

Institution: University of Oxford		
Unit of Assessment: 2 – Public Health, Health Services and Primary Care		
Title of case study: Improving the healthiness and sustainability of global diets		
Period when the underpinning research was undertaken: 2013 – 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Mike Clark	Researcher	August 2018 – present
Tim Key	Professor	October 2007 – present
Mike Rayner	Professor	September 1993 – present
Peter Scarborough	Associate Professor	March 2003 – present
Marco Springmann	Senior Researcher	December 2013 – present
Period when the claimed impact occurred: June 2014 – July 2020		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact		
<p>Research from Oxford University has driven widespread changes towards more healthy and sustainable, plant-based diets. In particular, this work has conclusively demonstrated that a global shift towards plant-based diets would deliver significant environmental and health co-benefits, and be the most effective dietary option to address climate change. By modelling the potential impact of policy options for different countries, including fiscal incentives, the researchers demonstrated that widespread taxes on red and processed meat would be one of the most effective means to achieve this. These studies have been recognised by international agencies and parliamentary bodies, raising the global agenda for healthy and sustainable diets. A particularly influential report based on this research, <i>Food in the Anthropocene</i>, sparked intense media interest and extensive social media discussions. Ultimately, this contributed to action at country, city, business and individual level, with increased positive attitudes towards plant-based diets and demonstrable falls in meat consumption.</p>		
2. Underpinning research		
<p>Research from the University of Oxford has significantly contributed to the definition of a healthy and sustainable diet, explored both the environmental and health consequences of global changes in diet, and modelled the impact of national food policies. This has been achieved through a multidisciplinary, collaborative approach which for the first time enabled dietary policies for population health to be simultaneously quantified in terms of their resource use, climate change impacts and health impacts. Using dietary data from a long-term cohort study involving 65,000 participants, University of Oxford researchers produced the first study analysing the dietary climate change impacts of 2,041 vegans, 15,751 vegetarians, and 37,712 meat eaters [1]. Until this work, the question of whether low meat diets were better for the environment was the subject of debate. The results conclusively demonstrated that real-life, plant-based diets have far lower carbon footprints than diets high in animal products. Building on this work, the researchers developed a global food-health-environment model to estimate the impact of food systems in 2050. This model had country-level resolution, using data on food production and trade in each country, and combined meta-analyses of nutritional epidemiology to estimate the health impacts of the scenarios. With this detail, the research team were able to perform the first comprehensive assessment of the climate-change and health implications of a global transition towards plant-based diets, including an economic valuation of the health and climate-change co-benefits [2]. In collaboration with the International Food Policy Research Institute, University of Oxford researchers integrated this model with a global agriculture economics model, which projected scenarios based on assumptions of climate change, population growth and global development trajectories for over 150 countries [3]. The researchers also led a broad collaboration involving experts in environmental change, agriculture economics and life cycle analysis to produce the first study which comprehensively assessed food-system options to stay</p>		

within planetary boundaries by 2050. This explored at country level the impacts of reducing food loss and waste, changing technologies and management practices, and dietary change towards healthier diets. Researchers at University of Oxford developed the scenarios, conducted the analyses and were lead authors on the resultant paper [4].

The food-health-environment model developed for this was then applied by University of Oxford researchers to estimate the impact of national food policies for multiple countries. This included an assessment of the impact of health-motivated taxes for red and processed meat for all major world regions on health and sustainability outcomes [5]. Unlike most public health analyses of food taxation, the integrated model accounts for feedback in production and trade associated with raised prices for red and processed meat providing a more conservative assessment of the total impact. This found that widespread taxes on red and processed meat (set at the optimum level for each country) would result in a 9% reduction in the global number of deaths attributable to red and processed meat consumption, with a 14% decrease in attributable healthcare costs.

