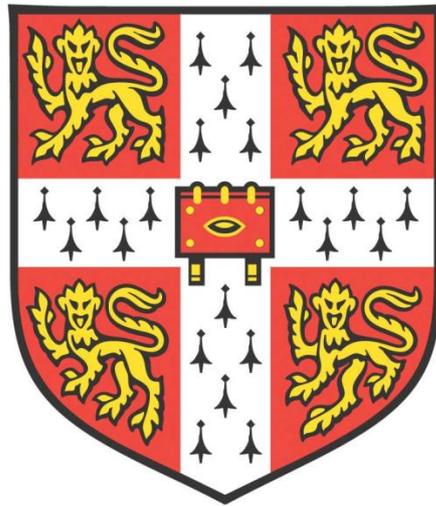


**CHANGES TO MARKETING IN RESPONSE
TO SUGARY BEVERAGE TAXATION: THE
SOFT DRINKS INDUSTRY LEVY IN THE
UNITED KINGDOM**



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This thesis is submitted for the degree of Doctor of Philosophy

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DECLARATION

This dissertation is the result of my own work under the supervision of Dr Jean Adams, Professor Martin White, Dr Felix Greaves, Professor Louis Levy (from 2017 to 2019), and Victoria Targett (since 2019). I have not submitted this work, in part or whole, for any other degree at the University of Cambridge or elsewhere. This dissertation does not include work done in collaboration except where declared in the ‘Contributions and dissemination’ section and specifically indicated in the text.

In accordance with the Degree Committee of the Faculty of Clinical Medicine and Veterinary Medicine guidelines, this dissertation is does not exceed 60,000 words.

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SUMMARY

Changes to marketing in response to sugary beverage taxation: the Soft Drinks Industry Levy in the United Kingdom

Hannah Forde

Background: Overall sugar intake in the United Kingdom (UK) continues to exceed recommended levels. As high sugar consumption contributes to multiple non-communicable diseases, the World Health Organization recommends the implementation of sugary beverage taxes (SBT). To this end, the UK government introduced a levy on soft drinks manufacturers in 2018, known as the Soft Drinks Industry Levy (SDIL). SBTs are likely to lead to a variety of reactions among stakeholders across the food sector that may, in turn, impact on beverage, and sugar, consumption.

Reactions of soft drinks companies may be particularly important in this regard. It has been hypothesised that soft drinks companies may respond to an SBT with marketing to protect their profits. Many definitions of marketing exist, sharing an understanding that marketing is a multi-component process that encompasses many activities, often coordinated by strategy. There is substantial literature acknowledging that marketing is an important determinant of dietary behaviours and inequalities. Though existing research on SBTs has explored their impacts on some features of marketing (such as changes to price or formulation), many other features have been overlooked (such as promotion). Furthermore, existing evidence has often failed to situate itself within a wider understanding of marketing as reflecting strategic coordination of activities. This risks overlooking the mechanisms through which changes in marketing in response to an SBT may enhance or undermine the SBTs impact on public health.

Aims: This dissertation aimed to understand what ‘marketing’ encompasses in the context of SBTs, explore whether marketing changes are likely to influence the outcomes of SBTs, and assess marketing changes that followed the SDIL.

Method 1: First, a scoping review of reviews using principles of critical interpretive synthesis was used to find conceptual confusion in the study of food and drink marketing in the public health literature to date. From these results, I concluded that future studies of marketing, including those specific to SBTs, should be grounded in the understanding that a broad range of separate marketing activities take effect in integration.

Method 2: Second, I fitted multinomial logistic regression models to the 2017 cross-section of the International Food Policy Study, to explore the association between exposure to one form of marketing – sugary beverage promotion – and sugary beverage consumption. In doing so, I found exposure to promotion was associated with the consumption of sugary beverages. . The results tentatively suggest that changes to this form of sugary beverage marketing following an SBT could influence subsequent consumption behaviours, and thus the outcomes of the SBT.

Method 3: Third, thematic analysis of 18 interviews with representatives from academia, civil society and industry, explored how marketing might change following the SDIL. Analyses unearthed the breadth and variety of anticipated changes that marketing might encompass, the decision-making contributing to a companies’ selection of these changes, and factors within and external to a company that might lead to heterogeneous responses across the soft drinks industry.

Method 4: Finally, I used interrupted time series analyses to explore changes in leading soft drinks companies’ expenditure on advertising following the announcement and implementation of the SDIL. Analyses used advertising expenditure data supplied by Nielsen, a market research company, that measures expenditure through various media types (though excluding some novel forms of digital media). Though there was no evidence of changes in expenditure, it is possible that promotion changed in other ways, for example through greater use of digital media platforms.

Conclusions: Evidence presented in this dissertation adds to existing literature by presenting a more comprehensive study of marketing in the context of SBTs. Together, this evidence illustrates that ‘marketing’ could be an important lens through which the complexity and breadth of soft drinks company responses to an SBT might be understood. Doing so has the potential to inform the design of policy strategies around SBTs that preempt adverse responses by soft drinks companies, such as complementary policies that restrict any increases in advertising, and thus may have better health outcomes. Moreover, embedding a greater appreciation of marketing in the design of public health policies might help them elicit commercial responses that amplify favourable health outcomes without harming profit, achieving both public health and commercial goals.

CONTRIBUTIONS AND DISSEMINATION

Chapters 2-5 are based on research that I led and have prepared for publication, in collaboration with multiple authors, and for which I am guarantor. The contents of these papers are reproduced in each chapter with minimal changes. Authors contributions are reported according to International Committee of Medical Journal Editors' (ICMJE) criteria.¹

Research presented in Chapter 2 is the result of collaboration with Yanaina Chavez Ugalde (YCU), Rebecca Jones (RJ), Dr Kate Ellis (KE), Dr Prasanti Alekhya Kotta (PAK), and supervisors Dr Felix Greaves (FG), Victoria Targett (VT), Professor Martin White (MW), and Dr Jean Adams (JA). HF, JA and MW conceived the study. HF, JA YCU and MW conceived the analyses and methodology. YCU, RJ, KE, PAK, and JA collected data. HF, JA, and MW completed the formal analysis, visualisation and original manuscript draft. All authors contributed to the interpretation of the data and reviewed the manuscript. We are grateful to the academic librarians in the Cambridge Medical Library, Dr Veronica Phillips and Isla Kuhn, for their help developing the database search strategy; and for the assistance of the wider team in retrieving literature.

Chapter 2 is under review at *Obesity Reviews* as: Forde H, Chavez-Ugalde Y, Jones R, Ellis K, Kotta P A, Greaves F, Targett V, White M, Adams, J. The conceptualisation and operationalisation of “marketing” in public health research: a scoping review of reviews focused on food marketing using principles from critical interpretive synthesis. An earlier version of this work was presented at the UK Society for Behavioural Medicine 16th Annual Scientific Meeting in January 2021.

Research presented in Chapter 3 is the result of collaboration with Professor David Hammond (DH), Dr Lana Vanderlee (LV), Stephen Sharp (SS), and supervisors JA, MW, FG and Professor Louis Levy (LL). DH conceived the International Food Policy study, and DH, LV, JA and MW developed the survey with others. HF and JA conceived the analyses and methodology, and HF completed the formal analysis, visualisation and original manuscript draft. All authors contributed to the interpretation of the data and reviewed the manuscript. Thank you to all participants who dedicated their time to the study, as well as the research assistants who were fundamental in surveying and data collection. We are also grateful to Professor Agnes Nairn in the Department of Management at the University of Bristol for insights into commercial marketing.

Chapter 3 is published as²: Forde H, White M, Levy L, Greaves F, Hammond D, Vanderlee L, Sharp S, Adams J. The Relationship between Self-Reported Exposure to Sugar-Sweetened Beverage Promotions and Intake: Cross-Sectional Analysis of the 2017 International Food Policy Study. *Nutrients*. 2019; 11(12): 3047. <https://doi.org/10.3390/nu11123047>. An earlier version of this work was presented at the Society for Social Medicine Annual Scientific Meeting, Glasgow, in September 2018 and an accompanying abstract was published as³: Forde H, Adams J, White M, Levy L, Greaves F. RF36 A cross-country comparison of self-reported exposure to sugary drink marketing and sugar-sweetened beverage intake. *J Epidemiol Community Heal*. 2018; 72(Supp 1): A59-A60. doi:10.1136/jech-2018-SSMabstracts.124.

Research presented in Chapter 4 is the result of collaboration with Dr Tarra Penney (TP), and supervisors JA, MW, LL and FG. All authors conceived the study and developed the methodology, and HF acquired the data. HF, JA and MW completed the formal analysis, and all authors contributed to the interpretation of data. HF drafted the original manuscript, which all authors revised. We are grateful to interviewees who agreed to take part in this study.

Chapter 4 is under review at *International Journal of Health Policy and Management* as: Forde H, Penney T, White M, Levy L, Greaves F, Adams J. A Framework for Understanding Marketing Responses to a Tax on Sugary Drinks: a Qualitative Interview Study in the United Kingdom, 2019. An earlier version of this work was presented at various student conferences, Public Health Research and Science Conference, in March 2018, and Public Health Science Conference, London, in November 2019, where an accompanying abstract was published as⁴: Forde H, Penney T, White M, Levy L, Greaves F, Adams J. Understanding changes in soft drinks marketing after introduction of the UK Soft Drinks Industry Levy: developing a theory of change from stakeholder interviews. *The Lancet*. 2019; 394(Suppl 2): S40. doi:10.1016/S0140-6736(19)32837-5.

Research presented in Chapter 5 is the result of collaboration with Dr David Pell (DP), Yuru Huang (YH), SS, and supervisors MW and JA. HF, MW and JA conceived the study. All authors developed the methodology, and HF acquired the data. HF completed the formal analysis in consultation with DP, YH, SS, MW and JA, and all authors contributed to the interpretation of data. HF drafted the original manuscript, which all authors revised. We are also grateful to Dr Miriam Alvarado for her analysis and STATA insight.

Chapter 5 is in preparation for submission to *Globalisation and Health* as: Forde H, Pell D, Huang Y, Sharp, S J, White M, Adams J. Changes in advertising expenditure of market-leading soft drinks companies associated with the UK Soft Drinks Industry Levy: interrupted time series analysis (2014 -2019). An earlier version of this work was presented at the Cambridge Economic and Social Research Council Doctoral Training Partnership Annual Conference, online, in January 2021.

Appendix 1 provides details of additional research contributions I made throughout my doctoral research, the results of which are not contained within this dissertation.

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LIST OF ABBREVIATIONS

BFQ	Beverage Frequency Questionnaire
BSDA	British Soft Drinks Association
CFS	Canada Food Study
CI	Confidence interval
CHD	Coronary heart disease
COREQ	COnsolidated criteria for REporting Qualitative research
CSR	Corporate social responsibility
CVD	Cardiovascular disease
e.g.	Exempli gratia, or ‘for example’
g	Grams
HFSS	High fat, salt and sugar
i.e.	Id est, or ‘that is’
IFPS	International Food Policy Study
kcal	Kilocalorie
L	Litres
LMIC	Low- and middle- income countries
mL	Millilitres
MNC	Multinational company
n	Number, used to indicate sample size
NIHR	National Institute of Health Research
NCD	Non-communicable disease
NDNS	National Diet and Nutrition Survey
NNS	Non-nutritive sweetener
OLS	Ordinary least squares
OR	Odds ratio
p	p-value

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1 INTRODUCTION

1.1 Overview

This dissertation is concerned with how soft drinks companies respond to sugary beverage taxation (SBT) policies. There is growing realisation in the public health community that the ability of an SBT to reduce sugar consumption will depend on the reactions of related stakeholders. How soft drinks companies choose to respond, particularly through changes to the marketing of their beverages, may be especially important to understand. Marketing encompasses many of the possible adaptations that companies make both to comply with legislation and to mitigate the impacts on their corporate performance, yet marketing has been under-researched in this context to date.

This dissertation aims to understand what ‘marketing’ encompasses in the context of SBTs and explores whether marketing changes are likely to influence the outcomes of SBTs. This dissertation also assesses marketing changes that followed the introduction of an SBT in the United Kingdom (UK): the Soft Drinks Industry Levy (SDIL). Research presented in this thesis was undertaken alongside the National Institute of Health Research (NIHR)-funded evaluation of the SDIL, led by Professor Martin White, at the Centre for Diet and Activity Research, University of Cambridge.

This first chapter outlines the public health policy context in which this dissertation was undertaken, summarises the overall aims of the dissertation, and introduces the remaining chapters. The chapter begins with an overview of the rationale for limiting the intake of sugary beverages, including definitions of sugar and sugary beverages, and a summary of the health risks of their consumption (Section 1.2 Sugary beverages and health). Second, the chapter presents SBTs, their different designs, and the relevant evidence of their effects to date (Section 1.3 Sugary beverage taxation). I also frame the SDIL in the context of ‘complex adaptive systems’ and summarise existing evidence about reactions to the SDIL across the system in which it resides. Doing so highlights gaps in existing evidence related to responses of soft drinks companies. Next, the chapter introduces a separate

body of literature concerned with marketing (Section 1.4 Marketing and sugary beverage taxes). I describe marketing in the context of other commercial activities, known relationships between marketing and dietary behaviours, and why it might be important to understand marketing changes that follow an SBT. Finally, I provide the overall aims of the dissertation and a summary of remaining chapters.

1.2 Sugary beverages and health

Poor diet is an important, preventable risk factor for non-communicable diseases (NCDs).⁵ In 2017, 11 million deaths were attributable to dietary risk factors.⁵ A diet lacking in sufficient fruit and vegetables, and consisting of foods high in fat, salt and sugar (HFSS) increases the risk of adverse health outcomes that contribute to NCD prevalence.^{6,7} In recent years, the consumption of too much sugar in the UK, especially in liquid form, has been of concern to policymakers and health advocates. Here I summarise definitions for sugar and sugary beverages, the health risks they present, and recent trends in sugar and sugary beverage purchasing and consumption.

1.2.1 Definitions of sugar and sugary beverages

Terms used frequently in literature relevant to SBTs are defined below.

Soft drinks The term ‘soft drink’ was popularised in the UK when the Soft Drinks Regulation 1964 (since amended) was set into law, and included definitions for codified products.⁸ There is no single definition of soft drinks, but it is generally accepted that they are sweetened (naturally or artificially), water-based beverages that may also contain acidity.⁸ According to the British Soft Drinks Association (BSDA), an industry body representing UK soft drinks producers, the main categories of soft drinks are carbonates, fruit juices, ‘dilutable’ (e.g., cordials), still and juice drinks, bottled waters, sports drinks and energy drinks.⁹ Most teas, coffees, dairy-based beverages and alcoholic drinks are not considered ‘soft drinks’,⁸ though the boundary between soft drinks and alcoholic beverage markets is increasingly “blurred”.^{8(p18)}

Sugar Use of ‘sugar’ in this dissertation refers to ‘free sugars’, unless stated otherwise. Free sugars are added sugars in any form; those naturally present in fruit and vegetable juices, purées and pastes, all sugars in drinks (except in dairy-based drinks); and where lactose and galactose have been added as ingredients.^{10(p1636)} Though related terms exist (e.g., non-milk extrinsic sugars, added sugars¹¹), free sugars are the basis for current

dietary recommendations in the UK. Sugar is classified as a ‘nutritive sweetener’, as it contains carbohydrate that provides energy.¹²

Sugary beverages or **sugar-sweetened beverages** (SSBs) are soft drinks sweetened with free sugars. Much of the existing literature cited in this chapter has used the term ‘SSBs’. ‘Sugary beverages’ is the preferred term for research I present in this dissertation, except in Chapter 3 where I analyse secondary data that refers to ‘SSBs’.

Non-nutritive sweeteners (NNSs), also known as non-caloric sweeteners, are caloric sweetener substitutes that provide minimal or no calories.¹³ Generally, use of NNSs in beverages means the product is of equal sweetness but contains fewer calories than if it were sweetened with sugar. For example, one of the best known NNSs is saccharin, which in its soluble form is 450 times sweeter than sugar.⁸ Though the term NNS is often used interchangeably with ‘**artificial sweeteners**’, some NNSs – such as stevia – are derived from plant sources rather than artificially.¹³

Artificially sweetened beverages (ASBs) are soft drinks in which at least some of the sweetness of a beverage comes from a non-nutritive sweetener.

1.2.2 Associations between sugar, sugary beverages, and poor health

1.2.2.1 Free sugars and sugary beverages

The associations between the consumption of sugar and sugary beverages with diet-related ill-health are well established. In 2015, the UK Scientific Advisory Committee on Nutrition (SACN) published a comprehensive report on carbohydrates and health.¹¹ It includes evidence of the associations between the consumption of sugar, sugary beverages, and the risk of NCDs.¹¹ Risks include obesity, cardiovascular disease (CVD), type 2 diabetes, some cancers and dental caries.¹¹

The report has since informed the implementation of several measures in the UK, including the SDIL. In part this is because the scale of risks posed by consuming more sugar than is recommended, especially in liquid form, are non-negligible.¹⁴ For example in 2015, Imamura and colleagues published a systematic review and meta-analysis that used data from 17 cohort studies to examine the prospective associations between the consumption of SSBs, ASBs, and fruit juices with type 2 diabetes.¹⁵ Since adiposity may act as both a mediator and confounder, the association was meta-analysed both with and without adjustment for adiposity.¹⁵ Of the 2.6 million events of type 2 diabetes predicted to occur over 10 years in the UK (absolute event rate 5.8%), 79,000 were estimated to be

attributable to SSB consumption (population attributable fraction 3.6%, 95% confidence interval (CI): 1.7%, 5.6%).¹⁵

Such NCDs are also linked to risk of mortality. In analyses of multiple large cohort studies of US adults, the consumption of SSBs was associated with a higher risk of total mortality, primarily through CVD.¹⁶ After adjusting for other diet and lifestyle factors, consumption of SSBs was associated with a higher risk of total mortality, which increased with beverage intake.¹⁶ For consumption of less than <1 SSB serving per month, 1–4 servings per month, 2–6 servings per week, 1–<2 servings per day, and ≥ 2 servings per day, pooled hazard ratios across categories were 1.01 (95% CI: 0.98, 1.04), 1.06 (95% CI: 1.03, 1.09), 1.14 (95% CI: 1.09, 1.19), and 1.21 (95% CI: 1.13, 1.28), respectively.¹⁶ Comparing the lowest to highest consumption categories, the association for CVD mortality was 1.31 (95% CI: 1.15, 1.50).¹⁶ It is likely these results are generalisable to the UK.

