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Evaluation of the UK Soft Drinks Industry Levy

Martin White
Professor of Population Health Research

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Interests

- Public declaration of interests here: https://www.mrc-epid.cam.ac.uk/people/martin-white/
- Receive research funding from UK Research and Innovation via the Medical Research Council, Economic and Social Research Council, and Biotechnology and Biological Sciences Research Council
- Interact with some commercial food companies in research, but receive no funding
- Undertake consultancy on national food strategy for Government of States of Jersey, Guernsey Health Improvement Commission, and Bloomberg Philanthropies
- Member of professional associations, including Faculty of Public Health and British Medical Association
- Expert adviser to the Food Foundation, and the House of Lords Committee on Food, Diet and Obesity.
- Previously to the House of Lords Committee on food poverty, health and the environment, and to the National Food Strategy independent review

The Study Team

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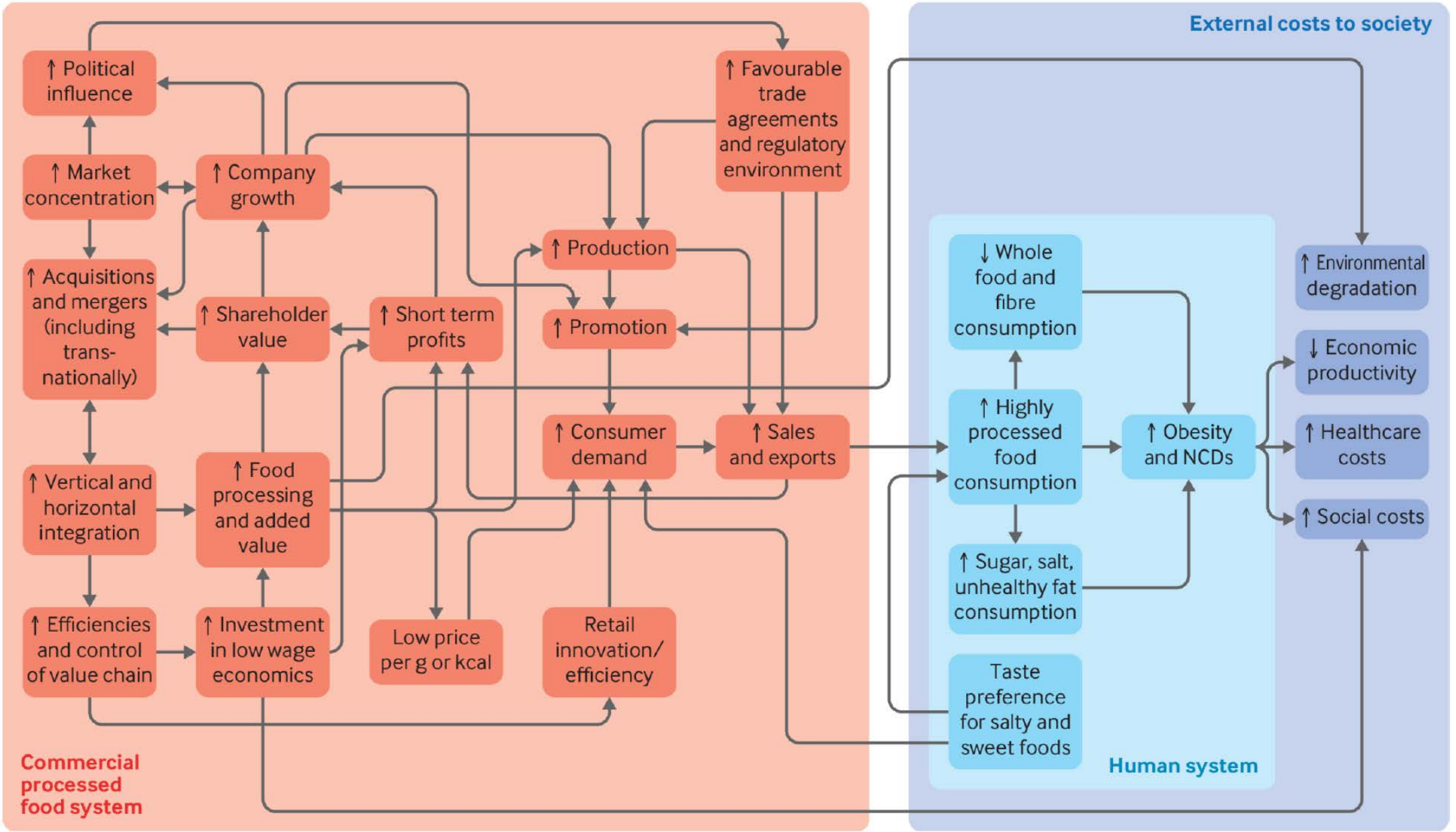
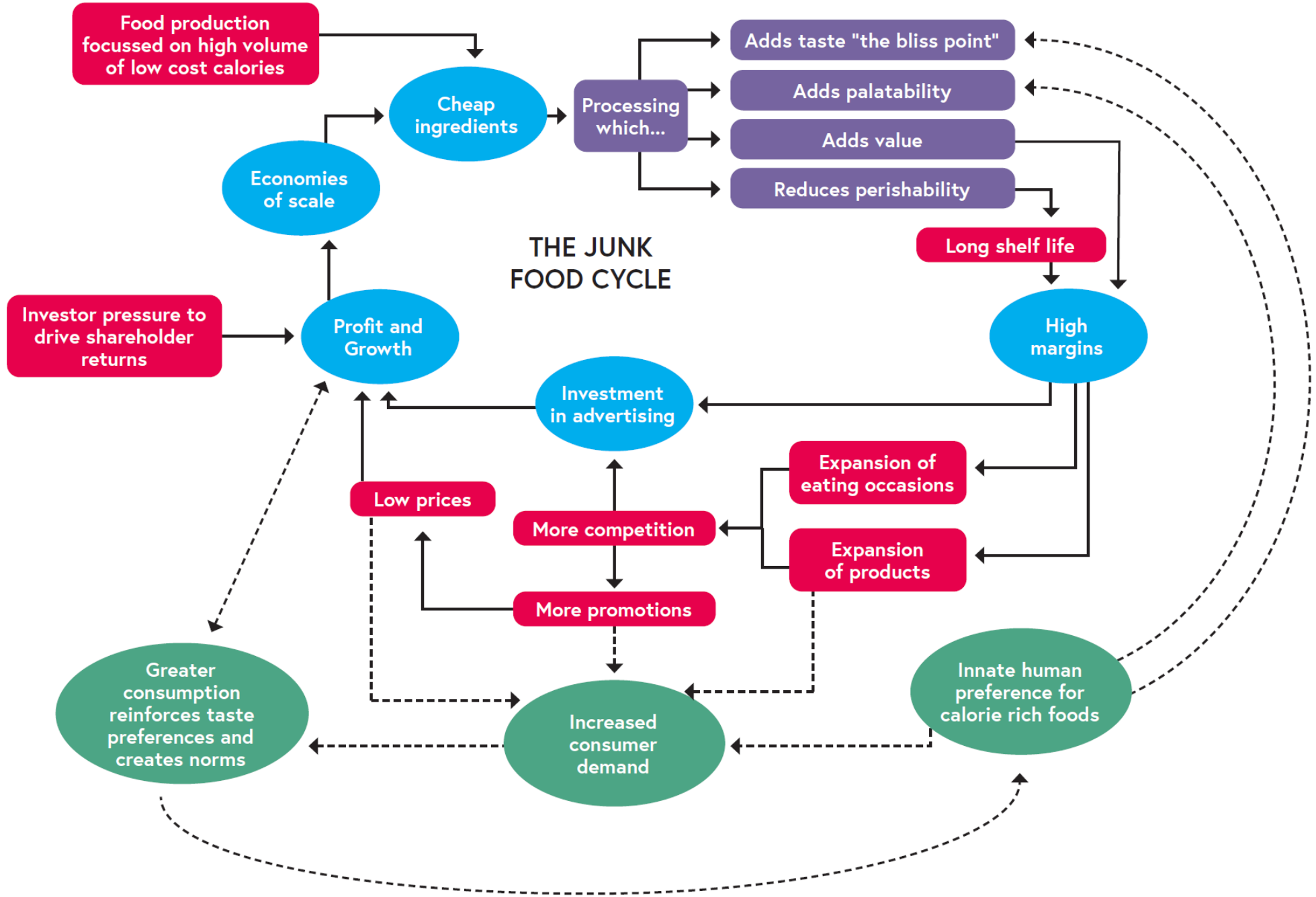
The commercial processed food system, influences on human health, and external costs to society



White M et al, BMJ 2020 https://www.bmj.com/content/368/bmj.m545



https://www.nationalfoodstrategy.org/wp-content/uploads/2021/08/NFS_Evidence-Pack.pdf

System equilibrium and the ‘balloon effect’

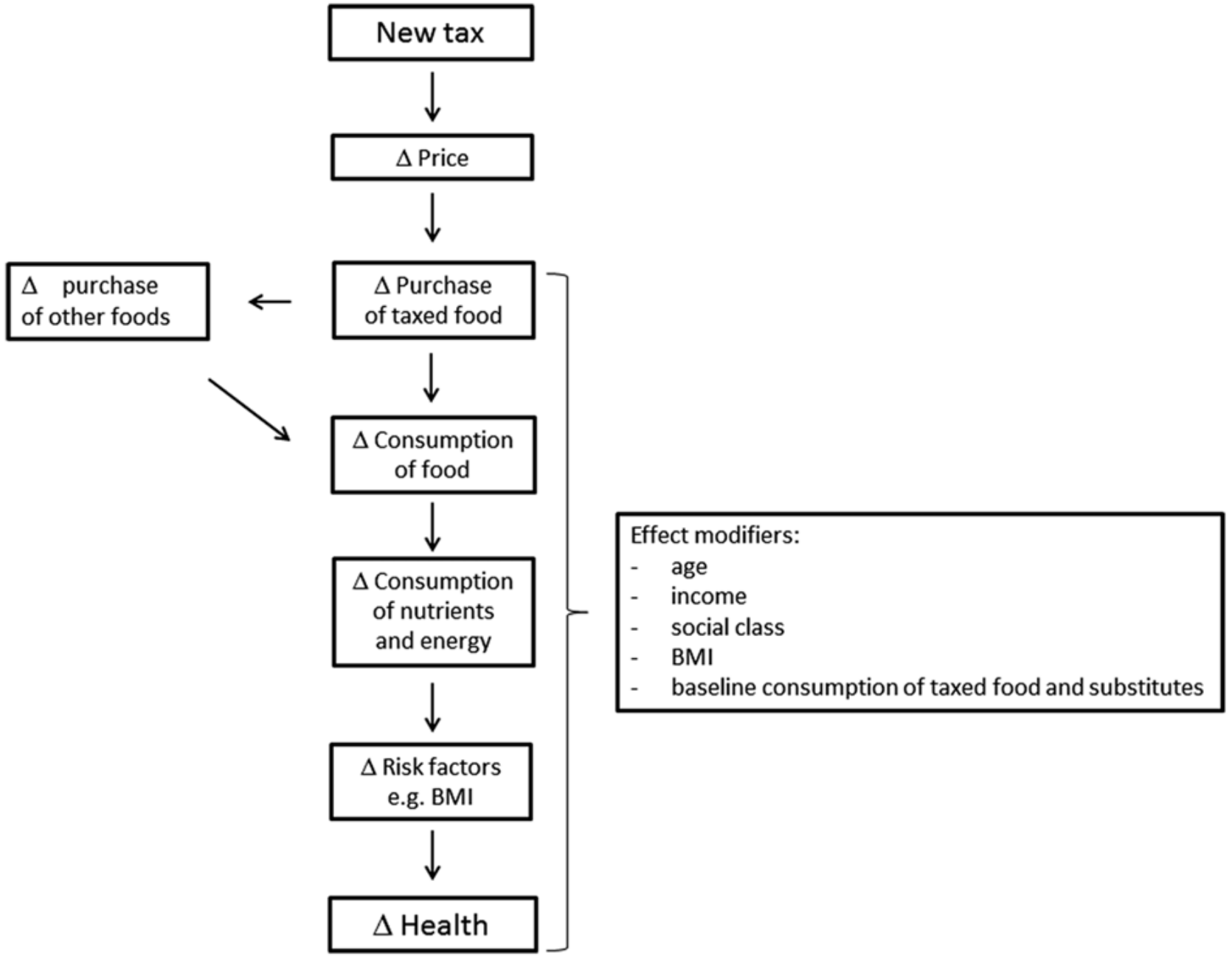
Under pressure from an external stimulus, the system adapts to maintain the status quo

NIHR rapid funding grant (£50k) (July 2016)