3. References to the research (Oxford researchers highlighted in bold, students in italics)

1. **Scarborough P, Appleby PN**, Mizdrak A, *Briggs AD*, **Travis RC, Bradbury KE** and **Key TJ** (2014). Dietary greenhouse gas emissions of meat-eaters, fish-eaters, vegetarians and vegans in the UK. *Climatic change*, 125 (2):179-192. DOI: [10.1007/s10584-014-1169-1](https://doi.org/10.1007/s10584-014-1169-1)
2. **Springmann M, Godfray CJ, Rayner M** and **Scarborough P** (2016). Analysis and valuation of the health and climate change co-benefits of dietary change, *Proc. Natl. Acad. Sci.* 113(15):4146–4151. DOI: [10.1073/pnas.1523119113](https://doi.org/10.1073/pnas.1523119113)
3. **Springmann M**, Wiebe K, Mason-D'Croz D, Sulser T, **Rayner M** and **Scarborough P** (2018). Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. *The Lancet Planetary Health* 2(10):e451-e461. DOI: [10.1016/S2542-5196\(18\)30206-7](https://doi.org/10.1016/S2542-5196(18)30206-7)
4. **Springmann M, Clark M, ... Scarborough P, Rayner M, Godfray CJ et al** (2018). Options for keeping the food system within environmental limits, *Nature* 562:519-525. 23 authors, of which 5 are from University of Oxford. DOI: [10.1038/s41586-018-0594-0](https://doi.org/10.1038/s41586-018-0594-0)
5. **Springmann M**, Mason-D'Croz D, Robinson S, Wiebe K, **Godfray HCJ, Rayner M** and **Scarborough, P** (2018). Health-motivated taxes on red and processed meat: a modelling study on cost-compensating tax levels and health and climate-change co-benefits, *PLOS One* 13(12):e0204139. DOI: [10.1371/journal.pone.0204139](https://doi.org/10.1371/journal.pone.0204139).

Funding to the University of Oxford included BHF Intermediate Fellowship to Scarborough, GBP576,980 (FS/15/34/31656, 2016-21) and Wellcome Trust 'Livestock, Environment and People', GBP4,391,572 (205212/Z/16/Z, 2017-2021) (PI Godfray, Co-Is including Scarborough).

4. Details of the impact

A new global policy agenda for healthy and sustainable diets

The dietary scenarios developed in study [4] were the centrepiece of a highly influential report by the international EAT-Lancet commission in 2019: 'Food in the Anthropocene' [A]. This provided a template for global food-based dietary guidelines. The report concluded that international health, sustainability and climate change objectives would only be achieved with a radical population-level shift towards plant-based diets. In addition to generating considerable media interest (see below), this report resulted in international policy action. At the C40 Mayoral Summit in October 2019, 14 global cities committed to city-level policy change to align with EAT-Lancet's recommendations [B]. The report has also helped shape new national dietary guidelines that incorporate sustainability, including for Indonesia and Norway. EAT-Lancet also formed the basis of a new policy document from the International Association of Medical students to integrate nutrition and sustainability into global medical curriculums [C].

The research studies have also influenced United Nations (UN) climate negotiations, including meetings of the Conference of the Parties (COP) of the UN Framework Convention on Climate Change in 2017 (COP23) and 2018 (COP24). The research evidence and recommendations were cited in subsequent COP publications: for instance, the WHO's COP24 Special Report *Health and Climate Change* [Di] states: 'A synergistic combination of supply and demand measures to increase consumption of diets with more fruit and vegetables, produced sustainably and ideally locally, will be necessary to gain the potential health and environmental benefits',

