

**Evaluation of the impacts on health of the proposed UK industry
levy on sugar sweetened beverages: developing a systems map and
data platform, and collection of baseline and early impact data**

PROTOCOL

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Background to the research

The public health problem: consumption of sugar sweetened beverages

Sugar-sweetened beverage (SSB) consumption is independently associated with dental caries, total energy intake, obesity, type 2 diabetes (T2DM) and cardiovascular disease (CVD).¹ For example daily consumption of SSBs is associated with a 19% increased risk of T2DM and 17% increased risk of CVD.^{2,3} The economic burden of these conditions is significant. Although not entirely attributable to SSBs, obesity cost the UK an estimated £27 billion in 2015;⁴ with direct cost to the NHS of over £5 billion.⁵

The dietary patterns that contribute to an increased risk of disease are often formed during childhood and adolescence,⁶ with SSBs currently representing the single biggest source of dietary sugar for young people in the UK.⁴ SSBs are thought to contribute to poor health through behavioural (e.g. limited satiation of sugar from liquids) and biological mechanisms (e.g. effect of high glycaemic load on insulin resistance).⁷ In childhood and adolescence, SSB consumption is associated with dental caries (the most common cause of hospital admission for children aged 5-9 years) and obesity.^{8,9} These child and adolescent conditions can track into adulthood; 80% of obese children between the ages of 10-14 become obese adults,¹⁰ increasing their risk of T2DM, cardiovascular disease, cancer and musculoskeletal conditions. SSB consumption, and associated dietary risks, are also strongly socioeconomically patterned,¹¹ contributing to inequalities in health.

The intervention: The HM Treasury Soft Drinks Industry Levy (SDIL)

In 2016 the Chancellor announced a tiered soft drinks industry levy (SDIL) on industries importing or selling SSBs in the UK with the explicit intention of reducing consumption of sugar from SSBs. The introduction of the SDIL is punctuated by three events:

- i. the chancellor's announcement (April 2016, 2 years ahead of implementing the levy)
- ii. the introduction of legislation within the Finance Bill 2017, which will confirm details of the levy
- iii. the implementation of the Levy (anticipated April 2018)

Each of these events aims to prompt changes in industry behaviour - primarily reformulation to lower sugar content but also other changes, such as in marketing to persuade consumers to switch to lower sugar alternatives. Reformulation (e.g. by Tesco and Britvic) is already occurring. Moreover, each phase of the introduction of the SDIL is accompanied by media coverage guided by HM Treasury and HM Revenue and Customs, which may emphasize the health risks of SSB consumption. Introduction in April 2018 may be associated with a rise in the price of SSBs. All of these changes may impact SSB and total sugar consumption, with potential consequences for diet and health. The effects of these 'perturbations' in highly complex food and health systems are multiple and likely to interact dynamically. While the intervention is subject to consultation and legislation, the current proposal is to impose the levy in relation to the sugar content of drinks as follows:

- No levy on drinks $\leq 5\text{g}/100\text{ml}$ of added sugar (e.g. Oasis, Lucozade Sport, 'diet' colas etc.)
- A low rate on drinks $>5\text{g}/100\text{ml}$ and $\leq 8\text{g}/100\text{ml}$ of added sugar (e.g. Dr Pepper, Sprite, Fanta)
- A high rate on drinks containing $>8\text{g}/100\text{ml}$ of added sugar (e.g. Coca-Cola, Pepsi, IRN BRU)

The outcome of the levy consultation (undertaken in summer 2016)¹² was published in December 2016¹³. Additional components may be announced subsequently, which we will consider including within the evaluation. Levy revenue will be used to promote children's health (funding sport and breakfast clubs in school), although this spending is not contingent on the levy.

Soft drink excise tax: reformulation, price, purchasing and consumption

The UK SDIL is different from SSBs taxes that have been introduced to date in other countries: it is an industry levy rather than an excise tax and has three levels. We anticipate there will be several pathways through which the levy could reduce both SSB and sugar consumption. Existing research primarily considers one of these pathways (change in price). Previous studies (of excise taxes) have shown that the tax is passed onto the consumer, although not always fully, and that the taxes/price rises are associated with reduced

purchases and consumption.^{14–16} Economic theory and data strongly suggest that price is an important determinant of SSB purchases.¹⁷ No study has shown excise taxes are associated with reduced consumption (i.e. drinking of SSBs) and associated changes in health (although modelling studies suggest that such taxes may result in important health gains).

The government has made it clear that the SDIL is not a tax on consumers and that companies should seek to reformulate and not pass the levy on to consumers.¹⁸ Moreover, the tiered nature of the levy, early signs that industry is reformulating in response to the levy,¹⁹ and initial scoping work, all suggest that reformulation may be an important industry response (potentially alongside price rises). No studies have quantified the extent of reformulation in response to levies or taxes. However, members of our team have recently modelled the potential impacts of the SDIL and have found that price increases, reformulation and other activities (e.g. marketing) that result in consumers switching to low sugar alternatives all have considerable scope to improve health (e.g. 144,000 (95% uncertainty interval: 5,100 to 306,700) fewer adults and children with obesity in the UK, 19,000 (6,900 to 32,700) fewer incident cases of diabetes per year, and 269,000 (82,200 to 470,900) fewer decayed, missing, or filled teeth annually).²⁰ However the study, informed by expert opinion, highlighted considerable uncertainty around the nature and magnitude of the industry response.