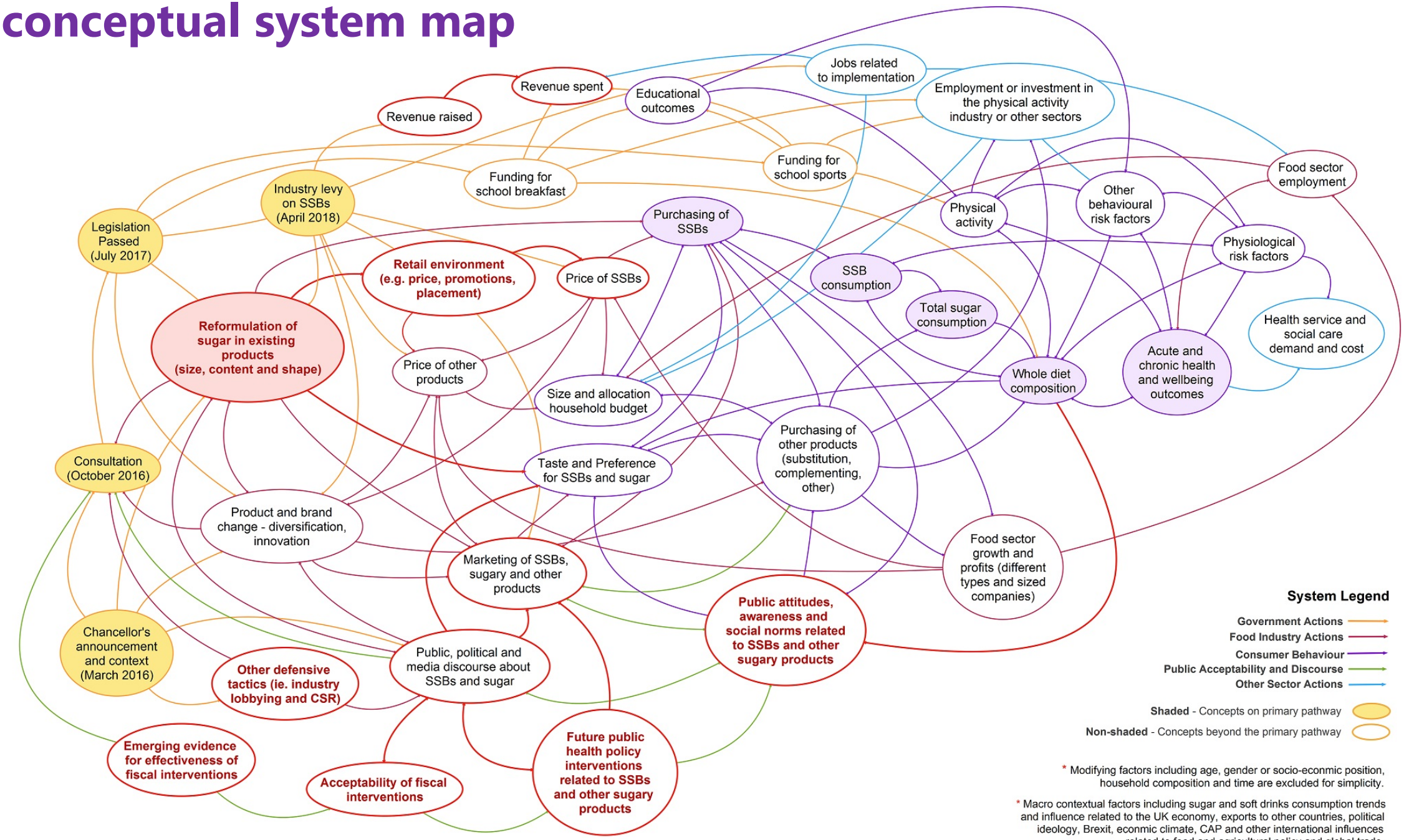
1. Evidence review, theorising and conceptual system mapping
2. Stakeholder consultation – verification of theoretical system map using online Delphi study
3. Mapping of data sources to system map to determine viability of evaluation design (evaluability assessment)
4. Establish baseline data collection from non-routine sources
   - Qualitative interviews with stakeholders
   - Governmental discourse
   - News and social media discourse on sugar and the SDIL
   - Public attitudes to sugar and SDIL
5. Develop protocol and grant application for evaluation

Existing implicit theorisation of SSB tax mechanism of action

Oliver Mytton, Helen Eyles, David Ogilvie. Evaluating the Health Impacts of Food and Beverage Taxes. Curr Obes Rep, 2014; 3: 432–439



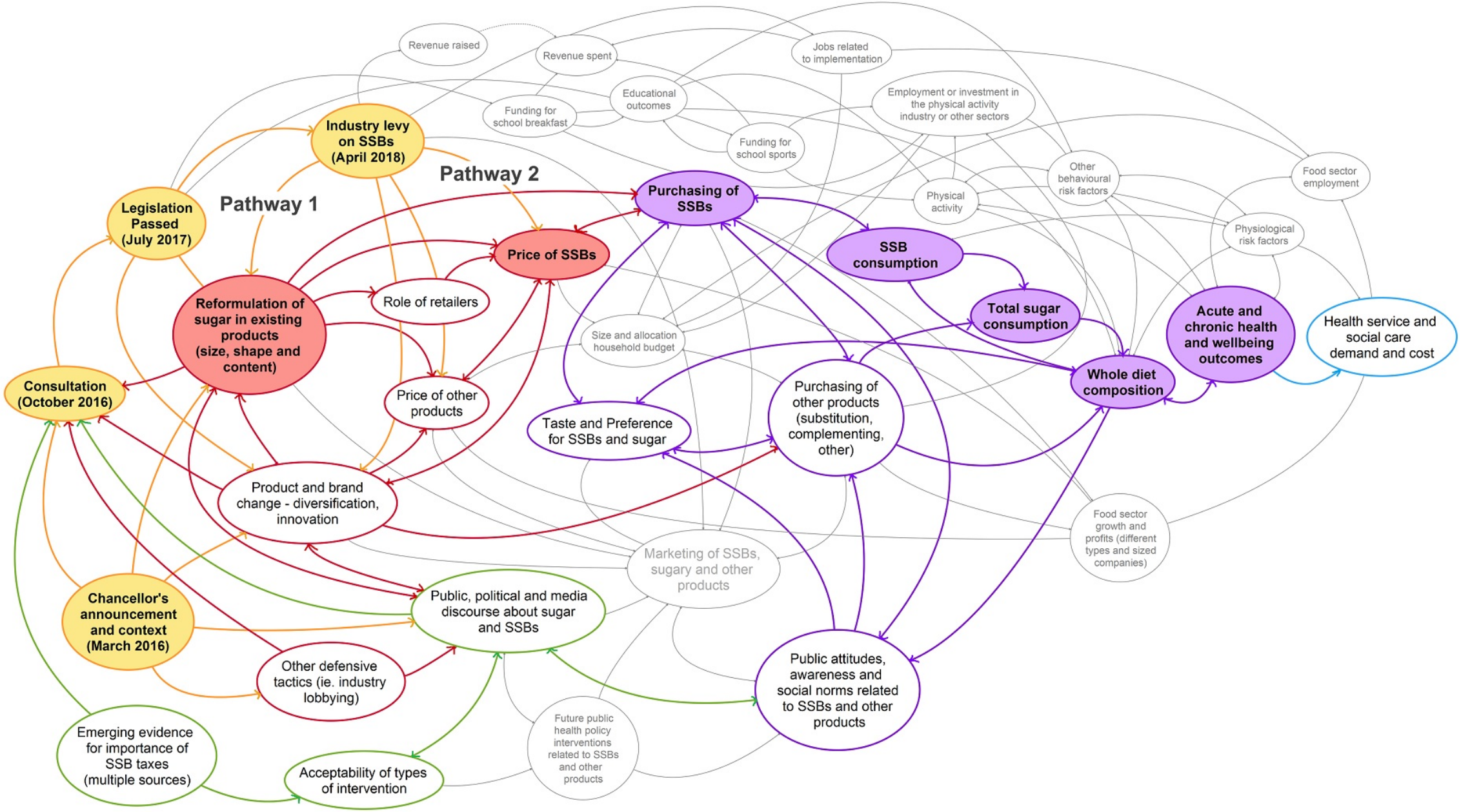
SDIL conceptual system map



Priority data sources identified from the system map

	System map factor with measurement available	Data type	Data source	Work Package	Cost for access	Cost for collection
Industry Actions	Reformulation of sugar in existing products *and* role of retailers	Commercial sales data	Kantar WorldPanel	WP1	Yes	No
	Product and brand change - diversification, innovation	Supermarket inventory data	Online supermarket websites	WP1	No	Yes
	Price of other products	Supermarket inventory data	Online supermarket websites	WP1	No	Yes
	Price of SSBs	Supermarket inventory data	Online supermarket websites	WP1	No	Yes
	Other defensive tactics (i.e. industry lobbying)	Industry communications and interviews	Industry online publications and stakeholders	WP4	No	No
Consumer Behaviour	Purchasing of SSBs	Commercial sales data	Kantar WorldPanel	WP1	Yes	No
	Purchasing of other products (substitution, complementing, other)	Commercial sales data	Kantar WorldPanel	WP1	Yes	No
	Taste and preference *and* public attitudes for SSBs and sugar	Commercial sales data	Kantar WorldPanel	WP1	Yes	No
	SSB consumption	National Survey	National Diet and Nutrition Survey	WP1	No	No
	Total sugar consumption	National Survey	National Diet and Nutrition Survey	WP1	No	No
	Whole diet composition	National Survey	National Diet and Nutrition Survey	WP1	No	No
	Acute and chronic health and wellbeing outcomes	Administrative data, national study and PRIMEtime model estimates	Hospital Episode Statistics (dental caries); National Child Measurement Programme (childhood adiposity); Office for National Statistics and the General Register Offices for Scotland and Northern Ireland and Hospital Episode Statistics (model)	WP1 & WP2	No	No
Public Acceptability and Discourse	Media, political and public discourse on SSBs and sugar	News media coverage, social media, documentation and online sources	LexisNexis, Twitter, Parliamentary records and documents and online media	WP4	No	No
	Acceptability of types of intervention	Focus groups	General public including parents, children and young adults	WP4	No	Yes
	Emerging evidence for importance of SSB taxes	Interviews	Professional stakeholders	WP4	No	Yes
Government Actions	Chancellor's announcement	Documentation	UK Treasury	WP1-5	No	No
	Consultation	Documentation	UK Treasury	WP1-5	No	No
	Legislation passed	Documentation	UK Treasury	WP1-5	No	No
	Industry levy	Documentation	UK Treasury	WP1-5	No	No
Other Sectoral Actions	Health service and social care demand and cost	Micro (PRIMEtime) and Macro (Computable general Equilibrium) model estimates	Office for National Statistics and the General Register Offices for Scotland and Northern Ireland and Hospital Episode Statistics (micro), Global Trade Analysis Project and UK Treasury (macro)	WP3	No	No

SDIL system map – available data



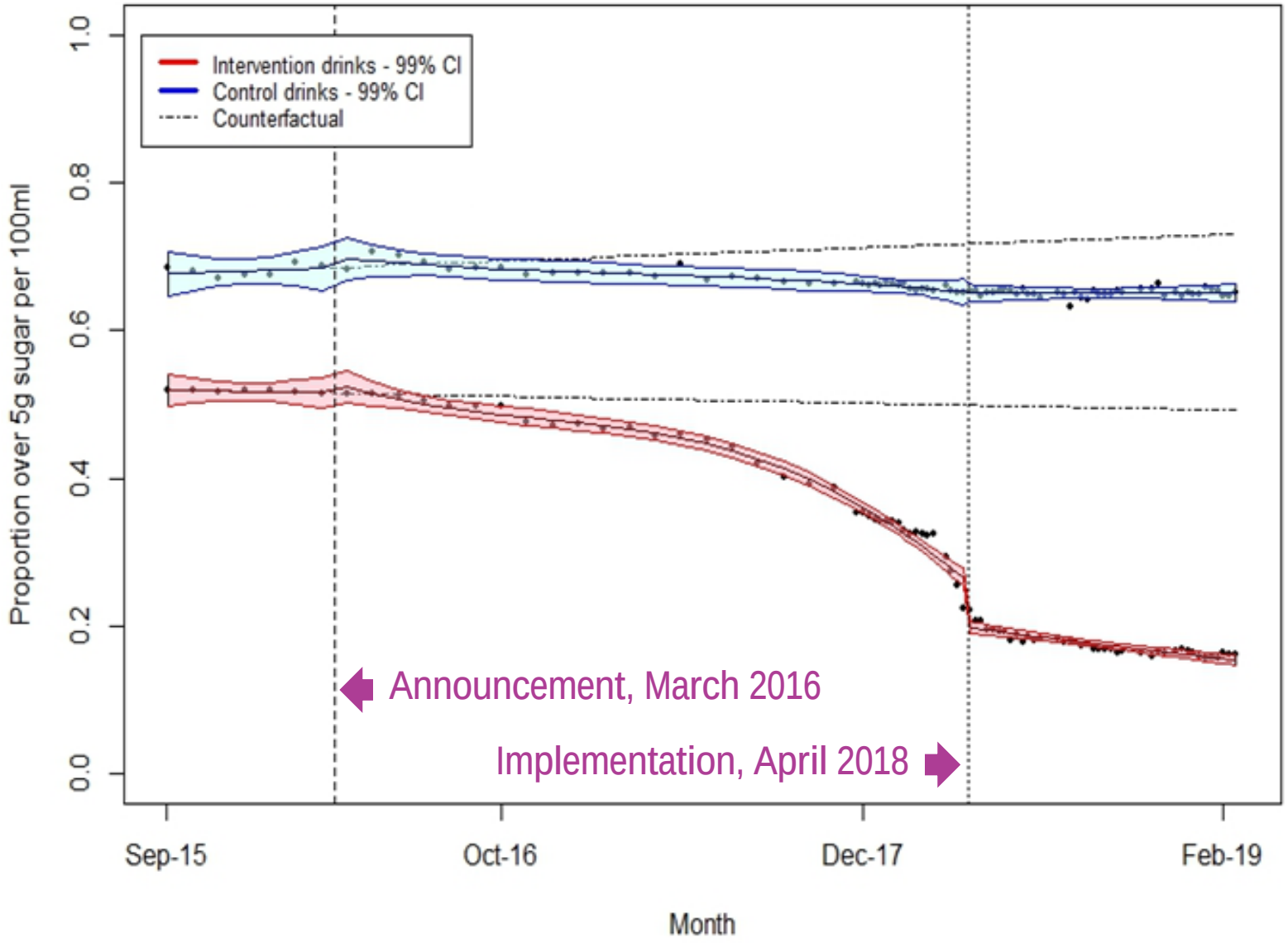
SDIL evaluation design

A mixed methods, natural experimental evaluation with a whole system focus in six work packages over three two-year time periods (2014-20)

1. Theorising the intervention as events in a complex adaptive system
2. Controlled interrupted time series analyses to evaluate impacts of the SDIL on:
   - Soft drink product formulation, volumes and prices, product diversification, purchases, and consumption
   - Prevalence of childhood obesity and hospital admissions for severe dental caries
3. Modelling health outcomes over short (5 years), medium (5-10 years) and long term (>10 years)
4. Economic evaluation to assess impacts of SDIL on individuals, households, Treasury, industry and UK economy
5. Qualitative research to determine the perceived acceptability and impacts of the SDIL - interviews with professionals and the public, thematic content analysis of news media, governmental discourse
6. Updating of systems map, evaluation of system change, synthesis of findings and casual inference from WPs1-5, refinement of intervention theory

