consumption.

What is more, as this review details, new evidence has emerged recently on what constitutes a healthy diet – but the advice in the Eatwell Plate has not significantly changed since 1994.

It can be difficult to quantify dietary advice – not least because the scientific data is not always conclusive.

Also the needs of individuals within any given population change at different stages of life. However, it is clear we must start somewhere.

The World Cancer Research Fund does make a recommendation of an upper limit of 500 g per week of beef, lamb and pork[166] and avoidance of processed meats altogether.

In 2005, based on recommendations from the Harvard School of Public Health, the US Food Guide Pyramid was replaced with MyPyramid,[167] a new symbol and consumer-friendly 'interactive food guidance system' which divides the diet up as wedges of a pyramid.

MyPyramid is built on a foundation of exercise and conscious dietary choices and, significantly, moves meat and dairy to the edge of the food pyramid to indicate that it should no longer be considered the centrepiece of the diet but instead should be eaten sparingly.

It recommends around 6 ounces (160 g) of meat or meat equivalent per day and is accompanied by copious information on what healthy meat equivalents are. It should be noted that this recommended intake is still substantial, though represents a significant reduction on average daily US intake of around 8 ounces per day of meat and poultry.[168]

Current UK meat consumption is largely in line with this recommendation. But an overreliance on meat, as opposed to meat equivalents can bring problems of excesses in fat, protein and sodium, as already discussed.

Table 3 shows the recommendations of various health policy bodies compared to average UK intake.

TABLE 3
AVERAGE DAILY MEAT AND DAIRY INTAKE RECOMMENDATIONS VARIOUS BODIES

	MEAT	DAIRY
UK average*	**177.7 g (6 oz)**	**332.2 g (11 oz)**
Harvard School of Public Health	170 g (6 oz)**	680 g (24 oz)
WHO***	160 g (5.6 oz)	312 g (11 oz)
Less Meat Diet ****	70 g (2.5 oz)	142 g (5 oz)
Fair Less Meat Diet ****	31 g (1.1 oz)	57 g (2 oz)
WCRF	43 - 71 g (1.5 - 2.5 oz)+	None made
Eatwell plate	Not quantified++	Not quantified++

* figures based on Family Food survey 2008 ** meat/meat equivalents. Figures average adult men/women.

*** World Health Organisation European Region. CINDI dietary guide. Copenhagen: WHO, Europe, 2000. http://www.euro.who.int/Document/E70041.pdf average adult men/women, a diet of 2200 calories/day; meat/and equivalents, assumes meat serving size 80 g cooked weight and dairy serving size 125 g.

**** The Less Meat and Fair Less Meat diets' nutritional quality has been calculated using protein levels described in Eating the Planet? and converted into weight, based on the Family Food Survey 2008, which provides kcal and weight for food categories. Both diets can provide adequate protein levels, but the amount of protein and meat content depend on the type of meat, eggs and dairy and the type of cuts or processing involved.

+ lean, very little if any processed, based on recommendation of 300 g-500 g(11-18 oz) week with 300 g being the optimal public health goal. Amounts reflect cooked weight. Meat loses approx. one third of its weight in cooking.

++ Eatwell advises 12 per cent daily calories should come from meat including two portions of fish per week, and 15 per cent daily calories from milk and dairy.

CONCERNS ABOUT NUTRIENT DEFICIENCIES

In spite of the evidence that we eat far too much protein at the moment it has been argued that a low-meat diet could lead to nutrient deficiencies especially in vulnerable groups such as children, the elderly and in low income individuals. There is little data to support this. The healthiness of a diet depends less on whether it contains meat and more on the food choices made within the framework of that diet.[169]

A few studies have compared the diets of meat eaters with vegetarians and vegans in such as way as to increase understanding of nutrient intake. The EPIC-Oxford study is one of the largest studies to provide this information. Its results suggest that a diet with little or no meat is unlikely to cause any substantial deficit in dietary nutrients.

These results suggest that for both adult men and women:

- Meat eaters get more protein than is recommended and vegans less than is recommended. Fish eaters and vegetarians' diets are in line with protein recommendations.
- With the exception of vegans, all diet types had an intake of vitamin B12 and calcium which was well over daily recommended values (DRVs), suggesting that reduced intake of these vitamins is not inevitable with a low-meat diet.
- All groups except vegans had an iron intake below recommended values, suggesting this is a problem for all current British diets and not one specific to meat reduction alone. The deficit is small and could, according to advice from the US MyPyramid,[171] be adequately made up with a 4 oz serving of spinach or an 8 oz serving of baked beans or other pulses, or a handful of pumpkin seeds – in other words through the inclusion of more whole grains and vegetables in our diets.

