

Institution: University of Leeds		
Unit of Assessment: UoA06		
Title of case study: Driving policy change around dietary carbohydrates and human health		
Period when the underpinning research was undertaken: 2000 - 2018		
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:
Dr Charlotte Evans	Associate Professor in Nutritional Epidemiology	2006 – present
Dr Victoria Burley	Associate Professor in Nutritional Epidemiology	2010 - 2017
Period when the claimed impact occurred: 2010 – present		
Is this case study continued from a case study submitted in 2014? N		
1. Summary of the impact (indicative maximum 100 words) <p>High sugar diets have critical, costly health implications. Research at the University of Leeds on dietary carbohydrates and cardio-metabolic health outcomes provided key evidence to the Scientific Advisory Committee on Nutrition, leading to changes to government policy and industry practices, including new UK dietary guidelines for free sugar and fibre intakes, a 'Soft Drinks Industry Levy' and sugar-reduction reformulation by the international food industry. Consequently, the content of sugar in sugar-sweetened beverages has fallen by 43.7% since 2015 and the dietary intake of free sugars has reduced significantly across all age groups. Additionally, the research has influenced international policy development.</p>		
2. Underpinning research (indicative maximum 500 words) <p>Drs Burley and Evans are members of the Nutritional Epidemiology Group (NEG) within the School of Food Science and Nutrition at the University of Leeds. They work closely with Dr Greenwood, a senior biostatistician in the Faculty of Medicine and Health. NEG gained World Health Organization collaborating centre status in 2018. Its epidemiological research linking diet to chronic disease development, and evaluation of dietary behaviour change, are recognised internationally.</p> <p>Through a competitive bid in 2010, the Department of Health (DoH) commissioned a team led by Drs Burley and Evans to undertake the most extensive systematic review and meta-analysis of published research linking the quantity and quality of dietary carbohydrates to cardio-metabolic health outcomes. The outcomes included cardiovascular disease, blood pressure, type 2 diabetes mellitus, lipidaemia, cholesterolaemia, obesity, and inflammation biomarkers.</p> <p>From 2010 to 2012, the research team systematically reviewed evidence from 42,583 published scientific papers. They conducted more than 100 meta-analyses using extracted data from both randomised controlled trials and prospective cohort studies for each outcome where available. Key findings were published in prestigious peer-reviewed journals [2, 3, 4, 5] and the body of research contributed to all chapters on cardio-metabolic health outcomes in the 'Carbohydrates and Health Report' published by the Scientific Advisory Committee on Nutrition (SACN) in draft and final versions in 2013 and 2015, respectively [1, A].</p>		

The research findings from the Leeds team made up 60% of the total body of evidence in the final report [1, A]. This included analysis of data on the intake of sugars and fibre, as well as related dietary patterns such as low glycaemic index (GI) diets, and their relationships with cardio-metabolic health outcomes. The key findings from the systematic reviews and meta-analyses were:

- Consuming one 330 mL can of sugar sweetened beverage (SSB) per day was associated with a 20% and 23% increase in the risk of type 2 diabetes mellitus for adults and children respectively [1, 2].
- Every 7 g/day increment of total fibre intake reduces the relative risk of all cardiovascular events by 9% [1, 3], type 2 diabetes mellitus by 6% [1] and first stroke by 7% [1, 4]. Seven grams of fibre is the equivalent of two slices of wholemeal bread and one bowl of high fibre cereal.
- Every 5 GI unit increment increases the relative risk of type 2 diabetes mellitus by 8% [1, 5]. Diets with a low GI are characterised by higher intakes of wholegrains, legumes and types of fruits and vegetables.

The research recommended consumption of 'complex' rather than refined carbohydrates in foods and drinks to reduce the risk of cardio-metabolic disease [1, 5].