Indirect taxes (i.e. taxes levied on goods) are financially regressive, although they may be progressive from a health perspective.²¹ More disadvantaged individuals suffer from a disproportionate burden of diet-related diseases,²² but are also more sensitive to price changes.¹⁷ As SSBs are not a dietary requirement, and one culturally appropriate alternative (i.e. water) is available at little or no cost, a shift from SSBs toward water among disadvantaged groups could improve health and reduce diet related health inequalities.²³ An assessment of distributional effects at a population level has yet to be undertaken.

The soft drinks industry levy as an event within a complex system

The implementation of a fiscal policy is an intervention that is highly context dependent,^{24,25} resulting in reactions by many stakeholders including government, civil society, industry, health sector and consumers, and the potential to affect a range of diet and health

outcomes. The multifaceted nature of the SDIL necessitates consideration of the context (i.e. the system(s) of factors) that surrounds the levy to systematically guide empirical work. Our proposed evaluation will focus on aspects of this complex system, in addition to direct measures of reformulation, price, purchasing, consumption and potential health impacts:

- *Compensatory industry strategies:* HM Treasury expectation is that the levy should prompt reformulation by industry. However, opposition to the levy has been voiced in media reports²⁶ and position statements (e.g. the British Soft Drinks Association).²⁷ This reaction has been seen elsewhere: for example, PepsiCo threatened to move its corporate headquarters out of New York when the state considered implementing an 18% sales tax on SSBs.²⁸ Industry strategies may include: creating doubt regarding scientific studies, political lobbying, criticising potential policies as negatively impacting on employment, complaining about restrictions on personal choice, and emphasising physical activity.²⁹
- *Media and public discourse on sugar and taxation:* SSBs are covered frequently in mainstream British media (e.g. print newspapers, online news websites). A media analysis (2014) found significant coverage on SSBs related to public health advocacy with messaging from experts, campaign groups and health organisations on the detrimental effects on health. However, only 25% of this coverage included proposed policy responses, in particular fiscal policies related to addressing consumption.³⁰ Given the broader context of the UK levy, such as the 2015 WHO sugar guidelines³¹, and 2016 call for wider use of fiscal approaches³², the media and public discourse is likely to have shifted with unknown influences on acceptability of the levy, industry reformulation and purchasing or consumption.
- *Consumer acceptability:* Public support for food and beverage taxes to address obesity has been increasing in the US.³³ The way in which the issue is framed is considered important for shaping consumer acceptability, with presentation of the tax as a way to promote health and highlighting that revenues are earmarked for promoting child health shaping a more favourable view of taxation.³⁰

Objectives

We aim to conduct formative research to support a proposed whole systems approach to the evaluation of the health-related impacts of an industry levy on SSBs in the UK, and the mechanisms through which these impacts are generated. Specifically, this includes three areas of work:

1. *System-map*: To describe components of the complex adaptive system on which the announcement and implementation of the UK industry levy on SSBs will have impacts, the major outcome parameters and their likely direction of change
2. *Data platform*: To identify the feasibility of establishing a comprehensive system-level evaluation data platform, including time series data on the key social, economic and health outcome parameters and potential mediating, moderating, confounding and distributional factors
3. *Early impacts*: To collect time-sensitive qualitative and quantitative data on key early impacts of the announcement and implementation of the UK industry SSB levy in order to provide a viable baseline and allow measurement of change in key outcomes over time

Methods

Objective 1: Develop and validate a system map

System map

An initial system map will be developed in a concept mapping workshop with the study team (8 content experts from a range of academic disciplines) where generation and structuring of an initial system map will be guided by concept methodology including a set of predefined questions and supplemented with iterative consensus building (Appendix A – questions and procedure).^{34,35} The initial full system map will be captured.

Modified online Delphi survey

A modified online Delphi survey will then be used to further refine the map through collection of perspectives from key stakeholder groups.³⁶

Survey participants and recruitment

Up to 50 participants will be purposively sampled with equal representation from key stakeholder groups based upon the parameters that emerged from the development of the initial system map. Specifically, individuals who are likely to have knowledge of the wide ranging effects of the SDIL, including academics with relevant areas of expertise (e.g. epidemiology, economics, sociology, nutrition), public health professionals, government, civil society and food industry representatives. Our recruitment strategy will use our existing networks to identify initial contacts across different organisation that represent identified stakeholder groups. These contacts will identify staff or members of the organisation to participate who have an interest or knowledge in a topic relevant to the SDIL and represent the views of that organisation; these participants will be extended via snowball sampling where necessary.

