Protocol v2.1

1. FULL TITLE

A public health evaluation of a voluntary ban on the use of price promotions to sell foods high in fat salt and sugar in two UK supermarket chains

2. BACKGROUND AND RATIONALE

The UK government and devolved administrations are at different stages of considering or preparing for mandatory bans on the use of special offers or 'price promotions' to sell High Fat, Salt and Sugar (HFSS) foods.

Sainsbury's in February 2016 and Tesco in October 2022 voluntarily introduced a ban on using multi-buy and extra volume price promotions to sell HFSS foods; both have kept the policy in place since.[1–3]

We will evaluate the impact of these two industry-initiated voluntary bans in the UK, from a public health perspective. Our multidisciplinary team will take a systems approach to evaluate this voluntary intervention, considering secondary and unintended consequences and the impacts on different groups, informed by our systems logic model (see Fig 1).

This study will provide novel information on the behavioural responses, health impacts, business economic performance and industry responses. This can help inform policy makers trying to implement or refine a mandatory ban on the use of price promotions.

Background

Obesity, diet, health and commercial marketing

Obesity and unhealthy diets are major causes of disease in the UK. In England 24% of years of life lost are attributed to high body mass index and unhealthy diets.[4] Excess consumption of HFSS foods contribute.

Commercial marketing of HFSS food drives purchasing, with price promotions being an important example.[5] Price promotions are common in the UK, accounting for 40% for food expenditure; and may cause a 9% uplift in total sugar brought for consumption in the home.[6]

UK Policy Context

In 2021 the UK government legislated to ban the use of some types of price promotions (multi-buy discounts, e.g. buy 2-for-the-price-of-1, and extra-free, e.g. 50% extra volume free) on HFSS foods in England by medium and large businesses.[7] Temporary price reductions (e.g. get 20% off the price) and small businesses (fewer than 50 employees) were excluded.[7] This was part of a wider strategy to address marketing (e.g. advertising restrictions, limits on checkout and end-of-isle sales) of HFSS foods.[8]

The policy has not been implemented in England, delayed twice due to concerns about the impact on people's budgets.[9] It is currently due to be implemented in October 2025.

The Welsh Government plans to legislate in 2025.[10] The Scottish Government wants to introduce a ban on their use.[11] Both are considering also banning temporary price reductions.[11] The Northern Ireland Assembly being suspended has had limited opportunity to develop policy in this area; we are not aware of any proposed policy.

Alongside other government policies to restrict marketing of HFSS products, supermarket chains are changing their approach to marketing HFSS and non-HFSS foods.[1,12] Voluntary or industry led policies tend to be seen as weaker/less effective,[13] although there are examples of effective voluntary policies within the food sector.[14]

UK public views

Polling on members of UK public show support for removing the use of price promotions to sell unhealthy food (57% support vs 26% oppose).[15] Our conversations with the public (PPI work) indicated they are concerned that price promotions lead them to consume more

than they want. However, some people use price promotions to save money and worry a (voluntary or mandatory) ban would mean they spend more on food.

Potential secondary and unintended consequences (see our logic model, figure 1)

Estimates of the UK government policy's potential impact is limited to simple economic estimates of the effect of price promotions on sales.[6] These estimates do not account for system reactions, like consumer behaviour (e.g. anticipating price promotions) and industry adaptation (e.g. use temporary price reductions, see preliminary data, or using loyalty cards to offer price promotions),[12] and what impact this might have on sales. A policy that restricted multi-buy and extra volume price promotions on alcohol in Scotland led to an increase in the use of temporary price reductions and growth in total alcohol sales.[16]

There may be business impacts affecting e.g. employment and tax revenue, which will affect acceptability (and influence health indirectly). Policy makers have told us it is important to understand these possible effects to pre-empt and address concerns.

Socio-economic inequalities

People we spoke to (PPI work) were concerned that the policy might affect or harm some groups (e.g. ethnic minority groups, families and people on lower incomes) differently. This has been a concern for politicians and has delayed implementation.[9] Conversely regulating price promotions (a structural low agency population-level approach) may reduce health inequalities, if it has a disproportionate affect in changing the diet of people on lower incomes.[17] It might be expected that people with less disposable income respond differently, being more sensitive to changes in prices.[18]

Young people might also be more affected if they are more sensitive to prices or may be more 'targeted' by price promotions if supermarkets (or manufacturers) are trying to win brand loyalty.[16] Policy makers told us they want to understand these issues better.

International policy context

Nearly all countries have a high or increasing prevalence of obesity and are seeking novel approaches to address high consumption of HFSS or ultra-processed foods and reduce diet-related diseases. The policy is novel internationally. Consequently, there is no robust real-world evidence of the policy's impact in the UK (as it has not been implemented) or elsewhere, on consumers or industry.

Literature review

Background

Marketing of food is pervasive. It is more common on less healthy foods and affects purchasing and consumption of food.[8,19] Price is one aspect of marketing and influences purchases.[18] Less is known about price promotions and particularly restricting their use.[20]

Literature search: price promotions, food and health

We undertook a literature search in PubMed (December 2023) to identify studies of price promotions and food with hand searching reference lists.

We found no real-world studies of the impact of policies to ban or limit the use of price promotions to sell less-healthy food. Whilst not specific to food there is one evaluation (in Scotland) that suggested that restrictions on the use of multi-buy and extra volume sales of alcohol led to an *increase* in the purchasing of alcohol.[16]

We found one RCT of an experimental online shop and four observational studies that have quantified the impact of price promotions on the purchasing of less-healthy foods. [6,21–24] Promotions caused purchases of less-healthy foods to increase by 10% to 80%, varying by promotion type (i.e. multi-buy, extra volume, temporary price reduction), promotion magnitude, product type and income group.

The observational studies make use of variation (i.e. comparing purchases or sales before and after stores introduce promotions) in the use of price promotions over time, so have limited ability to account for consumer stock piling or switching between brands, meaning they do not accurately assess the impact of policies to remove price promotions. Nor do these studies account for industry system reactions, such as different pricing or other strategies (see Fig 1) that stores might adopt if the use of price promotions was restricted.

There is a more extensive literature on the impact of price promotions on food in general, which shows that promotions increase purchases or sales, with heterogeneity in effect and size.[25]

We found only two (non-UK) studies quantifying and showing different responses to price promotions for different groups (e.g. women with obesity, ethnic minorities).[26,27] We did not identify any qualitative studies exploring how consumers use price promotions.

We found no studies that described the impact of removing price promotions on household food expenditure. We found one study that considered food industry perspectives on price promotions and their restriction that identified factors likely to create opposition (e.g. potential financial loss) and to drive implementation (e.g. mandatory policy, consumer education). This study did not consider how the industry might adapt to a ban (e.g. using loyalty card offers, changing price or pack size; see Fig1)

We found two systematic reviews of the prevalence of price promotions; whilst both showed heterogeneity across settings in the proportion of food sold using price promotions, they both showed promotions were used more to sell less-healthy than healthier foods.[28,29]

Review of ongoing research & potential overlap with existing studies

No studies were identified by searching the NIHR website and the ISRCTN registry that are evaluating the voluntary policies described above.

We are aware of two related studies concerning the mandated policy in England, and a potential third future study that will evaluate the proposed mandatory policy in Scotland.

NIHR PHR has funded in principle a study (NIHR152515) to evaluate the real-world combined impact of HFSS advertising bans (TV and online) and bans on price promotions to sell HFSS foods in England. The policies are due to be implemented in October 2025 and the study to start in January 2026. The study will measure the aggregate effect of all three combined policies (not of the individual policies).

Our study assumes NIHR152515 will happen and has been designed to be complementary and avoid duplication. WP2a will access Kantar dataset from a different time period (2005-24) and across all food categories (for NIHR152515: 2024-26, limited to four categories: breakfast cereals, chocolate confectionary, instant hot drinks and pastries); and our study will additionally use the Dunnhumby dataset that will not form part of NIHR152515. WP3 and WP4 will estimate policy specific health impacts (vs NIHR152515: combined impact of advertising and price promotion bans). WP5 will collect and analyse data that is not part of NIHR152515. Our study is shorter and starting earlier so will be able to provide earlier evidence and price promotion specific evidence to inform policy refinement (e.g. for England) and/or design/implementation (e.g. Wales, Scotland, Northern Ireland).

Several members of our study team are involved with NIHR152515 (Adams as PI, White & Smith as Co-Is). Adams & Mytton have worked closely to ensure the studies are complementary and will continue to consider at and outside of the regular study team meetings any opportunities for synergy between the studies as they progress. Where appropriate, parts of the research plan (below) give examples of complementarity.

The NIHR Policy Research Programme (PRP) has funded an evaluation (NIHR207065) of the impact of the mandatory policy to ban the sale of HFSS products at prominent locations in supermarkets and to collect baseline data on price promotion activities in retail outlets across England in preparation for mandatory ban on price promotions in October 2025.

Our study will evaluate the specific industry-led voluntary intervention to ban price promotions by two supermarkets and will consider a different time period to NIHR207065. Our WP5b (semi-structured interviews to understand how people use price promotions and what they think of the voluntary ban) is distinct from the equivalent part of NIHR207065 (which instead uses go-along interviews to understand how people are using the full range of marketing practices in retail outlets). The different samples in each study will increase the diversity of experiences obtained, and there is very limited research in this area.[20]

Vogel is PI of NIHR207065 and is also a Co-I on our study. Vogel & Mytton have worked to ensure these studies are complementary and will continue to consider at and outside the regular study team meetings any emerging opportunities for synergy between the studies as the studies progress.