citing [4]. The research studies also informed the Intergovernmental Panel on Climate Change (IPCC) special reports on Global Warming of 1.5 degrees Celsius (2018) [Dii] and on Land (2019) [Diii]; and in several UN reports, including those of the Standing Committee on Nutrition. For example, the IPCC special report on land [Diii] states *‘Consistent evidence indicates that, in general, a dietary pattern that is higher in plant-based foods... is more health-promoting and associated with lower environmental impact...[than] current global average diets’*, citing [2], [3] and [4]. The University of Oxford also jointly published with the UN Food and Agricultural Organisation the report *‘Plates, pyramids, planet’* [Ei], citing [1], which found that only four countries worldwide integrated sustainability within their food-based dietary guidelines for health, prompting more countries to begin doing this. The report [Ei] was cited in the 2018 WHO information booklet on healthy and sustainable diets [Eii] which stated that *‘A healthy diet should be sustainably produced and consumed, and there is growing evidence that human health and environment ‘win-wins’ are possible’*. This represented a new policy direction: prior to this, WHO dietary guidelines focused on health outcomes, without integrating environmental objectives. Fiscal policies, as modelled by [5], to achieve healthy and sustainable diets have now become prominent issues for European Governments; in particular, a tax on processed and red meat was discussed by a meeting of the European Parliament and has featured in election campaigns (e.g. Denmark and Finland).

Impact on the UK policy arena

The EAT-Lancet study [A] was directly referred to during oral evidence sessions for the Parliamentary Environmental Audit Committee inquiry into Planetary Health, and the recommendations in the resulting 2017 report, *Our Planet, Our Health* [Fi], draw on those of the EAT-Lancet study, for example: *‘One of the key messages of the recent EAT–Lancet Commission on healthy diets from sustainable food systems was that: “Transformation to healthy diets from sustainable food systems is necessary to achieve the UN Sustainable Development Goals [SDGs] and the Paris Agreement”’*. The report also cited the EAT-Lancet Commission as part of its recommendation that *‘The Government should ...consider using financial incentives to promote access to, and consumption of, healthy and sustainably produced food’*. The underlying research papers [2,4,5] were also cited in the Parliamentary Office of Science and Technology’s 2019 policy briefing paper on Climate Change and Agriculture [Fii] and the Committee on Climate Change (CCC)’s 2020 report on land use in the UK [Fiii] as evidence supporting a population level shift to plant-based diets to reduce greenhouse gas emissions. The CCC report made the specific recommendation to *‘reduce... the consumption of beef, lamb and dairy by at least 20% per person’* [Fiii]. In January 2020, the Behavioural Insights Team published an evidence review outlining the 12 most effective strategies to promote healthy and sustainable diets [Fiv]. This called for carbon taxes on food products to be introduced: *‘Many health professionals have become proponents for a meat tax to save lives’*, citing publication [5].

MPs have acknowledged the role of University of Oxford research in driving forward the debate on healthy and sustainable diets in numerous parliamentary debates. For instance, during a debate in the House of Commons on ‘Environment and Climate Change’ in May 2019, Kerry McCarthy (MP for Bristol East) said *‘If we do not make changes, the food and farming system will singlehandedly use up our Paris climate agreement emissions budget within the next 30 years...There have been endless wake-up calls, including from the UN, the IPCC, EAT-Lancet, Chatham House, academics from Harvard and Oxford, and many more...’*. Health and sustainability are now firmly integrated into Government food production policy, as demonstrated by the Department for Environment, Food and Rural Affairs’ 2020 Progress Report: Farming for the Future [G]. This states *‘The next 10 years are a period of significant change and 2021 represents the first step of government and farmers working together to invest in farming business, public goods and the production of safe, healthy and sustainable food.’* Several MPs have also given public support in favour of government-enforced financial incentives to increase access to healthy and sustainable food products, including Caroline Lucas, MP for Brighton Pavilion, at the 2019 Oxford Farming Conference.