1.2.2.2 Artificially sweetened beverages

Along with fruit juices, ASBs have received considerable attention for their potential as a substitute to consumption of SSBs.¹⁷ The European Food Safety Authority advise that artificial sweeteners are safe for consumption,¹⁸ though such advice is under continuous review. Whether ASBs are a viable, healthier alternative to SSBs is frequently debated, in part because some evidence has found ASB consumption to be associated with adverse health outcomes.

Like SSBs, consumption of ASBs been found to be associated with type 2 diabetes and CVD. In Imamura and colleagues' systematic review, higher consumption of ASBs was also associated with a 25% greater incidence of type 2 diabetes per one serving per day (95% CI: 18%, 33%) and 8% (95% CI: 2%, 15%) before and after adjustment for adiposity.¹⁵ Malik and colleagues also studied the association of ASBs with total and CVD mortality, finding ASBs were associated with mortality in the highest intake category of ASBs only: pooled hazard ratios were 1.04 (95% CI: 1.02, 1.12) for total mortality and 1.13 (95% CI: 1.02, 1.25) for CVD mortality.¹⁶ These results may have arisen because of non-glycaemic effects present in ASBs.¹⁶

In both studies, authors noted the possible presence of reverse causality (such as unmeasured comorbid conditions and health consciousness),^{15,16} and there were indications of publication bias and residual confounding in Imamura's study.¹⁵ Nonetheless, results tentatively indicate that ASBs are not an entirely suitable substitute for SSBs for the prevention of type 2 diabetes and CVD if consumed in high quantities.

This is an important consideration for sugar reduction measures that depend on reformulation using artificial sweeteners.

1.2.3 Purchasing and consumption trends

In response to evidence such as that presented above, the World Health Organization (WHO) recommends that the consumption of free sugars should not exceed 10% of total daily energy intake, and that a reduction to below 5% would provide additional health benefits.¹⁹ In the UK, it is recommended that free sugars provide no more than 5% of total daily energy intake for an average member of the population aged 2 years and over.²⁰ However, sugar consumption levels remain high.²¹ Further details about the purchasing and consumption of sugar and sugary beverages are summarised below.

1.2.3.1 Free sugars

Adults and children in the UK are consistently consuming more free sugars than is deemed healthy. The National Diet and Nutrition Survey Rolling Programme (NDNS) is a cross-sectional survey that assesses diet, nutrition intake and nutrition status of those aged 1.5 years and over living in private households in the UK.²⁰ Though it reported that mean intake of free sugars as a proportion of total energy intake exceeded recommendations between 2016 and 2019 for all ages, consumption was highest in children, particularly girls aged 11 to 18 years and boys aged 4 to 10 years (12.5% and 12.4% respectively).²⁰ In the same period, only 2% of children aged 4 to 10 years and 7% of children aged 11 to 18 years met the government recommendation.²⁰

There are some promising indications that purchases and consumption of free sugars are falling. Analyses of take-home consumer data found a 4.94 grams (g) decrease in the amount of sugar purchased per capita per day in Britain between 2014 and 2017.²² These reductions were mirrored by declining intake of free sugars reported in the NDNS.²⁰ Although consumption continues to exceed recommendations, intake of free sugars as a percentage of total energy fell by 3.8%, 3.9% and 4.9% between 2011 and 2019, for children aged 1.5 to 3 years, 4 to 10 years and 11 to 18 years, respectively.²⁰ Over the same period, there was also a significant – though smaller – reduction in free sugar intake as a percentage of total energy intake for adults.²⁰

Evidence suggests that socioeconomic inequalities in purchases of free sugars have persisted, despite changes to purchasing and consumption overall. This was demonstrated in Berger and colleagues' analyses of the GB Kantar Fast-Moving Consumer Goods

panel, a nationally representative panel of food and beverage purchases.²³ Their analyses first found the differences in daily sugar purchased between the lowest and the highest social grades: in 2014, these were 3.9g/capita/day (95% CI: 2.9g, 4.8g) for table sugar, 2.4g (95% CI: 1.8g, 3.1g) for SSBs, 2.2g (95% CI: 1.5g, 2.8g) for chocolate and confectionery, and 1.0g (95% CI: 0.7g, 1.3g) for biscuits.²³ The authors subsequently found little evidence of change in social grade differences between 2014 and 2017.²³

1.2.3.2 Sugary beverages

In 2015, soft drinks (excluding fruit juices) were the largest single source of dietary sugar for children aged 11 to 18 years in the UK, providing 29% of average daily sugar intake.²⁴ While beverages have continued to form a substantial source of dietary sugar,²⁵ evidence suggests that purchasing and consumption have also changed in recent years.

According to the BSDA, the volume of soft drinks sold in the UK decreased by 2.9% between 2018 and 2019, while value of drinks sold remained approximately stable (+0.1%).⁹ This could indicate that fewer soft drinks have been sold at a higher price relative to volume (for example, through smaller portion sizes). However, evidence supplied by Public Health England (PHE), an executive agency of the UK Department of Health and Social Care, reported that sales of soft drinks increased by 14.9% between 2015 and 2019, from 3,542,574 thousand litres to 4,070,902.²⁶ As PHE's results are derived from an independent data source and show a greater effect sustained over a longer period, they may be more reliable. PHE also reported that total sugar sold in soft drinks decreased by 35.4% from 135,501 tonnes to 87,602 tonnes across the same period.²⁶ This corresponds with Berger and colleagues' analyses, that found SSBs were one of the main sources of the 4.94g decrease in the daily amount of sugar purchased per capita in Britain between 2014 and 2017 (-15%).²² Together, this might suggest that purchases have shifted towards soft drinks containing less sugar (for example, through reformulation using NNSs).

Data from the NDNS shows that there have been corresponding declines in the consumption of sugary beverages across all age groups.²⁰ Of those consuming sugary beverages between 2008/2009 and 2018/2019 (the study period for the NDNS), consumption reduced by a yearly average of 7% (95% CI: 3%, 10%), 4% (95% CI: 2%, 6%) and 5% (95% CI: 3%, 6%) in children aged 1.5 to 3 years, 4 to 10 years, and 11 to 18 years, respectively.²⁰ A similar, though smaller, reduction was observed in adults aged

19 to 64 years who consume sugary beverages: in the same period, consumption reduced by a yearly average of 2% (95% CI: 1%, 2%).²⁰

As with sugar, there are sociodemographic patterns to sugary beverage consumption in the UK. In a cross-sectional study of UK adults aged 30-64 years, recruited between 2005 and 2013 (n = 2,041), prevalence of daily SSB consumption was 20.4%.¹⁷ SSB consumption was more common in men than women (odds ratio (OR) 1.33, 95% CI: 1.17, 1.50).¹⁷ Consumption was also associated with being younger, being overweight or obese, and with having lower income (<£20,000 per year) compared to those reporting higher income (>£40,000 per year) (OR 1.31, 95% CI: 1.09, 1.58).¹⁷ However, as this evidence precedes the decline in sugar and sugary beverage consumption outlined above, it would be valuable to update this analysis with more recent data.

1.2.3.3 The Childhood Obesity Plan

The UK government have implemented several sugar reduction measures, which may explain at least some of the decline in purchases and consumption of sugar and sugary beverages described above. Many of these sugar reduction measures are linked to the 'Childhood Obesity Plan', which is the UK government's strategy for reducing the prevalence of childhood obesity.²⁷ The first chapter of the plan was published in 2016,²⁷ a second chapter was published in 2018,²⁸ a third chapter was published as part of the 2019 prevention green paper,²⁹ and further chapters are expected. The plan specifies a number of actions that the UK government are taking in attempts to reduce the prevalence of childhood obesity in the UK, which includes the SDIL.²⁷ The design and emerging results from the SDIL are described further in the next section.

Another notable measure included in the plan is the sugar reduction programme, led and run by PHE. It challenged all sectors of the food and drinks industry to voluntarily reduce overall sugar content across a specified range of product categories by at least 20% by 2020.²⁷ The most recent report from PHE presents evidence for the period between 2015 and 2019, some of which was summarised earlier in this section.²⁶ The report shows that progress towards the sugar reduction target has varied across product categories, with greater progress in soft drinks than in other categories that are only included in the voluntary sugar reduction programme.²⁶ This correlates with a wider view that though self-regulated measures may be easier to implement,³⁰ they tend to be less effective than those independently regulated.³¹

1.2.4 Summary and unanswered questions

It is well established that sugar consumption, particularly via beverages, contributes to poor health. Though purchases and consumption of sugar and sugary beverages have fallen in recent years – possibly in part, because of government-led sugar reduction measures – all age groups still consume more sugar than is recommended. Furthermore, as there is evidence of persistent socioeconomic differences in sugary beverage consumption, attempts to reduce consumption should focus on doing so equitably. In other words, it may be better for future interventions affecting sugary beverage consumption to disproportionately discourage consumption among low socioeconomic groups, who currently consume more sugary beverages and thus have potential to receive greater health benefits.

1.3 Sugary beverage taxation

Population health interventions are public health interventions that aim to impact on NCD outcomes by modifying social determinants of health at a population-level.³² They draw on Geoffrey Rose's population approach to prevention,³³ by applying an intervention to the entire population rather than only high-risk groups.³⁰ This section introduces a subset of population health interventions – fiscal interventions – with a focus on SBTs. I provide an overview of the design of existing SBT policies, a rationale for their implementation, and a more detailed description of the SDIL. I also describe evidence of responses to the SDIL, which are conceptualised as adaptations made in a complex adaptive system, in turn highlighting gaps in existing research.

1.3.1 Fiscal population health interventions

Poor health and health inequalities – including those related to high sugar consumption – can be conceptualised as the product of 'market failure'.³⁴ Market failures occur when market forces – in a free market driven by supply and demand³⁵ – lead to a reduction in societal welfare, warranting government intervention.³⁴ The four categories of market failure are: under-provision of public goods or services, imperfect information about goods and services, negative externalities, or concentrated market power.³⁴ Consuming more sugar than is recommended is likely to be a product of several market failures; for example, consumers not fully understanding the health effects of sugar (imperfect information), coupled with companies that produce sugary products being overly influential in the food system (market power). While policymakers can correct market

failures contributing to diet-related ill-health with a combination of four categories of intervention – regulation, spending, information, or taxation³⁴ – taxation has become particularly popular. Taxes to improve diet are distinguishable from others applied to foods and drinks, such as value-added tax on food consumed in UK restaurants, as they are primarily intended to benefit health.³⁶

The three main designs of taxes used for population health interventions are:

- Excise tax: taxes collected directly from manufacturers or distributors; may or may not be passed through to prices paid by retailers and/or consumers;
- Volume-based excise tax: an excise tax in which the tax rate is based solely on the volume of a product; or
- Tiered density volume tax: a volume-based excise tax in which the tax rate varies based on the amount of a particular ingredient (e.g., sugar content, grams/volume) in the taxed product.^{21(p6.3)}

It is also possible to apply a customs or import duty tax (taxing imported products) or a sales taxes (collected from consumers at point of purchase), but these are less common.³⁷

Theoretically, taxes work by ‘internalising’ the negative externalities of a good or service that are currently not accounted for in their retail price, and are instead borne by society or an individual.³⁸ This is known as the ‘Pigouvian principle’.³⁹ The design of a tax may influence who bears the cost of internalising. For excise taxes, the rate of a tax that is transferred from manufacturers to consumer (e.g. by raising the retail price of a product), is referred to as the ‘pass-through rate’.³⁷ Manufacturers can decide how much of the cost they will bear directly by paying the tax, how much they will pass-through to consumers, or whether they can undertake an array of other changes to avoid tax-eligibility (e.g., reformulation). Meanwhile, a sales tax may be more likely to lead to higher retail prices of a product, such that either consumers bear the cost, or utility-maximising, price-sensitive consumers are deterred from purchasing.^{39,40}

Interventions for health are theorised to demand varying degrees of ‘agency’, or personal resource, for them to take effect.³⁰ The higher the degree of agency that an intervention demands, the fewer individuals are able to participate overall, and those with low personal resource are most likely to be excluded.³⁰ Taxes are deemed a ‘low agency’ form of intervention, as they can be applied nationally while demanding little personal effort from an individual for them to take part.³⁰ Furthermore, though taxes may be financially

regressive by charging low income individuals a relatively higher proportion of their income, they may be health progressive by having greater effects among low income individuals experiencing health inequalities.^{36,40} Thus, taxes may be a more attractive form of population health intervention than higher agency alternatives, such as national health information campaigns.

In 2007, the UK Government's Foresight Programme published their seminal report on options for addressing obesity, since referred to as 'The Foresight Obesity Report'.⁴¹ In the report, the impact of fiscal policies were modelled across four scenarios. The report found that taxation on 'obesity-promoting' foods could have medium to low impact on obesity (of the options high, medium, low).⁴¹ Since 2007, successive implementation of fiscal population health interventions worldwide has facilitated substantial evolution in the evidence base, to the extent that there is now consistent and moderately strong evidence that these interventions are effective for improving diet-related health.⁴² For example, Afshin and colleagues' systematic review and meta-analysis of interventional or prospective observational studies – published 10 years after The Foresight Obesity Report – found a 10% price increase (e.g., as a result of a tax) decreased consumption of unhealthful foods by 6% (95% CI: 4%, 8%; n = 15).⁴³

1.3.2 Why tax sugary beverages?

There have been calls to tax products high in salt and fat,⁴⁴ and indeed several such taxes already exist globally.⁴⁵ Nonetheless, most existing taxation policies that aim to improve diet-related health have targeted sugary beverages. In 2017, the WHO recommended SBTs as 'best buy' interventions for addressing NCDs, on the basis that they had a demonstrable and quantified effect, were cost effective, and were feasible.⁴⁶ There are currently 48 health-promoting taxes on sugar or sugary beverages worldwide, mostly at a country-level but some state-, county- or city-wide only.⁴⁵ Others have been implemented and later retracted,⁴⁷ and many others planned but strongly opposed, primarily by industry.⁴⁸

In their review of fiscal policies for health improvement, Thow and colleagues recommend three considerations for policymakers deciding which product a policy should target.⁴⁰ These considerations are used here to summarise the evidence that supports taxation of sugary beverages.

- (i) Which products are associated with poorer health outcomes in epidemiological evidence?⁴⁰

As described earlier in this dissertation, high consumption of sugar and sugary beverages are associated with diet-related ill-health, and is socioeconomically distributed. Thus, reducing their consumption may equitably improve population health. As Thow and colleagues outline, it is more efficient to improve diet-related health by reducing consumption of non-core or discretionary foods, which are products that have no particular nutritional benefit.⁴⁰ Sugary beverages are non-core products that have no nutritional benefit beyond their calories.³⁶

- (ii) To what extent does the consumption of this product impose negative externalities that could be affected by fiscal policy?⁴⁰

Evidence suggests that SBTs can be effective at increasing product price, theoretically internalising negative externalities of sugary beverages. Afshin and colleagues 2017 review found each 10% price increase on SSBs reduces their intake by 7% (95% CI: 3%, 10%), which is a greater reduction than for some other products.⁴³ Thow and colleagues indicate that this is because sugary beverages are more ‘price elastic’ – have price-sensitive consumers – than other discretionary products.⁴⁰ It has also been demonstrated that SBTs have potential to equitably improve health outcomes. Specifically for the UK, a modelling study published in 2013 found that a 20% tax on sugary beverages could reduce the number of obese adults by 1.3% (95% CI: 0.8%, 1.7%) or 180,000 people (95% CI: 110,000, 247,000), and the number of overweight adults by 0.9% (95% CI: 0.6%, 1.1%) or 285,000 (95% CI: 201,000, 364,000) people.⁴⁹ These analyses also anticipated the effects of a tax to distribute equitably, possibly because of the low agency demanded by a tax. Authors found reductions in prevalence of obesity for income thirds 1 (lowest income), 2, and 3 (highest income) were 1.3% (95% CI: 0.3%, 2.0%), 0.9% (95% CI: 0.1%, 1.6%), and 2.1% (95% CI: 1.3%, 2.9%).⁴⁹ Though there is very little existing evidence that has explicitly evaluated the socioeconomic impacts of SBTs implemented to date,⁴² this study demonstrated that an SBT in the UK had potential to address overall- and socioeconomic-specific effects of sugar consumption.

In reality, whether an SBT influences sugar consumption is complicated by there being many possible mechanisms through which a tax can take effect.⁵⁰ One particular pathway to note here is that sugary beverages may have cross-price elasticity with other products, possibly contributing to substitution and complementarity effects that could curtail the ability of a tax to improve health.⁵¹ It is theorised that following the introduction of an SBT, consumers will substitute beverages that are healthier and freely available (e.g., water).³⁶ However, a modelling study that was applied to Kantar Worldpanel data from

31,919 households between January 2012 and December 2013 found that an increase in the price of high-sugar beverages led to an increase in the purchase of an alcoholic beverage (lager).⁵² Using evidence emerging from policy evaluations to understand unintended negative consequences of SBTs, or ‘spillover’ effects,⁵³ and ways that the design of a tax could be enhanced to avoid them, will be important for ensuring future SBT policies improve overall health.

(iii) Is the product likely to be most feasible to tax?⁴⁰

Taxing sugary beverages is more administratively feasible than for other discretionary foods and drinks.⁴⁰ Sugary beverages are more bounded and definable within existing legislative frameworks than many other discretionary product categories,⁵⁴ such as confectionary.