Public Health Scotland (Shipton) are in the early stages of planning an evaluation of the Scottish Policy. Our study will help Public Health Scotland understand and interpret the results of the Scottish regulations (if implemented). Shipton has agreed to join our Policy Advisory Group; Mytton and Shipton will work to ensure the studies are complementary and learning is shared (see partner letter of support from Public Health Scotland)

What this research can add to the body of knowledge

Proposals to ban price promotions in the UK are nearly 10 years old.[6,30] The previous government delayed implementation twice due to concerns about the impact on people's budgets.[9]

Opportunities for natural experimental evaluations like this are rare yet policy makers have told us they can provide valuable evidence to inform population-level public health policies; no such evidence exists for policies to ban price promotions to sell food.

Specific gaps this study will fulfil include:

Population health

The study will estimate the impact of the intervention on population health; we are not aware of any such estimates of the impact of price promotions or policies to restrict/ban their use.

Unintended and secondary consequences

The study will document whether and how industry responds to this voluntary policy, including changes in the regular price, product size and use of temporary price reductions (including loyalty card pricing). Speaking to policy makers in England, Scotland and Wales there is significant interest in extending the mandatory policy to include temporary price reductions,[31] and data around their use would help inform decisions about their inclusion in a mandatory ban.

Business impacts

The study will quantify the impacts of the policy on business economic performance.

Socio-economic and socio-demographic inequalities

There is significant concern about the socio-economic effects of the policy. On the one hand there is concern that the policy may disproportionately negatively affect people and families on lower income. On the other, supermarkets claim the policy will lead to lower prices.[2] Additionally, many diet-related disease and dietary risk factors show strong socio-economic patterning,[4] suggesting the policy may reduce health inequalities.[17]

There is uncertainty about the direction and magnitude of these effects, which this study can help to quantify. We will test for different impacts (food purchasing, food expenditure, health), where possible by socioeconomic status, age, sex/gender, ethnicity and country.

Voluntary vs mandated measures

Public health professionals and governments want to understand commercial influences on health and when it is appropriate to use mandatory and voluntary approaches.[32,33] If the

mandatory policy is introduced, this evaluation will facilitate an unusual opportunity to compare the impact of similar policies, introduced either voluntarily (i.e. by Sainsbury's and Tesco) or mandated (e.g. as studied in NIHR152515).

Generalisability

The intervention has been delivered in two UK supermarket chains (combined market share ~43%).[34] Their shoppers are similar to the UK median (household income £19.9k for Tesco & £20.4 for Sainsbury's vs £19.3k for UK). Our data are from Great Britain (Kantar dataset) or the UK (Dunnhumby dataset). Analysis by socio-demographic group and country, where possible, will improve and inform generalisability.

Whilst historically the UK market has tended to use price promotions more than other European countries,[6] there are significant similarities between the UK grocery market and other countries, such that the findings of this work will be relevant internationally.

3. RESEARCH QUESTIONS/AIM

Aims

Our primary aim is to evaluate the aggregate impact from a public health perspective of voluntary policies in two UK supermarkets chain to ban the use of price promotions to sell unhealthy foods ('the intervention').

The public health perspective will consider the following:

- Health behaviours (e.g. purchasing of HFSS food) and modelled population health outcomes linked to diet
- Relevant costs to enable a cost-consequence analysis, i.e. impact on industry economic performance[35]

In keeping with a public health perspective**, our secondary aims** are to:

- where possible, to quantify, compare and understand impacts on health behaviours, food expenditure and health impacts across socio-demographic groups
- to explore possible compensatory behaviours or unintended consequences, including system adaptation, at an individual (e.g. expenditure on food) and industry level
- provide data and evidence that will facilitate a comparison between voluntary initiatives and mandated initiatives
- engage with and disseminate our findings to the public, policy makers and industry actors to inform the development of a healthy food policy in the four UK nations

Research Questions

1. What was implemented and when? What were the other changes in the marketing of HFSS foods (e.g. price, product size, temporary price reductions, loyalty card prices) at or around the same time of policy implementation?
2. What are the pre-post changes in the purchasing of HFSS and non-HFSS foods, and expenditure on food, in aggregate and by sub-group?
3. What are the modelled health impacts due to the pre-post changes in food purchasing in aggregate and by sub-group?
4. What are the pre-post changes in the economic performance of Sainsbury's and Tesco supermarkets, and other relevant actors/sectors of the food industry in the short and long term? What are the pre-post changes in government tax receipts of introducing price promotions bans?
5. How do supermarkets describe and justify the policy?
6. What are consumers' stated knowledge, attitudes and behaviours towards price promotions and bans in their use?
7. Were any changes in outcomes in RQ1-4 due to the intervention?

Description of the intervention

Sainsbury Policy: According to the Sainsbury's press release (February 2016), Sainsbury's pledged to "phase out multi-buy promotions from its grocery business by August 2016" both "in-store and online", in "favour of lower regular prices". This applied across dairy, canned and packaged goods, meat, fish, poultry, soft drinks, confectionary, biscuits and cakes. The policy allows for exceptions "at certain times of the year". Various motivations are given in the press release, notably reducing waste and offering better value for customers.

From this description and preliminary Kantar analyses (attached), we assume this applied across all UK stores (i.e. the whole UK population was exposed) and applied to extra volume price promotions.

Tesco Policy: According to Tesco's press release they would "continue with plans to remove volume-led promotions on HFSS products from October 2022", despite government plans to delay legislation.[3] At that stage they reported that the products affected would be announced "at a later date". In June 2023, Tesco "reaffirmed" its commitment to the policy, and reported that there would be exemptions for five-for-the-price-of-four promotions and during the Christmas period.[1] A variety of motivations were mentioned, predominantly health and better value for customers. It was framed as part of a wider strategy of helping customers eat healthily.

From this description and preliminary Kantar analyses (see uploaded graphs), the policy applied across all UK stores (i.e. the whole UK population was exposed).

WP2 will describe what was actually implemented (onset date, affected products, store types included, geographic range) and will be supplemented/compared with information from WP5a (formal statements on company websites and documents) to give a full description of the intervention (both the policy and what actually changed). We will use the TIDieR-PHP checklist for describing population health and policy interventions to describe the intervention in each supermarket chain.[36]

Research plan/methods

We plan a mixed methods natural experimental evaluation of the intervention with five inter-linked work packages (see Fig 2 Flow Diagram) informed by our logic model (Fig 1). WP1 will integrate and share the overall synthesized findings.[37] WP2 will use consumer data to quantify the impacts of the policies on purchases and food expenditure, and explore industry adaptation; WP3 will model the health impacts of observed changes (overall and by sub-group); WP4 will quantify the industry economic impacts (e.g. employment, profitability); WP5 will use qualitative methods to explore industry and consumer knowledge, attitudes and behaviour.

WP1: Engagement, Integration and Dissemination (Lead UCL: Mytton, with Lawson, White & Vogel)

Addressing RQ7: Were any changes in outcomes in RQ1-4 due to the intervention?

Rationale for WP: We recognise that integration is not a final event, but is a foundational event and a continuous process that starts before any of the WPs; for this reason this is WP1. Engagement of key stakeholders (public, civil society and policy makers) is also foundational for the research and its dissemination, and so is included within this WP.

Engagement

In the process of developing this application we have spoken with the public and policy makers who have helped to shape the research aims and activities. At the start of the study, we will form two engagement groups (a public or PPI panel, and a policy advisory group).

Lawson (Public Co-I) and Vogel with support from the project manager will recruit a diverse group (i.e. covering differing ages, gender, ethnicities, regions, socioeconomic positions, and household compositions) of 10 public participants from across the UK drawing upon our existing networks and NIHR infrastructure (e.g. NIHR North Thames ARC, Obesity Voices). Recruitment of panel members will commence in the two-month window prior to the study

commencing (i.e. January 2025). The group will meet four times across the two-year study (two as face-to-face). As set out below for each WP and in the PPI section, this group will provide input across the different stages of the study and all WPs, including helping the research team to: refine our logic model (see Fig 1), WP research questions, data collection tools and recruitment methods; interpret findings; and disseminate outputs. We will feedback to the group every 6-8 weeks on the study and the impact of their contributions. We will draw upon our model of peer-to-peer capacity building led by public co-I (*Lawson*), alongside formal training in PPI delivered by Lawson and/or NIHR North Thames ARC to ensure high quality respectful PPI activities. The panel will not be expected to have an understanding of the statistical or research methods used in the study, which demand many several years of training at doctoral level; researchers will explain the study methods (when needed) and focus on discrete requests (as set out in the PPI section for each WP). The 'asks' will be discussed/agreed with Vogel and Lawson and the WP leads to ensure they are appropriate activities for a public panel that can have a meaningful impact on the research and its dissemination. Lawson and Vogel will continually check in with the PPI panel about their level of comfort with the methods and findings being shared and identify training needs in discussion with the PPI panel and Mytton as they arise. Evaluation logs will also be used to monitor and improve PPI activities throughout the project.

We have spoken to several policy makers (Bhatia, Department for Health & Social Care; Johnson, Public Health Wales; Shipton, Public Health Scotland – see letters of support) who will form a policy advisory group with a representative from Northern Ireland and from civil society groups (e.g. Which?, The Food Foundation, The Food Ethics Council) that will meet twice per year. They will input into research design, data interpretation and dissemination.

For engagement with industry, we will take a cautious approach reflecting concerns about industry influencing health policy.[38] Interactions with industry will be informed by Food Research Risk (FORK) guidance and toolkit,[39] and discussed with the full study team and if warranted with the independent Scientific Advisory Group. Davies, a Price and Promotions consultant (see partner letter of support), with an understanding of the industry will offer independent advice on industry behaviour and approaches, that the study team can draw upon as they chose. He will advise on how best to interact with industry and disseminate findings if/where appropriate (e.g. if the findings suggested health benefits for Tesco or Sainsbury's customers).