Impact on business and investment decisions

The World Economic Forum (WEF) commissioned University of Oxford researchers to write a review on alternative proteins as part of their discussion series on the future of meat. The report

[Hi] drew upon the modelling analyses developed for the studies outlined above. The subsequent WEF white paper *Meat: The Future, A Roadmap for Delivering 21st-Century Protein* [Hii] cited this commissioned report extensively as supporting evidence, for instance: *'[Hi] highlights that replacing a single daily portion of beef (and to a lesser extent both pork and chicken) with the studied alternatives (beans, pulses, mycoproteins, nuts etc.) can reduce diet-related mortality in high-income and upper-middle-income countries by up to 5%, while simultaneously reducing greenhouse gas emissions'*. This paper was sent to delegates and discussed at the World Business Council on Sustainable Development (WBCSD) in December 2018). In its 2020 report on assessment of risks in the food and agriculture sector [Hiii], the WBCSD said: *'The report issued by the EAT-Lancet Commission [A] in February 2019 outlines how to deliver a sustainable and healthy food system for 10 billion [10,000,000,000] people within the boundaries of the planet by 2050... This is an opportunity for governments to set regional- and country-specific targets and regulations'*.

In June 2020 FAIRR (Farm Animal Investment Risk & Return), a global network of investors managing over USD20,000,000,000,000 of assets, published *The Livestock Levy: Progress Report* [I] in which they concluded that *'momentum is clearly building in European capitals'* for an EU-wide meat tax. The research was invoked extensively as supporting evidence in the report, for instance: *'Research by Oxford University concludes that a health tax on red and processed meat could save over \$40 bn [USD40,000,000,000] in global healthcare costs'*, as found in [5]. The report's recommendations for investors in the animal protein sector include reducing meat content in composite products and adopting supply standards that mitigate health and environmental risks.

The EAT-Lancet report [A] has inspired pilot projects from major food service companies to move towards healthier and more sustainable products and menus. This includes the Compass Group, the world's largest foodservice company, whose Sustainability Director wrote:

"Our sustainability strategy is focused on taking targeted actions where we believe they will have the greatest impact... This exciting pilot with EAT allows us to test key elements from the EAT-Lancet report and use it to inform our business decisions" [J].

Impact on public discourse

The EAT-Lancet report [A] sparked considerable public debate about the merits of plant-based diets, having been featured in over 5,800 articles in 118 countries, and shared over 1,000,000,000 times on social media in the year following its publication. The report and the research [1–5] received widespread coverage in traditional media, documentary films and podcasts, including *BBC News*, *Sky News*, *The Daily Telegraph* and *The Guardian*. The researchers have been interviewed about their work on Radio 4's *Today* programme, and other programmes including BBC's *Trust me, I'm a doctor* (1,410,000 episode views) and *Countryfile* (4,860,000 episode views). Documentary films have included *The End of Meat* (9/2017, Germany) and *#Powerplant* (2/2019, Netherlands), as well the video *How could veganism change the world?* for *The Economist* (780,000 views). For the latter, approximately 94% of reactions (likes/dislikes) were positive. Opinion pieces in national newspapers have described how this research has motivated dietary change e.g. in *the Guardian*: *'I have changed what I eat because of the now overwhelming evidence of global environmental damage caused by meat and dairy production... If the world's diet doesn't change, we simply can't beat climate change'* [embedded link to EAT-Lancet report [A]]. Marco Springmann also summarised the main research findings from [1-5] in a 'TEDx' talk (5/2019) which has been viewed over 16,000 times, with approximately 81% of reactions (likes/dislikes) being positive.

The researchers also engaged the UK film and TV industry at screenwriter workshops including BAFTA Screenwriting for Sustainability (6/2016), BBC Eco-Enders (10/2018), and BAFTA Soap Sustainability Story Summit (6/2019). This led to greater understanding within the sector of the health and environmental rationale for plant-based diets, as testified by the Head of Industry Sustainability at BAFTA [K]: *'Peter Scarborough and the team at Oxford have helped the industry to get to grips with (climate change). Bringing the scientific and creative community together in this way would not have been possible without the department's detailed understanding and passionate delivery'*. In 2018, Coronation Street (viewing figures of approximately 6,000,000 people) ran a story featuring vegan diets, while in October 2020

EastEnders (viewing figures of approximately 5,000,000 people) stopped serving meat products on screen, using vegetarian alternatives instead in order to avoid waste and reduce its carbon footprint – a decision that generated significant media attention.