In addition to Thow and colleagues’ considerations,⁴⁰ ethical concerns surrounding SBTs have been described elsewhere.^{55–57} Common counter-arguments to SBTs is that they infringe personal liberties,⁵⁸ often referred to as ‘nanny stateism’.⁵⁹ However, a comprehensive assessment of SBTs found no strong grounds for concerns regarding negative liberty, freedom, and autonomy,⁵⁷ and indeed they may be preferable to alternative interventions by these measures.⁵⁶ Elsewhere, SBTs have been described as possibly increasing choice, as they do not eliminate the option of buying sugary beverages, but instead might encourage manufacturers to expand their range of low- or no-sugar products.⁵⁵ There may be a particularly strong ethical rationale for implementing an excise tax on sugary beverages: not only are they progressive in health outcomes, but taxing manufacturers instead of individuals means excise taxes are less likely to stigmatise overweight individuals.⁵⁵

1.3.3 The UK Soft Drinks Industry Levy

In addition to SACN’s 2015 report on carbohydrates and health,¹¹ PHE and the House of Commons Health Select Committee expressed support for implementing an SBT in the UK.^{24,60} In the budget speech of March 2016, the UK Government’s Chancellor of the Exchequer announced that an SBT would be introduced.⁶¹ The SDIL formed a landmark policy in the Childhood Obesity Plan.²⁷ Two years later, in April 2018, the SDIL was implemented. The SDIL is a form of excise tax, and is a tiered sugar density tax on soft drinks manufacturers and importers: £0.18/Litre (L) is applied to beverages containing

$\geq 5\text{g}/100$ millilitre (mL) and $< 8\text{g}/100\text{mL}$ of added sugar, and £0.24/L for beverages with $\geq 8\text{g}/100\text{mL}$ of added sugar.⁶² No charge is levied for beverages containing $< 5\text{g}/100\text{mL}$ of added sugar. Some beverages are exempt from the SDIL regardless of sugar content: 100% fruit juices, beverages containing $> 75\%$ milk, beverages containing $> 1.2\%$ alcohol, beverages sold as alcohol replacements, beverages sold as powders, and beverages sold by ‘small’ manufacturers (selling < 1 million litres/year of beverages not exempt for other reasons).⁶³ The SDIL was introduced with the explicit aim of encouraging reduced portion sizes and reformulation of high sugar drinks to lower sugar alternatives.⁶² At the outset, revenue from the SDIL was intended to pay for sports facilities and equipment in schools, and fund healthy school breakfast clubs.⁶⁴

1.3.4 Sugary beverage taxes as interventions in complex adaptive systems

It is difficult to unravel the contexts and mechanisms of action that lead to an SBT improving health outcomes.^{21,50} For example, some studies have found that despite relatively acute price changes, the impact of SBTs on purchases accumulate over time,⁶⁵ which may suggest price increases are not the sole mechanism of action. Furthermore, the long lags between tax implementation and emerging health effects, and the involvement of multiple other stakeholders and factors that contribute to sugary beverage consumption, means it can be difficult to attribute any observed changes to an SBT.²¹ Such difficulties enable opponents to conclude SBTs are not a ‘silver bullet’ and ‘do not work’,⁶⁶ even though this likely belies the true sequence of events and effects.

1.3.4.1 Complex adaptive systems

Conceptualising population health interventions – and the societal problems they seek to address – to exist in ‘complex adaptive systems’ is increasingly popular. Indeed, the NIHR-funded evaluation of the SDIL is explicitly grounded in this conceptualisation.⁶⁷ Doing so recognises that methods traditionally employed by public health researchers have failed to provide adequate explanations or solutions to these complex, multifaceted problems.⁶⁸ Using a complex adaptive system approach – also referred to a ‘systems thinking’, ‘systems approaches’, and ‘systems perspectives’ – emphasises the role of relationships between actors contributing to a variety of processes operating at different levels and scale, that eventually produce macro-level patterns.³² Furthermore, these approaches appreciate the need to comprehend these dynamic interrelationships, to understand and address wider societal patterns. Complex adaptive systems are

characterised by specific features, such as feedback and adaptation, which are summarised in Table 1.³²

Complex adaptive systems are also a helpful perspective for understanding population health interventions like SBTs. Though the term ‘complex intervention’ has been popularised (Table 1), discourse is shifting away from dichotomising interventions into those that are ‘simple’ and those that are ‘complex’.⁶⁹ Instead, there are understood to be simple or complex explanations of interventions.^{69,70} Systems approaches appreciate complexity by conceiving interventions to act as stimuli, sending reverberations across the system in which they reside.⁷¹

Table 1 Glossary of complex adaptive systems terms, adapted from McGill et al. (2021, page 2)

Term	Description
Adaptation	Adjustments in system behaviour in response to interventions.
Agents	Individuals, households, institutions, or other entities.
Boundaries	Defining what to include/exclude in the system we are interested in studying.
Complex intervention	Intervention described as complex based on: “Number of interacting components within the experimental and control interventions; number and difficulty of behaviours required by those delivering or receiving the intervention; number of groups or organisational levels targeted by the intervention; number and variability of outcomes; degree of flexibility or tailoring of the intervention permitted.” ^{72(p2)}
Emergence	Properties of a complex system that cannot be directly predicted from the elements within it and are more than just the sum of its parts.
Feedback loop	A positive or negative response that may alter the intervention and its impacts. Feedback loops describe a situation in which a change reinforces (amplifies) or balances (inhibits) further change.
Non-linear relationships	Relationships within a system that do not follow a simple, constant input-output line. Cause-and-effect relationships within a system are frequently disproportionate (bigger or smaller) to the initial input of an intervention.
System	A set of entities (e.g., people, organisations, resources) and their interconnections. Complex systems involve elements interconnected in such a way that they produce their own pattern of behaviour over time.
Whole system intervention	A complex intervention that explicitly seeks to change several different points in a particular system (e.g., a local obesity strategy that includes school, high street, governmental, and media interventions).

Note: mostly reproduced, but with some terms excluded.

Systems approaches for evaluating a population health intervention attempt to comprehend the functioning of an entire system, rather than isolating the causal effect of a single factor.³² While scientific inquiry has traditionally entailed describing a real-world process using a series of observations and hypotheses,⁷³ this can confuse the resulting evidence base if complexity or context-specific effects were really driving the process under observation.⁶⁸ Such methodological reductionism, or simple explanations,⁶⁹ might condemn associated research and policy implementation to repeated failure, known as ‘policy resistance’,⁷⁴ by providing wrong answers to important research questions.^{68,75} A systems perspective suggests that evaluations should instead focus on understanding the reactions of stakeholders across the system that might elicit outcomes contributing towards improved health. Doing so might yield the added benefit of identifying unintended consequences, such as alcohol consumption identified in a modelling study,⁵² and help find previously unknown leverage points that may be appropriate for further intervention.⁷⁴

Perhaps unsurprisingly, evaluating population health interventions from a complex adaptive systems perspective demands fresh approaches, which expand on ‘evaluation’ as it has been conceived to date.⁷⁰ Such approaches were summarised in McGill and colleagues’ literature review, which aimed to: (i) classify and describe complex systems methods in evaluation applied to public health; and (ii) examine the type of evaluative evidence generated by each method.³² Their analyses produced a typological framework that aligns the types of systems methods identified by the review alongside the five stages of the evaluation process.³² The framework differentiates between (i) studies that theorise and illustrate a system’s boundaries and inter-related parts (‘system mapping’); (ii) studies that focus on relationships between individuals or organisations relevant to a system (‘network analysis’); (iii) computational models that stimulate changes within a complex system over time (‘system modelling’); and (iv) approaches that have emerged from the systems thinking tradition or attempts to apply systems theories and concepts to other evaluation methods (‘system framing’).³²

1.3.4.2 The complex adaptive system surrounding the SDIL

The SDIL represents a potentially major perturbation in complex and interlinked social, health, and economic systems, which is likely to trigger multiple reactions by stakeholders, potentially resulting in important impacts on diet and health.⁶⁸ The NIHR-funded evaluation of the SDIL, which is grounded in a complex adaptive systems perspective,⁶⁷ has used approaches outlined in McGill and colleagues’ typology.³²

Namely, concept mapping and a modified Delphi survey were first used to develop a systems map that underpins the evaluation (T. Penney et al., unpublished data, 2021).^{67,76} It depicts the complex and interlinked social, health and economic systems and stakeholders likely to experience reverberations from the SDIL (Figure 1) (T. Penney et al., unpublished data, 2021).^{67,76} The map has informed the collection of qualitative and quantitative evidence from a range of sources, which will contribute towards a synthesis at the end of the evaluation to determine whether the policy improved health overall.⁶⁷ The evaluation endeavours to achieve a whole-system understanding of the SDIL through research that is divided into five work packages (WP):

- WP1: impact on diversification, formulation, marketing, prices, purchases and consumption of SSBs, and early health impacts;
- WP2: impacts on medium to long term health outcomes;
- WP3: economic impacts on food and other industries, HM treasury, health and social care;
- WP4: impacts on key stakeholders: the public, politicians and professionals; and
- WP5: integration, synthesis and dissemination of findings from WPs 1-4.⁶⁷

1.3.5 Responses to the UK Soft Drinks Industry Levy

Evidence is emerging from research undertaken in these evaluation WPs,⁶⁷ as well as research undertaken elsewhere, to illustrate the effects of the SDIL across the complex adaptive system in which it resides. I am aware of 17 empirical studies published since the SDIL announcement that have explicitly explored repercussions of the SDIL in the context of health. These are in addition to PHE's progress report on the sugar reduction programme, which includes key information about the SDIL.²⁶ The 18 publications are summarised in Table 2.

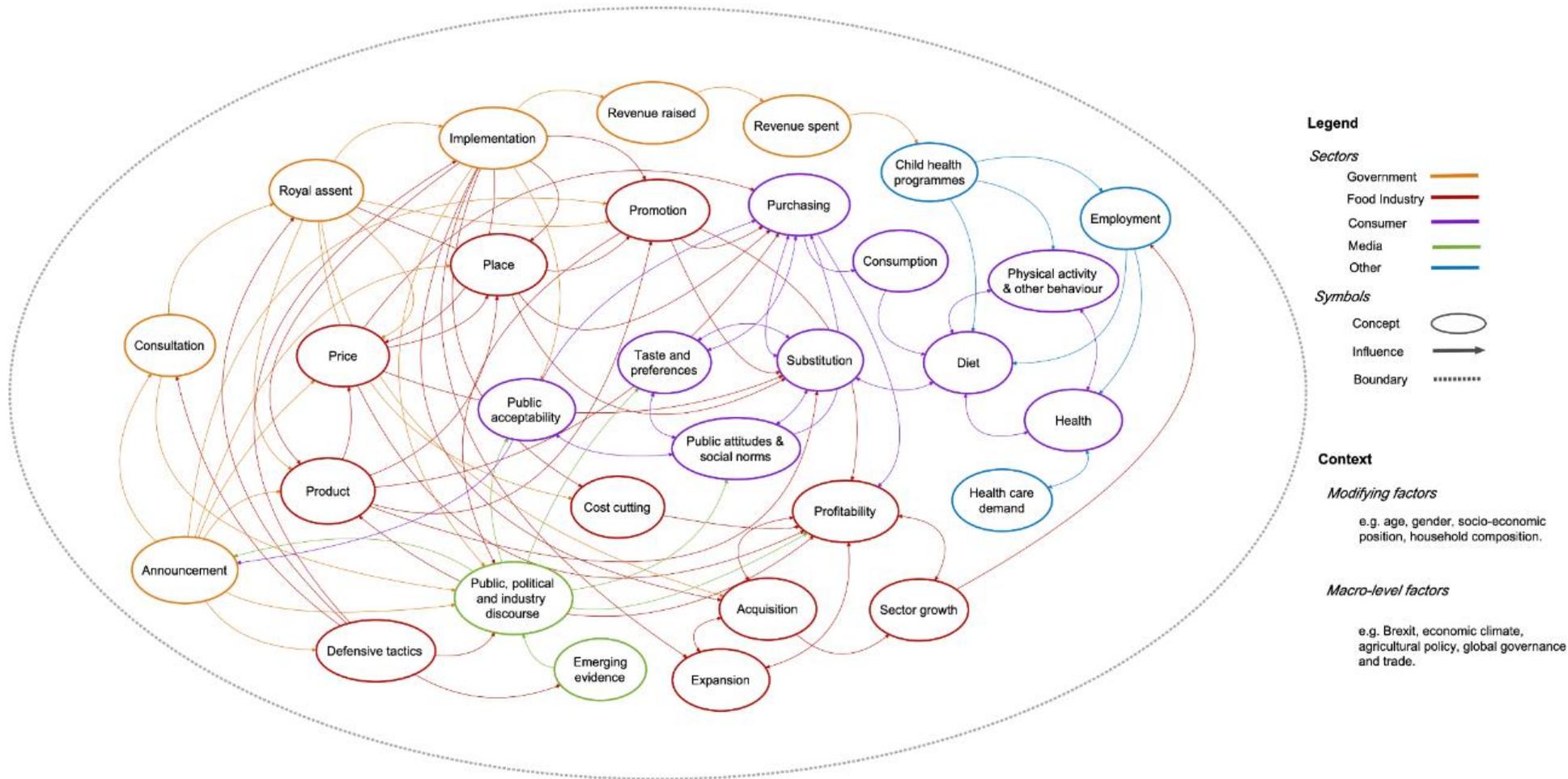


Figure 1 Systems map depicting the complex system surrounding the SDIL, taken from Penney et al. (unpublished data)

Table 2 Summary of published evidence relating to the UK Soft Drinks Industry Levy systems map

Authors (year)	Related area of systems map	Study details
Bridge et al. (2020) ⁷⁷	Public, political and industry discourse	Method 286 articles about sugar or SSB taxes from six UK newspapers, 1 st April 2016 to 1 st May 2019, thematically analysed. Key findings Discussion of sugar and SSB taxes peaked at announcement and introduction. Themes in support of the SDIL highlighted negative impacts of sugar on health, need for complex actions to reduce sugar consumption. Themes opposing the SDIL emphasised individual responsibility for health, unfairness of taxation for organisations and the public
Bridge et al. (2021) ⁷⁸	Public, political and industry discourse	Method Social network analysis of Twitter users using hashtag ‘SugarTax’, 5 th August 2017 to 7 th May 2019. Content, sentiment and thematic analysis. Key findings 5,366 tweets; network included 1,883 users, with 686 unique edges and 4,679 edges with duplicates. Majority of tweets were negative in sentiment, when assessed by both automatic (64%, n = 141) and manual sentiment analysis (52%, n = 115) methods. Nine key themes were identified and grouped into two groups according to ‘support for a sugar or SSB tax’ or ‘opposition for a sugar or SSB tax’.
Buckton et al. (2018) ⁷⁹	Public, political and industry discourse Public acceptability	Method Quantitative content analysis of 684 articles discussing sugar and SSB consumption published in 11 national newspapers from April 2015 to November 2016. Key findings Coverage peaked with evidence publication, campaigner activities and policy events. More articles supported (23.5%) than opposed (14.2%) SSB taxation. More oppositional articles than supportive ones in the month of SDIL announcement. Sugar and SSB consumption presented as health risks, actions of industry identified as cause of health problem. Responsibility for addressing problem assigned to government.
Buckton et al. (2019) ⁸⁰	Public, political and industry discourse	Method Media content analysis used to build a dataset of newspaper articles, May 2015 to November 2016. Discourse network analysis to visualise networks of stakeholders and coalitions. Key findings Identified 3,883 statements by 214 individuals from 176 organisations, 47 concepts. Network of stakeholders with clear sceptical and supportive coalitions. Industry stakeholders less united in the network, particularly before the SDIL announcement. Some key industry actors appeared in the supportive coalition. Jamie Oliver was a dominant stakeholder embedded with public health advocates.

Authors (year)	Related area of systems map	Study details
Hilton et al. (2019) ⁸¹	Public, political and industry discourse	<p>Method Content analysis of newspaper articles discussing SSB taxes published in 11 UK newspapers, 1st April 2015 to 30th November 2016, found using Nexis database. Inductive thematic analysis and comparison with typology of industry arguments.</p> <p>Key findings 491 newspaper articles cited stakeholders' (n = 287) arguments in relation to SSB taxation (n = 1,761: 65% supportive and 35% opposing). Stakeholders' positions reflected vested interests. Inconsistencies arose from: changes in ideological position; insufficient clarity on nature of problem to be solved; policy priorities; consistency with academic rigour.</p>
Hilton et al. (2020) ⁸²	Public, political and industry discourse	<p>Method Discourse analysis combined with network visualization, 11 national UK newspapers. For the minimum unit pricing (MUP) debate 1,924 statements by 152 people from 87 organizations were coded from 348 articles. For the SDIL debate 3,883 statements by 214 people from 175 organizations were coded from 511 articles. Network analysis and network measures of size, connectedness and cohesion.</p> <p>Key findings Networks for both MUP and SDIL involve similar policy discourse coalitions. SDIL network is larger than the MUP network, particularly the proponents' cluster, with more than three times as many stakeholders. Both networks have tight clusters of manufacturers, think-tanks and commercial analysts in the opponents' coalition. Public health stakeholders in both networks, no health charity or advocacy group is common to both.</p>
Law et al. (2020) ⁸³	Public, political and industry discourse	<p>Method 'Event study' methodology using stock returns of four UK-operating soft-drink companies listed on the London Stock Exchange.</p> <p>Key findings 3 of the 4 firms experienced negative abnormal stock returns on the day of announcement. Cross-sectional analysis revealed that the cumulative abnormal returns of soft drinks stocks were not significantly less than that of other food and drinks-related stocks beyond the day of the SDIL announcement. Limited evidence of negative stock market reaction to the release of draft legislation on 5th December 2016, and confirmation of tax rates on 8th March 2017.</p>
Gillison et al. (2020) ⁸⁴	Public attitudes and social norms	<p>Method Cross-sectional online survey with UK parents of children aged 5 to 11 years (n = 237). Regression analyses to test associations between psychosocial responses to the levy and behavioural intentions to change consumption and purchasing.</p> <p>Key findings 92% of respondents aware of the SDIL; 57% supported its aims; 29% felt it threatened their freedom of choice; 41% intended to change shopping habits or restrict child's intake as a result; reactance and motivation were poorer in low-income families, and intentions to change were positively predicted by motivation.</p>