TABLE 4
DAILY NUTRIENT INTAKE FOR DIFFERENT DIETS IN THE EPIC-OXFORD STUDY

	WOMEN				MEN				
	Meat	**Fish**	**Veg**	**Vegan**	**Meat**	**Fish**	**Veg**	**Vegan**	**DRV**
Energy (MJ)	8.1	7.8	7.6	7.0	9.2	8.9	8.8	8.0	8.1
Energy (kcal)	1916	1851	1815	1665	2193	2126	2097	1913	1935
Carbohydrate (per cent E)	48	51	53	56	47	50	51	55	47
Protein (per cent E)	17	15	14	14	16	14	13	13	15
Total fat (per cent E)	32	31	30	28	32	31	31	28	33
Saturated fat (per cent E)	10	9	9	5	11	9	9	5	10
PUFA (per cent E)	5.2	5.4	5.3	7.2	5.2	5.6	5.7	7.5	6
Dietary fibre (g NSP*/day)	19	22	22	26	19	22	23	28	18
Folate (µg)	321	346	350	412	329	358	367	431	200
Vitamin B12 (µg)	7.0	4.9	2.5	0.5	7.3	5.0	2.6	0.4	1.5
Calcium (mg)	989	1021	1012	582	1057	1081	1087	610	700
Iron (mg)	12.6	12.8	12.6	14.1	13.4	14.0	13.9	15.3	14.8

Source: Information adapted from EPIC–Oxford, 2003 [170]

* Non-starch polysaccharides

Note on energy intake: Recommended daily energy intake values for young adults and men are around 2500 kcal/day (10 MJ/day) and 2000 kcal/day (8 MJ/day) for women

CONCERNS ABOUT NUTRIENT DEFICIENCIES

The EPIC study results reinforce the notion that the overall balance of our diet is more important than the inclusion of meat or otherwise. As a general rule of thumb, the greater variety there is in a diet, the less likely nutrient deficiencies will occur. If a diet relies heavily on meat as a source of protein for example, it can be at the expense of other nutrient-dense sources of protein that can help protect against deficiencies in other areas.

A recent US expert panel review[172] which looked at how the conclusions of research into meat-free diets fit into overall dietary recommendations likewise noted how important it was to think in terms of whole diets rather than examine components in isolation, since all the foods we eat work together synergistically[173] to deliver health benefits – or not.

When it comes to meat in the diet this notion of synergy is important. An individual can meet all their daily protein needs by eating lots of red meat. But as the Harvard School of Public Health notes, while red meat is a useful source of protein, all sources of protein are not the same in terms of their total impact on diet:

"A 6-ounce broiled porterhouse steak is a great source of complete protein – 38 grams worth. But it also delivers 44 grams of fat, 16 of them saturated. That's almost three-fourths of the recommended daily intake for saturated fat. The same amount of salmon gives you 34 grams of protein and 18 grams of fat, 4 of them saturated. A cup of cooked lentils has 18 grams of protein, but under 1 gram of fat."

In the US MyPyramid meat, poultry, fish, dry beans, eggs, and nuts are classified as a single group of foods encouraging users to choose from a variety of quality protein sources at a glance.[174] Advice is given as to what quantities of non-meat foods equate to a serving of meat. For example, 1 ounce of meat, poultry, or fish is equivalent to ¼ cup cooked dry beans, one egg, two tablespoons of peanut butter, or ½ ounce of nuts or seeds. Dairy products are also good sources of protein and other essential nutrients (though MyPyramid notes these are also high energy input foods).

The Eatwell Plate guidelines similarly note that different cuts of meat contain different levels of fat[175] "for example, back bacon contains less fat than streaky bacon" and that grilled and roasted meat generally contains less fat than fried meat.

But it does not go so far as to recommend alternatives to meat. Users have to search out the pulses, nuts and seeds page[176] to find out that "Pulses are a great source of protein *for vegetarians*, [our emphasis] but they are also a very healthy choice for meat-eaters" and that nuts and seeds are "high in fibre, rich in a wide range of vitamins and minerals and a good source of protein (which is important *for vegetarians*)" [again, our emphasis].