<u>WP integration and data synthesis:</u> Our logic model (Fig 1), uses a causal loop diagram (a type of system map) to express our theory of change. We will use it to guide our literature review at strategic points in the study (e.g. start and end). We will continuously revisit and update the map in light of new findings and with input from our public panel to inform the research.[37] We will integrate (i.e. combine findings on different questions) findings from WP2-WP5, and through having Co-Is (Vogel, Adams, White, Smith) working across related projects also integrate and share across other research (NIHR152515 and NIHR207065). Integration will not be a one-off final event, but will be a continuous activity throughout the research project, e.g. by sharing proposed research methods or emerging issues and findings from interim analyses, e.g.: WP5a and WP2 will help us understand what was implemented and when, in turn influencing WP3 (modelling) and help with interpretation of WP4 (business impacts); WP2a will provide inputs and inform the sensitivity analyses for WP3, and guide WP4 (e.g. identify affected food manufacturers); WP5b will aid interpretation of WP2 findings; WP4 and WP3 outcomes will be combined to provide cost consequence or net economic benefit analyses. By analysing different sources of data (e.g. Kantar and Dunnhumby datasets) and data addressing different outcomes (e.g. industry profitability and consumer purchasing), we will be able to triangulate findings to test the robustness of our conclusions. Study components and other research may either confirm, expand or diverge; these will be explicitly discussed at the regular team meetings, with additional meetings set-up as needed to compare and explore findings across WPs. Recognising that policy makers place value on synthesised findings rather than individual studies, where appropriate we will

synthesize findings (i.e. combine findings on similar questions), drawing on existing literature and findings from ours and related studies. The interpretation and recommendations of findings will be discussed with the public and policy groups.

Dissemination: See Section 5

Ethics: no primary data collection will be conducted so approval is not required

Timescale: Mar25-Feb27

WP2: Changes in price promotions, food purchases and food expenditure

Addressing RQ1 and RQ2 What was implemented and when? What were the other changes in the marketing of HFSS foods (e.g. price, product size, temporary price reductions, loyalty card prices) at or around the same time of policy implementation? What are the pre-post changes in the purchasing of HFSS and non-HFSS foods, and expenditure on food, in aggregate and by sub-group?

PPI input: Across WP2 the public panel and policy advisory groups will review and provide input to the research plan; and help us to interpret findings. For example, the public panel can help us understand how consumers shop and use loyalty cards (e.g. sharing of loyalty cards amongst family members) to understand limitations of the data.

WP2a: Kantar At-Home Purchase Panel dataset (Lead IFS, O'Connell with Rahilly Mytton and Dobson)

WP Rationale: It is necessary to understand what was implemented; other (secondary) changes in marketing of HFSS foods; as well as the aggregate and sub-group impacts of the policy on purchasing of HFSS and non-HFSS food, and expenditure on food.

Data Source and population: We will use the Kantar At-Home Purchase Panel (hereafter 'Kantar dataset'), a longitudinal consumer dataset.[40] It records all 'fast moving consumer goods' (i.e. food and toiletries) brought for consumption in the home. The panel comprises a representative sample of approximately 30,000 households across Great Britain (i.e. excluding Northern Ireland). Households remain in the panel for a three-year period on average, with continuous loss and replacement of panel members, whilst maintaining an overall representative sample. The Institute for Fiscal Studies (IFS) hold data (i.e. already purchased) covering all fast-moving consumer goods from 1 April 2005 to 17 March 2024.

The dataset has been used by public health researchers, including undertaking ITS analyses to evaluate national-level and regional policies.[41–45] This dataset captures granular information on all food purchases brought into the home (product prices, nutrient composition, purchase volumes, promotional activities, store details) purchased across any retail outlet and household socio-demographic information (including banded household income; age and gender of all household members; social grade and ethnicity of the main shopper; and the postcode district of the home, i.e. the first 3-4 characters of the postcode). Data completion is good (e.g. ethnicity 85% coded). Important limitations include: the sample size of Tesco and Sainsbury's customers (~1,600-7,500) will limit power for some sub-group analyses, particularly minority groups (e.g. ~13% are from an ethnic minority group); and limited information on price promotions for loyalty card holders.

Research Design:

We will use controlled interrupted-time-series (ITS) to visualise and quantify the impacts of intervention[46] Given, the social, regulatory & financial context (2016 vs 2022) and motivation (sustainability for Sainsbury's vs health for Tesco)[1,2] for the two policies were different, we will study the policies separately. Controlled ITS can handle seasonal variation and trends, helps control for time-varying confounders, and is standard for similar analyses.[46,47]

Formal statistical tests (Wald test) will be used to test for parallel trends.[48,49] In the eventuality that other supermarket users do not have a comparable trend we will use an uncontrolled ITS.

Intervention and comparison groups:

We will identify two intervention groups:

a) all households that are customers of Sainsbury's

b) all households that are customers of Tesco.

In each case we will consider two definitions of 'customer'; a 'strict' definition designed to capture only households that predominately shop (at least 70% of purchases by expenditure) with the retailer, and a 'loose' definition (at least 40% of purchases by expenditure) designed to include customers that regularly shop with multiple retailers. The former group may have more limited possibilities to substitute towards buying HFSS foods in other (non-intervention) retailers than the latter group.

Using the strict definition results in sample sizes of ~1,600 and ~4,000 for Sainsbury's and Tesco; and loose results in sample sizes of ~3,500 and ~7,500 respectively.

For each intervention group, we will identify two control groups:

i) all other (non-intervention) supermarket customers
ii) a matched control group of non-intervention supermarket customers, matched on key demographics.(e.g. age, income, household composition).

For the strict definition, the control group participants will make at least 70% of purchases at one of the other stores (i.e. the Sainsbury's control group will make 70% of their purchases a non-Sainsbury's store). For the loose definition, the control group participants will make at least 40% of purchases at one of the other stores (i.e. the Sainsbury's control group will make 40% of their purchases a non-Sainsbury's store) and not be in the intervention group.

To identify a control group, we will derive propensity scores for shopping at Tesco or Sainsbury's (using the strict and loose definition), based upon household socio-demographics characteristics. A matched control group will be identified from participants who meet the criteria for being in the control group set out above and are not in the intervention group, using weighted kernel matching.[50]

Temporal Range: To maximise statistical power, data will be obtained for different periods for each intervention. For Sainsbury's a minimum of 104 weeks pre-intervention (Feb16) and 104 weeks post-intervention. Whereas for Tesco a minimum of 52 weeks pre-intervention (Oct22) and 52 weeks post-intervention. In each case, this substantially exceeds the minimum threshold needed for an ITS analysis.[51] The study period will enable the detection of the existence of seasonality or auto-correlation and avoid the period when COVID-19 was most affecting shopping habits (2020 to early 2021).

Outcome Measures:

a) HFSS and non-HFSS product purchases by promotion type:
   i) change in the percentage of HFSS calories and non-HFSS calories purchased using multi-buy, volume promotions and temporary price reductions between the pre- and post-intervention periods
   ii) change in the percentage of money spent on HFSS and non-HFSS products using multi-buy, volume promotions and temporary price reductions between the pre- and post-intervention periods
b) Price of HFSS and non-HFSS products
   change in mean and median price (GB pounds) of HFSS and non-HFSS products purchased between the pre- and post-intervention periods
c) Size of HFSS and non-HFSS products
   i) change in mean and median size (g) of HFSS and non-HFSS products purchased between the pre- and post-intervention periods
   ii) change in mean and median size (ml) of HFSS and non-HFSS products purchased between the pre- and post-intervention periods

d) Household food purchases
   i) change in calories purchased per household for all food, HFSS food and non-HFSS foods between the pre- and post-intervention periods
   ii) change in kilogram purchased per household for food, HFSS food and non-HFSS foods between the pre- and post-intervention periods
   iii) change in litres purchased per household for food, HFSS food and non-HFSS foods between the pre- and post-intervention periods
   iv) change in expenditure in pounds sterling (GBP) per household on food, HFSS food and non-HFSS foods between the pre- and post-intervention periods
e) Household nutrients purchased
   i) change in salt (g) purchased per household for all food between the pre- and post-intervention periods
   ii) change in fibre (g) purchased per household for all foods between the pre- and post-intervention periods
   iii) change in sugar (g) purchased per household for all foods between the pre- and post-intervention periods

We will define HFSS foods using the UK FSA-OFCOM nutrient profiling model (NPM), based on the nutrient data in the Kantar dataset.[52] The Kantar dataset includes nutritional content per 100g to enable calculation of HFSS status as defined in the interventions. Alongside standard nutrients, percentage fruit, nuts and vegetables is required to calculate HFSS status. As previously, we will estimate % fruit, nuts and vegetables from Kantar's qualitative assessment of content: high (>80%), medium (40-80%), and low (<40%).[45] The term 'food' implies food and/or drinks.

Power calculation

To detect a 1 percentage point difference in the calories of HFSS foods, assuming 23% (SD 9%) of food calories are HFSS (based on volume share of products from food classified as HFSS within the Kantar dataset), at significance level 0.05 with power 0.8 requires a sample size of 635 in both arms, which shows we are well powered and will have the ability to explore some sub-group differences.

Sensitivity and sub-group analyses: Sensitivity analyses will include analysis of identical time periods (where each intervention supermarket is restricted to 52 weeks each pre- and post-intervention); temporal falsification; removal of periods potentially impacted upon by the COVID pandemic; removal of the Christmas period (recognising that the policy is applied differently during the Christmas period).[1–3] We will conduct sensitivity analysis around the 40% and 70% thresholds for being a customer of Tesco or Sainsbury's.