Authors (year)	Related area of systems map	Study details
Pell et al. (2019) ⁸⁵	Public acceptability	<p>Method Logistic regression models were fitted to the 2017 cross-section of UK participants aged 18 to 64 years in International Food Policy Study (n = 3,104).</p> <p>Key findings Most participants supported the SDIL (70%), believed it would be effective (71%), had a positive attitude to SSBs (62%), had knowledge of the link between SSBs and obesity (90%), and trusted messages from health experts (61%), but not those from the food and beverage industry (73%). 46% had negative social norms about drinking SSBs.</p>
Chu et al. (2020) ⁸⁶	Product; purchasing	<p>Method Beverages retrieved using online shopping tool, my Supermarket, for nine UK supermarkets and manufacturers. Comparisons of sugar content for pre-/post-implementation of the SDIL.</p> <p>Key findings 131 fruit juice and juice drinks included. Mean sugar content of all beverages was 6.3g ± 4.5/100mL. Variation in sugar content from 0.1g/100mL to 15.2g/100mL; smoothies contained the most sugar (11.55 ± 1.62g/mL). After SDIL: only seven juice drinks were levy eligible. Four of these had reformulated resulting in <5g/100mL sugar.</p>
Hashem et al. (2019) ⁸⁷	Product	<p>Method Obtained data from product packaging and nutrition information panels of carbonated sugar-sweetened soft in nine supermarkets in May 2014 and April 2018. Used paired t-test to assess differences in sugar and energy content of the products between 2014 and 2018.</p> <p>Key findings Data from 166 products in 2014 and 464 products in 2018, of which 83 products were the same in both years. Large variations in stated sugar content were found between the different carbonated SSBs in both 2014 and 2018 for all products and for the 83 products. Mean sugar content of 83 products decreased by 42%, from 9.1g/100mL (standard deviation, SD: 3.3g) to 5.3g/100mL (SD: 3.5g; p < 0.001). Mean energy content decreased by 40%, from 38 kilocalories (kcal)/100mL (SD: 13g) to 23kcal/100mL (SD: 15g; p < 0.001).</p>
Law et al. (2020) ⁸⁸	Purchasing; profitability	<p>Method Interrupted time series analysis using monthly time series data on UK manufacturers' domestic turnover, April 2010 to March 2019, from Office for National Statistics.</p> <p>Key findings Evidence of a short-term negative impact of the SDIL announcement on the domestic turnover of the UK soft drinks manufacturers. Effect did not continue post-implementation.</p>

Authors (year)	Related area of systems map	Study details
Bandy et al. (2020) ⁸⁹	Product; purchasing; acquisition	<p>Method Annual cross-sectional study using nutrient composition data of 7,377 products collected online, paired with volume sales data for 195 brands offered by 57 companies.</p> <p>Key findings Between 2015 and 2018: -30% in volume of sugars sold/capita/day from soft drinks, equivalent to -4.6g/capita/day; fall in sales-weighted mean sugar content of drinks: 4.4g/100mL to 2.9g/100mL; -50% in total volume sales of drinks containing >5g/100mL of sugar; +40% in total volume sales of drinks containing <5g/100mL of sugar</p>
Pell et al. (2020) ⁹⁰	Purchasing	<p>Method Controlled interrupted time series analyses using Kantar Worldpanel data that includes linked nutritional data on purchases. Separate analyses for higher, lower, and no-levy tier drink controlling with purchase volumes of toiletries.</p> <p>Key findings At 2 years post announcement: no difference in volume of or sugar from purchases of higher-levy-tier drinks compared to the counterfactual of no announcement; -96.1mL (95% CI: -144.2mL, -48.0mL) reduction in volume and -6.4g (95% CI: -9.8mL, -3.1mL) reduction in sugar purchased in these drinks per household per week. Changes led to a 6.1 g (95% CI: 3.9g, 8.2g) increase in sugar purchased in these drinks per household per week. No evidence that volume of or amount of sugar in purchases of all drinks differed from counterfactual.</p>
Pell et al. (2021) ⁶³	Purchasing; reformulation	<p>Method Controlled interrupted time series analysis using Kantar Worldpanel data (see previous). Average weekly number of participants n = 22,183; March 2014 to March 2019.</p> <p>Key findings In March 2019, compared with counterfactual estimated from pre-announcement, purchased volume of drinks in high levy tier decreased by 155mL/household/week (95% CI: 240.5mL, 69.5mL), equivalent to -44.3% (95% CI: 59.9%, 28.7%), and sugar purchased in these drinks fell 18.0g (95% CI: 32.3g, 3.6g), or 45.9% (95% CI: 68.8% , 22.9%). Purchases of low tier drinks reduced by 177.3mL/household/week (95% CI: 225.3mL, 129.3mL), or 85.9% (95% CI: 95.1%, 76.7%), with a 12.5g (95% CI: 15.4g, 9.5g) fall in sugar in these drinks, equivalent to 86.2% (95% CI: 94.2%, 78.1%). No overall change in volume of no levy drinks purchased, there was an increase in sugar purchased of 15.3 g/household/week (95% CI: 12.6g, 17.9g), equivalent to 166.4% (95% CI: 94.2%, 238.5%). For all soft drinks combined, volume of drinks purchased did not change, but sugar fell by 29.5g (95% CI: 55.8g, 3.1g), or 9.8% (95% CI: 17.9%, 1.8%).</p>

Authors (year)	Related area of systems map	Study details
Public Health England (2020) ²⁶	Product; purchasing	<p>Method Range of analyses using Kantar Worldpanel data.</p> <p>Key findings Between 2015 and 2019, for retailers and manufacturer branded products: -43.7% in total sugar content per 100mL; overall sales (in litres) of drinks subject to SDIL +14.9%, but total sugar sales from drinks -35.4%; total sugar purchased/household from drinks subject to SDIL decreased across all socio-economic groups; reduction largest (38.5%) in households where main wage earner is in skilled manual occupation; number of calories likely to be consumed on a single occasion fell by 35.2% between 2015 and 2019. In eating out of home sector: -38.5% in simple average total sugar content for drinks subject to the SDIL; -37.7% in calories for drinks likely to be consumed on a single occasion</p>
Scarborough et al. (2020) ⁹¹	Price; product	<p>Method Controlled interrupted time series analyses using 209,637 observations of soft drinks over 85 time points between September 2015 and February 2019, collected from websites of leading supermarkets in the UK.</p> <p>Key findings Proportion of drinks with sugar >5g/100mL fell from expected level (49%) to 15%. Little change in the product size or the number of products available to consumers. Price of high sugar drinks increased post-implementation, but only by £0.075/L (95% CI: £0.037, £0.115, p< 0.001)—a 31% pass through rate</p>
Seferidi et al. (2018) ⁹²	Implementation	<p>Method Modelled a baseline SDIL scenario; SDIL under ‘soft’ Brexit (withdrawal of the UK from the European Union); and SDIL under ‘hard’ Brexit. Used IMPACT Food Policy model and probabilistic sensitivity analysis to estimate effect of each scenario on CHD deaths in 2021.</p> <p>Key findings SDIL associated with approximately 370 (95% CI: 220, 560) fewer CHD deaths and 4,490 (95% CI: 2,690, 6,710) life-years gained in 2021. Associated reductions in CHD mortality were 4 and 8% greater under ‘soft’ and ‘hard’ Brexit scenarios, respectively. SDIL associated with approximately 110 (95% CI: 50, 190) fewer CHD deaths in the most deprived quintile compared with 60 (95% CI: 20, 100) in the most affluent, under ‘hard’ Brexit.</p>

Notes: SD = standard deviation; CI = confidence interval; CHD = coronary heart disease; kcal = kilocalorie; L = litres; mL = millilitres.

Comparing the publications in Table 2 to the systems map in Figure 1 shows that existing evidence has primarily focused on beverages themselves (acquisition; product; price; purchasing) and discourse surrounding the policy (public acceptability; public attitudes and social norms; and public, political and industry discourse). The studies show that at least some of the reverberations across the system initiated by the SDIL have led to lower purchases of sugar from beverages (e.g.,⁶³). Regarding beverages, studies have shown that the sugar content of soft drinks has reduced,^{89,91} most likely because of reformulation or acquisition of lower sugar products. For example, the most recently published study found that one year after the SDIL was implemented, the volume of soft drinks purchased did not change, but the amount of sugar in those beverages was 30g, or 10%, lower per household per week, compared with trends before the SDIL was announced.⁶³ Such changes are likely to have contributed to trends in purchases of sugary beverages reported earlier in this chapter. Purchases of sugary beverages are also likely to be deterred by the price of sugary beverages having increased (though at a rate lower than the value of the tax).⁹¹ Regarding discourse, evidence highlights the role of signalling about the health benefits of the tax, which may have encouraged its acceptability, both by the public and politically.⁸⁵

Together, this evidence illustrates a range of repercussions of the SDIL among related stakeholders, with more expected to be published by other WPs of the NIHR-funded evaluation.⁶⁷ Many repercussions that were hypothesised – and for some, now evidenced – to occur depend on the adaptations made by soft drinks companies. Indeed, features of the SDIL mean the influence of the policy on consumers necessarily depends on decisions made by the companies being taxed: (i) the tax is applied to manufacturers (not consumers), (ii) there was a two-year lag period between announcement and implementation to allow manufacturers to make adjustments, and (iii) the tax is tiered (to incentivise reformulation to lower tiers).⁶³

In addition to elucidating areas now supported by evidence, comparing the publications in Table 2 to the systems map in Figure 1 highlights gaps in the research published to date. These gaps relate to other possible responses by soft drinks companies, for example, changes to ‘promotion’. It is also not currently clear how individual soft drinks companies decide which adaptations to make.

1.3.6 Summary and unanswered questions

The SDIL was implemented in response to evidence that shows SBTs can effectively and equitably reduce sugary beverage consumption. Understanding that SBTs like the SDIL exist in complex adaptive systems is useful for hypothesising the ways that a policy may lead to beneficial health outcomes, helping to avoid inaccurately concluding that a policy did not work. Doing so for the SDIL highlighted the gaps in existing evidence of adaptations that soft drinks companies may make to the policy.

1.4 Marketing and sugary beverage taxes

The next section introduces the commercial food industry activities that are collectively known as ‘marketing’. Marketing is used to pursue corporate interests, but evidence suggests it also contributes to diet-related ill-health. Marketing is presented as a lens through which soft drinks companies’ adaptations to SBTs may be understood.

1.4.1 The commercial food industry

Since Marmot’s formative work, there has been greater emphasis on identifying and addressing underlying social causes of population ill-health.^{93,94} A large portion of social causes are influenced by commercial interests, now commonly called ‘commercial determinants of health’.⁹⁴ Though first used by West and Marteau,⁹⁵ the term has since been applied to the study of corporate process contributing to NCDs.^{96,97} Mialon’s recent review revised the term to explicitly encompass three specific areas of corporate activity: (i) unhealthy commodities contributing to ill-health; (ii) business, market and political activities used to sell commodities; (iii) global drivers facilitating such practices e.g., globalisation.⁹⁷

Commercial determinants that are relevant to diet-related ill-health primarily concern ‘Big Food’ companies.^{98,99} Except where specifically defined otherwise, I will apply the definition used by Mialon for the term ‘corporation’, to mean ‘company’ throughout this dissertation: “the individuals and organisations involved in the production, distribution and marketing of commodities: manufacturers, wholesalers, retailers, distributors, service providers, and producers of raw material, as well as organisations acting on their behalf, such as trade associations, public relations firms, philanthropic organisations, and research institutions”.^{97(p2)} Big Food refers to multinational food and beverage companies (MNC) with significant, concentrated market power,⁹⁸ and has been identified to have

driven the global upsurge in the consumption of ultra-processed foods, including sugary beverages.^{98,100}

Several soft drinks companies are classified as Big Food companies, in part because they have consistently held substantial market power. Analyses of Euromonitor data in 2011 found that the top ten soft drinks companies accounted for 52.3% of sales worldwide, and Coca-Cola led with 25.9%.¹⁰¹ In the UK in 2018, analyses of Euromonitor data also showed that eight companies held 72.2% of the market share for carbonated drinks (in litre volume sales), with Coca-Cola Enterprises Ltd and Britvic Soft Drinks Ltd holding 40.5% and 20.3%, respectively.⁸⁸

1.4.1.1 Commercial food system

Companies involved in the agriculture, processing, sales and marketing of food are part of the ‘commercial food system’.⁷¹ The commercial food system shares properties of complex adaptive systems and is dominated by Big Food companies.⁷¹ As most of the commercial food system’s outputs are heavily processed, and disproportionately target the poorest populations, it currently contributes to a ‘double-burden’ of malnutrition.^{71,102} In general, though with some exemptions,⁷¹ the primary goal of the commercial food system is to attain corporate objectives, such as maximising profits and shareholder returns.⁷¹ Whether actions taken to pursue these objectives promote public health is usually a coincidence, rather than a concern of commercial actors.⁹⁶ When an external stimulus like an SBT is exerted in a commercial food system, related stakeholders will make adaptations to maintain an equilibrium point that existed prior to the stimulus at which their corporate objectives were attained (e.g., profit maximising).⁷¹ As described earlier, such adaptations were explicitly theorised to occur in the complex adaptive system surrounding the SDIL (T. Penney et al., unpublished data, 2021).^{67,76}

Commercial strategies to pursue corporate objectives have been described as either ‘market’ or ‘non-market’,^{103,104} though this distinction is increasingly blurred as many commercial activities fulfil both market and non-market objectives.^{103,105} Non-market strategies leverage political and social circumstances in order to create value range and improve the perception of the company.¹⁰³ They range from lobbying for policies that are commercially favourable (regardless of their influence on public health),¹⁰⁶ to framing solutions to NCDs in ways that obscure the food and drink industry’s contribution to the problem.⁸⁰ Evidence suggests that soft drinks companies have used such strategies.^{107–110} Market strategies are defined as patterns of activity in the market environment in order to

improve corporate performance.^{104,105} ‘Marketing’ encompasses many of the activities that constitute market strategies, though occasionally overlapping with non-market strategies too.

1.4.2 Marketing terminology

Market activities that concern products, their price, promotion and placement are collectively called ‘marketing’ (the ‘4Ps’, or the marketing mix).^{111,112} No single definition or theory of marketing exists, but definitions share key features; primarily that marketing is a multi-actor, multi-component and coordinated process used to pursue the sales of goods and services. In doing so marketing embodies the Aristotelian principle of “achieving a whole greater than the sum of its parts”.¹¹³ Relevant definitions of marketing-related terms are summarised in Table 3.

Table 3 Definitions for marketing related terms

Term	Definition
Advertising	“The exercise of promoting a company and its products or services through paid channels”. ¹¹⁴
Brand	“A brand is a name, term, design, symbol, or any other feature that identifies one seller’s goods or service as distinct from those of other sellers”. ¹¹⁵
Brand equity	“Everything that exists in the minds of the customer with respect to a brand (e.g., thoughts, feelings, experiences, images, perceptions, beliefs, and attitudes).” ¹¹⁶
Integrated marketing communications	“A strategic business process used to plan, develop, execute and evaluate coordinated, measurable, persuasive brand communication programmes over time with consumers, customers, prospects, and other targeted, relevant external and internal audiences.” ^{117,118}
Marketer	Individuals responsible for marketing.
Marketing	“The activity, set of institutions and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners, and society at large.” ¹¹⁵
Marketing mix or 4Ps	Product, price, promotion, and place. ¹¹²
Marketing strategy	“An over-riding directional concept that sets out the planned path”. ¹¹⁹ “Lays out target markets and the value proposition that will be offered based on an analysis of the best market opportunities.” ¹²⁰

1.4.3 Marketing of sugary beverages

There is strong and consistent public health evidence to show that food and beverage marketing influences food preferences, purchases and consumption.¹²¹ Most public health research, and subsequent policy, has focused on children, who may be less able to discern the persuasive intent of marketing.¹²² Furthermore, marketing is increasingly viewed as a

child's rights concern¹²³: the Convention on the Rights of the Child requires policymakers to protect children from the negative impacts of food marketing.¹²⁴ The 2003 Hastings review, conducted on behalf of the Food Standards Agency, was the first to systematically document the extent and nature of food marketing to children.¹²⁵ The review was updated in 2006 and 2009 on behalf of the WHO,^{126,127} to reflect emerging evidence. In Chapter 2 I conduct a more in-depth exploration of existing literature reviews of food marketing. For brevity, here I focus on evidence concerning sugary beverage marketing.

There is evidence that the marketing of sugary beverages uses activities across the marketing mix. Houghtaling and colleagues used a marketing mix and choice-architecture framework to review SSB marketing activities in the USA. They identified evidence relating to profile (e.g., beverage availability; n = 13), pricing (e.g., price discounts; n = 13), or promotion (e.g., advertisements; n = 13) activities.¹²⁸ Authors also found some evidence of marketing that targeted at-risk consumers, and higher SSB prominence in supermarkets.¹²⁸ Though this evidence was not drawn from a UK setting, similar activities in the UK should be expected as most leading soft drinks companies are MNCs that operate in both countries (e.g., Coca-Cola).

The scale of global sugary beverage consumption has been attributed to successful marketing.¹²⁹ In 2015, PHE published their review of behaviour changes resulting from marketing of sugary foods and non-alcoholic beverages, also grounded in the marketing mix framework.¹³⁰ The review included 45 primary studies conducted in a range of settings (five studies in England). Much of the evidence was from children and young people, and was not beverage-specific (e.g., sugary snacks).¹³⁰ Results specific to sugary beverages included an observational study in England, which used objective sales data to find place – in the form of end of aisle displays, after controlling for other marketing features – increases sales volumes of carbonated drinks by over 50% (p<0.001).^{130,131} For product, a lower quality observational study in the USA found that self-reported sugary beverage consumption decreased when larger size options were restricted, but increased when smaller sizes were offered in bundles.^{130,132} For promotion, a study conducted in Australia found exposure to 100 incremental TV adverts for sugary beverages during 2002 to 2004 was associated with a 9.4% increase in 3rd and 5th grade children's soft drinks consumption in 2004.^{130,133} Scully and colleagues' study found self-reported exposure to print, transport and school food marketing was associated with consumption of sugary snacks in adolescents (including, but not specific to, sugary beverages).^{121,130} Though PHE's review only found lower quality evidence for price,^{130,134} a recently

published study that used USA household consumer panel data (n = 11,299 households), found that more frequent and deeper price promotions were associated with higher annual per capita SSB purchases.¹³⁵

1.4.3.1 Mechanisms of effect

It has been difficult for existing research to conclusively demonstrate a relationship between marketing and sugary beverage consumption.¹³⁶ As illustrated in the studies reported above, research has been highly heterogeneous, exploring different features of marketing in various contexts and populations (though mostly children). However, using the Bradford-Hill criteria,^{137,138} the scale of soft drinks industry marketing may posit that there's a causal relationship. For example, Woods et al. reported that in 2019, the advertising budget of the Coca-Cola Company (USD \$4.25b billion) was approximately equivalent to the entire 2018-2019 programme budget for the WHO.¹⁰⁵ As advertising is only one feature of marketing, the total financial resource that soft drinks companies direct to marketing across the marketing mix is likely to be vast.