In the UK, intake of pulses, nuts and seeds is low (intake of pulses is not even measured separately in the NDNS and Family Food Surveys and nuts and seeds represent just 1 per cent of daily calories for adults and 0 per cent for children in the UK diet). Emphasising their usefulness only to those who do not eat meat suggests they are not desirable or necessary for meat eaters. Grouping these food items separately from meat may prove a mouse-click or two too far to encourage omnivorous users to explore alternative sources of protein.

Protein

Studies show the maximum protein requirement from plant or animal sources for a healthy 70 kg adult living in a developed country is approximately 22 kg/year which is equivalent to around 60 g, or approximately 2 ounces, each day. The exact requirements depend on the individual, age and level of activity.[177]

There is a persistent idea that a switch to more plant-based or meat-free diets would negatively impact protein intake. However, as a population the UK takes in far more protein than is considered necessary and optimal. Indeed, most people living in the developed world, particularly meat eaters, consume far more than their daily protein requirement.[178]

An overall reduction in meat in the diet is likely to reduce protein intakes to optimal levels, especially if the foods that replace meat in the diet are high quality sources of vegetable protein. A reduced meat diet can also include protein from fish and eggs, though both these animal foods are subject to their own environmental and sustainability issues.

It is true that meat-free diets are typically lower in protein than omnivorous diets, but as Table 4 shows these sorts of diet, in general, provide the recommended amounts of daily protein.

What does deserve at least some attention is the health impact of eating too much protein. In the UK, whilst preparing its guidelines on nutrient intake, the Department of Health found several potential adverse effects of high protein diets and concluded that it was prudent to avoid protein intakes of more than twice the recommended amount.[179]

In particular, it has been proposed that a high-protein diet can be detrimental to kidney function.[180] This view is controversial,[181] though in cases of existing kidney disease lower protein diets can slow progress of the disease.[182]

The health impacts of different sources of protein are also influential and there may be benefits from including higher amounts of vegetable protein in the diet.

Amongst 30,000 women followed for 15 years, substituting vegetable protein for animal protein resulted in a 5 per cent lower risk of dying from heart disease. The same study also found that substituting largely refined carbohydrates for red meat or for dairy products significantly raised the risk of death by 44 and 41 per cent respectively. It concluded: "Long-term adherence to high-protein diets, without discrimination toward protein source,

may have potentially adverse health consequences."[183]

A pan-European study of similar size found that, compared to those who had the lowest intake of animal protein, those with the highest had more than 2½ times the risk of developing diabetes over the 10 years of the study.[184] This result was independent of dietary fat intake. Intake of vegetable protein was not associated with increased risk of developing diabetes.

The link between animal protein and diabetes has been demonstrated in other studies.[185] [186]

Other evidence suggests that a high rate of animal protein in the diet, compared to vegetable protein, can increase the rate of bone loss and the risk of fracture in post-menopausal women.[187] This is thought to be because diets that are rich in animal foods and low in vegetable foods can lead to higher blood acidity[188] which in turn can deplete calcium stores.[189] This appears to become more pronounced with increased age.

More study is needed to confirm this effect and indeed the authors suggest in another article that:

"For bone, the problem may not be too much acid from protein, but too little acid-neutralizing base [alkali] from those types of plant foods that are rich in base, such as roots, tubers, fruits, and vegetable fruits and leaves."

They also note that the plant foods that Americans eat most are refined cereal grains, such as wheat and rice, and that the volume of consumption of these foods may 'crowd out' other plant foods that are more alkaline, and more nutrient-dense. High blood acid levels, related to higher animal protein intake, have also been associated with increased risk of hypertension.[190]

Iron

As shown in Table 4, low iron intake is an across-the-board problem for many diet types. Previous data shows that those who eat meat are just as likely to be iron deficient as those who do not.[191] Interestingly the 2008 National Diet and Nutrition Survey suggests that on average across the adult population we take in more iron than recommended each day. Deeper examination of the figures, however, suggests that low iron intake is a problem for some subgroups, women in particular. Almost 50 per cent of teenage girls, for example, had low iron intakes.