Online Delphi survey

The survey will be conducted in two rounds, the first round will include questions about anticipated effects of the levy from professional and/or organisational perspectives, followed by a series of questions that guide participants through different aspects of the system map to collect their feedback (Appendix B – example questions). As we are seeking input specific to different aspects of this unique map, questions will be developed for this purpose alone based on the research question and pilot work that aims to develop a method to clearly communicate and guide participants through a complex system map. After the first round, the detailed responses will then be used to inform revisions to the system map, which will be updated and followed by a second round.

Analysis of Delphi survey responses and updating the system map

Analysis of Delphi responses will include level of agreement with map components/connections, synthesis of qualitative feedback related to disagreements and revision of the system map. The final map will inform the specification of the evaluation data platform and will be used to ground interpretation of different streams of work throughout the full evaluation.

Objective 2: Identify data sources to build a data platform

The initial system map will be used as the basis to seek data sources for specific parameters and related variables (i.e. mediators, moderators and confounders) identified on the map. Details about data availability (variables, numbers, etc.) over time and costs will be identified and a final profile of data will be summarised against the initial system map. Feasibility and cost of generating new data will be appraised if necessary and will result in a scoping document and evolving summary table with identified data sources mapped to specific aspects of the system map.

Objective 3: Explore early impacts

Using the methods below we aim to identify and explore early impacts of the levy, as well as the views of a range of stakeholders. In this formative phase, the work will primarily focus on developing and refining methods for data acquisition including sampling, recruitment, and preliminary analysis. Given the limited time frame of this study, it is not anticipated that definitive analyses will be conducted and the primary purpose will be to establish the methods for a definitive, system-level evaluation of the SDIL and secure early (baseline) data.

Stakeholder interviews

We will explore early impacts of the SDIL from different stakeholder perspectives in a qualitative study involving telephone interviews. Questions are designed to explore initial

reactions and anticipated impacts of the upcoming SDIL to be implemented in April 2018 (Appendix C – interview guide).

Participants and recruitment

Up to 10 participants will be recruited from the Delphi survey sample, representing relevant stakeholder groups who are likely to experience a change in their practices or be involved in the public discourse as the result of the levy (i.e. academics, public health professional, government, civil society and industry). We will ask all Delphi participants to indicate their willingness to be interviewed and then, if necessary, purposively sample to ensure the entire range of perspectives is represented in the data.

In addition, we will recruit up to 10 members of the public, so as to include public views on the SDIL and sugar consumption. These interviews, while offering a contrasting stakeholder perspective for this study, will also inform the development of survey questions to use in subsequent work to assess changes in public views over time. As we are seeking rich content from individuals who have an interest related to this work, we will sample the public using ‘People in Research’, an NIHR initiative that facilitates public participation in research.³⁷

All participants will be interviewed by telephone at a time and date convenient to them. Interviews will last approximately 30 minutes each. Participants will be asked to give verbal informed consent at the outset, which will be documented on a consent form by the interviewer. All interviews will be digitally recorded.

Analysis of interviews

Interviews will be transcribed verbatim and anonymised. Data from interviews will be analysed thematically³⁸, assisted by NVivo software, using the Framework method³⁹, with constant comparison⁴⁰ and deviant case analysis⁴¹ to enhance validity. Initial frameworks will be developed from interview topic guides and modified iteratively using emergent themes, so that earlier transcripts influence the analysis of subsequent transcripts. Data will be coded initially by two independent researchers, leading to the development of a working analytical framework. The resulting framework will then be applied to index all data using

the identified codes and categories into a matrix to determine themes across and within stakeholder groups.

Documentary sources and social media analysis

We will collect data to develop an understanding of any early impacts of the SDIL on public discourse through both news media and social media sources. We will also document official responses through review of government sources. In this preliminary work, the methods for these analyses will be developed and, where time permits, limited substantive analyses or early data will be undertaken. More definitive analyses will be undertaken in a definitive evaluation of the SDIL (dependent on further funding).

Review of official documents

We will search for and retrieve official documents relating to the SDIL, including those issued by the Treasury, Department of Health, Public Health England and Parliament (i.e. Hansard). These will be analysed to identify: (a) the sequence of events related to the SDIL (i.e. its progress from the Chancellor's announcement, through public and industry consultation, to legislation and implementation) – this line of enquiry will continue into the definitive evaluation; (b) thematic content analysis, to identify political discourse surrounding the SDIL, how decisions were influenced and taken, and outcomes of consultations.

Content analysis of news media coverage

Sources will be identified by interrogating the LexisNexis database using a pre-determined search strategy that will be refined following initial scoping, to identify all articles referring to regulation of sugar in food/drinks, or to the SDIL specifically in UK national newspapers and trade (food industry) press from 2 years before announcement of the levy (April 2014) until January 2017. Using a set of inclusion criteria that will also be developed during initial scoping, articles will be screened by two independent researchers. Depending on the volume of material, we may need to sample articles from across the time period to achieve

a manageable workload, while achieving thematic saturation. The majority of national press articles can be accessed online, where public reactions to articles can also be found. This public discourse will also be sampled and analysed iteratively, to saturation.

Analysis of sources will use a combination of the Framework method⁴² and contextual analysis as used in previous research.³⁰ A coding framework will be developed to describe and categorise the articles found. All articles meeting inclusion criteria will then be categorised into groups based on content of interest set out after initial coding (e.g. prominence of the article, slant of the article, article advocacy etc.). Descriptive information about the article will also be captured including type of article, publisher and date of publication.