3. References to the research (indicative maximum of six references)

[1] A systematic review of the evidence of the benefits and risks of different carbohydrates on cardio-metabolic health and disease. Nutritional Epidemiology Group. University of Leeds, Leeds. 2013 - Draft 2015 - Final. <https://www.gov.uk/government/publications/sacn-carbohydrates-and-health-report>

[2] Greenwood, D.C., Threapleton, D.E., **Evans, C.E.L.**, Cleghorn, C., Nykjaer, C., Woodhead, C., **Burley, V.J.** (2014). Association between sugar-sweetened and artificially sweetened soft drinks and type 2 diabetes: Systematic review and dose-response meta-analysis of prospective studies. *British Journal of Nutrition*, 112(5), 725-734. Doi: [10.1017/S0007114514001329](https://doi.org/10.1017/S0007114514001329)

[3] Threapleton, D.E., Greenwood, D.C., **Evans, C.E.L.**, Cleghorn, C.L., Nykjaer, C., Woodhead, C., Cade, J.E., Gale, C.P., **Burley, V.J.** (2013). Dietary fibre intake and risk of cardiovascular disease: systematic review and meta-analysis. *BMJ* (Clinical research ed.), 347, f6879. Doi: <https://doi.org/10.1136/bmj.f6879>

[4] Threapleton, D.E., Greenwood, D.C., **Evans, C.E.L.**, Cleghorn, C.L., Nykjaer, C., Woodhead, C., Cade, J.E., Gale, C.P., **Burley, V.J.** (2013). Dietary Fiber Intake and Risk of First Stroke: A systematic review and meta-analysis. *Stroke*, 44, 1360-1368. Doi: <https://doi.org/10.1161/STROKEAHA.111.000151>.

[5] Greenwood, D.C., Threapleton, D.E., **Evans, C.E.L.**, Cleghorn, C.L., Nykjaer, C., Woodhead, C., **Burley, V.J.** (2013). Glycemic Index, Glycemic Load, Carbohydrates, and Type 2 Diabetes: systematic review and dose-response meta-analysis of prospective studies. *Diabetes Care*, 36(12), 4166-71. Doi: <https://doi.org/10.2337/dc13-0325>

4. Details of the impact (indicative maximum 750 words)

Policy Impact

Drs Burley and Evans undertook the most extensive systematic review and meta-analysis of published research to date linking carbohydrate quantity and quality to cardio-metabolic health outcomes. In 2012, Burley and Evans presented their findings to SACN, including senior policy makers from Public Health England (PHE). The research findings were used in all chapters on cardio-metabolic health outcomes, constituting 60% of the evidence in the overall 'Carbohydrates and Health Report', published by SACN as a draft in 2013 and as a final version in 2015 [1, A].

The contribution by Leeds researchers is acknowledged both within the report [A] and by the SACN carbohydrates working group chairman stating: “Dr Evans and colleagues contributed substantially to the evidence base for the conclusions and recommendations drawn by SACN” [B].

The research underpinned SACN’s rationale for urgent policy action on sugars and fibre. Within three months of the final report publication, UK government dietary guidelines were changed for free sugars and fibre [C] and PHE published their report ‘Sugar Reduction: The Evidence for Action’ [D]. This document recommended a range of actions to reduce the consumption of free sugars, including a Soft Drinks Industry Levy (SDIL) [F] which was announced in March 2016, closely followed by the Childhood Obesity Plan by the DoH that incorporated actions to reduce sugar intake by children [E]. By 2018, when the SDIL was implemented, many drinks manufacturers had reformulated their products to meet the criteria [F]. The impact of Leeds research is underpinned by the SACN carbohydrates working group chairman who stated: “Government accepted the SACN Carbohydrates Report in 2015 and then began developing policies to implement the recommendations as part of the Childhood Obesity strategy and with wider nutritional policy” [B]. This evidence has, therefore, directly led to impacts on public health policy and industry practices through dietary guidelines [C] and statutory legislation on sugar content of SSB in the UK [F].

Change to Dietary Guidelines in 2016

Based on evidence provided by Leeds [1,2], reported by SACN and PHE on sugar intake [A, D], PHE changed the recommendation for sugar intake for the population from 11% to 5% of food energy [C]. The evidence on fibre intake [1, 4, 5, 6] led to an increase in the total fibre recommendation from 24 g to 30 g per day [C], expressed using the definition by the Association of Analytical Chemists.