We will further test for existence and analyse stratified sub-groups of our full sample (by household composition, and socio-demographic characteristics (ethnicity, age, gender, social grade, income, index of multiple deprivation (IMD) quintile) to understand differential impacts; and consider aggregation across supermarkets to enhance power. Using the data on household composition we will group the sample into households with and without children to understand possible differential impacts on children and adults. Postcode will be linked to local authority to enable stratification by local authority IMD quintile.

We will also consider repeating our primary analyses comparing different groupings of food, e.g. less healthy vs healthier, UPF vs non-UPF or utilising food categories that better reflect the implemented policy and/or industry groupings (e.g. informed by WP5a and/or Davies).

Dataset cost: the data has already been purchased by the IFS. There are no additional costs to access or purchase the data.

Ethics: Kantar data is collected in line with standard market research code of ethics. The data that Kantar provide to IFS is pseudo-anonymised and does not contain identifiable person data so additional ethical consent is not required.

Timescale: Mar25 – Aug26

WP2b: Dunnhumby data set on Tesco loyalty card holders (lead UCL: Mytton and Rahilly, with Dobson)

WP Rationale: It is important to identify practices that may circumvent the intended impact of public health policies. The public (PPI work), industry consultants (Davies) and the Competition and Markets Authority[53] all suggest that Sainsbury's and Tesco have increasingly offered promotions exclusively to loyalty card holders in part replacing the withdrawal of multi-buy and extra volume promotions.[12] As a new feature this has received little research attention. Currently price promotions for loyalty card holders are exempt from the proposed mandatory policies in England, Wales and Scotland.

The Dunnhumby dataset which is restricted to loyalty card purchases and is much larger than the Kantar dataset will be used to understand whether and how promotions offered to loyalty card holders have changed and what impact this has had on purchasing of HFSS products. It will complement the Kantar dataset, be used to explore sub-group effects and (where appropriate) to triangulate findings with the Kantar dataset.

Data: The Dunnhumby dataset is derived from a 10% subset of all Tesco Clubcard data (~2 million of Tesco ~20m Clubcard customers). Tesco Clubcards (a loyalty card) are used by most (~80%) Tesco customers when making grocery purchases.

The Dunnhumby dataset is a 'product-purchase' dataset, i.e. it contains information on the total volume of purchases of each individual food and non-food items sold by Tesco, from the sample of the Tesco Clubcard dataset. It includes data on the value, volume and frequency of itemised purchased, and is disaggregated by week. It can be further disaggregated to a granular level by life-stage and lifestyle. Price promotions are not directly observed but can be inferred by the pattern of purchases data over time.

The Cameo system, widely used in the industry, segments customers into life stage (young adults, young families, older families, older adults, and pensioners), and lifestyle (less affluent, mid-market and upmarket).[54] It is not based on directly observed data (i.e. reported age or social class by the clubcard holder) but is inferred using established Dunnhumby algorithms from customer spending patterns and geographic location of the purchases.

Whilst the dataset has significant strengths (size, power, granularity of products, specificity to loyalty card holders), it also has limitations. It covers aggregate product purchases rather than individual-level data and does not capture purchasing beyond Tesco. Socio-demographic profiling is not directly observed but inferred and has not been independently validated.

The data has been used predominantly by UEA academics to address public health and business studies research questions.[16,54,55]

Research Design: Data are restricted to a single supermarket chain (Tesco), not allowing for a viable control, and for this reason we will use an (uncontrolled) Interrupted Time Series analysis, enabling estimation of effects upon the difference between observed outcomes and a synthetic counterfactual extrapolated from pre-intervention trends; and improving comparability with WP2a, which will use (controlled) ITS.

Temporal Range: 52 weekly data points prior to intervention date (October 2022) and 52 points after intervention, which will allow for adjustment in the presence of seasonal or autocorrelated trends and offer equal distribution of data around the intervention, and comparability with WP2a.[46,47]

Outcome Measures:

a) change in purchase volume (measured in calories, kilogram, litres, GBP) using multi-buy, volume promotions and temporary price reductions between the pre- and post-intervention periods

b) change in mean/median price (GBP) and packet size (g or ml) of products purchased between the pre- and post-intervention periods
c) change in energy (kcal) and nutrient (salt (g), sugar (g), fibre (g)) purchased by households between pre- and post-intervention periods

Given the time involved in data preparation and matching, the analysis will be restricted to exemplar product lines (e.g. cakes, confectionary, biscuits, bread, pasta, frozen goods, breakfast cereals). Results will be presented for each food group/category separately, and where appropriate disaggregated into HFSS and non-HFSS products.

Products in the Dunnhumby dataset will be matched to products in the Kantar dataset, and the HFSS classification from the Kantar dataset used to classify food items in the Dunnhumby dataset into HFSS and non-HFSS foods, i.e. the same approach to classifying foods as HFSS will be applied in WP2a and WP2b.[52]

Sub-group and sensitivity analyses: We will test for different effects by country (England, Northern Ireland, Scotland, Wales), customer life-stage defined by the Cameo system (i.e. 'young families', all children under 10 years of age; 'older families', at least one child aged 10 years or over; 'young adults', aged 20-39 years; 'older adults', aged 40-59 years; 'pensioners', adults aged over 60 years with children) and customer lifestyle defined by the Cameo system (i.e. 'less affluent', 'mid-market' and 'upmarket').[54]

We will consider further disaggregating the food groups to explore different effects for different foods, utilising food categories that better reflect the implemented policy (e.g. groupings used previously by Public Health England)[6] and/or industry groupings (e.g. informed by WP5a and/or Davies).

Power calculation: A simulation-based power calculation was performed using an ITS design. Based upon preliminary data (for the biscuit category in 2021-22), the mean product aggregate purchases was used to calculate a 1% change in aggregate purchases, running 1000 simulations, assuming significance of $\alpha=0.05$. The results of the power analysis indicate that our study will have approximately 84% power to detect a 1% change in the aggregate purchases of biscuits.

Dataset cost: UEA have an agreement with Dunnhumby and already have access to the data that we will use, i.e. there are no additional costs to access or purchase the data.

Ethics: The data that Dunnhumby provide to UEA are product level aggregate purchase data that does not contain identifiable person data, so ethics is not required.

Timescale: Mar25 – Nov26

WP3: Health Impact Modelling (Lead UCL, Mytton with Amies-Cull)

Addresses RQ3: What are the modelled health impacts due to the pre-post changes in food purchasing in aggregate and by sub-group?

PPI input: Modelling can generate many outcomes, which may not be easy to understand. The public will help us agree which findings are more salient (e.g. which disease outcomes we present) and how best to communicate the findings and limitations clearly.

Rationale for WP: In this study we do not plan to test the impact of the intervention on directly observed health outcomes, due to the timeframe, uncertainty over the magnitude of the effects, and the data protection challenges of linking shopping data to health datasets. Instead, and in keeping with similar research,[56] we propose to model the impacts on population health, from which we will also model the changes in NHS healthcare costs.

Whilst there is uncertainty over the magnitude of the effect of the intervention on HFSS purchasing, current RCT data and observational studies of price promotions (see Literature Review section) suggest the intervention will lead to changes in average household purchasing of HFSS products. In the absence of aggregate level changes, given the different responsiveness of different groups to price promotions (see Literature Review section), it seems likely that different groups will respond differently, affecting health inequalities.

For this reason, we will first estimate (model) health impacts for the population (based on average effects) and then undertake exploratory analyses (even in the absence of an average effect), to estimate impacts by socio-economic group (IMD quintile, age and sex).

Health Model: We will use PRIMEtime,[57] an established multi-state proportional lifetable model, designed to simulate the effects of changes in dietary risk factors on health outcomes and healthcare costs in the UK, based on established quantified links between diet and health. Relationships between diet and disease are parameterized using meta-analyses of randomized controlled trials or prospective observational studies. These relationships are modelled through salt consumption on blood pressure, calorie consumption on BMI; fibre and red meat are modelled directly to disease outcomes.[57] The model can be disaggregated by age and sex. The model has recently been adapted by Amies-Cull to provide estimates at the local authority level;[58,59] by aggregating local authorities by IMD quintile, to facilitate disaggregated estimates by IMD quintile.

PRIMEtime has previously been used by members of our research team to estimate the impact of a variety of real or hypothesised policies designed to improve population diet in the UK, e.g. the UK Soft Drinks Industry Levy, restrictions on the advertising of HFSS foods, and restrictions on the opening of new takeaway food outlets.[56,60–62]

Research design: We will use differences in food purchases resulting from the interventions (from the Kantar dataset, WP2a, as this captures all in-home purchasing at the household level) to describe changes in the energy, nutrient content (salt, sugar, fibre) and red meat (i.e. capturing the main dietary risk factors liable to change that are linked to non-communicable diseases) purchased. Making allowance for food consumed outside of the home, we will then estimate the change in diet (calories, salt, sugar, fibre and red meat) as result of the intervention amongst supermarket customers. As WP2a estimates household purchases, we will divide by household size (Kantar dataset) to estimate per person consumption.[62]

We will then use an established health impact model (PRIMEtime) to model changes in population health (obesity prevalence, incidence of cardiometabolic disease and cancer, quality adjusted life years (QALYs) and life expectancy) and consequent changes in NHS costs.[57,60]

Sample: Based on Kantar data (IMD quintile), we will construct a weighted population to resemble Tesco and Sainsbury's shoppers at these supermarkets (using our stringent and relaxed definitions, see WP2a).