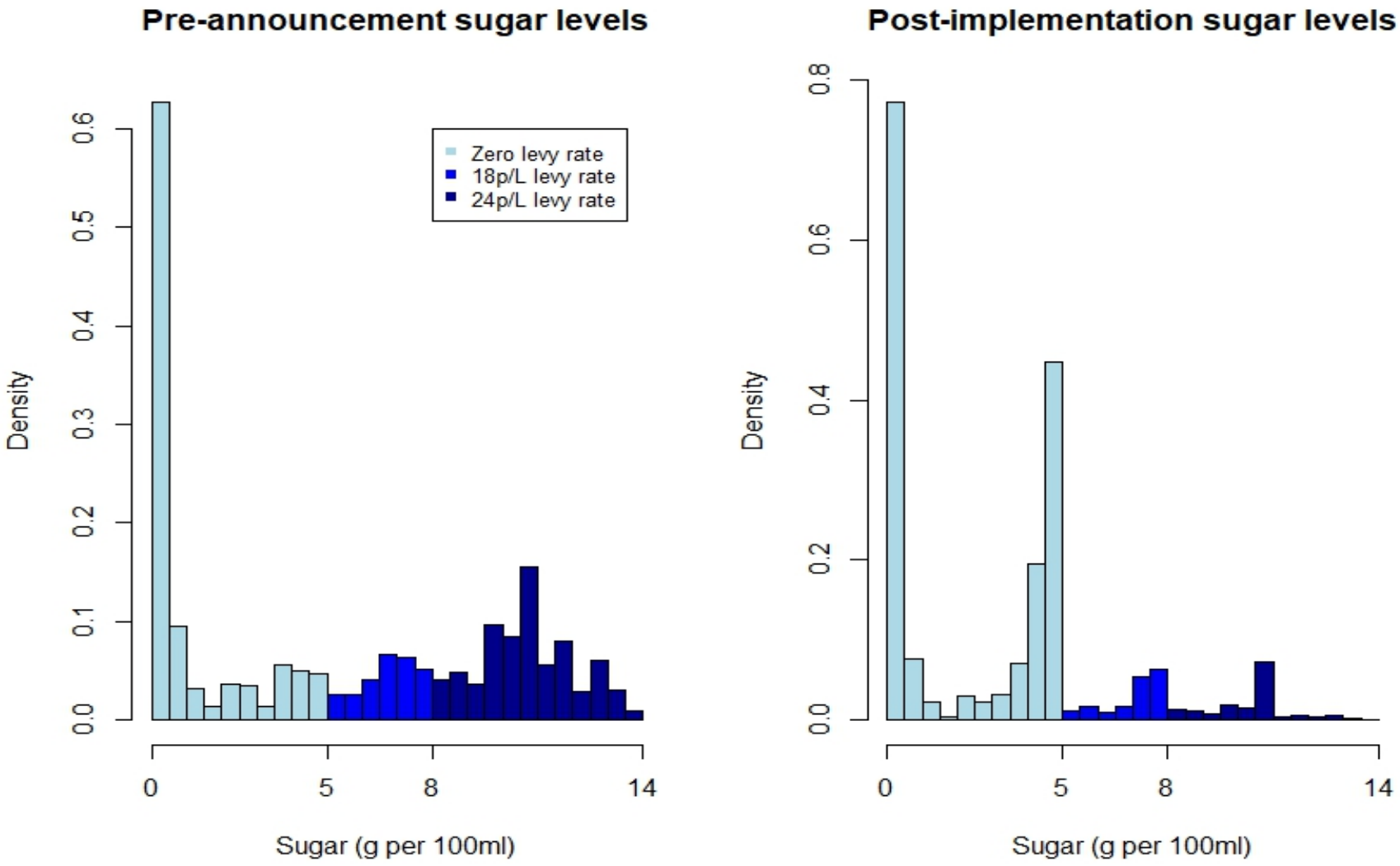
Prior to announcement **Apr 2014- Mar 2016**	Announcement to implementation **Apr 2016- Apr 2018**	Following implementation **Apr 2018- Mar 2020**

Proportion of soft drinks over the lower levy threshold



Scarborough et al, *Plos Med, 2020* https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1003025

Sugar levels in drinks before announcement and after implementation



Scarborough et al, *Plos Med, 2020* https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1003025

Impact of the UK SDIL on the soft drink prices, 2017–2020

Luick M, et al. (2024) The impact of the UK soft drink industry levy on the soft drink marketplace, 2017–2020: An interrupted time series analysis with comparator series. PLoS ONE 19(6): e0301890. https://doi.org/10.1371/journal.pone.0301890

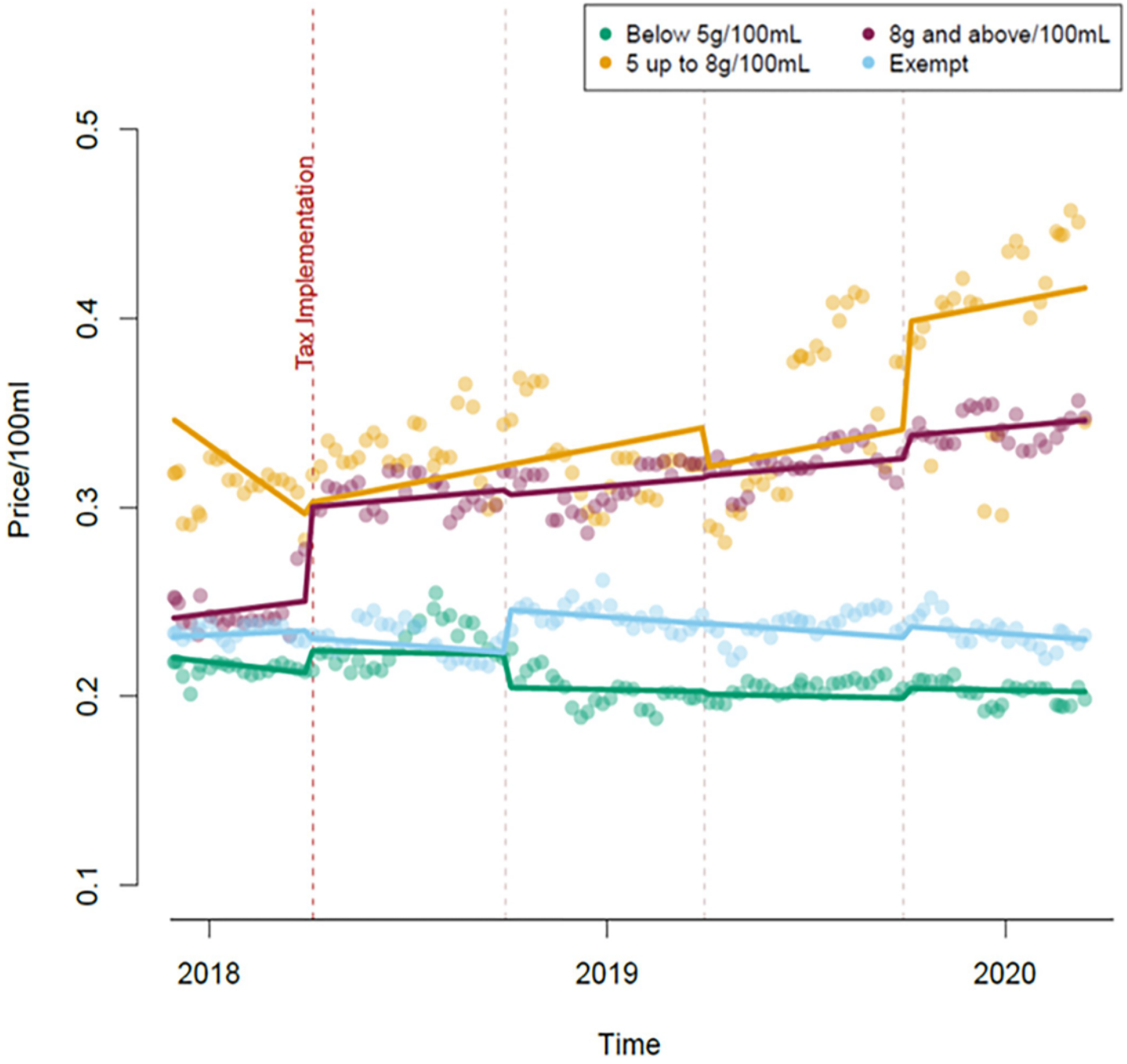


Fig 3. Price per 100mL of drinks, classified as either control or the levy group they were in last in the dataset.

https://doi.org/10.1371/journal.pone.0301890.g003

Impact of the UK SDIL on soft drink volumes, 2017–2020

Luick M, et al. (2024) The impact of the UK soft drink industry levy on the soft drink marketplace, 2017–2020: An interrupted time series analysis with comparator series. PLoS ONE 19(6): e0301890. https://doi.org/10.1371/journal.pone.0301890

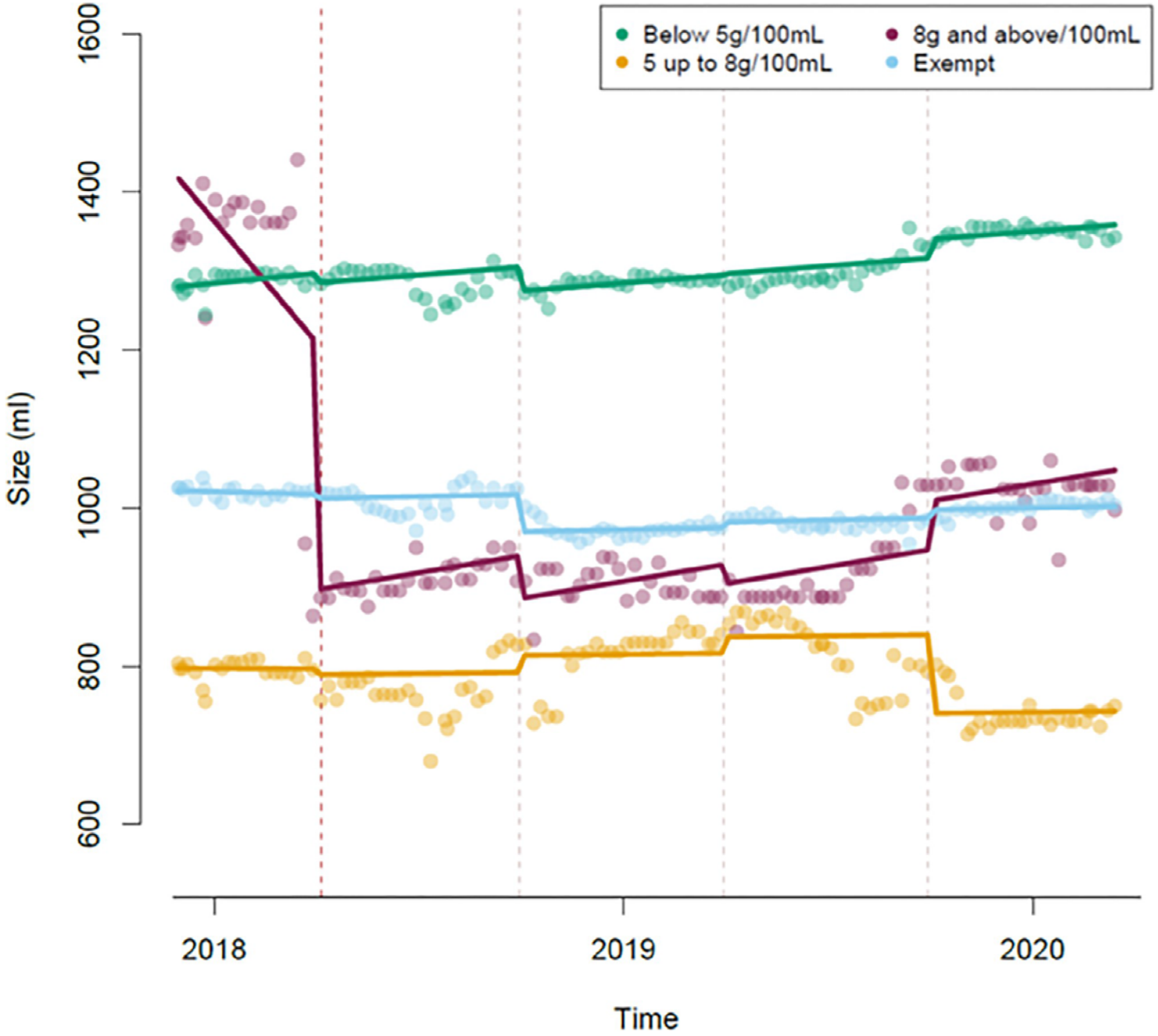


Fig 4. Volume in mL of drinks, classified as either control or the levy group in which they were in last observed in the dataset.

https://doi.org/10.1371/journal.pone.0301890.g004

Varied industry reactions

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Time to stockpile Irn-Bru? How the sugar tax will change our favourite drinks

A tax on sugary soft drinks comes into effect on Friday. The industry has found ingenious ways to get the levels down – from 'restructured sugar' to artificial sweeteners. But will it make their products any healthier?

Regular IRN-BRU is reducing its sugar content

12 Oct 2017

From January 2018 IRN-BRU will contain approximately 50% less sugar.

The sugar content per 100ml will reduce from 10.3g to 4.7g.

For a time old and new products may be on shelf together so remember to check the label.

NUTRITIONAL INFORMATION - TYPICAL VALUES PER 100ml	
ENERGY	85 kJ/20 kcal
CARBOHYDRATES	4.8g
of which sugars	4.7g

Regular IRN-BRU will remain a sugary drink but will now be blended with a mix of low calorie sweeteners including aspartame, a source of phenylalanine.

People with diabetes should be aware of the carbohydrate content change and should seek medical advice.

Other medical questions should be raised with a health professional.

For production information please visit : www.agbarr.co.uk/our-brands/irn-bru/ or contact consumercare@agbarr.co.uk

Coca-Cola to sell smaller bottles at higher prices in response to sugar tax

Soft drink manufacturer refuses to alter recipe, as rivals face backlash over reduced sugar Irn-Bru in Scotland

▲ The plans will see a 1.75 litre bottle of Coke shrink to 1.5 litres and increase in price by 20p Peter Kovalev/TASS

Coca-Cola is to use smaller bottles and sell at higher prices rather famous sugar-laden secret recipe, while Irn-Bru faces a growing c backlash over fears a new lower sugar version will ruin Scotland's drink.