Implementation of the SDIL and Reformulation of Foods and Drinks

The SDIL outlined the criteria for placing a levy on SSB with sugar contents above 5 g per 100 ml. The soft drinks industry was given two years from 2016 to voluntarily meet the criteria by reducing sugar levels in their products. PHE published a report on the progress made between 2015 – 2019 which included the following highlights [p53-54 in F]:

- A 54.2% increase in sales of lower sugar products exempt from the levy.
- A 54.8% reduction in sales of higher sugar products in levied categories, equivalent to 514,624 litres.
- A 3.0% reduction in the sugar content of foods and drinks overall and a 43.7% reduction in sugar content of drinks included in the SDIL.
- A 35.2% decrease in energy consumed from SSB on a single occasion.

In 2019, members of the Royal Society for Public Health (RSPH) voted the SDIL as the second greatest public health achievement of the 21st century. The society stated that the levy signalled a shift towards greater recognition of the role played by the food and drink industry in enabling healthier choices and will continue to have a strong positive impact on public health [G]. The Public Health Minister reported at the time ‘The Soft Drinks Industry Levy is ground-breaking policy that will help to reduce sugar intake’ [G].

Reductions in Daily Free Sugar Intake

National Diet and Nutrition Survey (NDNS) data for 2016-19 was recently published and compared to the previous 2 years. Significant reductions in the intake of free sugars were seen in all age groups. Percentage of energy from free sugars reduced from 13.5 to 12.1% in children aged 4-10, from 14.1 to 12.3% in adolescents aged 11-18 and from 11.1 to 9.9% in adults aged 19-64 [table 3.10, H]. Average SSB consumption reduced by 26% from 191g/day in 2014-16 to 142g/day in 2016-19 in adolescents (the highest consumers) [table 7.10, H]. Evans also reported a 19%

reduction in the content of free sugars in children's packed lunches after the publication of the draft SACN report [I].

International Reach

The SACN report is accredited in a policy context document by the Australian Government Department of Health as providing evidence for new dietary guidelines on sugar intake [J].

5. Sources to corroborate the impact (indicative maximum of 10 references)

[A] SACN, Carbohydrates and Health report (2015)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/445503/SACN_Carbohydrates_and_Health.pdf

[B] Letter of Leeds contribution by the SACN Carbohydrates working group chairman, 11/12/18

[C] PHE, Government Dietary Recommendations (2016)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/618167/government_dietary_recommendations.pdf

[D] PHE, Sugar Reduction The evidence for action (2015)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/470179/Sugar_reduction_The_evidence_for_action.pdf

[E] Department of Health and Social Care (DHSC), Childhood Obesity A plan for action (2016)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/546588/Childhood_obesity_2016_2_acc.pdf

[F] PHE, Sugar reduction: Report on progress between 2015 and 2019 (2020)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925027/SugarReportY3.pdf

[G] RSPH Top 20 public health achievements of the 21st century and Government news story with quotes from the Public Health Minister (2019)

<https://www.rsph.org.uk/about-us/news/top-20-public-health-achievements-of-the-21st-century.html>

<https://www.gov.uk/government/news/soft-drinks-industry-levy-comes-into-effect>

[H] PHE, NDNS Rolling programme Years 9 to 11, results report and data tables (2016/2017 to 2018/2019)

<https://www.gov.uk/government/statistics/ndns-results-from-years-9-to-11-2016-to-2017-and-2018-to-2019>

[I] Evans, C. E. L., Melia, K. E., Rippin, H. L., Hancock, N., Cade, J. (2019). A repeated cross-sectional survey assessing changes in diet and nutrient quality of English primary school children's packed lunches between 2006 and 2016. *BMJ Open*. Doi:

<http://dx.doi.org/10.1136/bmjopen-2019-029688>.

[J] Australian Government, Department of Health, Policy context relating to sugars in Australia and New Zealand (2017)

[http://www.health.gov.au/internet/fr/publishing.nsf/Content/C6995F10A56B5D56CA2581EE00177CA8/\\$File/Policy%20Context%202017.pdf](http://www.health.gov.au/internet/fr/publishing.nsf/Content/C6995F10A56B5D56CA2581EE00177CA8/$File/Policy%20Context%202017.pdf)