The SACN Draft Report Iron and Health[192] found similar results with low iron intakes amongst:

- 12-24 per cent of children aged 1½ - 2½ years
- 44-48 per cent of girls aged 11-18 years
- 25-40 per cent of women aged 19-49 years

It is worth remembering however, that inadequate iron intake can, but does not always, lead to iron deficiency and anaemia. Much depends on how well the iron in the diet is absorbed – and this, in turn, is a function of several factors.

Dietary iron comes in two forms: heme iron (the organic form, mainly found in meat) and non-heme iron (the inorganic form, mainly from plants). Healthy adults absorb about 15 per cent of the iron in their diet, but absorption is influenced by the body's iron stores (absorption increases significantly when body stores are low and decreases when stores are high to protect against iron overload), the type of iron in the diet, and by other dietary factors that can either help or hinder iron absorption.[193]

The body's ability to absorb iron changes over time. It is particularly pronounced during pregnancy when a woman's body chemistry changes to allow greater absorption of iron: at 36 weeks the body's ability to absorb iron is nine times greater than in early pregnancy.[194] Conversely, absorption is lower in postmenopausal women, in whom iron stores are generally high.[195]

How much iron we absorb also changes with what we eat. A diet based on a wide variety of foods, especially fruits and vegetables, will provide the co-factors necessary for optimum iron absorption. In the UK it is mandatory to fortify flour with iron and some breakfast cereals are also fortified with iron. Small amounts of heme iron found in meat can improve the absorption of non-heme iron.

CONCERNS ABOUT NUTRIENT DEFICIENCIES

Low iron stores are not necessarily unhealthy and it is important to distinguish between this condition and the more serious iron-deficiency anaemia, which SACN estimates affects up to 6 per cent of the population. Once again the data suggest that diets that are over-reliant on one type of food – for instance meat or milk – are more likely to be iron deficient.

In a study of nearly 2000 British toddlers (1.5-4.5 years), overdependence on milk, where it displaces iron-rich or iron-enhancing foods such as lean meat, fish, fruit, and nuts, may put toddlers at increased risk of poor iron status. Children consuming more than 400 g per day of milk and cream were less likely to consume foods in other groups and this lack of dietary variety contributed to low iron status. The calcium in milk can also decrease iron absorption from other foods. Greater meat and fruit consumption, on the other hand, improved iron status.[196] In this study, not eating meat was not predictive of low iron status.

It has long been assumed that heme iron, because it is more readily bioavailable, is superior to non-heme iron. However some data suggests that heme iron can, at least theoretically increase oxidative damage through the formation of free radicals and increase the formation of these N-nitroso compounds.[197 198 199]

This sort of damage is common in heart disease, cancer and some autoimmune diseases such as diabetes. In 1994 a four year Harvard study of 45,000 men found that while iron intake in general was not associated with higher risk of heart disease, high intake of heme iron was. Compared to those with the lowest intake, those with the highest had a 42 per cent higher risk of developing coronary heart disease.[200]

These results were echoed in a smaller study of 6000 diabetic women published in 2007. Those with the highest intake of heme iron had a 50 per cent increased risk of heart disease compared to those with the lowest intake. The risk was particularly high in post-menopausal women.[201]

Researchers from the National Cancer Institute have found similar links between heme iron intake and prostate cancer.[202]

For some groups major dietary changes can increase the risk of deficiency. For example, teenagers who switch to strict vegetarian or vegan diet without due consideration for nutrient intake can end up eating unbalanced diets.

However it is worth remembering that meat reduction does not take all meat out of the diet and that meat taken out of the diet will be replaced by other foods. The challenge for public health campaigns around meat reduction is to make sure that those 'other foods' are in great enough quantity and variety to provide balanced nutrition across the daily diet. Thus the best way to address the perceived iron deficiency of the UK diet is likely to be by addressing the food imbalances that exist within that overall diet.

Children

There are no studies on meat reduction in children. Studies of vegetarian diets show that for this group, any potential nutritional deficiencies are related to the type of diet, i.e. the foods that are excluded.[203] In general, the greater the degree of dietary restriction, the greater the risk of nutritional deficiency.