Once the coding framework is complete, further contextual analysis will be conducted to provide greater detail with respect to underlying themes and messages from the media coverage based upon established methods from previous food and tobacco industry media analysis over time.^{30,43}

Social media discourse

Sources will be identified by two methods. Firstly by searching of Tweets, which will be collected using both specific keywords and also by following Twitter accounts of key individuals and bodies, from October 2016 onwards. Secondly, by searching cached pages on the Facebook accounts of key stakeholder organisations and individuals involved in all aspects of SSBs and the SDIL. This will include data on public and professional (e.g. public health, industry, media) discourse, as well as advocacy from civil society organisations and individuals, which will be triangulated with other sources (see below).

Relevant tweets will be identified using search strategies, to be determined by iterative scoping searches, to identify discourse on the SDIL. Key sources (twitter accounts) identified as commenting on the SDIL in early searches will be routinely searched in subsequent searches for continuing discourse (e.g. Faculty of Public Health, British Soft Drinks Association, Jamie Oliver). The volume of material may be high. For qualitative analysis, to ensure a manageable quantity of data, we will prioritise 'popular' tweets (e.g. highly

retweeted) and the Facebook and twitter accounts of key stakeholders, as well as sample material for content analysis, which will continue to saturation.

Supermarket food and beverage analysis

Soft drink market diversity, formulation and price data will be collected and preliminary analysis undertaken. Specifically, we will explore the short-term effects of the intervention on soft drink diversification, formulation and price.

Data source and sample

Prior to receiving funding, we developed automated data collection techniques (commonly referred to as 'data scraping') and will use these to collect time-stamped data on all soft drinks available for purchase from six online UK supermarkets (Tesco, Morrison's, Asda, Sainsbury's, Waitrose and Ocado). Together these supermarkets (online and in-store) represent more than 75% of the UK grocery market.⁴⁴ The resultant database ('FoodDB') contains data on the complete product range of soft drinks from each supermarket in each month. For each drink we will collect the following: date of data collection; nutritional content; price; pack size; serving size; whether or not the drink is on promotion; and manufacturer. Data from 1281 Tesco drinks were collected from 2011 to 2016 using a combination of live and archived websites, 391 of which have more than 3 time points at which data was available. During the current rapid funding phase, this data collection for all drinks will be extended to ensure full availability from all six major online supermarkets from October 2016, with data collected at monthly intervals.

Measures

Our outcome measures will relate to drinks in four categories:

- non levy-eligible drinks* (i.e. non-alcoholic drinks with <5g free sugars/100ml and drinks excluded from the levy) – these will be disaggregated into further sub-categories including bottled waters; pure fruit juices; and entirely artificially sweetened, 'diet', drinks to determine substitution effects

- lower level levy-eligible drinks* (i.e. non-alcoholic drinks with $5 < g < 8$ free sugars/100ml)
- higher level levy-eligible drinks* (i.e. non-alcoholic drinks with $> 8g$ free sugars/100ml)
- alcoholic drinks

* subject to confirmation of the levy structure

Market diversity, formulation and price data will be available per month within the above four drinks categories:

- number of products (e.g. Coca-Cola) available across six online supermarkets per month
- mean sugar concentration in g/100ml per month
- mean price in £/100ml per month.

Analysis

In this formative phase, analysis will include feasibility and utility of available data and development of analysis methods. The planned analysis is for data aggregated per time point (i.e. soft drink market diversification, formulation, price;), we will examine multiple time points covering the time period from prior to the SDIL announcement (March 2016) to December 2016, with ITS analyses for each outcome separately.⁴⁵ The units of analysis will be calendar months for all variables. For soft drink market diversity, formulation and price uncontrolled analyses will be conducted.

Ethics

We have received ethical approval for the stakeholder interviews and the online Delphi survey from the University of Cambridge Humanities and Social Science Research Ethics Committee. Ethical approval is not required for the other elements of the project.

Project management plan

This project involves 6 months of work. A detailed project management plan and associated milestones are attached (Appendix D). In summary they include:

- Objective 1 to begin in August 2016, to be completed by December 2016, resulting in a full system map.
- Objective 2 to begin in September 2016, and end in December 2016 with a table of data sources associated with each parameter of the system map.
- Objective 3 to begin in September 2016, with food and drink reformulation analysis to end in January 2017, and interviews and media analysis to end in February 2017.

Public Involvement

The SDIL is being designed by HM Treasury, which has consulted the public and key stakeholders. The outcome of this process and its influence on the design of the SDIL are not yet known. However, Treasury has indicated that legislation will be introduced to Parliament in the Finance Bill (anticipated March 2017)¹³ suggesting that there was strong public support for the SDIL.

We have discussed this work with a lay member of CEDAR's International Strategic Advisory Group, who has provided helpful comments, which have helped to shape the research. We have also engaged a range of stakeholders to participate in the online Delphi survey in order to have input on the system map that forms the foundation of the data platform and future evaluation activities and plans. Given the limited time available in the rapid funding proposal, we are planning to continue these connections into the full proposal to form the basis of future, more detailed PPI strategies.