Several surveys [L] indicate that greater awareness of the environmental and health consequences of animal-based foods has led to more individual action to reduce meat consumption. These indicate that the number of vegans in the UK quadrupled from 150,000 in 2014 to 600,000 in 2019 (The Vegan Society) and that in 2019, a quarter (26%) of those who describe themselves as meat-eaters (rather than plant-based flexitarians) were actively trying to reduce their meat consumption (YouGov). The UK National Diet and Nutrition Survey has shown a downward trend in consumption of red and processed meat between 2008/09 and 2016/17. Worldwide participants in the annual Veganuary campaign steadily increased from 3,000 in 2014 to over 400,000 in 2020, with around 50% saying they would continue a vegan diet at the month's end. University of Oxford research has been cited in Veganuary's campaign materials, for instance in the following Twitter post from December 2019: '#Veganuary2020 starts in just two weeks time!!! Recent Oxford Uni research concluded that, 'a vegan diet is probably the single biggest way to reduce your impact on planet earth'.

5. Sources to corroborate the impact

- A. Journal article: Willett W et al (2019). Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems, *The Lancet* 393:447-492. DOI: [10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4).
- B. Press release from C40 cities, October 2019: 14 Cities Commit to Sustainable Food Policies That Will Address the Global Climate Emergency. https://www.c40.org/press_releases/good-food-cities
- C. International Federation of Medical Students' Association Policy Document: Food for Health and Sustainability. August 2019.
- D. (i) World Health Organisation: COP24 Special Report Health & Climate Change. (ii) Impacts of 1.5°C Global Warming on Natural and Human Systems, in Global Warming of 1.5°C. An Intergovernmental Panel on Climate Change Special Report Special Report (2018) (iii) Intergovernmental Panel on Climate Change Special Report: Climate Change and Land (2019) Chapter 5: Food security.
- E. (i) Food and Agriculture Organisation of the United Nations (2016). Plates, Pyramids, Planet - Developments in national healthy and sustainable dietary guidelines: a state of play assessment. (ii) World Health Organization (2018). A healthy diet sustainably produced.
- F. (i) House of Commons Environment Audit Committee *Our Planet, Our Health*. September 2017. (ii) Parliamentary Office of Science & Technology POSTNOTE 600, May 2019 *Climate Change and Agriculture*. (iii) Committee on Climate Change *Land use: Policies for a Net Zero UK* January 2020. (iv) *A Menu For Change – Sustainable Eating For All* The Behavioural Insights Team, January 2020.
- G. DEFRA. Farming for the Future: Policy and progress update. February 2020.
- H. (i) World Economic Forum White Paper January 2019. Meat: The Future Series - Alternative Proteins. (ii) World Economic Forum White Paper January 2019. Meat: The Future: A Roadmap for Delivering 21st-Century Protein. (iii) World Business Council on Sustainable Development, January 2020. An enhanced assessment of risks impacting the food and agriculture sector.
- I. Farm Animal Investment Risk & Return (FAIRR) report The Livestock Levy: Progress Report, June 2020
- J. Compass Group joins forces with EAT to build a sustainable food future. December 2019. <https://www.compass-group.com/en/media/news/2019/compass-group-joins-forces-with-eat-to-build-a-sustainable-food-.html>
- K. Corroborator 1: Head of Industry Sustainability at BAFTA
- L. Surveys and reports of public attitudes towards plant-based diets. (i) Ipsos Mori, 2016 and 2019; (ii) YouGov, 03/2019; (iii) Public Health England and Food Standards Agency, 01/2019; (iv) The Guardian, 02/2020, (v) Vegan Society, 09/2020.