Strict no-meat diets are more likely to be associated with less than optimal intake of nutrients – not because they are inherently less nutritious but because they may require more careful planning to get the optimum balance of nutrients. But children eating a plant-based diet that includes milk and eggs consume diets closer to recommendations than children whose diets include meat. Their pre-pubertal growth is at least as good as children consuming meat.[204 205]

Vegetables, grains, fruits, legumes, and nuts are the optimal foods for children. They are rich in complex carbohydrates, protein, fibre, vitamins, and minerals, and including more plant-based foods early on in a child's diet can set up valuable eating habits for life. Research indicates that adults who consume fruits and vegetables are those who consumed these foods during childhood.[206]

The elderly

Data which focuses specifically on diet choices in the elderly are sparse. As has already been discussed, plant-based diets tend to promote better health and longevity well into later life. Some elderly individuals are at risk of not getting enough calories each day. This is not a risk associated with any particular diet choice. Nor is lower caloric intake always a sign of deficiency.

As we age a decrease in physical activity and basal metabolic rate (due to loss of muscle mass) means we need up to 20 per cent fewer calories to maintain a healthy weight. This means that as we age a nutrient-dense diet becomes even more important. A high-meat diet where meat displaces other healthy foods may actually be less desirable as we age.

In common with the general population of non-meat eaters, elderly people who eat a mostly plant-based diet may well have nutritional intakes below current recommendations for a number of vitamins and trace elements. However this does not always translate into deficiency. In studies of Seventh Day Adventists for example it was meat-eaters that showed a higher prevalence of deficiencies, except in vitamins B12 and D. The energy intake for both groups was low.[207] Low B12 status is particularly common in elderly vegetarians[208] though, again, this does not always equate with poor health.[209] A plant-based diet may also be less expensive – an important consideration for those living on a limited income.

Low income groups

The link between low socioeconomic status and poor health is multistranded. It is not caused – and, more crucially, will not be solved – by diet alone. People in lower income groups are likely to be less educated, to smoke, drink more

alcohol and be under much greater social and cultural pressures than the general population.[210] All of these things affect health.

Nevertheless, there is clear evidence that the nutritional problems of the general population become exaggerated among low income groups to the detriment of their health. Reducing meat intake, as part of a healthier diet overall, would help to improve health outcomes.

There is evidence to suggest that socioeconomic group is more important than age and gender in determining diet and health. It is estimated that as many as 10 million people in the UK live in poverty, including nearly three million children.[211] Low socio-economic status is linked to higher incidence of conditions that are associated with high meat consumption including cardiovascular disease (CVD) risk in men and women,[212] a higher rate of diabetes[213] and obesity[214] and a higher rate of premature death from nearly all causes[215] especially heart disease[216] and some cancers,[217 218] and increased falls and fractures in older people.[219]

Past studies have shown that:

- People on low incomes eat more processed foods which are much higher in saturated fats and salt.[220] They also eat less varieties of foods.[221]
- People living on state benefits eat less fruit and vegetables, less fish and less high-fibre breakfast cereals.[222]
- People in the UK living in households without an earner consume more total calories, and considerably more fat, salt and sugar than those living in households with one or more earners.[223]

The biggest and most recent survey into the dietary habits of people on low incomes, the FSA Low Income Diet and Nutrition Survey,[224] found that, for many foods, the types and quantities consumed by the low income population appeared to be similar to those consumed by the general population. However there were some notable differences. In particular, lower income individuals tended to take in higher than optimal levels of trans fats – attained mainly through meat and dairy products – and lower than optimal levels of beneficial polyunsaturates and monounsaturates.

Level of education was also influential. Men and women with a lower level of educational achievement tended to have a less healthy diet than men and women with more education. Those with less education ate fewer vegetables and more chips, fried and roast potatoes. Less educated women also consumed less fruit and fruit juice.

While there may be concern that lower-meat diets might impact on the protein intake of people on lower incomes, as with the general population, average daily intake of protein greatly exceeded recommended levels in all sex and age groups.

The average UK household now devotes around 9 per cent of its expenditure to food, down from 16 per cent in 1984. But the poorest 10 per cent of households in the UK saw 15 per cent of their expenditure spent on food in 2005–06,[225] whereas the richest 10 per cent spent just 7 per cent.