Steering Committee

As part of the full evaluation proposal that will be informed by this rapid funding project, we have developed a plan to form an independent Study Steering Committee. Given the timescale of this rapid funding project, we have not established a steering committee, but

will seek informal input prior to reporting from two independent advisors (one scientific, one policy stakeholder) – names to be agreed.

Progression Criteria

As this rapid funding project forms that basis for a future proposal for a definitive evaluation of the SDIL, we have embedded several criteria from which to assess the feasibility of our approach. These include:

1. The appropriateness of a systems approach to the evaluation of the SDIL as a public health intervention. Specifically, are the potential effects of the SDIL far reaching (i.e. involve a range of sectors and systems, and a range of outcomes that interact dynamically over time?).
2. The resonance with a systems approach of a range of potential stakeholders. Specifically, is the systems map an appropriate approach to theorising the effects of the SDIL from different stakeholder perspectives demonstrated by agreement with the systems map?
3. Based on the system map, are appropriate data available at a reasonable cost to undertake a definitive, system level evaluation of the SDIL?
4. Can we develop suitable methods to assess changing stakeholder and public discourse in relation to the SDIL and sugar consumption over time, drawing on live interviews and documentary sources?

If the answers to these questions are affirmative, then we will conclude that a definitive evaluation is feasible.

References

1. Moynihan PJ, Kelly SAM. Effect on caries of restricting sugars intake: systematic review to inform WHO guidelines. *J Dent Res*. 2014;93(1):8–18. doi:10.1177/0022034513508954.
2. Imamura F, O'Connor L, Ye Z, et al. Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis, and estimation of population attributable fraction. *BMJ*. 2015;351:h3576. doi:10.1136/bmj.h3576.
3. Xi B, Huang Y, Reilly KH, et al. Sugar-sweetened beverages and risk of hypertension and CVD: a dose–response meta-analysis. *Br J Nutr*. 2015;113(05):709–717. doi:10.1017/S0007114514004383.
4. Public Health England. *Sugar Reduction The evidence for action.*; 2015. Available at: www.gov.uk/phe. Accessed August 16, 2016.
5. Morgan L, Monica D. The economic burden of obesity. *Natl Obes Obs*. 2010;(October):1–13. doi:10.1111/j.1467-789X.2009.00712.x.
6. Randall E, Marshall JR, Graham S, Brasure J. Patterns in food use and their associations with nutrient intakes. *Am J Clin Nutr*. 1990;52(4):739–745. doi:10.1079/BJN20051418.
7. Mattes R, Cambell W. Effects of food form and timing of ingestion on appetite and energy intake in lean and obese young adults. 2010;109(3):430–437. doi:10.1016/j.jada.2008.11.031.Effects.
8. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: A systematic review and meta-analysis. *Am J Public Health*. 2007;97(4):667–675. doi:10.2105/AJPH.2005.083782.
9. Malik VS, Pan A, Willett WC, Hu FB. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. *Am Jounral Clin Nutr*. 2013;98(4):1084–102. doi:10.3945/ajcn.113.058362.1.
10. Lifshitz F. Obesity in children. *J Clin Res Pediatr Endocrinol*. 2008;1(2):53–60. doi:10.4008/jcrpe.v1i2.35.
11. Aguirre EK, Mytton OT, Monsivais P. Liberalising agricultural policy for sugar in Europe risks damaging public health. *Bmj*. 2015;351(October):h5085. doi:10.1136/bmj.h5085.
12. HM Treasury, HM Revenue & Customs. *Soft Drinks Industry Levy - Consultation document.*; 2016. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/546286/Soft_Drinks_Industry_Levy-consultation.pdf.
13. HM Treasury, HM Revenue & Customs. *Soft Drinks Industry Levy - Summary of Responses.*; 2016. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/575828/Soft_Drinks_Industry_Levy_-_summary_of_responses.pdf.
14. Colchero MA, Popkin BM, Rivera JA, Ng SW. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. *BMJ*. 2016;352:1–9. doi:10.1136/bmj.h6704.
15. Falbe J, Thompson HR, Becker CM, Rojas N, McCulloch CE, Madsen KA. Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption. *Am J Public Health*. 2016:e1–e7. doi:10.2105/AJPH.2016.303362.
16. Colchero MA, Guerrero-Lopez CM, Molina M, Rivera JA. Beverages sales in Mexico before and after implementation of a sugar sweetened beverage tax. *PLoS One*. 2016;11(9):4–11. doi:10.1371/journal.pone.0163463.
17. 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(2):216–22. doi:10.2105/AJPH.2008.151415.
18. HM Treasury, HM Revenue & Customs, Department of Health. *Soft Drinks Industry Levy: 12*