Scenarios: We will compare the health outcomes for the intervention scenario for: a) Sainsbury's and b) Tesco customers, to a 'business as usual scenario' without any intervention.

Time Horizon: This study will forecast the health and health care cost impacts over 30 years, so to 2046 for Sainsbury's and 2052 years for Tesco, using a closed cohort.

Outcome Measures: Modelled health impacts will include change in prevalence of obesity, number of cases of cardiometabolic disease and cancer prevented, change in QALYs and change in life expectancy for adults (change in obesity prevalence and life expectancy for children). NHS costs will be estimated and discounted using UK Treasury rates.[63] PRIMEtime can model the impact on many diseases (all of which affect QALYs and healthcare costs); we will talk with the public and policy makers to agree a parsimonious list of disease outcomes to communicate the findings effectively and fairly.

Sub-group Analyses: We will produce sub-group estimates by IMD quintile, sex and age (working age adults, aged 18-65 years; vs older adults, aged over 65 years). To produce estimates by IMD quintile, we will use Kantar estimates by IMD quintile and obesity by IMD quintile; other health outcomes will be based on aggregate health outcomes for the whole of England. To produce estimates by sex, we will use Kantar estimates (household level), and the (age) and sex specific estimates of disease incidence coded within PRIMEtime. To

produce estimates by age, we will use Kantar estimates split by age (households with adults aged 18-65 years; households with adults 65 years and over) and the age (and sex) specific estimates of disease incidence coded within PRIMEtime.

Uncertainty and sensitivity analyses: Monte Carlo simulations, resampling from distributions for the model parameters, will be used to estimate 95% uncertainty intervals. The overall model and its outcome will be assessed against best practice for modelling research,[64,65] and will be subject to sensitivity analyses (e.g. adoption of transitional period, varying time horizon, discounting rates, open vs closed cohort).

Ethics: The analysis does not use any personal data so will not need ethical approval.

Timescale: Dec26 – Nov27

WP4: Industry economic impacts (Lead: Exeter; Medina-Lara with Smith)

This WP will address RQ4: What are the pre-post changes in the economic performance of Sainsbury's and Tesco supermarkets, and other relevant actors/sectors of the food industry in the short and long term? What are the pre-post changes in government tax receipts of introducing price promotion bans?

PPI for WP4: We will present plans for WP4 to the public panel for review. They will help shape the focus of the research (e.g. important economic outcomes, key businesses affected in the UK and their geographic location). Findings will be discussed to help with interpretation and inform presentation.

Rationale for WP: The economic impact that voluntary bans on using multi-buy and extra volume price promotions on unhealthy foods might have on supermarkets revenue in the short and long term in unknown. Given the importance in public health policy making placed on industry, and wider economic impacts, and the concerns often expressed by industry, in light of data scarcity, it is critical that we assess them.[35] We will therefore compare the financial performance of the study supermarkets over time, before and after the intervention, and against the sector overall.

We will also assess the implications of any changes to tax collection, which may be a concern for policymakers, and changes to the wider supply chain (of those manufacturing the products which would be affected by the ban, identified in WP2). The economic impacts will be assessed from the supermarket and policymaker perspective using recommended methodology for public health interventions[66]

Research design: Interrupted time-series of monthly domestic turnover, employment, profits, tax and stock market value of:

a) the intervention supermarkets (comparison group: non-intervention supermarkets)

b) the largest UK manufacturers of HFSS products (uncontrolled).

This will draw on a similar approach that we used to evaluate the impact of the Soft Drinks Industry Levy on business performance.[67,68]

Geographical analysis and net economic or cost consequence analyses (using data from WP3) will also be attempted; the latter being presented within WP1 outputs. Findings from this WP will be triangulated with WP2s findings on household purchasing (volume and expenditure), as part of WP1, to interpret the impact of the intervention on market shares.

Data: The primary financial performance of the two study supermarkets will be obtained from their published annual financial reports. We will focus on domestic turnover, employment, corporation tax, business rates; wages and salaries; pension contributions; and National Insurance contributions. Share price performance will be obtained from the FTSE. The financial performance and tax contribution of the supermarket sector more widely will be obtained from the ONS Annual Business Survey (ABS) and employment data.[69] Financial performance of firms within the wider supply chain producing the products impacted will be similarly estimated from public financial reports and FTSE.

Time period: 12 months pre and 12 months post implementation; separated by an intervention period determined by WP2. The long-term economic impact for both supermarkets and government will be estimated using extrapolation. Long-term costs will be discounted using a 3.5% rate as recommended by HM Treasury.[63]

Ethics and data: This research will use already collected data that is either in the public domain or for ABS data, accessed through the Office for National Statistics (ONS) secure research service. There is no personal data. Ethics permission is not required. Access to the ABS data is subject to project application to the ONS research accreditation service after training.

Timescale: Jun26 - Nov27

WP5: Consumer and industry attitudes and behaviour

PPI for WP5: Our public panel will help develop our recruitment strategy, co-develop and test participation information sheets, consent forms and semi-structured interview guides; findings from WP5a and WP5b will be presented to our public panel for discussion and to inform interpretation and presentation.

WP5a: In-depth understanding of supermarkets' attitudes and behaviour to price promotions and their restrictions (Lead: Cambridge, White with Adams)

Addressing RQ1 and RQ5: What was implemented and when? What were the other changes in the marketing of HFSS foods at or around the same time of policy implementation? How do supermarkets describe and justify the policy?

Rationale for WP: The two supermarkets have voluntarily introduced these restrictions on how they sell HFSS foods. Understanding why the supermarkets are doing this, what other changes they have made, and how they explain their decisions to key stakeholders (consumers and investors), will complement and shed light on the analysis of what industry has done (WP2), its impact on purchases (WP2) and economic performance (WP4). This contextual understanding will be important for considering generalisability (e.g. could other retailers in other markets do the same thing?) and may inform strategies to encourage wider industry adoption (either voluntarily or mandatory).

Research Design: We will undertake a longitudinal qualitative study using publicly available documents to explore the supermarkets' stated knowledge, attitudes and behaviours towards price promotions and the adoption of voluntary restrictions on their use.

Setting: Two supermarket chains that have adopted a policy voluntarily.

Data and time-period: Documentary sources (e.g. press releases, trade press, company financial reports, company websites)[1,2] describing the use of price promotions, the intervention (including introduction, implementation) and outcomes from the intervention for a period two-years before implementation (i.e. 2014 for Sainsbury's and 2020 for Tesco) to the present time. We will use Factiva and systematically search company websites to find relevant documents. Given the small number of companies involved, the challenges of recruiting food industry stakeholders for primary data collection and concerns about their veracity, we opt for documentary analysis over e.g. one-to-one interviews for this WP.

Analysis: We will conduct a longitudinal study, as we have done previously,[70] using case-based reflexive thematic analysis. Documents from each supermarket (i.e. each case) will be organised into a time series to identify shifting themes over time. The document type and its intended audience will be categorised. Themes will be generated inductively using a data-driven approach. Using this approach, we will explore: the narrative that these two supermarkets have presented to justify the implementation (and maintenance) of the policy; the extent to which this narrative has changed over time; whether a different narrative is presented to different audiences; and whether and how impacts on other retailers and manufacturers are described. Data will be managed and analysed in NVivo software.

Ethics: The analysis uses existing data in the public domain and there is no personal data, so ethics approval is not required.

Timescale: Mar25-Feb26

Relationship to NIHR152515: The dataset described above will not be analysed as part of NIHR152515. Our RQs, being concerned with a voluntary measure, are different from the RQs being asked as part of NIHR152515 will analyse commercial responses to the UK Government consultation on mandatory policies. WP5 will complement NIHR152515 by providing contextual information that can be used when comparing and contrasting a voluntary and mandatory approach. Findings from WP5 and NIHR152515 will be integrated where feasible and useful in due course (the PI on NIHR152515 is Adams).

WP5b: Public knowledge, attitudes and behaviour (Lead: Cambridge, Adams, with White)

Addressing RQ6: What are public's stated knowledge, attitudes and behaviours towards price promotions and bans in their use?

Rationale for WP: Public attitudes will influence the acceptability of voluntary (and mandatory) policies. PPI work to date suggests the public adopt different tactics to using price promotions (i.e. their use is not homogenous), which may influence the effectiveness and financial impact of policies that withdraw their use.

Research Design: We will undertake in-depth semi-structured online interviews with a diverse range of consumers to explore consumers' knowledge, attitudes and behaviours towards price promotions and bans in their use.

Participants and recruitment: We will purposively sample people who shop at supermarkets in the UK (n~30-40) to ensure we have a diverse sample (age, gender, ethnicity, geography, household composition, socio-economic, online vs in-person shopping) to represent the range of views in the UK. We will use social media advertising and our PPI networks (e.g. North Thames, Southampton via Vogel, North-East via Mytton/White) to recruit our sample, using screening questions on demographic factors to ensure we curate a diverse sample.

Participants will be reimbursed for their time at standard NIHR rates (e.g. in the form of a shopping voucher, advised by the public panel). Inclusion criteria will be aged 16 years plus and regularly shopping at any or multiple (i.e. not restricted to Sainsbury's and Tesco) UK supermarket for food (e.g. at least 4 times in the last 3 months) and will include people who shop both in-person and online. Exclusion criteria will be: unable to give informed consent or unable to participate in a ~45-minute online interview.

Data collection: We will develop a draft topic guide that reflects the research questions and includes visual prompts such as examples of common price promotions. We will share this with our public panel and seek their feedback in a discussion before refinement. Where possible interviews will be conducted online and recorded using MS Teams, with telephone interviews as an alternative were necessary.