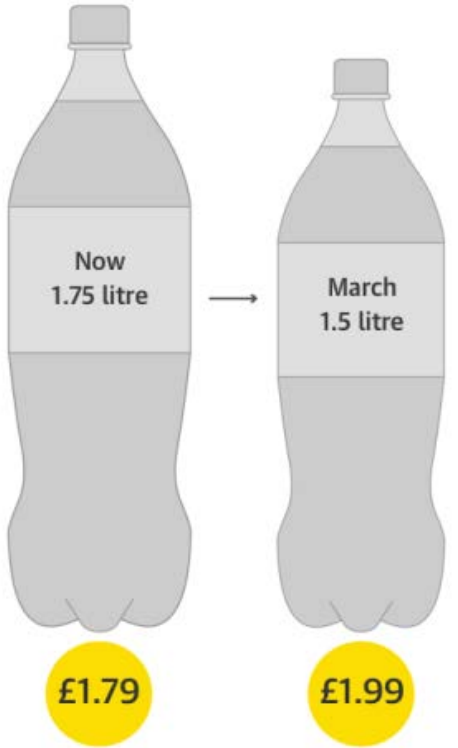
The changes are part of the preparations underway in the fizzy dri the sugar tax. The cost of some "price marked packs" of Coca-Col newsagents and convenience stores will increase by more than 10 before the new tax comes into effect the following month.

The plans will see a 1.75 litre bottle of Coke shrink to 1.5 litres an time increase in price by 20p to £1.99. The price of a 500ml bottle

1.02 p/ml
⇨1.33 p/ml

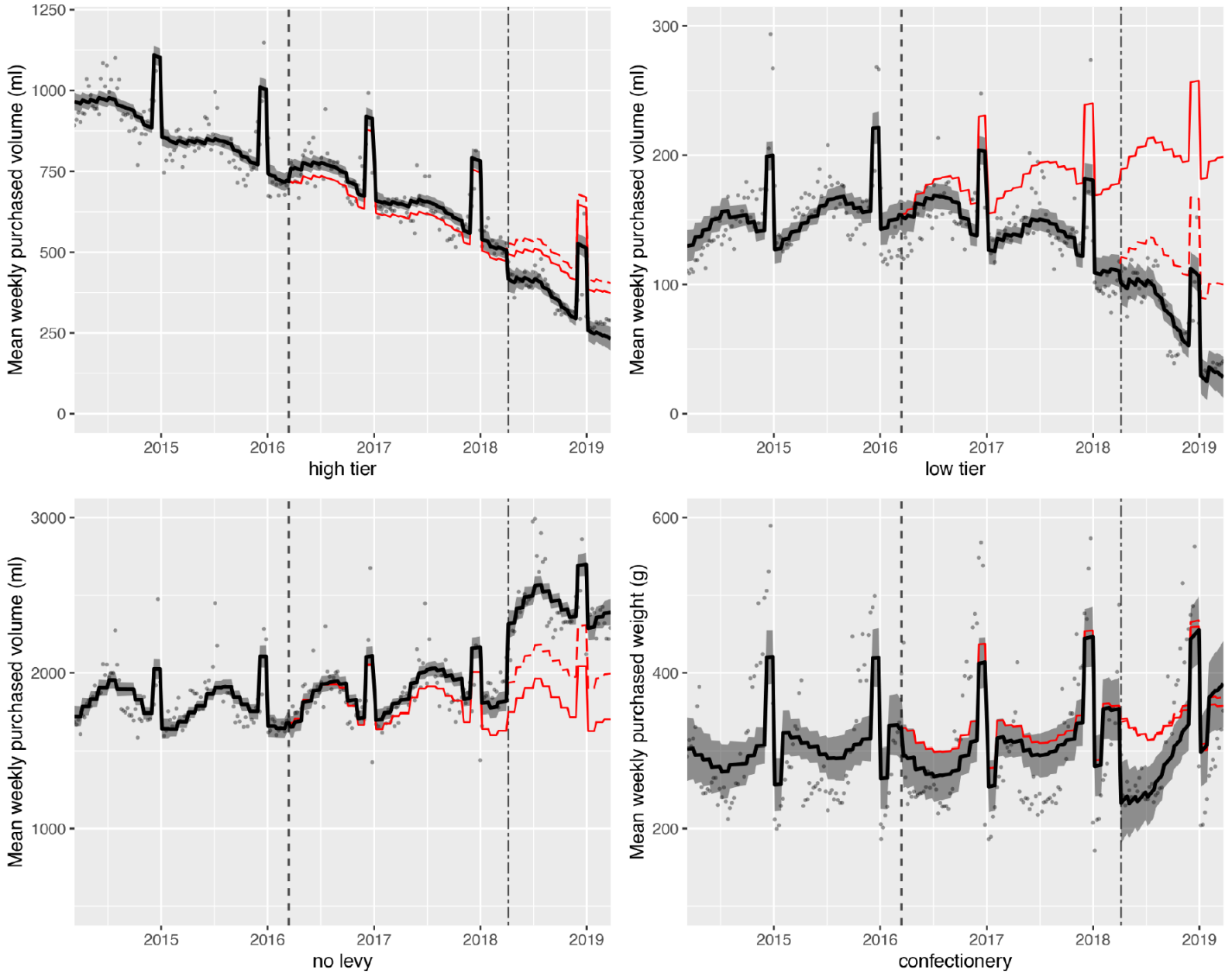
Bottle sizes

Coca-Cola is shrinking its bottles from 1.75l to 1.5l



Purchasing of soft drinks by SDIL tier and confectionery (control) – observed and modelled trends, 2014-2019

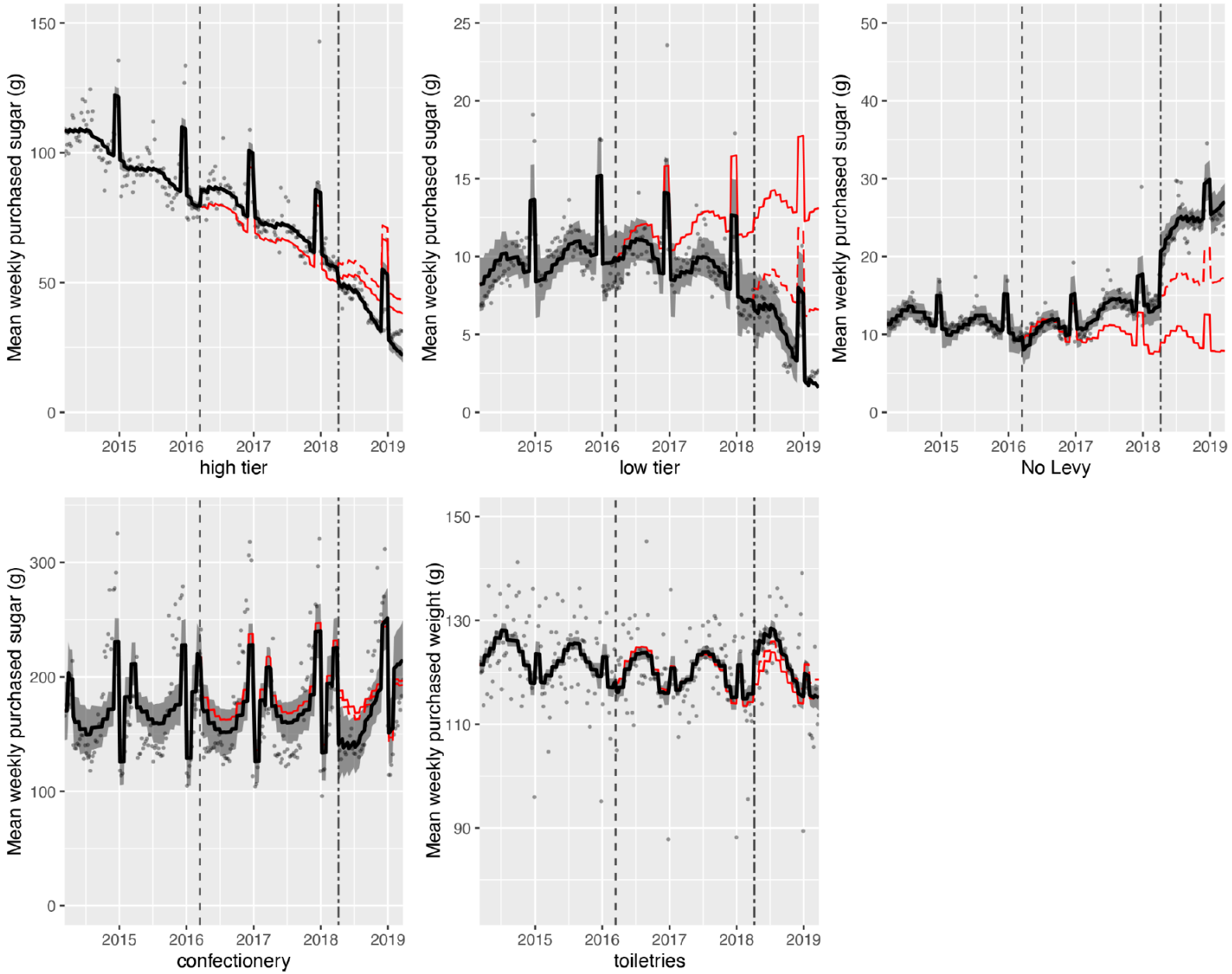
Observed
Expected post announcement
Expected post implementation
95% CI for observed
Announcement/Implementation



Rogers et al, BMJ Open, 2023.
doi:10.1136/bmjopen-2023-077059

Purchasing of sugar in soft drinks by SDIL tier and confectionery (control) – observed and modelled trends, 2014-2019

Observed
Expected post announcement
Expected post implementation
95% CI for observed
Announcement/Implementation



Rogers et al, BMJ Open, 2023.
doi:10.1136/bmjopen-2023-077059

Impact of SDIL on Sugar consumption

Table 1 Mean amount of free sugar (g) consumed in children and adults per day during the study period before and after the announcement of the soft drinks industry levy (SDIL)

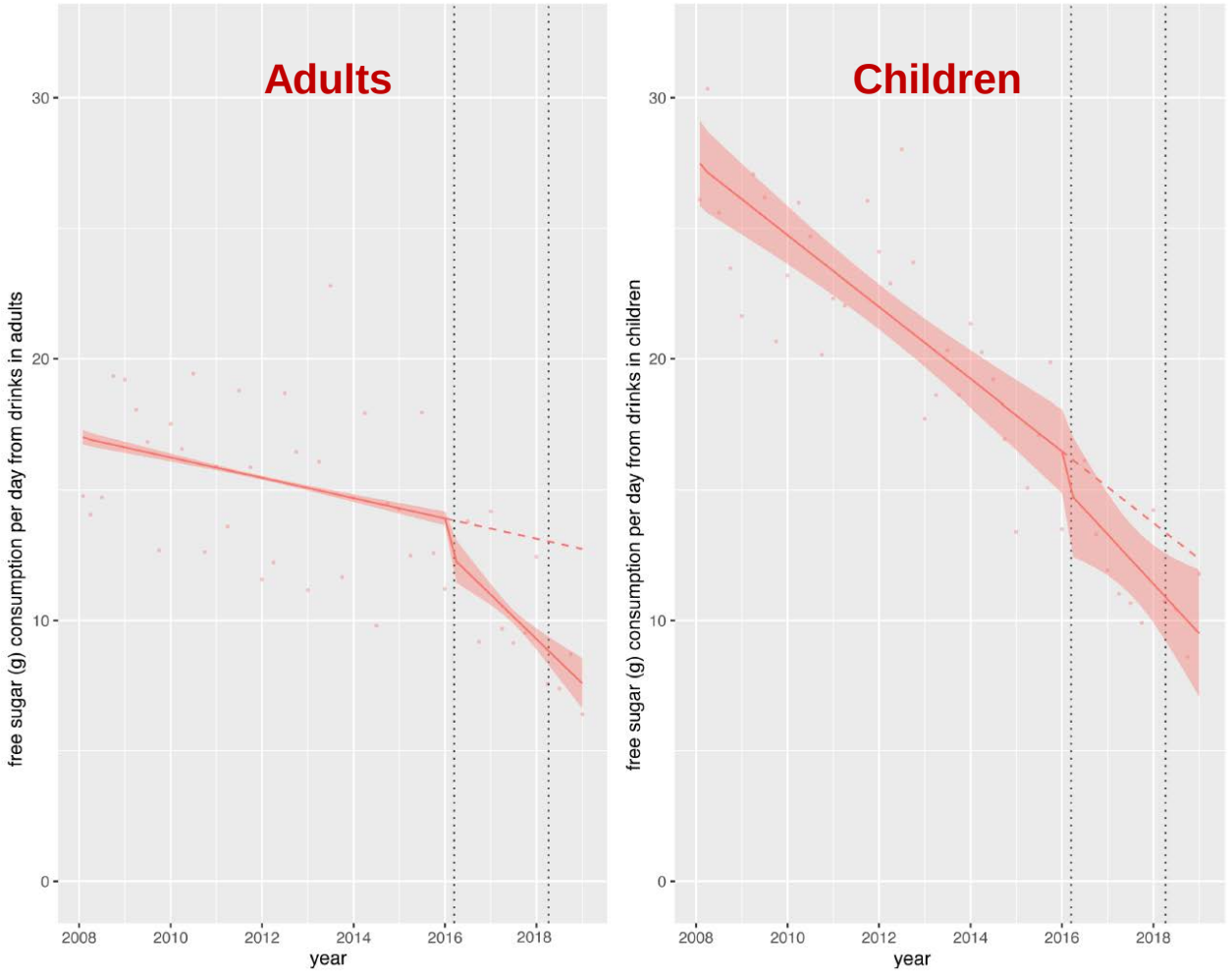
	Children		Adults	
	Pre-announcement*	Post-announcement†	Pre-announcement*	Post-announcement†
Age (years)	9.5 (5.2)	9.5 (5.2)	52.7 (19.8)	51.3 (18.7)
Sex (female), N (%)	2908 (48.9)	841 (49.0)	3618 (58.6)	1081 (58.8)
Free sugar (g/day)				
Free sugar from soft drinks only	22.0 (4.4)	12.0 (2.2)	15.3 (3.1)	10.0 (2.6)
Free sugar from food and soft drinks	62.4 (6.0)	47.8 (3.6)	57.9 (3.6)	47.9 (3.3)
Energy (from free sugar/protein) (%)				
Energy from free sugar in soft drinks as % of energy in soft drinks	48.1 (12.3)	26.3 (2.8)	34.3 (2.3)	22.8 (2.3)
Energy from free sugar in food and soft drinks as % of total dietary energy	16.7 (4.1)	9.9 (1.2)	12.7 (2.4)	8.8 (0.8)
Energy from protein in soft drinks as % of total energy in soft drinks	15.8 (2.6)	14.7 (1.1)	21.2 (4.0)	18.4 (1.2)
Energy from protein in food and soft drinks as % of total energy	16.7 (3.3)	12.4 (0.9)	18.0 (3.3)	14.8 (1.0)
Protein (g/day)				
Protein from soft drinks only	6.6 (0.6)	6.3 (0.6)	5.7 (0.5)	5.4 (0.4)
Protein from food and soft drinks	58.0 (2.0)	56.2 (1.5)	74.1 (2.6)	73.8 (2.2)

*April 2008 to March 2016.
†April 2016 to January 2019.