How marketing takes effect has also been extensively theorised. The WHO understands marketing to take effect through a combination of exposure (e.g., reach, frequency and impact) and power (e.g., content, design and execution),¹²² which summarises a more complicated process. For example, hierarchy of effect models illustrate that marketing may impact individuals sequentially, according to levels that operate both directly (e.g., by influencing brand awareness) and indirectly (e.g., by brand attitudes).¹³⁹ Marketing is also theorised to influence sociocultural values, affecting social norms, cultural values, customary practices and habits that are deemed socially 'normal'.¹⁴⁰ These examples illustrate that marketing is likely to affect an individual at both a conscious and sub-conscious level, and demonstrate the role that repeated exposure may have to the overall strength of marketing.

The complexity of how marketing takes effect makes objective measurement particularly difficult, though methods for this are continuously evolving.^{141,142} To measure exposure, existing sugary beverage marketing studies have used observational study designs (see examples above). However, these studies may exhibit reverse causation or confounding. Furthermore, use of self-reported exposure relies on recall and recognition, which might only capture a small proportion of total marketing exposure.¹⁴³ It may also be difficult for experimental studies to isolate the effect of marketing, and even when such isolation is achieved, there is a risk it is reductionist as it does not reflect 'real-world marketing'

where companies use coordinated activities across the marketing mix.¹³⁷ Such methodological challenges may be important considerations for any studies attempting to measure the extent and effect of commercial activities.

1.4.3.1 Digital marketing

There have been increasing efforts in the field to document the nature and effects of digital marketing,^{144,145} which is an increasingly used marketing modality.¹⁴⁶ In part, this reflects consumers' media consumption, as Ofcom reports that use of digital media is increasingly prolific. In 2020, 99% of UK adults in most age groups used a mobile phone, and the majority had a social media profile (though the rate decreased with age: 16-24years: 95%, 25-34 years: 93%, 35-44 years: 88%, 45-54 years: 82%, 55-64 years: 58%, 65-74 years: 39%, 75+ years: 21%).¹⁴⁷ Among children, half of children aged 10 years own a smartphone and 43% of 11 year olds have a social media profile.^{147,148} Digital marketing may be highly powerful, and thus impactful, through use of data analytics to target specific consumers, and creative and interactive techniques.^{146,149} Utilising a complex technology ecosystem also means that measuring individuals' exposure is challenging.^{146,150} As a result, digital marketing is inherently harder control^{146,150}

Evidence suggests that food and drink companies are using digital marketing activities across the marketing mix.¹⁴⁶ Novel techniques include the use of social media 'influencers' (individuals with significant influence on social media),¹⁵¹⁻¹⁵³ and 'advergaming' (advertised embedded within games).¹⁵⁴ In addition to evidence presented in reviews published by Houghtaling and PHE, some evidence has emerged to demonstrate the use of digital marketing by soft drinks companies.¹⁵⁵ For example, Facebook, a social media platform, has been used as a way for brands to align themselves with socio-cultural values of young people.¹⁵⁶ There is also anecdotal evidence of companies using social media to conduct highly targeted marketing,¹⁵⁷ and using creative campaigns (e.g., 'Dating apps'¹⁵⁸). However, as this evidence was not generated through peer-reviewed primary studies, the possible influence of such techniques on sugary beverage consumption, and subsequent health effects, are currently unclear.

1.4.4 Health-related marketing policies

Over the last 15 years, there has been a consistent, international drive to reduce HFSS marketing to children (Figure 2).^{122,159-163} In response to these calls, countries around the world have implemented successive policies to restrict marketing of HFSS food and non-alcoholic beverages to children. In the UK, policies exist to restrict at least some aspects

across the marketing mix for HFSS products (Figure 2), with further under consideration.^{148,164–168}

Despite a range of restrictions on HFSS food marketing in the UK, marketing remains disproportionately directed towards less healthy food: in 2019, only 2.9% of food and drink advertising expenditure was on fruit and vegetables.¹⁶⁹ As I have previously described in relation to SBTs, a systems approach suggests this may be because intervening in the commercial food system prompts adaptations by related stakeholders. In the context of regulation, this phenomenon is referred to as the “balloon effect”.^{170,171} The balloon effect hypothesises that applying restrictions to one form of marketing may lead to reactionary increases in others, in order to maintain overall system equilibrium.^{71,103,170} The balloon effect may explain why marketing regulation on traditional media has not been entirely effective to date (e.g. through displacement to digital),¹²³ and why support for simultaneously regulating multiple marketing levers is growing.^{39,71,172}

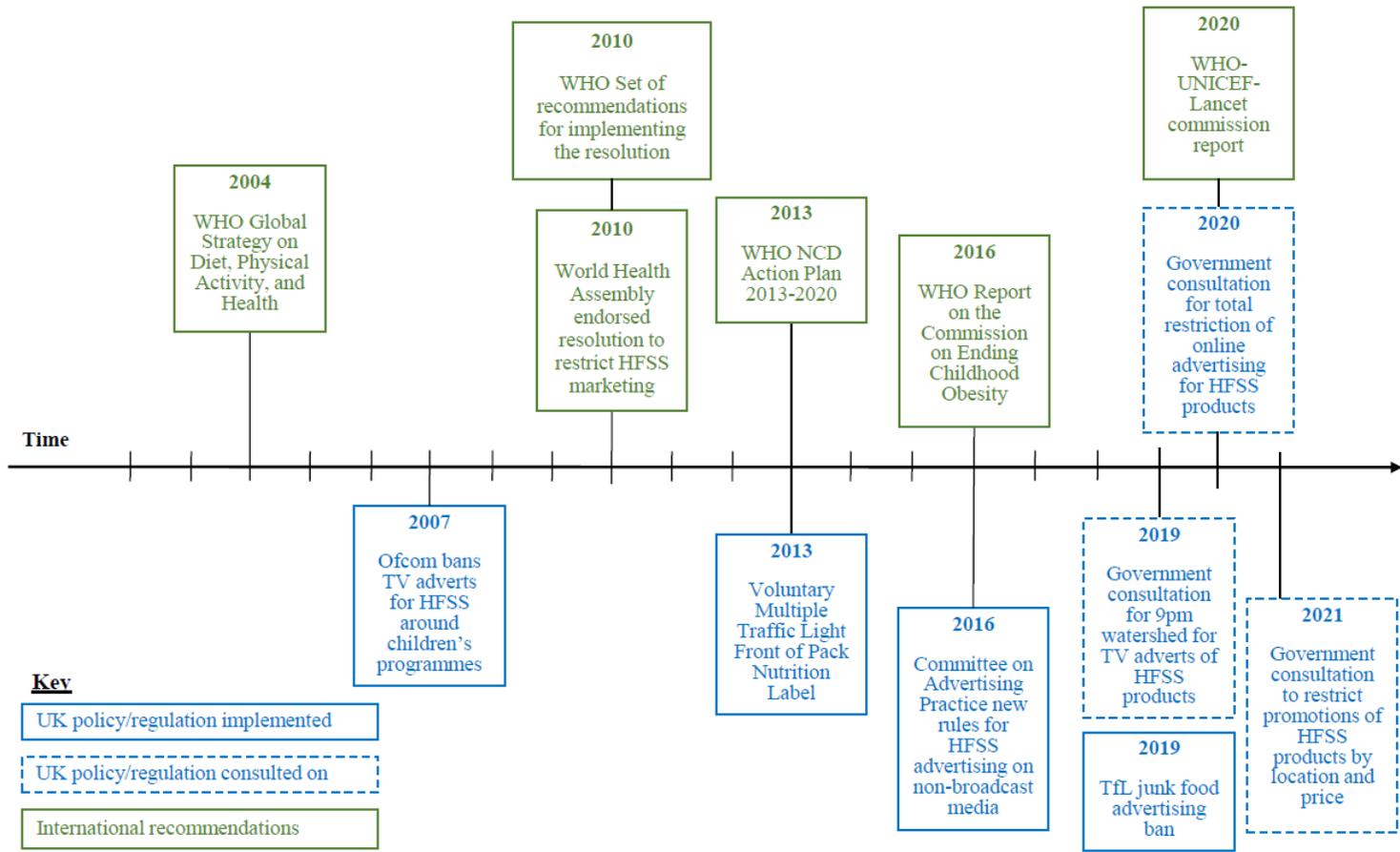


Figure 2 Timeline of key international recommendations on food marketing and UK regulation

1.4.5 Marketing in the context of the sugary beverage taxes

Marketing may be a valuable tool for understanding the variety of soft drinks company responses that were anticipated to follow the SDIL,³⁹ such as changes to price, product, promotion and placement (T. Penney et al., unpublished data, 2021).^{67,76} Applying such a marketing lens to SBTs was recently proposed by Claudy and colleagues.³⁹ They identified some evidence that commercial activities that follow an SBT are connected, but have not been explicitly attributed to marketing. For example, pass-through rate ('price') has been found to vary with package size ('product').^{39,173} Elsewhere, evidence that prices of drinks changed despite reformulation to below the levy threshold,⁹¹ might be indicative of strategic decisions across to increase margins on lower-cost products to account for profits lost in high-sugar products.³⁹

There are currently gaps in knowledge about specific, key features of marketing that follows SBTs. For example, evaluators for the SBT in Mexico commented that the policy was followed by, "aggressive in-store promotions and marketing", though without supporting evidence.¹⁷⁴ Of the studies reviewed by Claudy and colleagues, none had explicitly accounted for changes to advertising, public relations, or promotional strategies.³⁹ Since Claudy and colleagues' literature search, to my knowledge only two studies have been published that explicitly looked at promotion.^{175,176} Zenk and colleagues examined changes to price promotions, and exterior and interior advertising, 6- and 12- months following the implementation of an SBT in Oakland, California, USA.¹⁷⁵ Exterior advertising was that on the outside of the retail building measuring at least 8.52 x 11" in size, interior advertising included end-aisle displays and special floor displays inside in the retail store, and price promotions were products sold on sale or at a discounted price.¹⁷⁵ Though the authors found price promotions on SSBs fell in Oakland more than they did in the comparator site following the SBT, they found no significant changes to SSB exterior or interior advertising;¹⁷⁵ and there was no evidence of differences at 24-months post-tax.¹⁷⁶ These findings may be explained by the scale of the tax implemented: multinational companies that dominate the soft drinks market might be reluctant to renegotiate their promotional strategies with local retailers, but would possibly do so for a national tax. Furthermore, it is possible that other, unmeasured forms of marketing changed, such as package design.

Marketing was also explicitly theorised to change in response to the SDIL, both in a modelling study published in 2017,¹⁷⁷ and in the systems map initially produced for the NIHR-funded evaluation,⁶⁷ though since updated to reflect the marketing mix (T. Penney

et al., unpublished data, 2021). To my knowledge a marketing lens has not been applied to the evaluation of a singular SBT before. As an array of evidence across the system surrounding the SDIL is already being collected, it represents a prime opportunity to develop knowledge about marketing that follows an SBT. Applying a marketing lens acknowledges that these commercial adaptations are likely to be strategically coordinated (e.g., by a marketing strategy),³⁹ emphasising the need to take account of their dependent nature.

Considering the entirety of marketing changes that follow an SBT may clarify whether commercial responses serve or undermine the public health purpose of the policy. In doing so, they may highlight opportunities for additional intervention, known as ‘complementary’ policies.³⁹ For example, Breeze and colleagues found that simultaneous pricing and promotion policies implemented in leisure centres in Sheffield, UK, resulted in 31% fewer units of SSBs sold in the first year post-implementation.¹⁷⁸ This is a greater change than often observed following pricing strategies alone. However, it is unclear whether the same effect size would be observed at a national level: Breeze et al.’s study was highly-localised and conducted in a context where consumers could easily substitute purchasing to nearby shops.¹⁷⁸

1.4.6 Summary and unanswered questions

Sugary beverage marketing exists across the 4Ps, though there is heterogeneous evidence of its association with consumption, and most evidence to date relates to children. Very little evidence has considered soft drinks companies’ adaptations to SBTs to constitute a broader, marketing response; even though this is a recognised construct in commercial food system research. Doing so could facilitate understanding the full extent and intent of adaptations made by soft drinks companies to SBTs, which may inform the design of more effective policies in the future. Furthermore, such an approach may be particularly valuable for the study of an SBT like the UK SDIL, as excise taxes are specifically designed to elicit reactions from industry.

1.5 Overview of dissertation

In this dissertation, I set out to address three overarching questions about the study of marketing in the context of SBTs:

- (i) What does ‘marketing’ encompass in the context of SBTs?
- (ii) Are marketing changes likely to influence the outcomes of SBTs?
- (iii) Did marketing change in response to the SDIL?

The UK SDIL is used as a case study for establishing evidence to answer these questions. As the reactions of related stakeholders to the SDIL have already been conceptualised in the systems map, Figure 1, this figure will be used to facilitate interpreting findings that emerge from each chapter in the context of the wider system surrounding the SDIL.

Chapter 2 provides evidence to address the first question. I used a scoping review of reviews, and applied principles of critical interpretive synthesis, to explore the conceptualisation and operationalisation of ‘marketing’ in public health research that focuses on food and drink marketing.

Chapter 3 provides evidence to address the second question. I used multinomial logistic regression models to explore the relationship between self-reported exposure to sugar-sweetened beverage promotions and intake in the 2017 wave of the International Food Policy Study.

Chapter 4 addresses all three questions. I used thematic analyses of stakeholder interviews to explore changes to sugary beverage marketing following the announcement and introduction of the SDIL.

Chapter 5 focuses on the final aim. I used data from Nielsen, a market research company, to conduct an interrupted time series analyses to assess whether soft drinks advertising expenditure changed following the announcement and introduction of the SDIL.

Finally, in Chapter 6 I discuss the findings of preceding chapters in relation to the overarching research questions and reflect on other evidence emerging relevant to the system surrounding the SDIL (Figure 1).

Please note the order in which I conducted research contained within this thesis. The analyses in Chapters 3 and 4 were conducted concurrently. I then completed analyses presented in Chapter 2, and then finally, that in Chapter 5.

2 UNDERSTANDING ‘MARKETING’ IN DIETARY PUBLIC HEALTH LITERATURE

As described in Chapter 1, very little existing evidence has explicitly explored marketing in the context of sugary beverage taxes (SBTs). More generally, a large body of public health evidence that explores marketing and dietary behaviours has amassed, but the extent that this evidence aligns with the practical process of marketing has not been explored before. In this chapter, I present a scoping review that was conducted to address such a gap in existing knowledge.

2.1 Abstract

Evidence suggests food marketing has many dimensions that impact on dietary behaviours, but there is no consensus in public health on how these interact. To assess whether the conceptualisation and operationalisation of ‘marketing’ in public health literature aligns with marketing in practice, we conducted a scoping review of reviews using principles of critical interpretive synthesis. Databases of peer-reviewed literature and websites of relevant organisations were searched in July 2020. Following screening, 60 publications were included, with saturation reached after analysing 24. Informative text segments from articles were coded using NVivo until theoretical saturation. Codes were grouped into synthetic constructs and a synthesising argument, and a conceptual framework of marketing-related terms was developed. Our synthesising argument critiqued the understanding of ‘integration’: marketing activities were rarely considered part of an integrated whole, terms were used differently across publications, and creative processes were poorly operationalised. The framework conceptualises terms alongside, and nested within, each other, to improve the future study of food marketing in public health research.

2.2 Introduction

Most commercial activities of the food and drink industry are intended to maximise company profits, regardless of their alignment with public health goals.⁹⁶ Some commercial activities have been recognised to indirectly contribute to the global prevalence of non-communicable diseases (NCDs), such as type 2 diabetes and cardiovascular disease.⁹⁷ Commercial activities can be either ‘market’ or ‘non-market’.^{103,104} Non-market activities range from lobbying for policies that are commercially favourable but might not maximise public health,¹⁰⁶ to framing solutions to NCDs in ways that obscure the food and drink industry’s contribution to the problem.⁸⁰

Many market activities concern products, their price, promotion and placement, and are collectively referred to as ‘marketing’ (the ‘4Ps’, or marketing mix).^{111,112} In business terms, marketing is defined as “the activity, set of institutions and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners, and society at large”.¹¹⁵ The function of marketing is understood to take effect through the integration of a range of forms (i.e. instances of the 4Ps), coordinated by a marketing strategy.¹²⁰ As food and non-alcoholic drinks (collectively referred to as ‘food’ hereafter) that are high in fat, salt and sugar (HFSS) are more often the subject of marketing, and children and low-income populations more commonly targeted by it,¹⁷⁹ marketing has been proposed as an avenue through which commercial activities exacerbate NCDs and health inequalities.⁷¹

Regulating marketing may contribute to the prevention of some of the 11 million deaths worldwide that are attributable to NCDs each year.⁵ In the UK, public health policies exist to restrict at least some aspects of the 4Ps of marketing for HFSS products,^{180,181} with more – such as a 9pm watershed on television advertising – under consideration.¹⁶⁶ However, the public health effectiveness of policies to restrict marketing may be undermined by food companies reacting with increases in other forms of market activities to protect sales, profits and growth.⁷¹ This phenomenon is often referred to as the ‘balloon effect’,¹⁷⁰ and reflects the extent to which the commercial food system is complex and adaptive. The balloon effect hypothesises that regulator-enforced restrictions on one form of marketing lead to increases in others to maintain the overall equilibrium of the system (i.e. an expected level of profits or growth).^{71,103,170} For example, it has been proposed that SBTs may lead to reactionary increases in advertising to minimise the policy’s effect on profits.^{67,177} This has been shown for one such SBT, the UK Soft Drinks Industry Levy, which led to an increase in price of some products (one element of the 4Ps).⁹¹ Regulating

marketing is further complicated by the continual competitive pressure for firms to innovate with their marketing, most recently using digital means that are inherently harder to measure and control.¹⁴⁶ As a result, support for simultaneously regulating multiple marketing levers is growing.^{39,71,172} For example, the amended Chilean SBT (2014),¹⁸² was coupled with the Chilean Food Labelling and Advertising Law (2016).¹⁸³ The balloon effect also provides rationale for imposing restrictions on marketing via media now consumed less frequently, such as television,¹⁴⁷ as restrictions across the spectrum of possible marketing modalities limits the potential for reactionary increases in marketing using unregulated form of media.