- things you should know.<https://www.gov.uk/government/news/soft-drinks-industry-levy-12-things-you-should-know>. Published August 18, 2016.
19. Tesco reduces sugar content in all own brand soft drinks - 2016 - News releases - News - Tesco PLC. Available at: <https://www.tescopl.com/news/news-releases/2016/tesco-reduces-sugar-content-in-all-own-brand-soft-drinks/>.
20. Briggs ADM, Mytton OT, Kehlbacher A, et al. A health impact assessment of the UK soft drinks industry levy: a comparative risk assessment modelling study. *Lancet Public Heal*. 2016;In press.
21. Mytton OT, Clarke D, Rayner M. Taxing unhealthy food and drinks to improve health. *BMJ*. 2012;344(may15 2):e2931–e2931. doi:10.1136/bmj.e2931.
22. James WP, Nelson M, Ralph A, Leather S. Socioeconomic determinants of health. The contribution of nutrition to inequalities in health. *BMJ*. 1997;314(7093):1545–1549. Available at: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=9183207.
23. Finkelstein EA. Impact of Targeted Beverage Taxes on Higher- and Lower-Income Households. *Arch Intern Med*. 2010;170(22):2028. doi:10.1001/archinternmed.2010.449.
24. Knai C, McKee M. Tackling childhood obesity: the importance of understanding the context. *J Public Health (Bangkok)*. 2010;32(4):506–511. doi:10.1093/pubmed/fdq019.
25. Jou J, Techakehakij W. International application of sugar-sweetened beverage (SSB) taxation in obesity reduction: Factors that may influence policy effectiveness in country-specific contexts. *Health Policy (New York)*. 2012;107(1):83–90. doi:10.1016/j.healthpol.2012.05.011.
26. Harding P. Soft-drinks tax will cost us jobs and investment without cutting obesity. *Telegraph*. <http://www.telegraph.co.uk/business/2016/03/20/soft-drinks-tax-will-cost-us-jobs-and-investment-without-cutting/>. Published March 20, 2016.
27. British Soft Drinks Association. UK Soft Drinks Tax. Available at: <http://www.britishtsoftdrinks.com/Position-Statements/soft-drinks-tax>.
28. Hakim D. New York Vulnerable to Poaching in Recession. *New York Times*. <http://www.freerepublic.com/focus/f-news/2197239/posts>. Published March 1, 2009.
29. Brownell KD, Haven N. The Perils of Ignoring History: Big Tobacco Played Dirty and Millions Died. How Similar Is Big Food? 2009;87(1):259–294. doi:10.1111/j.1468-0009.2009.00555.x.
30. Elliott-Green A, Hyseni L, Lloyd-Williams F, Bromley H, Capewell S. Sugar-sweetened beverages coverage in the British media: an analysis of public health advocacy versus pro-industry messaging. *BMJ Open*. 2016;6(7):e011295. doi:10.1136/bmjopen-2016-011295.
31. World Health Organization. *Sugars intake for adults and children*.; 2015. doi:978 92 4 154902 8.
32. WHO. Fiscal policies for diet and the prevention of noncommunicable diseases. 2016;(May):36. Available at: <http://www.who.int/dietphysicalactivity/publications/fiscal-policies-diet-prevention/en/>.
33. Brownell KD. The Chronicling of Obesity: Growing Awareness of its Social, Economic and Political Contexts. *J Health Polit Policy Law*. 2005;30(5):955–964. doi:10.1215/03616878-30-5-955.
34. Burke JG. An Introduction to Concept Mapping as a Participatory Public Health Research Method. *Qual Health Res*. 2005;15(10):1392–1410. doi:10.1177/1049732305278876.
35. Jones J, Hunter D. Consensus methods for medical and health services research. *BMJ*. 1995;311(7001):376–80. doi:10.2164/jandrol.111.015065.
36. Culley JM. Use of a Computer-Mediated Delphi Process to Validate a Mass Casualty Conceptual Model. *Comput Informatics, Nurs*. 2011;5(29):272–279. doi:10.1126/scisignal.2001449.Engineering.
37. National Institute for Health Research. People in Research. Available at: <https://www.peopleinresearch.org/>. Accessed January 13, 2017.

38. Denzin N, Lincoln Y. *Handbook of Qualitative Research*. London: SAGE Publications; 2000.
39. Gale NK, Heath G, Cameron E, et al. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. 2013;13(1):117. doi:10.1186/1471-2288-13-117.
40. Silverman D. *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction*. London: SAGE Publications; 1993.
41. Clayman S, Maynard D. Ethnomethodology and conversation analysis. In: Have P, Psathas G, eds. *Situated Order: Studies in the Social Organisation of Talk and Embodied Activities*. Washington, DC: University Press of America; 1994.
42. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. 2013;13(1):117. doi:10.1186/1471-2288-13-117.
43. Helme DW, Borland R, Young W, Nycum C, Buller DB. The Development and Validation of a Coding Protocol to Measure Change in Tobacco-Control Newspaper Coverage. *Health Promot Pract*. 2006;7(1):103–109. doi:10.1177/1524839904266798.
44. Kantar Worldpanel. Great Britain: Grocery Market Share. 2016. Available at: <http://www.kantarworldpanel.com/en/grocery-market-share/great-britain>. Accessed November 23, 2016.
45. Penfold RB, Zhang F. Use of Interrupted Time Series Analysis in Evaluating Health Care Quality Improvements. *Acad Pediatr*. 2013;13(6):S38–S44. doi:10.1016/j.acap.2013.08.002.
46. Fink A, Kosecoff J, Chassin M, Brook RH. Consensus methods: Characteristics and guidelines for use. *Am J Public Health*. 1984;74(9):979–983. doi:10.2105/AJPH.74.9.979.