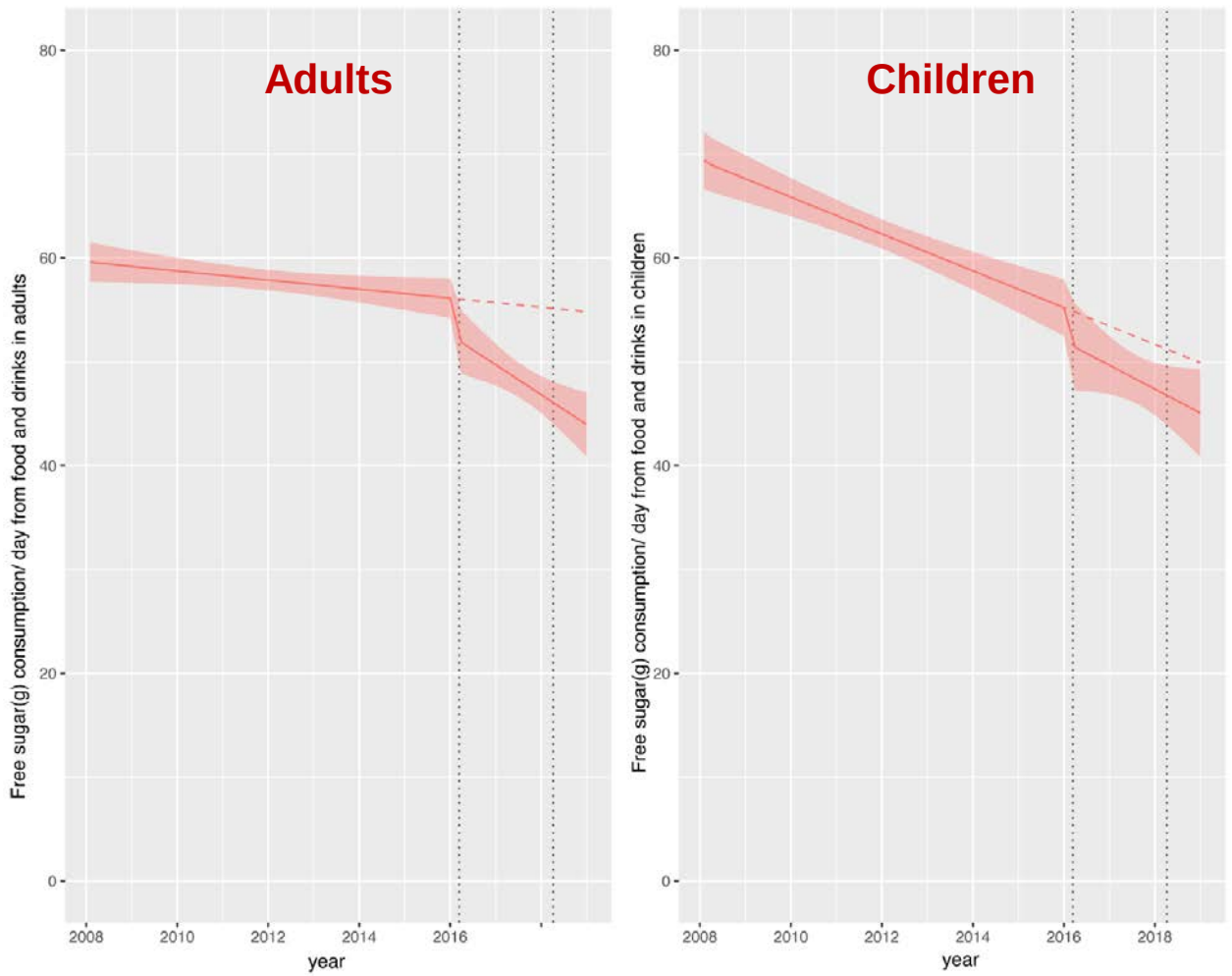
Rogers NT, et al. J Epidemiol Community Health, 2024;**78**:578–584. https://jech.bmj.com/content/78/9/578

Impact of SDIL on Sugar consumption

Drinks



Food and Drinks



Rogers NT, et al. J Epidemiol Community Health, 2024;**78**:578–584. https://jech.bmj.com/content/78/9/578

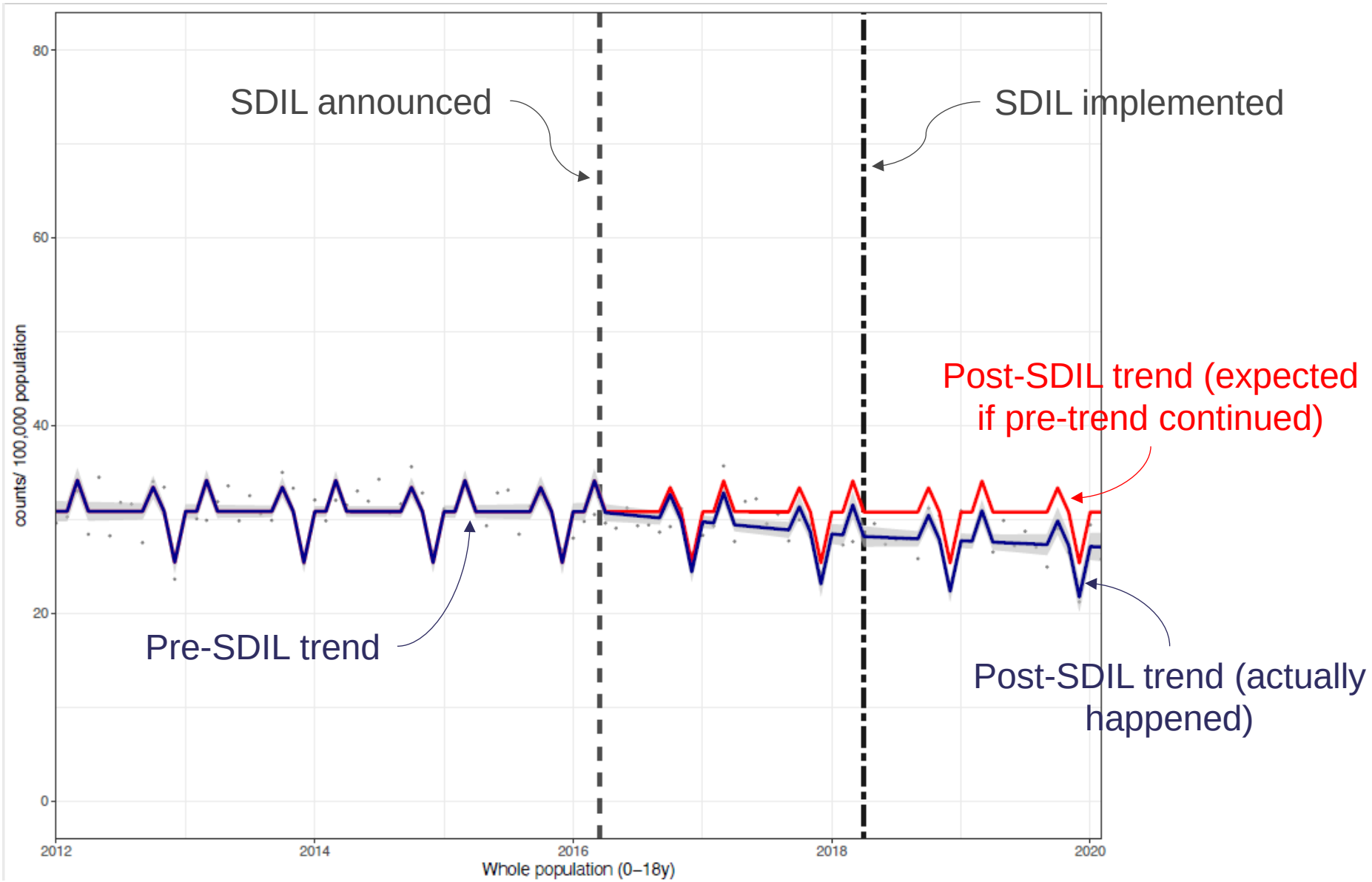
Impact of SDIL on Sugar consumption

Table 2 Change in free sugar consumption in food and drink and energy from free sugar as a proportion of total energy compared with the counterfactual scenario of no announcement and implementation of the UK soft drinks industry levy (SDIL)

	Children		Adults	
	Absolute change (g)	Relative change (%)	Absolute change (g)	Relative change (%)
Free sugar from soft drinks only	**–3.0 (–5.8, –0.1)**	**–23.5 (–46.0, –0.9)**	**–5.2 (–6.1, –4.2)**	**–40.4 (–48.0, –32.9)**
Free sugar from food and soft drinks	**–4.8 (–9.1, –0.6)**	**–9.7 (–18.2, –1.2)**	**–10.9 (–13.9, –7.8)**	**–19.8 (–25.4, –14.2)**
Energy from free sugar in food and soft drinks as % of total energy (%)	–0.7 (–3.9, 2.5)	–7.6 (–41.7, 26.5)	–2.6 (0.6, –5.8)	–24.3 (–54.0, 5.4)
Energy from free sugar in soft drinks as % of total energy in soft drinks (%)	0.4 (–7.1, 8.0)	1.8 (–30.7, 34.3)	–0.52 (–5.4, 4.3)	–2.4 (–24.6, 19.8)

Rogers NT, et al. J Epidemiol Community Health, 2024;**78**:578–584. https://jech.bmj.com/content/78/9/578

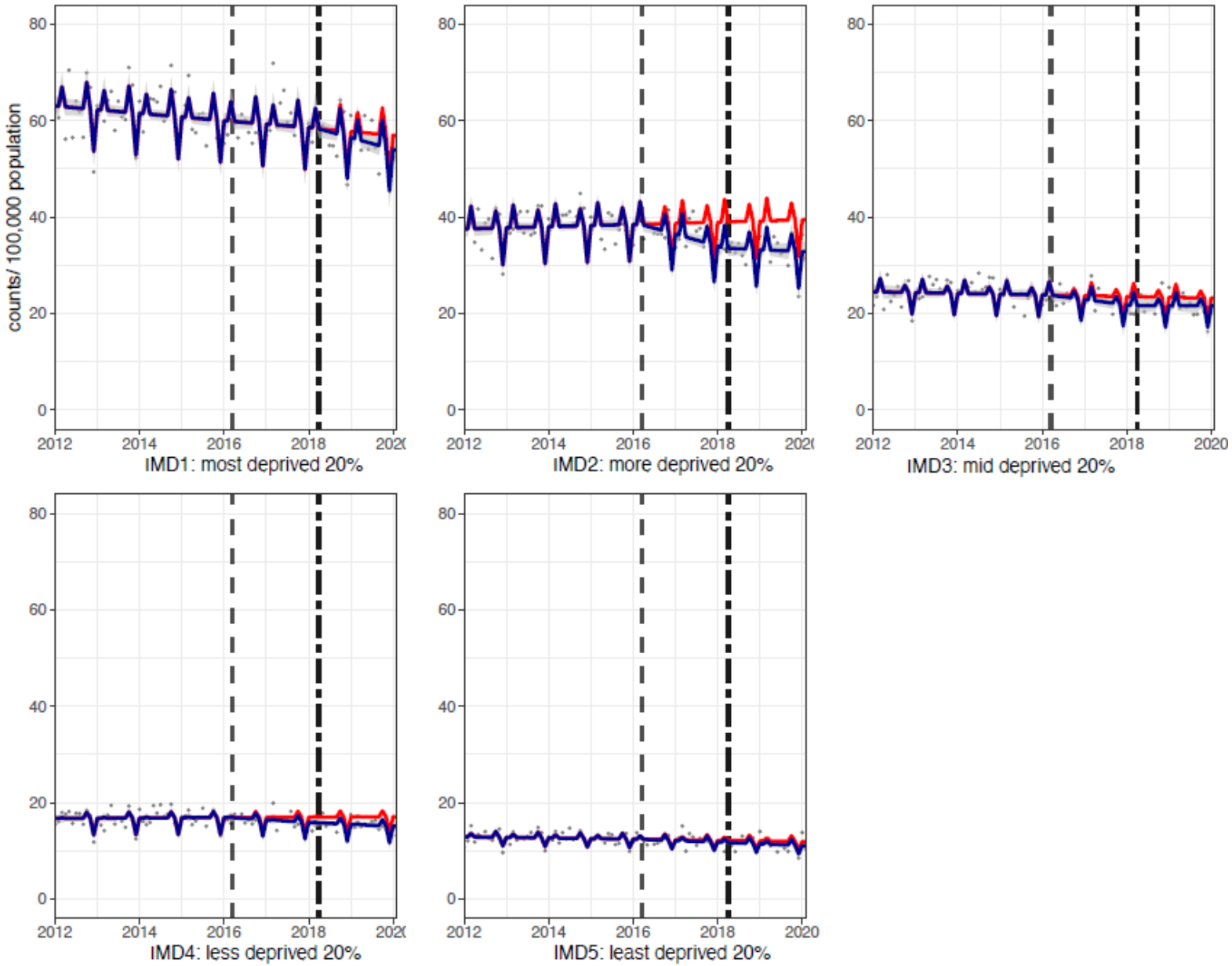
Impacts of SDIL on childhood dental caries