An evidence-based model of policymaking suggests that existing knowledge directly informs the development of policy.¹⁸⁴ Thus, reflecting on the extent that public health evidence on food marketing aligns with the practical process of marketing, and the associated policy it is intended to inform, could be valuable.^{184,185} There is abundant research assessing the nature, scope and effects of features of food and drink marketing,^{126,127,186} yet we are not aware of research that has assessed how food marketing is conceptualised and operationalised in public health literature relative to the business definition or real-world practice of marketing. Doing so may be important, firstly, to identify gaps in public health researchers’ understanding of commercial food marketing. Secondly, a fresh examination of the conceptualisation and operationalisation of marketing could be timely as marketing has existed for a long time and across multiple disciplines, and the evolution of terms has been shown to result in confusion.^{97,187,188} Finally, as the synthesis of evidence that uses inconsistent definitions is problematic,¹⁸⁹ improving conceptual clarity of marketing might improve the translation of evidence into public health policy in future.

Most scoping reviews aim to provide an overview of a body of literature by aggregating information.¹⁹⁰ However, aggregative approaches are often insufficient to provide a theoretical account that is neither too abstract nor too specific to understand a concept.^{187,191} Though interpretive synthesis reviews are better for induction and interpretation that develops concepts grounded in the studies reviewed, most methods for such synthesis are primarily developed for qualitative research.¹⁸⁷ Critical interpretive synthesis (CIS) is one approach for synthesising research regardless of study design.¹⁸⁷ CIS permits the reviewer to critique the treatment and underpinning assumptions of the phenomenon of interest in the literature,¹⁸⁷ producing a “mid-range” theoretical account of the evidence that has both empirical applicability and explanatory scope. CIS

recognises that it may be neither possible nor desirable to specify the precise research questions of a review at the outset.¹⁸⁷

In this review we set out with the broad aim of understanding the conceptualisation and operationalisation of ‘marketing’ – how it had been understood and applied – in public health research focused on food marketing. With the retrieval and analysis of literature, our aim evolved to focus on the conceptualisation of ‘integrated marketing’. We used a scoping review of reviews employing principles of CIS to meet this aim.

2.3 Methods

We conducted a scoping review of reviews, adapting Arksey and O’Malley’s six-step framework,^{192–195} to allow for the application of CIS principles. These six steps are (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating, summarising and reporting the results, and (6) consulting with key stakeholders.^{192–195} Principles from CIS were applied to steps (3) – (5), entailing back-and-forth movement and coding in order to develop a synthesising argument. To include a broad range of literature with differing epistemologies, the review was pragmatic and pluralistic, as has been the case for similar reviews.¹⁹⁶ The review was registered with Open Science Framework (available at: <https://doi.org/10.17605/OSF.IO/V5JWCW>), and is reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) (Appendix 2.1).¹⁹⁷

2.3.1 Steps (1) and (2): search methods for the identification of studies

Preliminary searches guided the identification of our research question and development of our search method. Though CIS assumes the topic under study has diffuse boundaries,¹⁸⁷ the existence of distinct definitions of marketing in non-public health literature guided our search (Table 3 in Chapter 1). The resultant eligibility criteria are less bounded than those of an aggregative review (Table 4).¹⁸⁷ We included reviews that explored any form of commercially-derived, or mimicking commercially-derived, marketing of food, even if not explicitly described as marketing by authors. As this evidence base is vast, we restricted our search to literature reviews (as defined by the authors of publications) that were supported by a specific review method. We only included reviews that explored food marketing in the explicit context of health. Searches were limited to literature published in English because conceptualisations could differ by

language, and nuances might be lost in translation. Literature published before 2006 was excluded since a transformative World Health Organization technical paper on the extent, nature and effects of food promotion was published in 2006,¹²⁷ possibly influencing the study of food marketing.

Table 4 Eligibility criteria

Category	Inclusion criteria	Exclusion criteria
Population type	Any human population.	Animal populations.
Year of publication	In or after 2006.	Before 2006.
Publication type	Any author-defined review of published evidence (i.e. must include ‘review’ as a self-descriptor) and provide a specified method for searching, retrieval and analysis of published material.	Not an author-defined review of published evidence (i.e. does not say ‘review’) or does not have a specified review method.
Country	Any country.	N/A.
Language	Published in English.	Not published in English.
Marketing	Relates to any form of commercially-derived, or mimicking commercially-derived, marketing (e.g., promotion, product, placement, price etc.), across any possible medium (e.g., internet, TV, retail environment).	Any form of marketing that does not derive from a commercial source or mimic that provided by a commercial source (e.g., social marketing, public health marketing, more general effect/behaviour of media use).
Food or drink related	Relates to marketing of any food/non-alcoholic drink.	Marketing not specific to food/non-alcoholic drinks (e.g., for alcohol, tobacco or other products).
Health context	Review must be in the explicit context of health (e.g., must refer to a health-related outcome or interest).	Review not in the explicit context of health (i.e. does not refer to a health-related outcome or interest).

We consulted academic librarians who advised on the most appropriate terms and databases for the search. We conducted title and abstract searches in Medline, Embase, PsycInfo (EBSCO), Web of Science Core Collection and Cochrane Library on 8th July 2020 using permutations of search terms relating to marketing, food and drink, health, and reviews, and index terms where appropriate (full search in Appendix 2.2). We conducted grey literature searches,¹⁹⁸ by purposively selecting organisations considered relevant to the review, informed by the research team’s expertise, and searched their websites for permutations of the terms ‘food’, ‘marketing’, ‘advertising’ and ‘promotion’. The selected organisations were: Cancer Policy Research Centre, Centre for Science in the Public Interest, Food Foundation, Institute for Social Marketing and Health, Obesity

Health Alliance, Public Health England, Sustain, UConn Rudd Center, UK Health Forum, and World Health Organization. We subsumed publications identified in the grey literature search at the full text screening stage.

All records emerging from the database searches were retrieved, stored and de-duplicated in Endnote,¹⁹⁹ reference management software, and then again in Covidence,²⁰⁰ a web-based platform that streamlines the production of systematic reviews. To ensure consistency across the team, JA, KE, HF, AK, RJ, and YCU first piloted screening the same sample of 200 records, discussing discrepancies and refining the criteria. The titles and abstracts of all articles were then screened independently against the eligibility criteria in duplicate (HF screened all publications; second screening was divided across KE, AK, RJ and YCU). All records with conflicting decisions between screeners at the title and abstract screening were parsed to full text review to minimise risk of excluding potentially relevant texts.

The independent duplicate-screening process was repeated for full texts, including those from the grey literature searches, with disagreements resolved in discussion. Remaining disagreements were arbitrated by JA, though we acknowledged that the nature of our review allowed blurred boundaries between those texts eligible and ineligible for inclusion. In instances where each screener chose different reasons to exclude a record, we recorded the first reason according to the order reported in the PRISMA chart.²⁰¹ No formal quality assessment was made as is standard practice for scoping reviews and for CIS, where judgements of credibility are usually made at the stage of evidence synthesis and are mainly based on the researchers' perception of relevance.^{187,193,202}

2.3.2 Steps (3) to (5): Sampling, extraction and critical interpretive synthesis

The nature of CIS required iterative movement between steps (3) – (5) of Arksey and O'Malley's six-step framework. Using CIS, researchers develop 'synthetic constructs', which are third order constructs that result from an interpretation of the whole of the evidence to unify several disparate aspects of a phenomenon in an explanatory way.¹⁸⁷ Using synthetic constructs in addition to second order constructs and possibly other evidence, CIS produces a 'synthesising argument', which integrates evidence into a coherent theoretical framework in order to provide a generalisable way of understanding a phenomenon.¹⁸⁷ Blending sampling, extraction and analysis alongside constant comparison with the data is an expectation of CIS.¹⁸⁷

First, metadata for all included studies, such as publication information and the marketing component under study, were extracted into a Microsoft Excel spreadsheet. Our perception of ‘thickness’, or whether there was a detailed account of marketing,^{203–205} were recorded alongside metadata. As there is strong evidence of bias in studies of the relationship between food and health where the food industry funds – or is involved in – the research,²⁰⁶ we also recorded whether authors had reported conflicts of interest in funding statements. Initially, JA and HF piloted data extraction using a form devised *a priori*, with the same sample of texts (n = 5). However, as with previous CIS reviews, we found the form restrictive and ill-suited to the diverse body of included literature and to our aims.^{187,207} Instead, we selected studies, extracted data, and analysed inductively, applying methods from other CIS reviews that drew on principles of grounded theory.¹⁸⁷

As CIS is concerned with interpretation rather than exhaustive summary, we used information relating to the thickness of studies, recorded in the spreadsheet, to inform the purposive sampling of studies from the corpus that met the inclusion criteria. Using the study aims as a “compass rather than an anchor”,^{187(p3)} HF first coded fragments of text pertinent to our research aims from a random selection (n = 12) of publications that had mostly been recorded as having thick description of marketing (11 thick, 1 thin). Coding was conducted using NVivo (software used for handling qualitative data).²⁰⁸ A diary was maintained alongside coding to help inform interpretation of the codes. HF, JA and MW discussed a subsample of codes, prompting refinement and initialising the development of synthetic constructs. Revised codes were reapplied to the initial sample of texts (n = 12), in addition to a further random selection of texts (n = 8). Doing so elaborated the refined codes and synthetic constructs, which were again discussed between HF, JA and MW, this time to seek and interpret relationships between synthetic constructs to develop a synthesising argument. Further thin texts were purposively selected by HF (n = 4), on the basis that they might test or elaborate codes and synthetic constructs, until theoretical saturation – the development of no new codes – was reached (total number of coded texts = 24). The synthesising argument was further refined by HF in consultation with JA and MW. Illustrative samples of texts are used to present the synthesising argument. The text samples omit any references contained in the original text as our interest was with the conceptualisation used by authors of the reviews, not whether this was derived from their own thinking or elsewhere.

As the synthesising argument identified concepts needing clarity, we used our analyses to develop a conceptual framework for these terms. This was informed by our wider

knowledge of marketing, which includes having researched and published on the topic over a number of years (e.g.,^{209–211}).

2.3.3 Step (6): consulting with key stakeholders

Finally, we conducted an adapted version of step (6), by inviting feedback from other colleagues researching the commercial food system at research group seminars, before finalising the analysis. Adapting stage (6) has been an accepted practice elsewhere,²¹² and was appropriate here since we were concerned with views within the field.

2.4 Results

2.4.1 Summary of included studies

The search and selection process are summarised in Figure 3. Following the removal of duplicates, 16,324 titles and abstracts were screened. Full texts for 623 publications were screened, 30 of which were retrieved from grey literature sources. In total, 60 publications met the inclusion criteria (Appendix 2.3).

Metadata for the 24 publications selected for synthesis are provided in Appendix 2.4. Two of the publications selected for synthesis were identified through the grey literature search.^{146,213} Articles were published between 2008 and 2020 and ranged from those studying singular components of marketing (such as price promotions) to reviewing literature across the marketing mix. Of the initial selection of 12 publications, 11 were classified as thick,^{139,214–223} and one as thin.²²⁴ The subsequent eight texts were all thick,^{146,213,225–230} and the final four texts were thin.^{231–234} Of the 24 publications, four did not report a conflicts of interest statements.^{139,146,223,230}

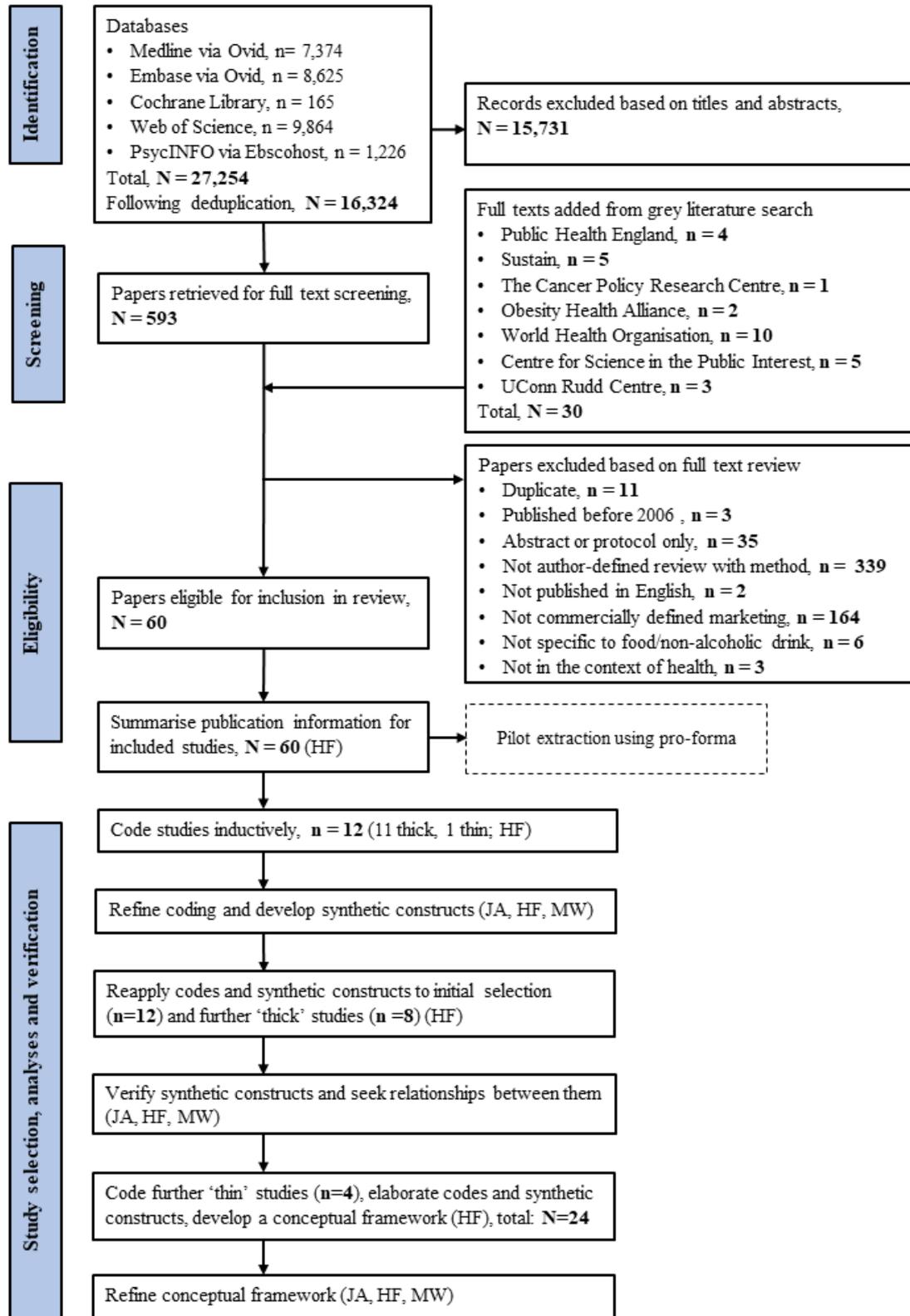


Figure 3 PRISMA diagram with adaptation for critical interpretive synthesis

Our synthesis produced a critique of the approach to studying food marketing in public health literature that anchors on the concept of ‘integrated marketing’.

2.4.2 Synthesising argument: critique of approach to ‘integrated marketing’

While definitions for specific forms of marketing, such as price promotions, were more likely to be consistent across publications; marketing as an overarching concept was less consistently defined. Indeed, a definition or framework for marketing, or the specific form of marketing under study, was not present in all publications. Furthermore, the way a concept was presented in introduction sections did not always correspond with conceptual frameworks presented later in reviews. While the marketing mix or 4Ps was the most cited conceptual framework, there were differences in how individual components of the marketing mix were defined and understood, particularly ‘promotion’. The definition provided by Grier and Kumanyika appears to reflect the marketing mix:

"Promotion includes advertising and other types of persuasive communications that convey product benefits, pricing strategies, and availability (e.g., sales promotions, direct mail, promotional Web sites, public relations, free food samples, special events, and product placement). Place refers to the distribution of the product, including how products are made accessible to target consumers and the quality and convenience of the available products. Price refers to the cost that is exchanged for the product, in absolute terms and relative to alternatives".^{226(p1617)}

In contrast, Blake and colleagues provide a narrower set of examples and include price promotions as part of price, rather than promotion:

"Product (availability and reformulation), price (including price promotions), place, and promotion (including advertising and labelling), or any combination of these"^{225(p1388)}

The concept of promotion thus appeared to range from referring to advertising alone, to any activity that exploits prices, product, or placement to encourage a positive perception of a product in the eyes of prospective consumers. Similarly, ‘place’ - which was often either explicitly defined or conceived as ‘placement’ - was also considered to encompass a wider set of activities by some authors:

"Place is often misinterpreted as the location of marketing messages, which is in fact a component of promotion. A more accurate definition of place, from a marketing perspective, is the location where behaviours are performed or related goods and services are acquired".^{229(p275)}

Despite differences in explicit conceptualisation, some authors acknowledged that the marketing component under focus in their review might interact with others, indicating that they understood marketing components to take effect in synergy. In addition to identifying the need for more research that explores the nature and effect of multiple components working together,²²⁵ authors also highlighted the disparity in available evidence for the various components of marketing:

"While similar marketing techniques may be found across different "media", those media are most certainly not the same, and some communications platforms are far more studied, understood and evoked than others".^{219(p1)}

It was difficult to infer that authors fully understood marketing as taking effect through integration in publications that omitted reference to components of marketing other than the one under study. In articles where authors seemingly moved between concepts without explanation, it seemed more likely that authors were unclear of the distinction and even used the terms synonymously. Such movement included introducing the concept of marketing but going on to draw on evidence only from specific components, such as advertising, without explanation; or interpreting study findings in reference to the wider phenomenon of marketing despite the review aims and inclusion criteria taking a narrower focus (e.g.,²²²).