Appendix A

System Mapping Process

Part 1: Introduction to method, and preparation work completed

Using a combination of concept mapping³⁴ adapted for an exercise for consensus building using an expert panel (i.e. nominal group method) including agreement for a majority of participants for acceptance of revisions without loss of that revision⁴⁶, followed by validation of the systems map using a Delphi process³⁶. We will be using a variety of methods to capture an initial systems map to describe the potential effect of the Soft Drinks Industry Levy (SDIL) on SSB consumption and health. It is expected that by taking a systems approach to this work, we will be able to anticipate unintended consequences and complex or emergent aspects of the SDIL.

Concept mapping is process that traditionally involves six steps, three relevant for this work:

- Preparation: a planning step where the focal areas are identified and criteria for participation are determined
- Generation: a participatory step where the group addresses the focal question and generates a list of items that will be used in subsequent analysis. Focal questions are designed to elicit information to address the primary research questions. Most often, data are obtained through data collection processes such as 'brain storming' sessions.
- Structuring: participants independently organise the list of generated items. They sort them into piles based on their perceived similarities or relationship to one another. Then each item is rated in terms of its importance or usefulness to the research question.

Consensus building for an expert panel includes will include firstly generating views on the research question that are listed and ranked in order of importance individually. This will then be used to make modifications to the system map iteratively until consensus, or near consensus is reached.

Part 2: Generation of potential factors and links

For this project, the focus will be on answering the question of *how, for whom and under what circumstance* might the SDIL impact on SSB consumption and health. Therefore, guiding the generation of different aspects of our system map will include the following probing questions for members to answer individually:

- What factors are involved in the wider context of the SDIL?
- What might change as the result of the SDIL?
- How could the SDIL change consumption of SSBs?

- o What are possible pathways?
 - o What might stop these from occurring?
 - o What might influence these effects?
- Who is likely to be effected by the SDIL?
 - o Organisations?
 - o Businesses?
 - o Consumers?

Part 3: Structuring the system map, reflection, revision and consensus

With a set of factors, links and notes related to different aspects of the systems map, we will to configure and modify the system map to accommodate these new possible links and associations. Each group member will have an opportunity to provide, in order of importance, the different factors and links generated during the previous session. Proposed modifications will then trigger discussion, and will require at least some consensus within the group. When all members have contributed their modifications, there will then be a process of reflection based on the map as a whole where each group member will suggest changes or parts of the map where there is disagreement – again requiring some group consensus. When suggestions are rejected, they will be noted; when suggestions are accepted the modification will be made. Periodic records of progress with the map will be made throughout the structuring process (e.g. using digital photography) to capture the evolution of the map and to allow for reflection on previously rejected ideas. This process will repeat until there is moderate (70% or more) to full consensus for the system map as a whole.

Appendix B – Example online Delphi survey Round 1

Page 1

Soft Drinks Industry Levy – Anticipated effects from your perspective

Thank you for agreeing to participate in our online survey. As described in the information sheet you were provided the UK Chancellor of the Exchequer announced an industry levy on soft drinks as part of the 2016 budget - to be introduced in April 2018. This will fall on drinks' producers and importers, and be higher for drinks with more sugar. The levy aims to encourage manufacturers to reduce the sugar in their drinks and the government plans to spend the revenue generated on primary school breakfast clubs, sports and extended hours.

To help us better understand the wide range of potential impacts of the proposed levy, we are seeking input from a range of stakeholders. As someone with an interest, or role, in the development or implementation of the levy we would like to know:

- 1) What do you anticipate will be **FIVE** effects of the soft drinks industry levy **from your perspective**?
- 2) Which of these effects would you would **RANK** as **most important to least important to you**?

Please add five anticipated effects in any order, you can then drag and drop the list to rank by importance until you are happy with the ranking.

Anticipated effect of levy and then drag and drop to rank (1 = the most important, 5 the least important)

To help us better understand different perspectives relating to the soft drinks industry levy, we are conducting short phone interviews. Would you be interested in learning more about the phone interview?

[yes, please email me an information sheet]

[no, please don't follow-up with me regarding the interviews]

Page 2

Soft Drinks Industry Levy – The Chancellor’s Announcement

As you shared on the previous page, the soft drinks industry levy is likely to have many different effects. We plan to study these wide-ranging effects through a comprehensive evaluation, and hope to build up a complete picture of whether, how, why and for whom the soft drinks industry levy has health-related effects.

Although there could be many potential effects of the levy, the variety of ways (or ‘pathways’) in which this could occur has yet to be explicitly stated or mapped for the UK. Therefore, using the Chancellor’s announcement as a starting point (quote below), our study team developed a systems map representing **a set of ‘reasonable connections or links’ that can be examined in future analyses**. We would like to get your input on this map.