Analysis: Audio recording will be transcribed verbatim and transcriptions checked for accuracy and anonymised prior to analysis. Data will be analysed using reflexive thematic analysis.[71] Themes will be generated deductively from the topic guide. We will also allow for new themes to be inductively identified. Data will be managed and analysed in NVivo software.

Ethics & data governance: Ethical approval for interviews will be sought from the University of Cambridge Humanities and Social Sciences Ethics Committee with sponsorship and insurance provided by the Cambridge University. Participants will give informed consent and data will be held on secure servers in accordance with MRC Epidemiology Unit data management policies.

Timescale: Mar25-Nov26

Relationship to NIHR152515: The proposed work is different to NIHR152515 in focus and methods. NIHR152515 will undertake focus group with adults and youth to explore awareness and acceptability of the advertising restrictions and mandatory restrictions in price promotions; whereas we will undertake individual interviews to understand responses to price promotions specifically and their withdrawal. Individual interviews will give better scope for exploring personal issues around price and money in the context of shopping. Findings will be compared and contrasted with NIHR152515, where possible.

4. DISSEMINATION, OUTPUTS AND ANTICIPATED IMPACT

What we will produce?

We will report our findings in open access peer-reviewed journals and a full synthesis of the study in the NIHR journal. We will work with our public panel and policy advisory group to develop accessible research summaries and policy briefings to explain key findings. These outputs will be written for different audiences (e.g. public, industry, civil society and policy makers). We will use different media (e.g. an infographic and a podcast) to summarise our findings. We will also summarise our findings with a seminar for policy makers (covering all four nations of the UK) and a webinar for industry. Lawson and the public panel will choose the final form of public dissemination events (e.g. series of local community events, public webinar).

How we will inform the public, policy makers and industry about our research?

We will maintain a study website where all outputs from the study can be accessed. Findings will be disseminated through our networks (e.g. using our policy advisory group; Davies will provide advice on dissemination to industry) and making use of targeted publications to reach key stakeholders (e.g. industry or consumer publications, like The Grocer and Which). Key academic papers will be press-released where appropriate to reach a broader public audience (Mytton and the team have significant experience of doing this). The podcast will be distributed through an established platform (e.g. UCL Public Health Voices, the Food Foundation).

How will our results inform public policy?

Our research will provide broad-health related evidence on the impacts of price promotions that address many of the questions that policy makers (and the public) have told us they need to know to implement mandatory policies to restrict the use of price promotions, e.g. around the impacts on people on lower incomes, industry impacts, as well as direct consumer and health benefits. By working closely with policymakers in each of the four nations (we have representation from England, Scotland and Wales on our policy advisory group) we will ensure we understand opportunities to inform the policy process (policy windows) and that our findings are shared with these officials in a timely fashion. We have intentionally kept the project short and started it ahead of NIHR152515, maximising scope to feed into the expected policy making process in Scotland and Wales.

Price promotions remain a fluid area of public health and food policy. Policy makers, industry (and now regulators)[53] have shown sustained interest in in this space. Further decisions on price promotions (e.g. restrictions on the use of temporary price reductions in England), the inclusion of smaller stores and online food delivery apps may also be made in the future. The Competition and Markets Authority is reviewing loyalty pricing in the grocery sector.[53] This suggests there will be opportunities to inform decision making in the future.

Barriers to further research and adoption of the intervention

There are several inter-related barriers to adoption of restrictions on the use of price promotions to sell HFSS food:

a) Uncertainty about the actual impacts of such policies, mandatory or voluntary: our study addresses many of the important areas of uncertainty.

b) Perceived or actual negative economic impacts of restrictions, particularly when these may negatively affect the commercial interests of large commercial companies. Our study will better understand whether these are real, and to quantify and understand the patterning of them, where they do exist.
c) Perceived or actual public resistance because of concerns about the impact on food prices: our study will better understand whether this is real, and how they may affect different groups differently.
d) Political or ideological resistance.

Research in this area has been limited to date, by opportunities to evaluate actual policies (none being implemented) and access to good quality data on consumer purchasing.

Impacts of the research

Primarily our work is intended to support better and evidence-informed decision-making regarding restrictions on the use of price promotions to sell HFSS food in the UK.

Other potential impacts of the research include:

a) Informing a wider narrative about how food is *actually* sold and the influence it has on people's health. Better understanding and awareness may improve the general acceptability of regulating parts of the food industry to improve people's health and/or create pressure on the food industry to change.
b) Facilitating (together with NIHR152515) an understanding of voluntary and mandatory approaches in this specific area, may inform future decisions about using mandatory or voluntary approaches.
c) Informing industry-led approaches to improving or changing how they sell food.
d) Informing practice or regulation (e.g. Competition and Markets Authority) of loyalty card pricing.
e) Influencing price promotion policy internationally.

Sharing information with participants and public (PPI) panel

We recruit participants only in WP5b. We will share with them: a brief written summary of the findings once finished, a link to the project website (which will have an information section for the public) and other key outputs of interest.

Our project manager (working with Lawson and Vogel as leads for PPI and Mytton) will produce updates for our public panel every 6-8 weeks to maintain contact and involvement in the work. Contact will be greater at the start to build rapport, deliver training and build understanding of the project. In addition to regular meetings, we will draw upon members as smaller groups and/or individually to ensure flexible timely input into research. Our public panel will be invited to contribute to our dissemination seminars.

5. PROJECT/RESEARCH TIMETABLE

The project will run for 24 months from March 2025, with staff recruitment for WP1 and WP2, happening before the formal start date. WPs are sequenced so that WP2a can feed into WP3 and inform WP4; review of literature (WP1) will happen at the start of WP1 to inform all other WPs; with 3 months at the end for integration, synthesis and dissemination. The Gantt chart (see page 20) shows the proposed timeline and key milestones.

6. PROJECT MANAGEMENT

Mytton will provide overall project leadership, with White (a highly experienced PI) providing mentorship. WP leads will provide day-to-day management, oversight and leadership of individual WP. The core research team (co-investigators and researchers employed on the grant) will meet monthly to bi-monthly (predominantly online, with three face-to-face meetings). Progress will be assessed at the team meetings against the milestones (see Gantt chart on p20). Vogel and Lawson will lead our PPI work. Both have experience of effectively integrating PPI throughout WP activities of large (public) health projects.

Independent scientific scrutiny will be provided by a Scientific Advisory Group compromising 4-6 independent academics (e.g. Morris, Leeds; Backholer, Deakin; van Rees, Warwick; Pechey, Oxford) and a member of the public (independent of the public panel), meeting twice per year.

Ethics

Specific details on ethics and research governance are set out under each work package. This project primarily uses data that has already been collected and as is pseudo-anonymised or not personal data.

Collection of new data from individuals is limited to WP5b; for this we will seek approval from the University of Cambridge Humanities and Social Sciences Ethics Committee. Data will be anonymised and stored on secure servers in line with local policy (i.e. MRC Epidemiology Unit policy) and restricted to project members.

7. PROJECT/RESEARCH EXPERTISE

Our multidisciplinary team has broad expertise in a range of methods and knowledge relevant to the proposed work. Different members of the team have different levels of experience in their roles, with more experienced academics providing mentorship and support for other colleagues providing training and capacity development for Co-Is as well as post-doctoral researcher associates (PDRA).

Oliver Mytton will provide overall leadership, lead WP1 and WP3, support Rahilly with WP2b, and supervise two PDRAs. He brings expertise in public health modelling, quantitative methods, public health policy, health inequalities, natural experimental evaluation of public health policies and leading complex multidisciplinary projects.

Leonie Lawson (public Co-I) will co-lead the PPI work. She is a mother of two children with primary responsibility for food shopping for her family. She has experience of leading PPI activities on large grants (with City and King's College) including: supporting members of the public, delivering PPI training, recruiting diverse public panels and monitoring PPI activities.

Christina Vogel will co-lead the PPI work and support integration for WP1. She has experience in nutrition, qualitative and mixed methods, dietary public health evaluation, systems methods, working with the food industry, and has managed major NIHR grants. She is PI on a related grant (NIHR207065)

Martin White will support integration for WP1, provide mentorship for Mytton, co-lead WP5 and co-supervise one PDRA. He has wide experience in public health research having led many large grants. Expertise includes evaluation of dietary public health policy, systems perspectives, qualitative methods, integration and working with the food industry.

Martin O'Connell will lead WP2a, supervising one PDRA. He brings expertise in economic and quantitative methods (e.g. difference-in-difference), and analysis of the Kantar dataset (which he has curated over several years).

John Rahilly will lead WP2b and co-supervise one PDRA with Mytton, and support Mytton with project management, gaining experience of project management and leadership. He has experience of quantitative methods (interrupted time series analysis), public health modelling and natural experimental evaluation of dietary public health policies.

Paul Dobson will support WP2b and access to (and initial cleaning of) the Dunnhumby dataset. He has expertise in business strategy and public policy, including with respect to food and alcohol, and working knowledge of the Dunnhumby dataset.

Amies-Cull will support WP3 and provide technical input to update/re-programme PRIMEtime for WP3. He brings expertise in public health modelling and health inequalities.

Medina-Lara will lead WP4 and supervise one PDRA, with support from Smith, developing her expertise in WP leadership. She has expertise in the public health economics, including the evaluation of the impacts of dietary public health interventions on industry.

Richard Smith will support WP4. He brings expertise in a wide range of economic methods, including micro, macro and behavioural economic methods applied to health.

Jean Adams will co-lead WP5, co-supervise one PDRA and work with Mytton to ensure complementarity with NIHR152515. She has expertise in understanding environmental impacts on diet, evaluation of dietary public health interventions, qualitative methods, interrupted time series analysis, integration and has managed major grants.