Though not the subject of any of the reviews included in the synthesis, strategy was frequently referenced in the selected publications, and may be a higher-order mechanism through which separate marketing actions are understood to take effect via integration. However, the conceptualisation of strategy was also contested. In some publications, 'strategy' was used to describe a lower-order activity, possibly in only one component of the marketing mix. For example, here the term was used to refer to specific types of activity:

"Multiple marketing strategies or techniques (from spokes-characters, premium offers and health/nutrition related claims to emotional appeals and themes of fun or taste)".^{219(p1)}

Elsewhere, strategy was used to mean instances where more than one component of the marketing mix had been used together, often (but not always) called a 'combined strategy':

"Reported by strategy type according to the 4Ps of merchandising (product, price, place, and promotion), or reported as a "combined" strategy where more than one of the 4Ps was used at once".^{225(p1388)}

Lastly, in some publications, strategy appeared to mean a cross-component process that was less easily defined using the 4Ps conceptual framework:

"Creative, sophisticated, and stimulating marketing strategies to produce attractive and engaging content, with audience participation and brand immersion at the forefront of activities".^{146(p27)}

Strategy being harder to articulate, and being devised by companies 'behind the scenes', might be reasons for not being the core focus of any studies included in our review.

It was also difficult to find a precise definition or conceptualisation of 'techniques', 'tactics' or 'appeal' in the sampled literature, which occasionally overlapped with authors' use of strategy, as in the quotation above. These activities appeared to cross media and marketing components, often describing specific, creative activities.^{228(p109)} It was proposed that these terms might refer to processes that increase the cohesion of marketing activities:

"Brand mascots are used by food and restaurant companies to create a product identity, promote brand personality and continuity across integrated marketing communications".^{228(p109)}

In this sense, these terms seemed to encompass an overarching message that drove specific activities, which was described to take effect by initiating emotional and cognitive responses.^{146(p30)}

Marketing frequently featured alongside other similar concepts such as 'retail environment' and in particular, 'food environment'. Sometimes, the two concepts explicitly overlapped and were conceptualised as the "marketing environment".²²⁸ On other occasions it was unclear where authors' saw the concept of marketing ending and that of food environment beginning, especially when the definition of food environment appeared similar to the marketing mix:

"The food environment has been conceptualized by Glanz et al. as including four aspects: (1) the community nutrition environment (e.g., type and location of food outlets); (2) the consumer nutrition environment (e.g., availability of healthy food options); (3) the organizational nutrition environment (e.g., food

access in settings such as schools) and; (4) the information environment (e.g., food marketing and advertising)".^{233(p2)}

That marketing takes effect through the integration of multiple actions was implicitly acknowledged when authors described, implicitly or explicitly, the balloon effect of regulation. Authors suggested that ignoring one component of marketing – usually the one under study – may not be an effective way of regulating marketing. Digital marketing was proposed as a particularly difficult form to regulate. While most authors recognising a balloon effect suggest that regulation should extend across the 4Ps, one proposed that it should also encompass non-market activities,²²⁹ such as those described earlier:

“Creative, sophisticated, and stimulating marketing strategies to produce attractive and engaging content, with audience participation and brand immersion at the forefront of activities”.^{146(p27)}

Inconsistent conceptualisation of integrated marketing extended to the measurement of marketing components. Authors described how use of different research methods, contexts, and locations made it difficult to synthesise results across studies. Exposure to marketing was thought to be particularly difficult to measure, especially through use of an artificially laboratory environment where it was considered impossible to assess the cumulative and longer-term nature of exposure.¹³⁹ Heterogeneity in terminology for searching the literature and defining or describing outcome measures was frequently reported, with search terms rarely reflecting integrated marketing in an expansive sense. Most search strings were orientated around a narrow interpretation of the 4Ps with related concepts.

2.4.3 Framework of marketing concepts

The synthesising argument illustrated areas of conceptual confusion in the understanding of ‘integrated marketing’ in the literature. To inform future food marketing research in public health, we drew on our analysis and wider knowledge to propose a framework of marketing concepts and their relationships (Figure 4), with an accompanying description (Table 5). The framework is understood in the context of consumer-directed marketing (equivalent to market activities¹⁰³), and thus differentiates between industry activity and the effects on consumers. Though marketing in other areas of the food system such as agricultural,²²³ or stakeholder marketing,¹⁴⁶ were referred to in publications included in the synthesis, they were not the focus of our review. The framework shows how concepts are nested within or alongside each other.

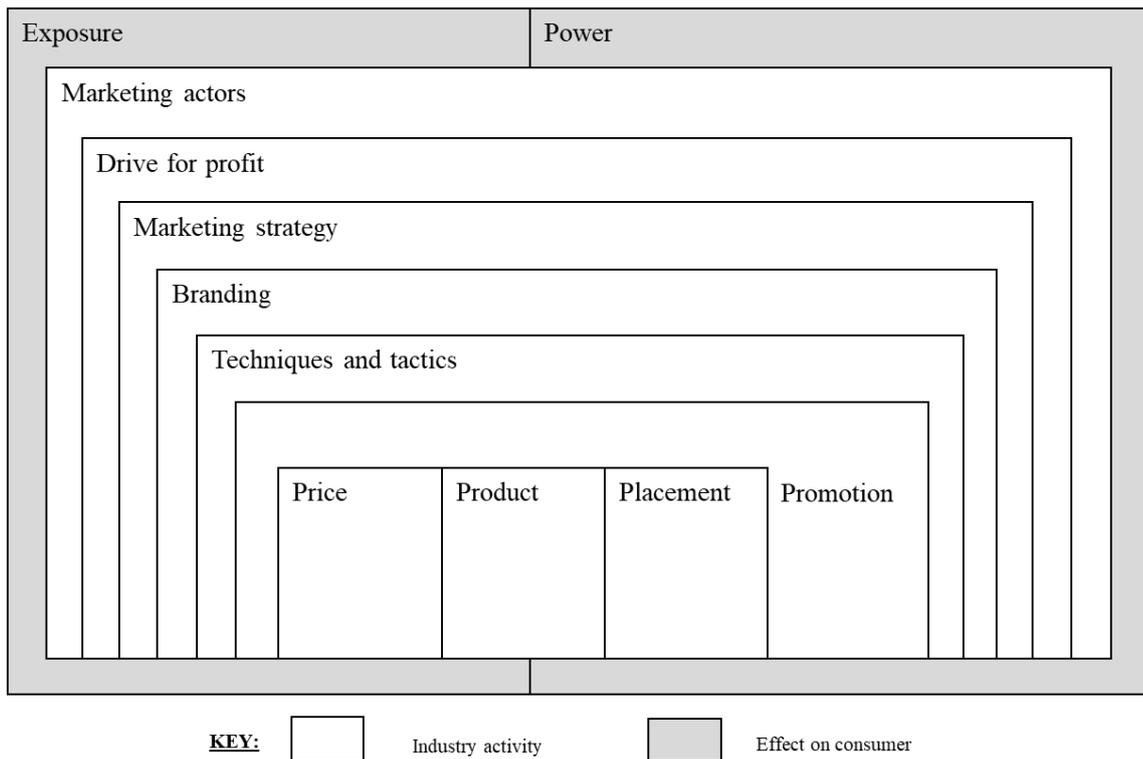


Figure 4 Framework of marketing concepts

Table 5 Proposed conceptualisation of marketing concepts in food marketing research

Marketing concepts	Proposed conceptualisation	Example
Price	Any manipulation of the cost of a product specifically intended to encourage purchases; often temporary.	Supermarket ‘buy-one-get-one-free’ offers on food items.
Product	Features of the product itself that are intended to encourage purchases.	Cartoon characters on food package to appeal to children.
Placement	Locating a product - physically or digitally - to encourage purchases.	Placement of snack food items at checkouts to encourage impulse purchases.
Promotion	Promotion has dual conceptualisation: it can refer to forms of activity concerned with encouraging product sales, or it can also refer to an over-riding process of "promoting" a product or brand that draws on multiple forms of media.	Advertising on television at ‘prime-time’ viewing hours; the collective promotion of a product online, outdoors, and in supermarkets.
Techniques and tactics	Creative approaches that often, but not always, cross-cut multiple forms of marketing. Usually carries a specific message or theme to stimulate a response among potential consumers.	Celebrity endorsement of a food product.
Branding	The identity that anchors marketing activities for a product; the result of multiple marketing actions rather than a singular one.	Use of consistent and prominent logo on all products, adverts, corporate sponsorship and retail environments.

Marketing concepts	Proposed conceptualisation	Example
Marketing strategy	The blueprint plan for nature and scope of activities across forms of marketing, and for the techniques, tactics and branding overarching those actions.	A plan for the launch of a new product range by a well-known soft drinks brand, including introductory price offers, free tastings at railway stations, product design and advertising campaign.
Drive for profit	A drive for profit is at the core of consumer marketing. State explicitly, acknowledge that there may be other business outcomes on pathways to attain profit, and that other goals may exist for non-capitalist systems.	Shareholders of a transnational food corporation demand quarter on quarter growth that can only be achieved by strong and relentless marketing.
Marketing actors	Range of stakeholders in the food system who, driven by profit, plan, organise, or perform marketing.	Representatives of the product manufacturer, advertising agency, and retailers work together to ensure that a product maximises profits in mutually beneficial ways.
Power	The strength of ‘pull’ to purchase products cumulatively produced by marketing activities.	Highly engaging marketing by a confectionery company campaign resulting in viral spread that leads to a measurable boost in sales.
Exposure	The total amount of marketing that potential consumers see or hear across all forms, including media, in terms of frequency (number of times), duration of exposure (length of each occasion) and intensity.	Coordinated marketing activities that include multiple advertisements on TV, radio and social media targeting homemakers in primetime slots of varying length and with complementary, amplifying messages, together with maximal product presentation at eye-level in stores.

2.5 Discussion

2.5.1 Summary of main findings

Using a scoping review that applied principles of CIS, we found that some features of the conceptualisation and operationalisation of marketing in public health literature on food marketing – such as drawing on the 4Ps framework – are common. However, there were indications that crucial concepts and underlying processes supporting integrated marketing were understood differently by different authors. This included differences in the conceptualisation of marketing strategy, the operationalisation of marketing frameworks, and understanding of creative concepts like ‘tactics’ and ‘techniques’.

To address this conceptual confusion, we developed a framework to inform the future use of marketing concepts in public health research that focuses on food marketing. We reviewed literature from the field of food marketing, but the principles and framework could be applied to other products with important impacts on population health. The

framework suggests how concepts could be considered alongside and nested within each other, in turn helping to operationalise the phenomenon of integrated marketing. We anticipate the framework will evolve with use, with input from other researchers in the field and as new research emerges.

2.5.2 Strength and limitations

Applying principles of CIS enabled us to question epistemological and normative assumptions of the literature, which is an advantage compared with other review methods.¹⁸⁷ Inevitably, we could only assess a subset of the sizable literature relevant to our aims. Focusing on reviews allowed us to explore a wider body of literature, and include evidence that is generally considered to be more robust and higher quality.²³⁵ However, it is possible that marketing is conceptualised and operationalised differently in reviews than in primary studies. As reviews are purposely more expansive than singular studies, primary studies may be less able to explore multiple marketing components – and thus, integrated marketing – than reviews. This could be explicitly evaluated in further research.

How we searched, screened, sampled, and coded the literature was shaped by our own perceptions of marketing. Though CIS results are inherently influenced by researchers' views,¹⁸⁷ using an expansive definition of marketing to underpin our work,¹¹⁵ and triangulating screening and interpretation across researchers – particularly those with different expertise – helped to reduce confirmation bias.²³⁶ Nonetheless, sampling literature for synthesis until apparent theoretical saturation may have led to the omission of important information.

The resulting framework was informed by our analyses of existing literature, focusing on a subset of the most salient marketing concepts and principles in the sampled literature, rather than exhaustively exploring all relevant terms. As the framework mostly draws on our wider understanding of marketing, a different research team may have produced different findings. We do not view the framework as a definitive product, but rather as a starting point for further discussion, research and consensus building.

2.5.3 Comparison to existing literature

There are several frameworks in diet-related marketing literature that aim to partially, or fully, depict the commercial marketing process (e.g.,^{139,140}). We found many suggestions for improving the food marketing evidence base in public health research in included

reviews, such as calls to measure marketing features more consistently,²²⁵ pay more attention to under-examined areas of marketing (e.g., novel forms),¹⁴⁶ and improve conceptual clarity.^{229(p275)} Our synthesising argument goes further by critiquing underlying assumptions of the evidence base to find a broader issue – the misunderstanding of integrated marketing – in the literature. We are not aware of a comparable critique of the field.

The framework we developed in this review differs from existing ones, as it seeks to address the root of methodological and conceptual misunderstandings in the study of food marketing in public health. Though frameworks like the 4Ps are useful for effectively communicating the scope of marketing, they are less able to illustrate how concepts are defined, related and nested within each other. This might explain why such tools can be operationalised differently by researchers, as we found in our review, contributing to conceptual confusion. Using a framework like that developed here might improve conceptual clarity in both research, and also the policy it informs.

2.5.4 Interpretation and implications

There are practical reasons that might have led to some of our study findings. Publishing in academic journals with restricted word limits might constrain authors from discussing marketing expansively. It is also likely that there are epistemological differences in how knowledge about marketing is developed by marketing practitioners (through real-world experience and tacit knowledge), and public health researchers (by developing hypotheses, evidence and theory). This might explain why creative processes identified in our synthesising argument, such as techniques and tactics, were particularly inconsistently conceived. It also emphasises the importance of generating evidence to inform marketing policy using diverse methods and epistemologies.²³⁵

Our analysis found no clear method or approach for integrating evidence across different components of marketing to understand its overall effect. Though conceptual frameworks were used by authors to gather evidence on a range of forms of marketing, they proved unable to measure its effects in their entirety. This is not only because individual components were conceptualised differently, but also because these results were usually presented by authors of primary papers in isolation.

It is important that greater attention is paid to developing methods for formal evidence integration across the various forms of marketing. Doing so would help measure the overall function and effect of marketing and expose opportunities to address the possible

balloon effect in response to existing public health marketing policies. Achieving a holistic and objective measure of marketing has been attempted before; for example, by monitoring individuals' exposure to marketing using wearable camera technology.¹⁴¹ However, such studies have tended to focus on exposure but not power, missing part of the key function of marketing.²³⁷ An alternative approach might be to collect objective exposure data (e.g., wearable camera technology¹⁴¹) and estimations of power (e.g., through existing coding tools²³⁸) orientated around a specific brand. Then, a method for formally integrating these findings could be applied (e.g., case studies²³⁹). Though such an approach might not achieve the same breadth as research that aims to understand a singular marketing activity across all products, it has potential to achieve depth of understanding that better depicts the true nature and influence of marketing.

2.5.5 Unanswered questions and further research

We did not seek to map existing marketing research, as has been done in some of the reviews we studied (e.g.,^{146,228}). Nonetheless, clear opportunities for future research emerged, including a greater focus on the commercial decision-making underpinning marketing activities, such as marketing strategy. Though it is likely that marketing strategies are commercially sensitive and thus not available in the public domain, it may be possible to 'reverse engineer' a company strategy. This might be achieved by measuring and triangulating evidence of multiple marketing components used by an individual company, or through critical analyses of industry documents available through the Industry Documents Library, a digital archive of documents created by industries that influence public health (<https://industrydocuments.ucsf.edu/>). Testing our findings with public health research on other commodities, such as tobacco and alcohol, would also help determine whether the problems we have identified are generalisable.

Conceptual clarity is only achieved when the meaning of a concept is widely shared. Thus, it might be particularly important to ensure our findings are disseminated, not only to prompt discussion but also uptake. While many existing studies have described the extent and nature of food marketing in different contexts,^{126,127,186} our analyses and framework present opportunities for new research questions in which the conceptualisation we propose might be propagated.

We set out with the broad aim to explore conceptualisation and operationalisation of marketing in public health research, yet the findings produced by our inductive analysis address the former more than the latter. Further work to improve the operationalisation

of marketing in public health research might include a systematic evaluation of the different measures of exposure and power that have been used in research. Building such research on a theoretical understanding of how marketing takes effect, and underpinning it with our recommendations for conceptual clarity, is more likely to generate meaningful evidence.

Both the critique of marketing integration and framework we developed build on the view that marketing takes effect through multiple, concurrent market activities. Though this view is widely accepted in business literature and the real-world practice of marketing,¹¹⁵ it is important to acknowledge that ‘integrated marketing communications’ is a distinct marketing concept (Table 3), that itself has been implemented differently by marketing practitioners and academics.¹¹⁸ Furthermore, the distinction between market and non-market activities is increasingly blurred,²⁴⁰ and non-market behaviours might have a growing role in determining consumer behaviour. These trends suggest it may be important to develop our findings with research that draws explicit comparisons between the conceptualisation and operationalisation of marketing among professional marketers and relevant policymakers. Our framework could help achieve this by forming a basis for elaboration with input from these stakeholders. This might consist of interviewing members of industry or marketing professionals, or document analysis of publications produced by companies (e.g., marketing strategy documents).

2.6 Conclusion

Improving the study of food marketing in public health through better conceptual clarity has the potential to inform policy that is more reflective of the true nature of marketing, and thus more likely to be effective. Through a focused examination of existing reviews of food marketing in public health research, we found this might be achieved by improving the operationalisation of integrated marketing, and present a framework to initiate efforts to enhance conceptual consistency of marketing in future research.