There is some evidence to suggest that diets with a larger proportion of plant-based food may prove more affordable than average diets at the moment.[226] Low-income households spend proportionately more on basic staples such as milk and eggs, which are among the most price-volatile products. A survey on behalf of the BBC in 2008[227] found that meat products in a typical trolley of UK food items had risen more in price than other food items: 22.9 per cent compared to 14.7 per cent for fruit and vegetables, 6 per cent for cereal and 1.8 per cent for dairy. When unpredictable global weather affected grain harvests in 2008, grain prices soared. As grain harvests continue to be affected, this has had a knock-on effect on meat prices because of the large amounts of grain needed to feed intensively reared animals.[228]

The Low Income Diet and nutrition Survey showed that 35 per cent of men and 44 per cent of women wanted to change their diet; 60 per cent of parents/carers wanted to change their children's diet.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RECOMMENDATIONS FOR A HEALTHIER BALANCE

There is an undeniable need for widespread adoption of healthier and more sustainable diets. The public health benefits of lower-meat diets are as compelling as the environmental imperatives. What's more, there appears to be public willingness to make dietary changes.

While significant amounts of public money have been invested in general healthy-eating campaigns and specific drives around fruit and vegetables – like the Five a Day programme[229] – policy makers have ignored the adverse health impacts of rising meat consumption. In fact, the Government has supported and promoted a high-meat diet by subsidising factory farming and focussing its research and development budgets on intensive food production. Furthermore, the diets funded by taxpayers in schools, hospitals, care homes and prison – which cost taxpayers £2.2 billion each year – are high in poor quality factory farmed meat.

Research

While the impact of high levels of meat consumption has been studied extensively and is summarised in this report, there has been no research carried out into low-meat diets. Much of what's understood about the health, or otherwise, of people who eat little or no meat comes from comparative studies between a vegetarian diet and a high meat diet. Research is urgently needed into low-meat diets to gauge the optimum levels of meat consumption from both a health and environmental perspective. Research is also needed on how best to encourage adoption of appropriate lower meat diets for different sectors to avoid ineffective measures and risk putting off or confusing consumers.

More research needs to be carried out into the mechanisms that will help people to switch to lower and better meat diets - and to substitute healthy alternatives - and the implications for different groups in society.

Promotion of lower and better meat diets

While more research is needed, there is already sufficient evidence that the Government could save lives, money and protect the environment by:

- **Changing public procurement policy** to incorporate and prioritise mandatory health and environmental standards - including less but better livestock products - for food sourced by all Government departments and the wider public sector, including schools, the armed forces, care homes and hospitals.
- **Modifying existing healthy eating and environmental behaviour guidelines**, such as the eatwell plate, to incorporate advice on the benefits of lower-meat diets.
- **Mounting a proactive public education campaign** on the health and environmental benefits of lower-meat and better meat diets.


Friends of the Earth

Promoting less meat waste

This would include encouraging consumers and the food industry to utilise more of each animal's carcass. Wasting less meat would reduce its overall environmental impact and would increase the quantity of meat produced by each animal, making meat from better bred animals more available and affordable.

Reforming the Common Agricultural Policy

More than £700 million of public money is currently spent subsidising environmentally damaging, large-scale meat production. While this is part of EU policy, the UK Government has considerable control over how the UK portion is distributed. It should act immediately to shift funds from factory farming to the production of better-quality meat and a healthier overall balance of food production. The reform of the entire European CAP in 2013 is an opportunity for massive improvements in food production across the EU. The UK Government should adopt a position that prioritises health and environmental concerns.

Labelling

Grass-fed meat and dairy products are healthier and more planet-friendly than factory farmed options.[230] They and are less likely to be damaging to health than highly processed products. This should be reflected through subsidies and advice given to consumers. They should be clearly labelled for consumers. This would help people make more informed food choices and stimulate the market for these products. Grass fed systems will need to be more clearly defined so that consumers can be confident that they are buying a product from animals that have been genuinely grass fed.

Marketing

Food advertising and marketing plays an important role in encouraging unhealthy eating habits, especially in children. It is almost always for unhealthy products. We need far more effective promotion of healthy foods and diets to counter this and regulation to protect children in particular from junk food advertising.

Strategy

Friends of the Earth is calling on the Government to implement these changes within the framework of a Sustainable Livestock Strategy.

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The production of meat and dairy is one of the most significant contributors to climate change and global wildlife loss – yet little is being done to reduce its impact.

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Friends of the Earth, England Wales and Northern Ireland
26-28 Underwood Street, London N1 7JQ, United Kingdom
Tel 020 7490 1555 Fax 020 7490 0881 Website www.foe.co.uk
Trust company number 1533942, charity number 281681

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