Cortina-Borjas (collaborator), an experienced medical statistician, will provide statistical review of analytic plans, statistical advice, and oversight of all statistical analysis.

8. SUCCESS CRITERIA AND BARRIERS

Success Criteria:

We propose both process (intermediate) and output/outcome success criteria:

a) Establishment of the study and team: recruitment of staff, ethics approval for WP5b, establishment of study support groups (public panel, policy and scientific advisory groups; establishing data sharing agreement between UEA and UCL.
b) High quality data collection completed for WP4 and WP5b.
c) Completion of data analysis: data analysis completed for all WPs; submission of articles for academic publication; integration of findings and synthesis of findings with other work and production of the final report.
d) Dissemination of results: delivery of seminar and briefings for key stakeholders, use of study findings and outputs by a wide range of stakeholders.
e) Evidence being used to inform policy and by other researchers (e.g. citation in policy documents and academic reports)

Barriers to proposed work:

a) **Access to data**; we are primarily relying on data that has already been collected and/or owned by the institutes involved in the study (e.g. WP2), and/or is in the public domain (e.g. WP4). This minimises risks around access to the data.
A data sharing agreement between UCL and UEA will need to be established to facilitate analysis of the Dunnhumby dataset (Mytton has experience of establishing data sharing agreements at UCL).
New (qualitative) data will be collected for WP5 by searching for industry documents and talking to the public. The latter will be done later in the programme of research, giving time for ethics permission and participant recruitment.
b) **Delay in recruiting staff (PDRA) for WP1, WP2 and WP5,** we recognise the need to move quickly from successful award to advertising for posts; all Co-I's responsible for recruitment/line management of post-doctoral research fellows have experience of recruiting through their host institution and will have job descriptions ready to advertise if we are successful. WP3 and WP4 will also recruit staff, but have a later start date for their PDRA, giving more time for staff recruitment.
c) **Inter-dependencies between work packages**: the most significant inter-dependency is between WP2 and WP3, with data from WP2 informing WP3. The WP have been sequenced to allow this to happen. Rahilly will work across these WP to ensure good communication and mitigation of risks.
d) **Null findings from WP2**, i.e. no change in consumer behaviour; in this eventuality we will seek to understand impacts by socio-economic and -demographic group (and different food groups); and then model health effects for these different groups. Given our preliminary findings and the existing research, we feel this is unlikely.
e) There is some (decreasing) **political uncertainty around whether the mandatory policy** will be implemented in England in October 2025. Our study is not contingent on this policy happening and can run independently of NIHR152515 (in the event of it being delayed or not starting). If the mandatory policy in England was halted, given the long-standing interest in the issue and interest in Wales and Scotland, it seems likely that policy makers in the UK (and abroad) will remain interested in the area and

our findings. We will work closely with government officials (e.g. engagement in policy advisory group) to share interim findings (when they are scientifically ready) to inform policy in a timely fashion.

f) **Findings are misunderstood**; a variety of powerful stakeholders (industry and government) will be interested in our research and may want to put their own interpretation on the findings. The team has experience of navigating these issues. To mitigate against this, we will communicate directly to important stakeholders to prevent misunderstanding and put emphasis on integrated findings in the context of the wider literature, and not put disproportionate weight on any single finding.

Record of Changes to the Protocol (Detailed Research Plan)

Date	Version	Changes Made
	1.0	**Original version**
18/12/24	**2.0**	**Changes made in response to feedback from NIHR Committee**
28/7/25	**2.1**	**Detailed Research Plan changed to Protocol**

References

1 Tesco. Tesco reaffirms commitment to support healthy, affordable diets. 2023. https://www.tescoplc.com/tesco-reaffirms-commitment-to-support-healthy-affordable-diets/ (accessed 3 April 2024)

2 Sainsbury's. Sainsbury's to phase out multi-buy promotions in favour of lower regular prices. 2016. https://www.about.sainsburys.co.uk/news/latest-news/2016/11-02-2016 (accessed 3 April 2024)

3 Tesco. Tesco commits to progress plans to support affordable, healthy diets. tescoplc.com. 2022.

4 Steel N, Ford JA, Newton JN, *et al.* Changes in health in the countries of the UK and 150 English Local Authority areas 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*. 2018;392. doi: 10.1016/S0140-6736(18)32207-4

5 Backholer K, Sacks G, Cameron AJ. Food and Beverage Price Promotions: an Untapped Policy Target for Improving Population Diets and Health. *Curr Nutr Rep*. 2019;8:250–5. doi: 10.1007/s13668-019-00287-z

6 Smithson M, Kirk J, Capelin C. Sugar Reduction: The evidence for action Annexe 4: An analysis of the role of price promotions on the household purchases of food and drinks high in sugar. London 2015.

7 The Food (Promotion and Placement) (England) Regulations 2021. UK: https://www.legislation.gov.uk/uksi/2021/1368/made 2021.

8 Department for Health. Childhood obesity: a plan for action, chapter 2. London 2018.

9 HM Government. PM backs public's right to choose with delay to BOGOF restrictions. 2023.

10 Welsh Government. Consultation and Call for Evidence: Proposals to make the food environment in Wales healthier. Cardiff 2024.

11 Scottish Government. Restricting promotions of food and drink high in fat, sugar or salt: business and regulatory impact assessment - partial. Impact Assessment. 2024. https://www.gov.scot/publications/restricting-promotions-food-drink-high-fat-sugar-salt-partial-business-regulatory-impact-assessment/pages/2/ (accessed 3 April 2024)

12 Simmonds E. Members only: can you trust loyatly prices. *Which?* 2024;12–5.

13 Knai C, Petticrew M, Douglas N, *et al.* The Public Health Responsibility Deal: Using a Systems-Level Analysis to Understand the Lack of Impact on Alcohol, Food, Physical Activity, and Workplace Health Sub-Systems. *Int J Environ Res Public Health*. 2018;15:2895. doi: 10.3390/ijerph15122895

14 Ejlerskov KT, Stead M, Adamson A, *et al.* The nature of UK supermarkets' policies on checkout food and associations with healthfulness and type of food displayed: cross-sectional study. *Int J Behav Nutr Phys Act*. 2018;15. doi: 10.1186/S12966-018-0684-2

15 Obesity Action Scotland. Support for Healthy Weight Policies – Polling Results August 2022. 2022.

16 Bokhari FAS, Dobson PW, Morciano M, *et al.* Banning volume discounts to curb excessive consumption: A cautionary tale. *Eur Econ Rev*. 2023;156. doi: 10.1016/j.euroecorev.2023.104480

17 Adams J, Mytton O, White M, *et al.* Why Are Some Population Interventions for Diet and Obesity More Equitable and Effective Than Others? The Role of Individual Agency. *PLoS Med*. 2016;13. doi: 10.1371/journal.pmed.1001990

18 Andreyeva T, Long MW, Brownell KD. The Impact of Food Prices on Consumption: A Systematic Review of Research on the Price Elasticity of Demand for Food. *Am J Public Health*. 2010;100. doi: 10.2105/AJPH.2008.151415

19 World Health Organization. Set of recommendations on the marketing of foods and non-alcoholic beverages to children. Geneva 2010.

20 Vogel C, Piernas C. The Retail Food Environment. *Transforming Food Environments*. 2022.

21 Nakamura R, Suhrcke M, Jebb SA, *et al.* Price promotions on healthier compared with less healthy foods: a hierarchical regression analysis of the impact on sales and social patterning of responses to promotions in Great Britain. Am. J. Clin. Nutr. 101, 808–16 (2015. *Am J Clin Nutr*. 2015;101:808–16. doi: 10.3945/ajcn.114.094227

22 Kopasker D, Ejebu O-Z, Norwood P, *et al.* Longitudinal study of the effects of price and promotion incentives on purchases of unhealthy foods: evidence for restricting food promotions. *BMJ Nutr Prev Health*. 2022;5:e000323. doi: 10.1136/BMJNPH-2021-000323

23 Watt T, Beckert W, Smith R, *et al.* The impact of price promotions on sales of unhealthy food and drink products in British retail stores. *Health Econ*. 2023;32. doi: 10.1002/hec.4607

24 Luick M, Pechey R, Harmer G, *et al.* The impact of price promotions on confectionery and snacks on the energy content of shopping baskets: a randomised controlled trial in an experimental online supermarket. *Proceedings of the Nutrition Society*. 2022;81. doi: 10.1017/S0029665122002014

25 Watt TLS, Beckert W, Smith RD, *et al.* Reducing consumption of unhealthy foods and beverages through banning price promotions: what is the evidence and will it work? *Public Health Nutr*. 2020;23:2228–33. doi: 10.1017/S1368980019004956

26 Wu Y-H, Moore S, Ma Y, *et al.* Longitudinal geo-referenced field evidence for the heightened BMI responsiveness of obese women to price discounts on carbonated soft drinks. *PLoS One*. 2021;16. doi: 10.1371/journal.pone.0261749

27 Zorbas C, Eyles H, Orellana L, *et al.* Do purchases of price promoted and generic branded foods and beverages vary according to food category and income level? Evidence from a consumer research panel. *Appetite*. 2020;144. doi: 10.1016/j.appet.2019.104481

28 Kaur A, Lewis T, Lipkova V, *et al.* A systematic review, and meta-analysis, examining the prevalence of price promotions on foods and whether they are more likely to be found on less-healthy foods. *Public Health Nutr*. 2020;23. doi: 10.1017/S1368980019004129

29 Bennett R, Zorbas C, Huse O, *et al.* Prevalence of healthy and unhealthy food and beverage price promotions and their potential influence on shopper purchasing behaviour: A systematic review of the literature. *Obesity Reviews*. 2021;21. doi: https://doi.org/10.1111/obr.12948

30 Health Select Committee. Childhood obesity: Time for action. London 2018.

31 Bokhari F, Dobson P. Why the government needs to rethink its HFSS multibuys ban. *The Grocer*. 2023.

32 Atherton F. Shaping our health: how commercial interests influence our choices and behaviour. Chief Medical Officer for Wales Annual Report 2023. Cardiff 2023.