All children 0-18y

- absolute reduction of 3·7 admissions (95% CI: 5·2-2·2) / 100,000 population/month
- relative reduction of 12·1% (95% CI: 17·0%, 7·2%)

Rogers NT, *et al. BMJ Nutrition, Prevention & Health* 2023;**6:**doi: 10.1136/bmjnph-2023-000714



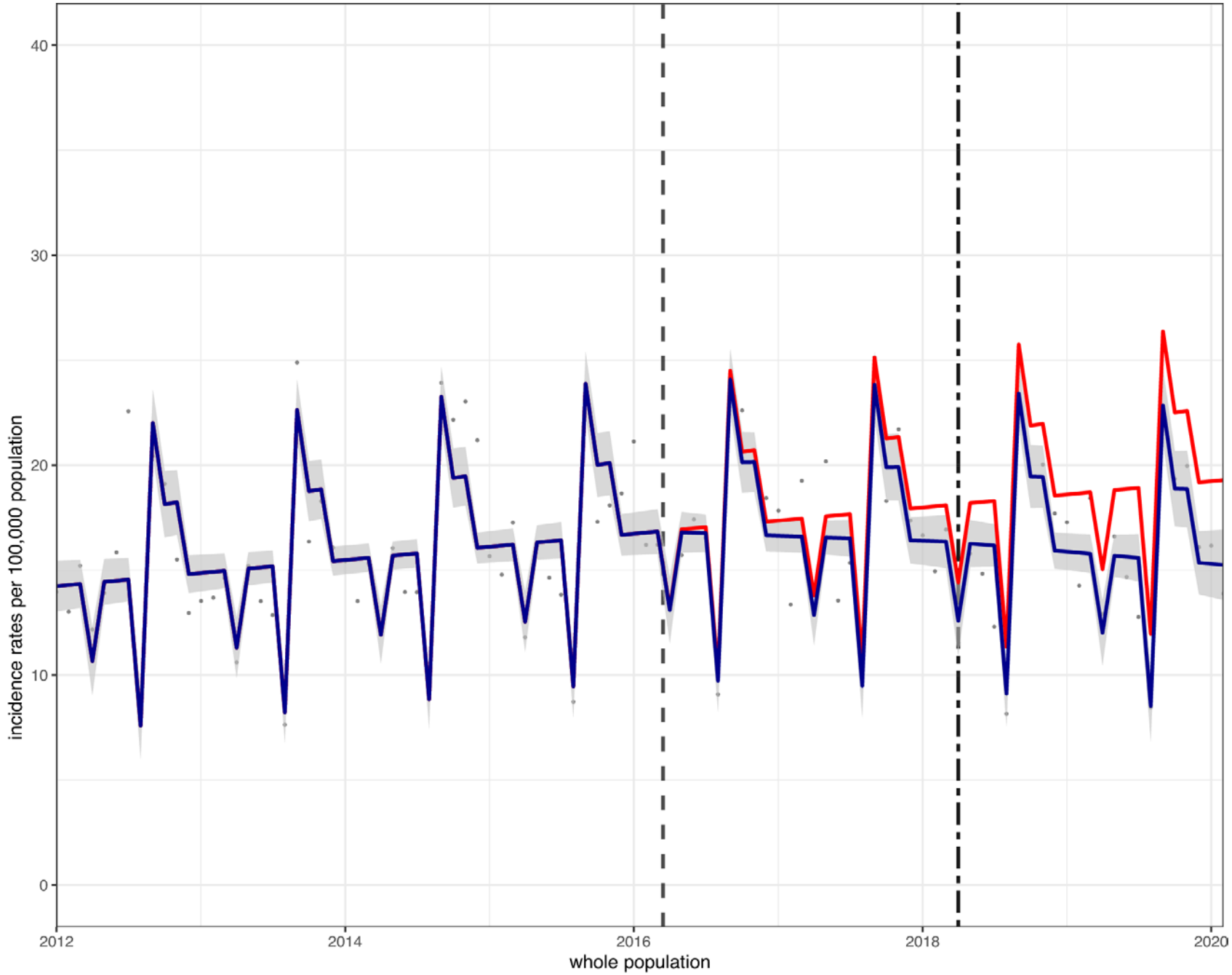
Broken down by deprivation group

IMD group	Relative reduction (95%CI)
1 (most)	**-5·4 (-10·0, -0·75)**
2	**-16·8 (-22·4, -11·3)**
3	-6·8 (-15·6, 2·1)
4	**-11·7 (-17·2, -6·2)**
5 (least)	**-7·2 (-12·5, -1·9)**

Rogers NT, *et al. BMJ Nutrition, Prevention & Health* 2023;**6:**doi: 10.1136/bmjnph-2023-000714

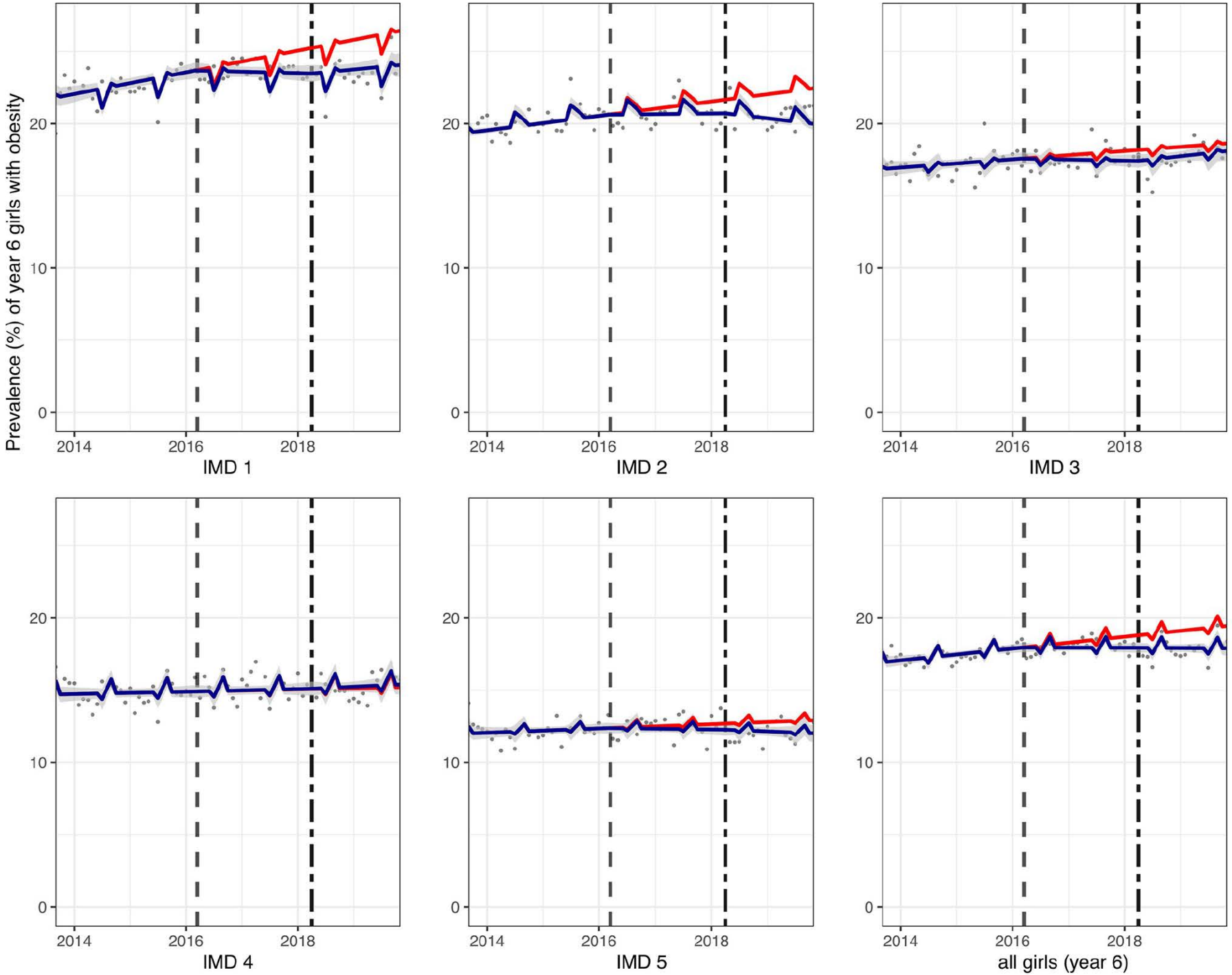
Childhood asthma hospital admissions

Rogers N et al. Nature Communications, 2024. https://doi.org/10.1038/s41467-024-49120-4



Impact of SDIL on childhood obesity: ITS of NCMP data by IMD quintile – year 6 girls

Rogers NT, et al. (2023) PLoS Med 20(1): e1004160. https://doi.org/10.1371/journal.pmed.1004160



Modelled impacts of SDIL on NCDs, QALYs and inequalities

Using a lifetable model, reductions in sugar in purchased drinks are estimated to lead to:

- 3,600 (95% uncertainty interval: 946 to 6,330) fewer cases of dental caries (DMFT) in children and adults, in the first 10 years after implementation
- 64,100 (54,400 to 73,400) fewer children and adolescents classified as overweight or obese, in the first 10 years after implementation.
- Reduced prevalence of overweight and obesity in the UK by 0.18 percentage points (0.059 to 0.31) for males and 0.20 percentage points (0.064 to 0.34) for females
- Impacts largest for children and adolescents in the most deprived areas (Q1: 11,000 QALYs [8,370 to 14,100], compared with least deprived areas (Q5: 1,860 QALYs [929 to 2,890]).
- If the simulated effects sustained over life course, it is predicted there will be a small but significant reduction in slope index of inequality: 0.76% (−0.9 to −0.62) for females and 0.94% (−1.1 to −0.76) for males.

Cobiac LJ, et al. (2024) PLoS Med 21(3): e1004371. https://doi.org/10.1371/journal.pmed.1004371

Responses to the SDIL: Industry media analysis

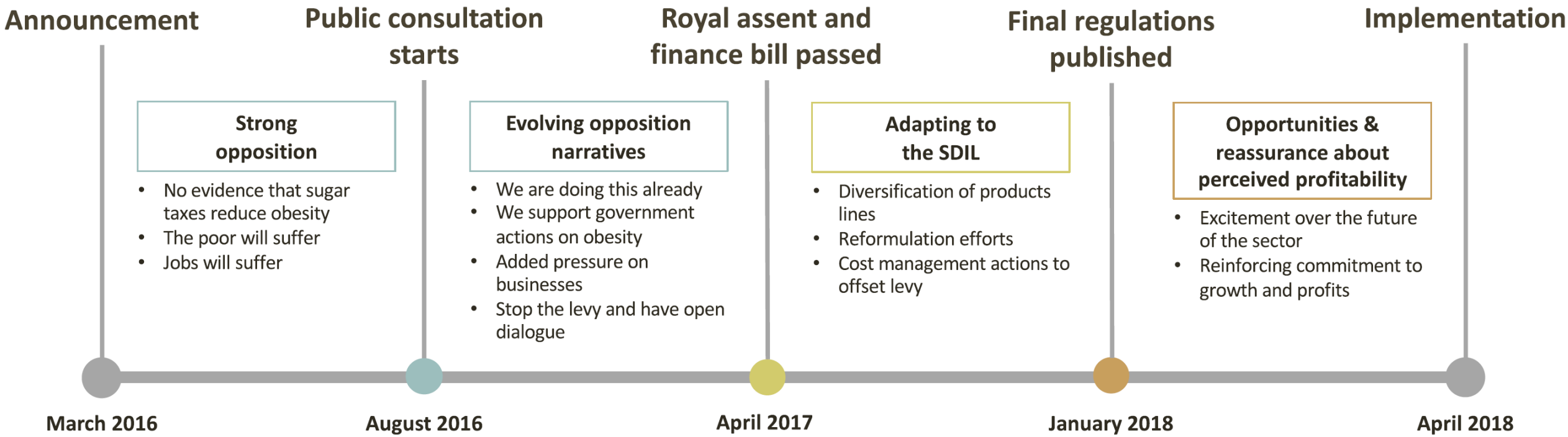
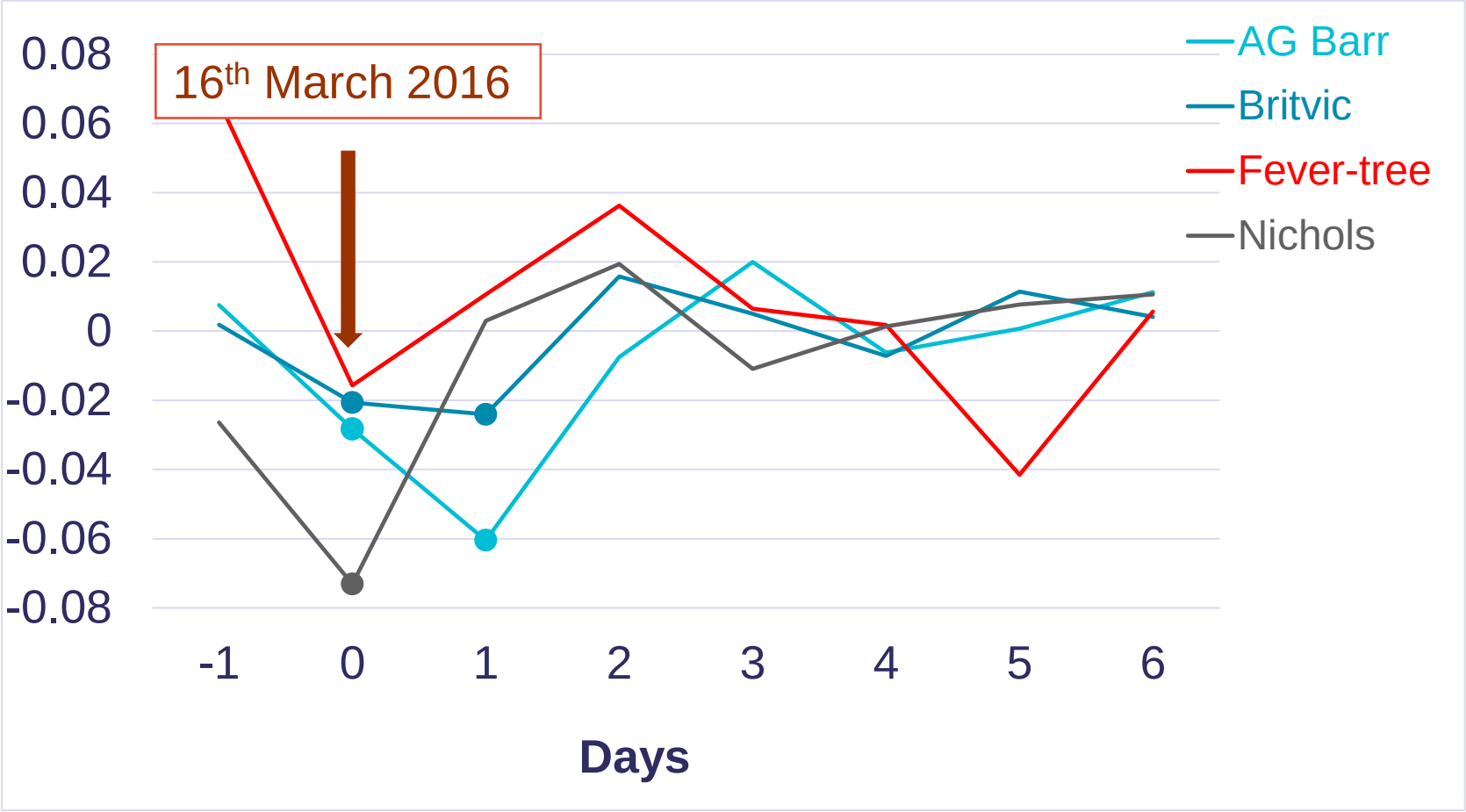