The 2016 budget announcement:

“Budget 2016 announces a new soft drinks industry levy targeted at producers and importers of soft drinks that contain added sugar. The levy will be designed to encourage companies to reformulate by reducing the amount of added sugar in the drinks they sell, moving consumers towards lower sugar alternatives, and reducing portion sizes.

Under this levy, if producers change their behaviour, they will pay less tax. The levy is expected to raise £520 million in the first year. The OBR [Office for Budget Responsibility] expect that this number will fall over time as the total consumption of soft drinks in scope of the levy drops, in part as a result of producers changing their behaviour and helping consumers to make healthier choices.”

On the next page we will present the map and begin to guide you through the remainder of survey.

Page 3

Soft Drinks Industry Levy – Input on sub-system

The map below ([click for large view of the map](#)) represent the various connections and links developed by the study team. This map is focused on In particular, we are interested in what you feel is **MISSING** or would **CHANGE** about any part of this pathway or domain.

[Map]

Do you feel anything is MISSING, or would you CHANGE anything about this map?

- No [next page]
- Yes
 - o Please provide your feedback in the comment box, listing any factors you feel are missing, and/or associations you would add or change. [comment box]

Appendix C – Interview Topic Guide

1. Welcome

Introduce yourself

Review the following:

- Who we are and what we're trying to do
- What will be done with this information
- Why we asked you to participate

2. Explanation of the process

Briefly explain what an in-depth telephone interview is.

About IDTIs:

- In this project, we are doing telephone interviews. These techniques allow us to explore topics in some depth.
- We learn from you (positive and negative)

Logistics:

- The interview will last about half an hour

3. Ask about any final questions

4. Turn on audio Recorder

5. Consenting process

Verbal consent details

Version 1 09/09/2016

Principal Investigator

Professor Martin White

Programme Leader for Research in Food Behaviours & Public Health

Director of Research

MRC Epidemiology Unit

University of Cambridge

Now that we have reviewed the purpose of the study and its details, I would like to get your verbal consent, and will share a series of points. Please say yes or no to the following, do you confirm that:

- You have read and understand the Participant Information Sheet version 1 dated 09/09/2016?
- You understand that all personal information will remain confidential and that all efforts will be made to ensure that you cannot be identified (except as might be required by law)?
- You I agree that data gathered in this study will be stored anonymously and securely, and may be used in future research?
- You understand that your participation is voluntary and that you are free to withdraw at any time without giving a reason?
- You agree to the voice recording of your interview and the use of anonymised quotations?

6. Ask the interviewee if they have any questions before we get started, and address those questions.

Discussion begins, make sure to give people time to think before answering the questions and don't move too quickly. Use the probes to make sure that all issues are addressed, but move on when you feel you are starting to hear repetitive information and allow for flexibility in the direction that the participant takes the conversation.

Questions

1. Introduction

- Position title (without institution/organisation)
- Area of specialist interest/role
- Length of time in position

2. Awareness

Can you tell me what the sugary drinks levy is and what you know about it?

Probes for Discussion:

- *What is the levy*
 - *Amount?*
 - *Purpose/intended effect?*
- *How did you first hear about the levy?*
 - *What (what information was shared/what do you know about the levy?)*
 - *How (formally through government representatives or through media?)*
 - *Colleagues responses, reactions & experiences*
- *What other information about the levy have you been exposed to?*
 - *What (what have you heard, read, discussed etc.)*
 - *How (media, research, friends/family, customers, colleagues inc. in other organisations etc.).*
 - *Staff responses, reactions & experiences*

3. Anticipated or early impact

Have you experienced, or are you aware of, any early impacts of the sugary drinks levy announcement?

Probes for Discussion:

- *Can you describe any anticipated or early impacts since the levy was announced?*
 - *Discussions about the levy*
 - *Colleagues, reactions & experiences*
- *Can you describe any anticipated outcomes of the consultation process?*
 - *Changes to the levy based on the consultation*
- *How will the levy affect your role/organisation when implemented?*
 - *Changes within the organisation*
 - *Changes to your role*

4. Attitudes regarding levy

In your opinion, how successful will the levy be?

Probes for Discussion:

- *What do you think will work well and what won't?*
 - *Why?*

- o *Suggestions for additions/changes/adaptations/alternatives etc.*
- *Positive and negative effects?*
 - o *Business (sales, brand etc.)*
 - o *Staff (practicalities, morale etc.)*
 - o *Customers (sales, health etc.)*
 - o *Charitable activities*
- *Is the levy a good idea?*
 - o *Does it fulfil its aims?*
 - o *What alternative strategies could you use?*
- *Do you have any suggestions for the implementation or evaluation of the levy?*

5. Exit questions

Provide a summary of the discussion, and ask

- Is there anything else you would like to say about any of the issues we have discussed today?
- Would you like a summary of the findings when available?

Materials and supplies for interviews

- 1 recording device
- Batteries for recording device
- Notebook for note-taking

Protocol - NIHR PHR Rapid Funding Scheme Project 16/49/01

Appendix D – Timeline and miles stone