33 Maani N, McKee M, Petticrew M, *et al.* Corporate practices and the health of populations: a research and translational agenda. *Lancet Public Health*. 2020;5. doi: 10.1016/S2468-2667(19)30270-1

34 Kantar. Grocery Market Share. 2024. https://www.kantarworldpanel.com/grocery-market-share/great-britain/snapshot/08.09.24/ (accessed 12 December 2024)

35 Smith R. Public health economics: Should it be more offensive? *Health Econ*. Published Online First: 4 June 2024. doi: 10.1002/hec.4868

36 Campbell M, Katikireddi SV, Hoffmann T, *et al.* TIDieR-PHP: a reporting guideline for population health and policy interventions. *BMJ*. Published Online First: 16 May 2018. doi: 10.1136/bmj.k1079

37 Alvarado M, Penney TL, Astbury CC, *et al.* Making integration foundational in population health intervention research: why we need 'Work Package Zero'. *Public Health*. 2022;211. doi: 10.1016/j.puhe.2022.06.028

38 Cullerton K, Adams J, White M. Should Public Health and Policy Communities Interact With the Food Industry? It Depends on Context Comment on 'Towards Preventing and Managing Conflict of Interest in Nutrition Policy? An Analysis of Submissions to a Consultation on a Draft WHO Tool'. *Int J Health Policy Manag*. Published Online First: 20 September 2020. doi: 10.34172/ijhpm.2020.176

39 Cullerton K, Adams J, Forouhi NG, *et al.* Avoiding conflicts of interest and reputational risks associated with population research on food and nutrition: the Food Research risK (FoRK) guidance and toolkit for researchers. *BMJ*. Published Online First: 29 January 2024. doi: 10.1136/bmj-2023-077908

40 Rogers NT, Conway DI, Mytton O, *et al.* Estimated impact of the UK soft drinks industry levy on childhood hospital admissions for carious tooth extractions: interrupted time series analysis. *BMJ Nutr Prev Health*. 2023;6. doi: 10.1136/bmjnph-2023-000714

41 Pell D, Penney TL, Mytton O, *et al.* Anticipatory changes in British household purchases of soft drinks associated with the announcement of the Soft Drinks Industry Levy: A controlled interrupted time series analysis. *PLoS Med*. 2020;17. doi: 10.1371/JOURNAL.PMED.1003269

42 Kopasker D, Whybrow S, McKenzie L, *et al.* The effects of minimum unit pricing for alcohol on food purchases: Evaluation of a natural experiment. *SSM Popul Health*. 2022;19. doi: 10.1016/j.ssmph.2022.101174

43 Kalbus A, Cornelsen L, Ballatore A, *et al.* Associations between the food environment and food and drink purchasing using large-scale commercial purchasing data: a cross-sectional study. *BMC Public Health*. 2023;23. doi: 10.1186/s12889-022-14537-3

44 Yau A, Law C, Cornelsen L, *et al.* Association Between Household Online Grocery Delivery Service Use and Food and Drink Purchase Behavior in England: Cross-Sectional Analysis. *JMIR Public Health Surveill*. 2023;9. doi: 10.2196/41540

45 Yau A, Berger N, Law C, *et al.* Changes in household food and drink purchases following restrictions on the advertisement of high fat, salt, and sugar products across the Transport for London network: A controlled interrupted time series analysis. *PLoS Med*. 2022;19. doi: 10.1371/journal.pmed.1003915

46 Lopez Bernal J, Cummins S, Gasparrini A. Interrupted time series regression for the evaluation of public health interventions: a tutorial. *Int J Epidemiol*. Published Online First: 9 June 2016. doi: 10.1093/ije/dyw098

47 Lopez Bernal J, Cummins S, Gasparrini A. Difference in difference, controlled interrupted time series and synthetic controls. *Int J Epidemiol*. 2019;48. doi: 10.1093/ije/dyz050

48 Yau A, Berger N, Law C, *et al.* Changes in household food and drink purchases following restrictions on the advertisement of high fat, salt, and sugar products across the Transport for London network: A controlled interrupted time series analysis. *PLoS Med*. 2022;19. doi: 10.1371/journal.pmed.1003915

49 Rahilly J, Williams A, Chang M, *et al.* Changes in the number and outcome of takeaway food outlet planning applications in response to adoption of management zones around schools in England: A time series analysis. *Health Place*. 2024;87. doi: 10.1016/j.healthplace.2024.103237

50 Austin PC. An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies. *Multivariate Behav Res*. 2011;46. doi: 10.1080/00273171.2011.568786

51 Penfold RB, Zhang F. Use of Interrupted Time Series Analysis in Evaluating Health Care Quality Improvements. *Acad Pediatr*. 2013;13. doi: 10.1016/j.acap.2013.08.002

52 Food Standards Agency. Nutrient Profiling Technical Guidance. 2009. http://www.food.gov.uk/sites/default/files/multimedia/pdfs/techguidenutprofiling.pdf (accessed 11 April 2016)

53 Competition and Markets Authority. Loyalty pricing in the groceries sector. Gov.uk. 2024. https://www.gov.uk/cma-cases/loyalty-pricing-in-the-groceries-sector (accessed 27 August 2024)

54 Fearne A, Borzino N, De La Iglesia B, *et al.* Using supermarket loyalty card data to measure the differential impact of the UK soft drink sugar tax on buyer behaviour. *J Agric Econ*. 2022;73. doi: 10.1111/1477-9552.12462

55 Green MA, Watson AW, Brunstrom JM, *et al.* Comparing supermarket loyalty card data with traditional diet survey data for understanding how protein is purchased and consumed in older adults for the UK, 2014–16. *Nutr J*. 2020;19. doi: 10.1186/s12937-020-00602-3

56 NIHR. Evaluation of planning policy to regulate takeaway food outlets for improved health in England. www.nihr.ac.uk. 2001. https://fundingawards.nihr.ac.uk/award/NIHR130597 (accessed 24 July 2024)

57 Cobiac L, Law C, Scarborough P. PRIMEtime: an epidemiological model for informing diet and obesity policy. *medRxiv*. Published Online First: 2023.

58 Amies-Cull B. *Estimating the effectiveness and cost-effectiveness of body weight interventions for the prevention of non-communicable disease in local authority areas of England*. 2023.

59 Rogers N, Amies-Cull B, Adams J, *et al.* Health impacts of takeaway management zones around schools in six different local authorities across England: a public health modelling study using PRIMEtime. *medRxiv*. Published Online First: 24 June 2024.

60 Mytton OT, Boyland E, Adams J, *et al.* The potential health impact of restricting less-healthy food and beverage advertising on UK television between 05.30 and 21.00 hours: A modelling study. *PLoS Med*. 2020;17. doi: 10.1371/journal.pmed.1003212

61 Briggs ADM, Mytton OT, Kehlbacher A, *et al.* Health impact assessment of the UK soft drinks industry levy: a comparative risk assessment modelling study. *Lancet Public Health*. 2017;2. doi: 10.1016/S2468-2667(16)30037-8

62 Cobiac LJ, Rogers NT, Adams J, *et al.* Impact of the UK soft drinks industry levy on health and health inequalities in children and adolescents in England: An interrupted time series analysis and population health modelling study. *PLoS Med*. 2024;21. doi: 10.1371/journal.pmed.1004371

63 HM Treasury. *The Green Book - Central Government Guidance on Appraisal and Evaluation*. 2022nd ed. London: HM Government 2022.

64 Caro JJ, Briggs AH, Siebert U, *et al.* Modeling Good Research Practices—Overview: A Report of the ISPOR-SMDM Modeling Good Research Practices Task Force-1. *Value in Health*. 2012;15. doi: 10.1016/j.jval.2012.06.012

65 Philips Z, Ginnelly L, Sculpher M, *et al.* Review of guidelines for good practice in decision-analytic modelling in health technology assessment. *Health Technol Assess (Rockv)*. 2004;8. doi: 10.3310/hta8360

66 Owen L, Fischer A. The cost-effectiveness of public health interventions examined by the National Institute for Health and Care Excellence from 2005 to 2018. *Public Health*. 2019;169. doi: 10.1016/j.puhe.2019.02.011

67 Law C, Cornelsen L, Adams J, *et al.* An analysis of the stock market reaction to the announcements of the UK Soft Drinks Industry Levy. *Econ Hum Biol*. 2020;38. doi: 10.1016/j.ehb.2019.100834

68 Law C, Cornelsen L, Adams J, *et al.* The impact of UK soft drinks industry levy on manufacturers' domestic turnover. *Econ Hum Biol*. 2020;37. doi: 10.1016/j.ehb.2020.100866

69 Office for National Statistics. ONS SRS Metadata Catalogue, dataset, Annual Business Survey - GB,. Office for National Statistics webpage. 2024.

70 Penney TL, Jones CP, Pell D, *et al.* Reactions of industry and associated organisations to the announcement of the UK Soft Drinks Industry Levy: longitudinal

thematic analysis of UK media articles, 2016-18. *BMC Public Health*. 2023;23. doi: 10.1186/s12889-023-15190-0

71 Braun V, Clkare V. *Thematic Analysis: A Practical Guide*. London: SAGE Publications Ltd 2021.