Fig. 1 Changing Soft drink industry reactions to the Soft Drinks Industry Levy between announcement and implementation: Themes and sub-themes in relation to key events

Penney TL, *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* **23**, 280 (2023). https://doi.org/10.1186/s12889-023-15190-0

Stock market reaction to announcement of the SDIL



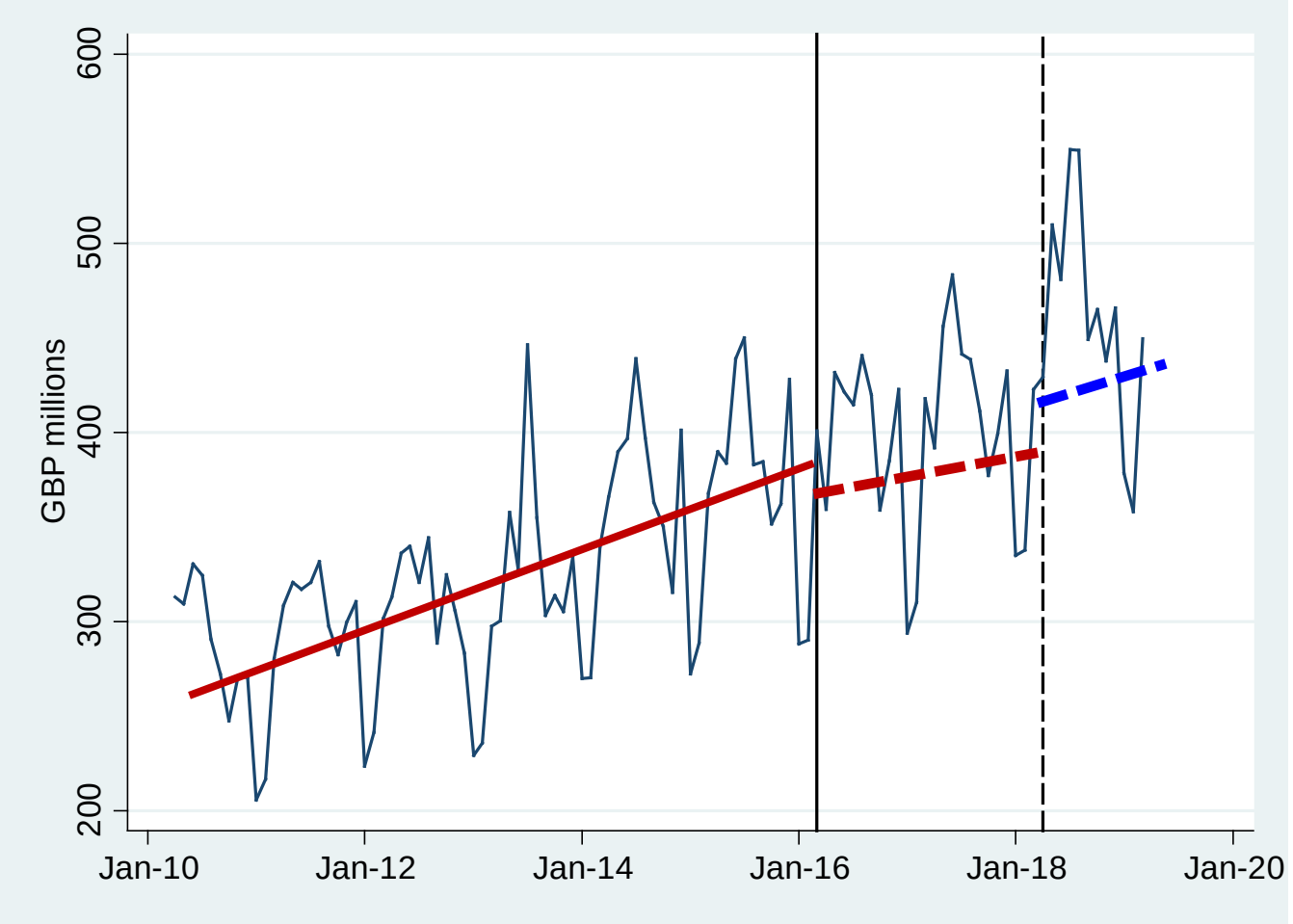
Proportional deviations from pre-event shareholder value

(● = significant (P<0.05))

Law et al, *Economics & Human Biology, 2020.* https://www.sciencedirect.com/science/article/pii/S1570677X19302096

Impact of SDIL on UK manufacturers of soft drinks

UK soft drinks manufacturers' domestic turnover (CPI adjusted)



Solid and dashed vertical lines indicate the SDIL announcement in March 2016 and the implementation in April 2018 respectively.

ITS results:
Statistically significantly impact on both the level (-5.6%) and trend (-0.5%) of turnover in the two-year period between the SDIL announcement and implementation (2016-18)

Reversion of trend after implementation

Industry largely mitigated effects of the SDIL post-implementation

Law et al, *Economics & Human Biology, 2020.* https://www.sciencedirect.com/science/article/pii/S1570677X19302606

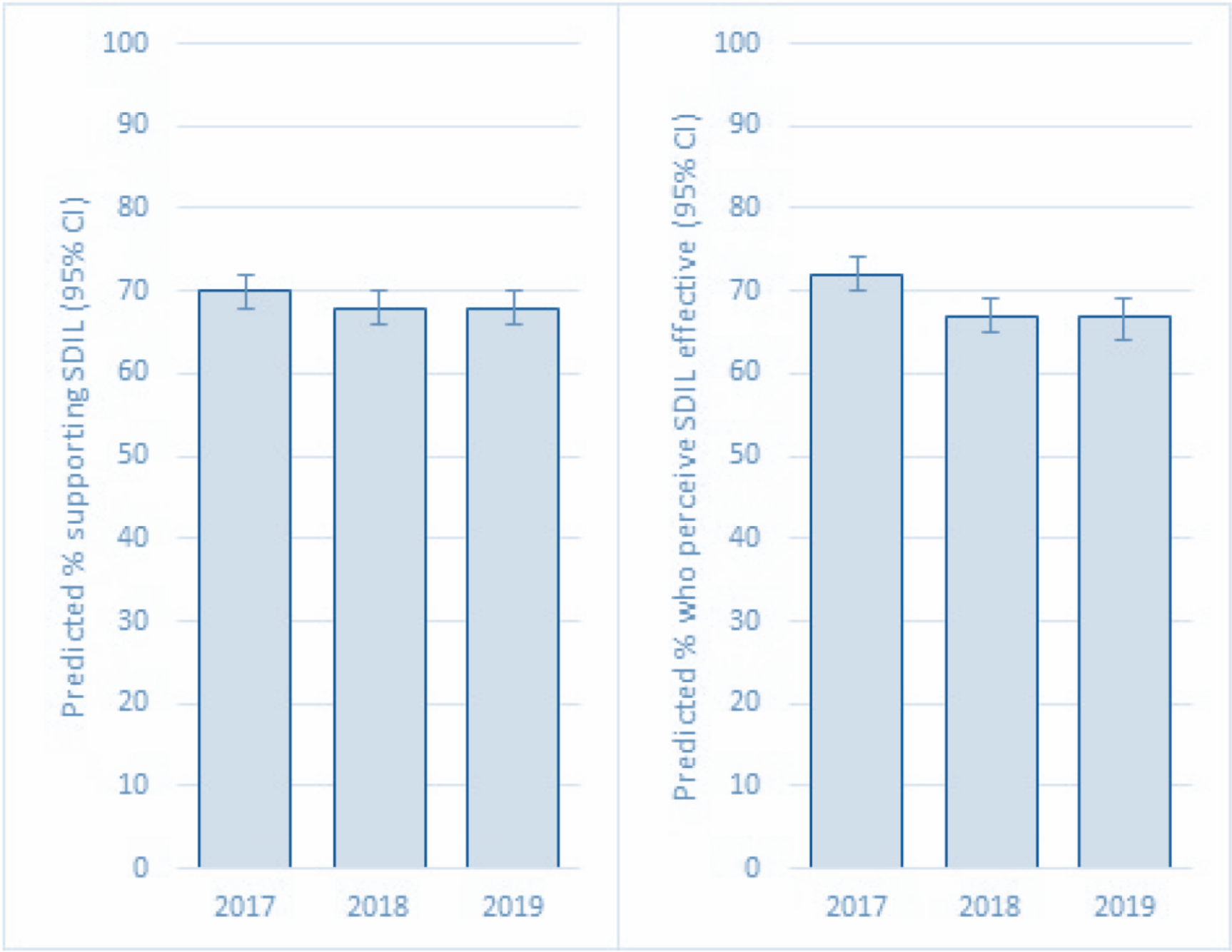
Industry views of the SDIL: thematic analysis of elite interviews with food and drink industry professionals, 2018–2020

Jones CP, *et al*. *BMJ Open* 2023;13:e072223. doi:10.1136/bmjopen-2023-072223

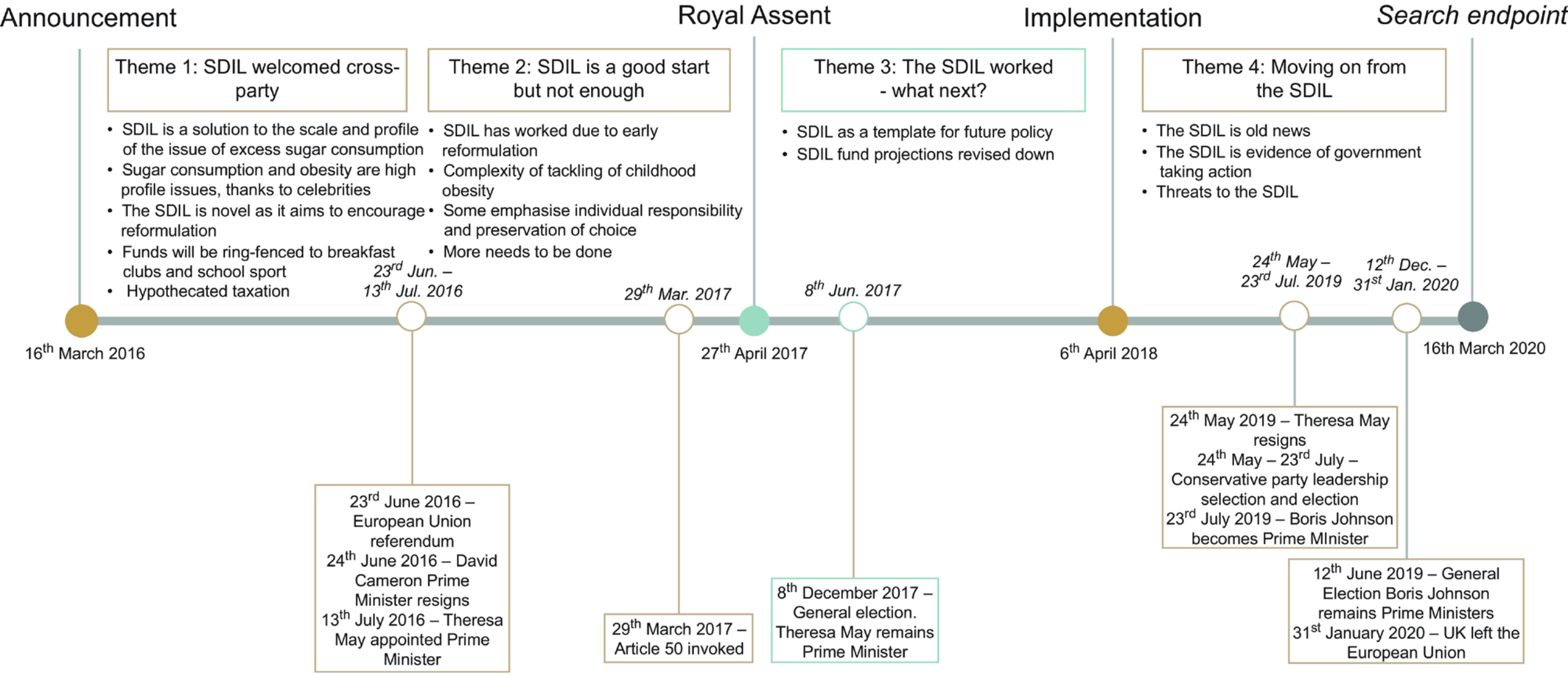
Theme 1: a level playing field…for some
⇒ The SDIL created a level playing field.
⇒ Milk-based drinks increased the complexity in the out-of-home sector.
⇒ Challenges for supermarkets with large product portfolios.
Theme 2: complex to implement but no lasting negative effects
⇒ Complexities in strategic response—price and product are key.
⇒ Leadership buy-in dictates strategic response.
⇒ Global companies and internal systems.
⇒ Contradictory government messaging.
⇒ Few long-lasting negative effects and the SDIL provided opportunities.
Theme 3: why us?—the SDIL unfairly targets the drinks industry
⇒ Sugary drinks in isolation were unfair targets for regulation.
⇒ Distrust of government's motivations to introduce the SDIL.
Theme 4: the consumer is king
⇒ Consumer response to product changes resulting from the SDIL.
⇒ Consumer momentum towards healthier products.
Theme 5: the future of the SDIL
⇒ Extending to milk-based and fruit-based drinks.
⇒ Impact on the wider food and drink industry and on other sectors.
⇒ Proposal to reverse the SDIL.

Public acceptability of the SDIL

Adams J, *et al*. Public acceptability of the UK Soft Drinks Industry Levy: repeat cross-sectional analysis of the International Food Policy Study (2017–2019). *BMJ Open* 2021;11:e051677. doi:10.1136/bmjopen-2021-051677

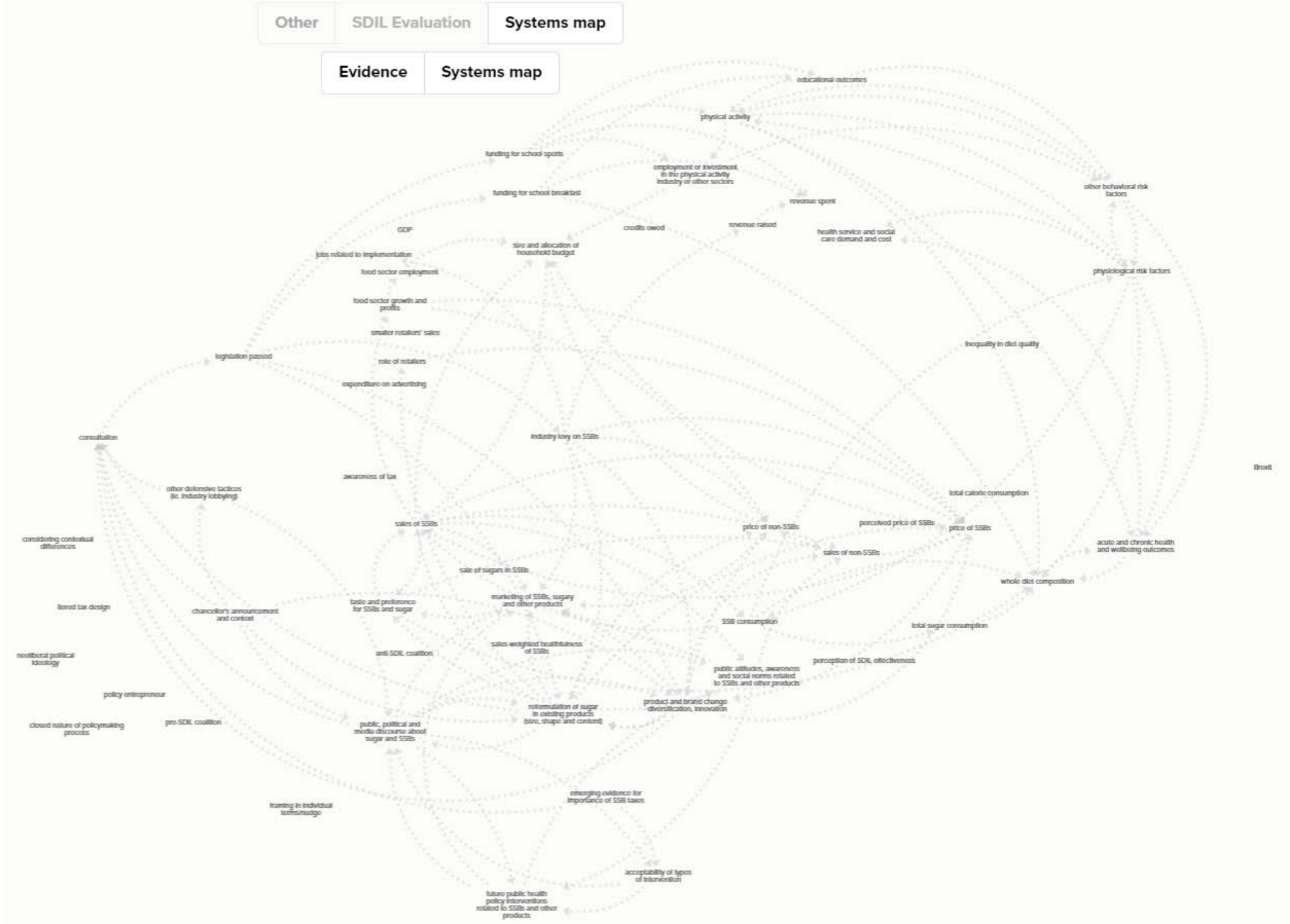


Parliamentary reaction to the SDIL: applied thematic analysis of 2016–2020 parliamentary debates

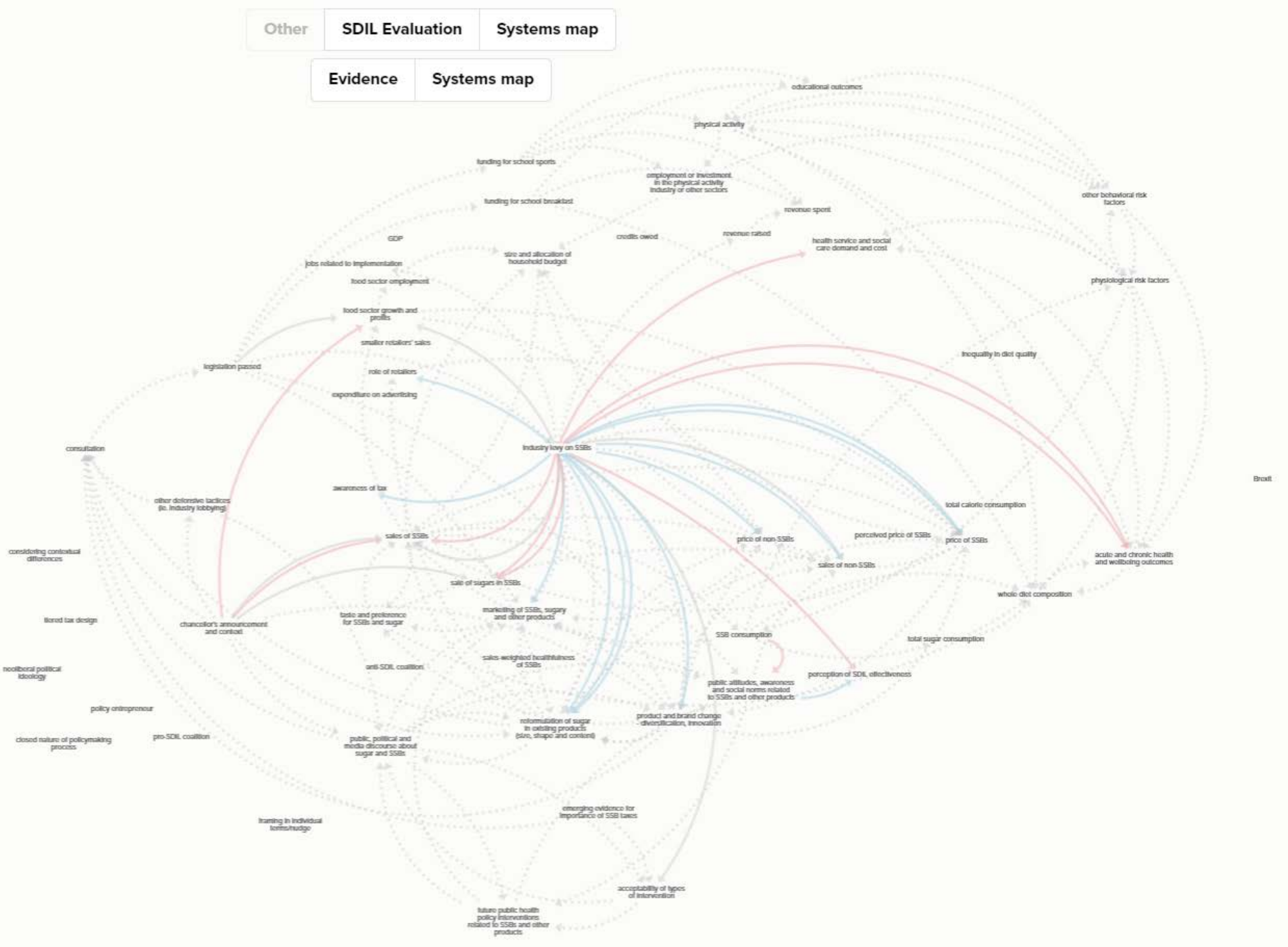


Jones CP, et al. *Public Health Nutrition*. 2024;27(1):e51. doi:10.1017/S1368980024000247

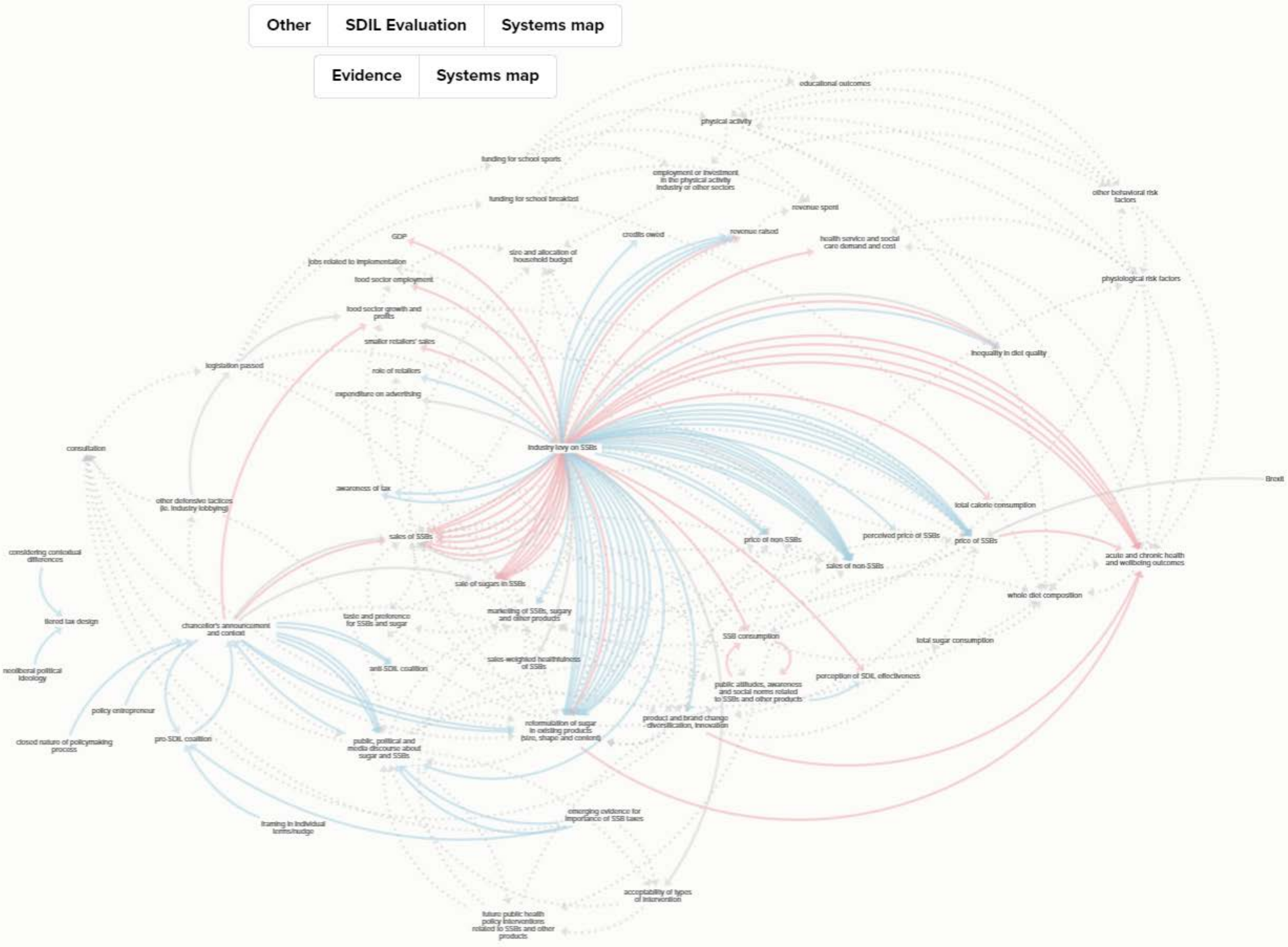
Revised system map



Revised system map
– evidence from NIHR evaluation



Revised system map – evidence from all evaluations (from evidence synthesis)



Overall conclusions

- SDIL has been successful in achieving its stated aim or stimulating reformulation
- SDIL has also resulted in increased relative price of sugary drinks
- Impacts on sugar content of drinks and price have translated to measurable impacts on purchasing and consumption
- Impacts on consumption have translated int measurable impacts on childhood obesity, dental caries and asthma
- Modelling suggests important benefits for life expectancy and health related quality of life, as well as substantial reductions in costs for heath and other sectors
- The SDIL does not appear to have had lasting adverse impacts on industry, which has rapidly adapted
- The SDIL is widely supported by the public and politicians
- Our findings are consistent with those of other studies
- Further interventions will be needed to maintain progress with improving diet and reducing obesity and NCDs