2.7 Reflection on overarching research questions and systems map

This chapter has presented evidence to address the first overarching research question of this dissertation: what does marketing encompass in the context of SBTs? I found that the study of food marketing in public health research currently has conceptual inconsistencies, and propose a framework of concepts that might be applied to – and

developed by – future research. Studies of marketing in public health research, including those specific to SBTs, would benefit from appreciating the breadth of activities that marketing encompasses in practice, and that they take effect synergistically.

Reflecting on the system surrounding the SDIL (Figure 1) with these findings emphasises that many food industry response to the SDIL may be appreciated as part of a broader marketing process. However, with findings from this chapter alone, it is unclear how soft drinks companies decide between various possible responses. It would also be beneficial to verify how marketing is understood specifically in relation to the SDIL. These issues are addressed in Chapter 4.

3 PROMOTION AND CONSUMPTION OF SUGARY BEVERAGES

In Chapter 1, I described how promotion is a key feature of marketing that has been understudied in the context of sugary beverage taxes (SBTs) to date. There is also little existing evidence of the relationship between sugary beverage promotion and consumption among adults. Developing evidence of this relationship, as presented in this chapter, will help evaluate the impact of changes to promotion on SBT outcomes.

3.1 Abstract

Sugar-sweetened beverage (SSB) consumption is independently associated with several non-communicable diseases, so policymakers are increasingly implementing measures, such as marketing regulation, to reduce intake. To help understand how such measures work, this study examined the association between SSB consumption and self-reported exposure to SSB promotions, both overall and by type of promotion, and whether these relationships vary between the UK, Australia, Canada, USA, and Mexico. Cross-sectional analysis of the online 2017 International Food Policy Study was performed ($n = 15,515$). Participants were grouped into 5,265 (34%) non-, 5117 (33%) low-, and 5133 (33%) high-SSB consumers. Multinomial logistic regression models were fitted to examine whether SSB consumption varied by exposure to total SSB promotion and by type: traditional, digital, recreational environment, and functional environment. Multiplicative interactions were included to investigate international variations. An additional unit of total self-reported SSB promotion exposure increased the likelihood of participants being low SSB consumers (relative risk ratio (RRR) 1.08, 95% confidence interval (CI): 1.06, 1.10) and high SSB consumers (RRR 1.13, 95% CI: 1.11, 1.16). Only exposure to traditional and digital promotion increased the likelihood of participants being SSB consumers, though this may be explained by degree of exposure, which was not measured in this study. Some evidence illustrated international variation in these relationships. Regulations of SSB

promotions may benefit from focusing on promotions other than those on television and reflecting country context.

3.2 Introduction

In 2017, 11 million deaths worldwide were attributable to dietary risk factors.⁵ High consumption of sugars is a known risk factor for non-communicable diseases (NCDs),^{11,241} such as overweight,²⁴² and type 2 diabetes,²⁴³ cardio-metabolic risks,²⁴⁴ poor oral health,²⁴⁵ and overall mortality.¹⁶ Sugar sweetened beverages (SSBs) are a substantial source of dietary sugar and the greatest source of dietary sugar for young people in many countries worldwide.^{24,246–249} Consumption of SSBs is associated with several NCDs, independent of effects mediated by obesity.^{15,250} Understanding determinants of SSB consumption could inform interventions to reduce SSB intake and thus prove beneficial to diet-related health.

Many attribute the scale of global SSB consumption at least in part to successful marketing.^{129,130} Significant attention has been paid to the effects of product promotion¹²⁵ – a company’s persuasive communication²⁵¹ – but marketing also entails strategic decisions about the product itself, its price, and its placement. Taken together, these are often referred to as ‘the 4Ps’.²⁵² While SSB producers are known to spend substantial amounts on marketing – Coca-Cola spent \$3.96 billion US dollars on worldwide advertising alone in 2017²⁵³ – there is only fragmented peer-reviewed evidence describing the association between SSB marketing and consumption.

There is substantial evidence that marketing of food and drinks influences purchasing and consumption in children,^{126,127,186} who are less able to discern the persuasive intent of marketing.¹²² However, little existing evidence focuses particularly on SSBs or adults, and most refers to a narrow range of drink products. There are also inherent methodological difficulties in ascribing a causal relationship between marketing and consumption; while observational, self-reported studies are at risk of reverse causation or confounding, sufficiently isolating the effect of marketing to conduct experimental studies, which is challenging and costly, and are often not reflective of real-world conditions in which marketing is consumed.¹³⁷ One way to increase confidence in a causal association is to demonstrate it in diverse international contexts. While SSB promotion utilises increasingly diverse modalities, shifting away from traditional television advertisements towards digital media,¹⁵⁵ there is less evidence available on the impact of non-television types of promotion of food and drink in general, and SSBs in particular.¹³⁰

Furthermore, despite international differences in SSB offerings, consumption, and regulation,^{254,255} we are not aware of any international comparisons of the relationship between promotion and consumption of SSBs. An absence of literature means it is currently unclear how well existing evidence concerning the relationship between SSB promotion and consumption generalises to alternative countries and contexts.

With increasing interest in regulating the promotion of less healthy products,¹⁶⁶ and concurrent awareness that other public health regulations, such as SSB taxes, might have unintended effects on SSB marketing,⁶⁷ addressing gaps in the evidence base could inform future policy development. The study reported here aimed to address such gaps in existing literature by: (1) examining the association between total self-reported exposure to SSB promotion and SSB consumption in a large international sample of adults; (2) exploring whether this association differs by type of SSB promotion; and (3) investigating whether these relationships vary internationally between the UK, Australia, Canada, USA, and Mexico.

3.3 Methods

We conducted a cross-sectional analysis of data from an international survey to address our aims.

3.3.1 Study design, sampling, and recruitment

Data were from the first wave of the International Food Policy Study (IFPS), a web-based survey completed in 2017 by adults aged 18–64 in the UK, Australia, Canada, USA, and Mexico. Most participants were recruited through the Nielsen Consumer Insights Global Panel and their partners' panels. A random sample of panellists known to be eligible to take part in the study was sent email invitations. All Canadian participants aged 18–30 years, and some aged 31–32 years, were recruited separately from the parallel Canada Food Study (CFS), which was a pre-existing online survey that formed the basis for the IFPS. Further details on the CFS are available elsewhere.²⁵⁶ Prior to completing the survey, respondents provided consent, and their participation was incentivised using their panel's existing reward structure. Further details of the study methodology can be found in the International Food Policy Study: Technical Report—Wave 1 (2017) at www.foodpolicystudy.com/methods.²⁵⁷ Participants had to pass a data quality screening question to be included in the subsequent analysis.

3.3.2 Variables used in the analysis

3.3.2.1 Sugar-sweetened beverage consumption

The seven-day Beverage Frequency Questionnaire (BFQ) included in the study was used to derive an SSB consumption variable. The BFQ is a validated mode of dietary recall,²⁵⁸ which uses photographs to prompt respondents to recall the number and size of 22 types of drinks, including caloric and non-caloric, alcoholic and non-alcoholic beverages. First, participants were asked to report the number of drinks they had consumed within each beverage category in the past 7 days. Next, participants were shown an image with an array of container sizes with corresponding volumes (mL or fl oz) specific to each beverage category for which they had indicated any consumption. Container sizes varied for each country according to the products available in each market. If a respondent selected the lowest size category ('less than [smallest size]' option), this was recoded as half of the smallest listed option that had a specified size (e.g., 50% of 250mL = 125mL). Likewise, respondents reporting the highest size category of 'more than [largest size]' were recoded as 125% of the largest option with a specified amount (e.g., 125% of 710mL = 88mL). Respondents who selected 'Don't know' or 'Refused', entered an implausibly large number of drinks consumed (>70), or failed to provide values for both the number and size for a particular drink were excluded from analyses. A volume variable was calculated for each beverage category by multiplying the derived drink size and frequency variables.

Total SSB consumption was computed by summing volumes for sugar sweetened drinks (Table 6). The total SSB consumption variable was categorized into three groups: non-consumers, low consumers, and high consumers, based around the weighted median of weekly SSB consumption amongst consumers (survey population: 1830mL; analytical sample: 1841mL).

3.3.2.2 Total self-reported exposure to SSB promotion

Participants were asked to report whether or not they had seen or heard 15 types of advertisements or promotions for sugary drinks in the last 30 days (including 'other'; Table 6), hereafter referred to as 'promotions'. An aggregate variable of self-reported awareness of exposure to SSB promotion was computed by summing participants' binary responses to each individual type of exposure, producing a variable with possible values between 0 and 15. Subsequent analyses treated this as a continuous variable.

3.3.2.3 Self-reported exposure to different types of SSB promotion

The aggregate self-reported promotion exposure variable was based on the assumption that exposure to different types of SSB promotions have homogenous associations with SSB consumption. To explore the potential for the association between SSB promotions and consumption to differ by type of promotion, the individual promotional exposures were also categorised into four dichotomous variables (Table 6): exposure to traditional SSB promotions, exposure to digital SSB promotions, exposure to SSB promotions in the recreational environment, and exposure to SSB promotions in the functional environment. In this study, we defined ‘recreational environment’ as the environment in which participants interact on the basis of enjoyment; whereas the ‘functional environment’ is used by participants to complete a specific function or task. Self-reported exposure to ‘giveaways, samples, or special offers’ was assigned to the recreational environment, though it could also be assigned to the functional environment; our findings were robust in reassigning this exposure between the two groups.

Table 6 Descriptions of the variables and question wording from the International Food Policy Study (IFPS) (2017)

Variable	Question	Relevant Response Options	Used in Analysis
SSB consumption	[Calculated from the Beverage Frequency Questionnaire: Reported frequency and volume of consumption over the last 7 days]	Regular pop; sweetened fruit drinks; regular flavoured water with calories; regular sports drinks; regular energy drinks; chocolate milk or other flavoured milk; specialty coffees; sweetened smoothies, protein shakes, or drinkable yogurts	Non-consumers (of these options); low SSB consumers (<overall median); high SSB consumers (>overall median)
Total self-reported exposure to SSB promotion	Sugary drinks are drinks that contain added sugar, such as fizzy drinks (Australia: soft drinks; Canada: pop), fruit drinks, sports drinks, energy drinks, chocolate milk, and speciality coffees that have added sugar. In the past 30 days, have you seen or heard any advertisements or promotions for SUGARY DRINKS in the following places? (select all that apply)	TV ads; radio ads; online/internet ads; mobile app/video game; social media (e.g., Twitter, Facebook, Snapchat); in a text message; magazine or newspaper; billboard or outdoor sign (e.g., posters, transit ads); in movies; at school/on campus; signs or displays in stores or restaurants; at a recreation/community centre; sports event or sponsorship (e.g., logos or links with events, teams, or athletes); giveaways, samples, or special offers; other; I haven't seen any marketing for sugary drinks in the last 30 days; don't know; refuse to answer	Summed number of locations responded positively to, with those responding: "I haven't seen any marketing for sugary drinks in the last 30 days", coded to 0, and "Don't know" and "refuse to answer" set to missing
Exposure to traditional SSB promotion	[Same wording as that for "Total self-reported exposure to SSB promotion" variable]	TV ads; radio ads; in a text message; magazine or newspaper	"Yes" if self-reported exposure to advertisements or promotions for SUGARY DRINKS in any of these locations, "No" if not

Variable	Question	Relevant Response Options	Used in Analysis
Exposure to digital SSB promotion	[Same wording as that for “Total self-reported exposure to SSB promotion” variable]	Online/internet ads; mobile app/video game; social media (e.g., Twitter, Facebook, Snapchat)	“Yes” if self-reported exposure to advertisements or promotions for SUGARY DRINKS in any of these locations, “No” if not
Exposure to recreational environment SSB promotion	[Same wording as that for “Total self-reported exposure to SSB promotion” variable]	Films or cinema; giveaways, samples, or special offers; at a recreation/community centre; at a sports event or concert	“Yes” if self-reported exposure to advertisements or promotions for SUGARY DRINKS in any of these locations, “No” if not
Exposure to functional environment SSB promotion	[Same wording as that for “Total self-reported exposure to SSB promotion” variable]	Billboard or outdoor sign; at a school/college/university; signs or displays in supermarkets, convenience shops or restaurants	“Yes” if self-reported exposure to advertisements or promotions for SUGARY DRINKS in any of these locations, “No” if not
Country	Automatically assigned	UK; Australia; Canada; USA; Mexico	UK; Australia; Canada; USA; Mexico
Sex	What sex were you assigned at birth, meaning on your original birth certificate?	Male; female	Male; female
Age	How old are you?	In years	Continuous
Ethnicity	Which of the following best describes your ethnic or racial background?	[Ethnicity options particular to each country]	Majority group; minority group

Variable	Question	Relevant Response Options	Used in Analysis
Education	What is the highest level of education you have completed?	Below upper secondary schooling = low; upper secondary schooling = medium; tertiary = high	Low; medium; high

3.3.2.4 Socio-demographic variables

Sociodemographic characteristics were self-reported in the survey. Since SSB consumption is known to vary across population sub-groups, those sociodemographic characteristics that have been reported elsewhere to be associated with SSB consumption were selected *a priori* to be included as covariates in the modelling. These were: country, age, and sex,²⁵⁹ ethnicity,²⁶⁰ and highest education level attained (as a proxy for socioeconomic status²⁶¹).

3.3.2.5 Ethics

The study received ethical approval from the University of Waterloo's Research Ethics Committee (Office of Research Ethics# 21460 for the IFPS and Office of Research Ethics# 30893 for the CFS).

2.3. Analyses

All analyses were conducted using STATA 14.2.²⁶² Survey participants providing valid responses to all of the variables used in the analyses were included in the analytical sample. Analyses were weighted with post-stratification sample weights rescaled to the analytical sample. For each country, these weights were constructed using population estimates from census data based on age, sex, and region. Applying sample weights throughout analyses helped to minimise the influence of differential non-response on the population representativeness of findings.

The sociodemographic characteristics of the sample were summarised. To test for differences between those included and excluded from the modelling, independent sample t-tests were used for continuous variables (total SSB promotion exposure, age) and Pearson's χ^2 tests for categorical variables (SSB consumption, types of SSB promotion, country, sex, ethnicity, education).

To examine the association between total self-reported exposure to SSB promotion and consumption, a multinomial logistic regression model was fit to the data using total exposure to SSB promotion as the independent variable and SSB consumption as the dependent variable, adjusting for country, sex, age, ethnicity, and education. Multinomial logistic regression modelling is appropriate in instances like these, where the dependent variable is nominal and has more than two categories, as illustrated elsewhere.²⁶¹ The UK was initially set as the reference country. To draw comparisons between included countries, the models were repeated by changing the reference country until all pairwise

permutations were exhausted. To determine if the association between exposure to SSB promotion and SSB consumption varied by type of SSB promotion, we fitted a multinomial logistic regression model that included and mutually adjusted for all SSB promotion exposure groups (including exposure to “other” promotions, which was not analysed as a separate dichotomous exposure), in addition to adjusting for the same covariates as described above. Finally, the first two models were extended to include multiplicative interactions between promotion exposures and country, in order to determine if associations between SSB promotion and consumption varied between countries. In the case of the second model, with the four different types of SSB promotion exposure, interactions with each type were introduced separately. The Wald test assessed the significance of these interaction terms; for countries with significant interaction terms, country-stratified models were produced.

3.4 Results

3.4.1 Sample characteristics

Table 7 presents the sociodemographic characteristics of the analytical sample (after applying response weights). Of the 19,857 survey respondents, 78% (15,515) were included in the analyses. A total of 4,342 individuals were excluded due to inadequate data: they refused to answer (or answered “don’t know”), had discrepancies in their responses, or had missing data for at least one of the variables in the models. Within the analytical sample, 51% (7,862) were men, the median age was 40 years, 79% (12,248) identified with majority ethnic groups, and approximately half had high education attainment (55%; 8,516). After finding the weighted median SSB intake volume, consumption was approximately evenly distributed across the three groups in the analytical sample: 5,265 (34%) were non-consumers, 5,117 (33%) were low consumers, and 5,133 (33%) were high consumers. Overall, 29% (4,549) of the study population self-reported no exposure to SSB promotions. No respondents reported exposure to all 15 types of promotion. Among those reporting exposure to SSB promotions, there was a median value of 3 exposures; 9,322 (60%) reported exposure to traditional promotions, 5,565 (36%) to digital promotions, 4,363 (28%) to promotions in the recreational environment, and 5,265 (34%) to promotions in the functional environment.

Table 7 Characteristics of the IFPS (2017) analytical sample (n = 15,515), post-weighting

Variable	Level	n	%
SSB consumption	None	5,265	34
	Low	5,117	33
	High	5,133	33
Total exposure to SSB promotion	Continuous	(none = 4,549)	Median = 3 (IQ 1, 5)
Exposure to traditional SSB promotion	Yes	9,322	60
	No	6,193	40
Exposure to digital SSB promotion	Yes	5,565	36
	No	9,950	64
Exposure to recreational environment SSB promotion	Yes	4,363	28
	No	11,152	72
Exposure to functional environment SSB promotion	Yes	5,265	34
	No	10,250	66
Country	UK	3,026	20
	Australia	2,996	19
	Canada	2,575	17
	USA	3,793	24
	Mexico	3,126	20
Sex	Male	7,862	51
	Female	7,653	49
Age (years)	Continuous	15,515	Median = 40 (IQ 29, 52)
Ethnicity	Majority	12,248	79
	Minority	3,267	21
Education attainment	Low	3,108	20
	Medium	3,891	25
	High	8,516	55

Notes: For continuous variables, n refers to the total number of participants who had a value of the variable and the median and interquartile ranges (IQ) are presented instead of %.

Differences were found between study participants included and excluded from the analytical sample (Appendix 3.1). For example, individuals in the analytical sample had lower total exposure to SSB promotions than those excluded and were older. We chose not to impute missing values because the magnitude of these differences was small.

3.4.2 Total exposure to SSB promotions and SSB consumption

Figure 5 summarises the associations between total exposure to SSB promotions and SSB consumption after adjustment for socio-demographic characteristics. The likelihood of being a low or a high SSB consumer (relative to a non-consumer) increased as self-reported exposure to promotions increased (low: RRR 1.08, 95% CI: 1.06, 1.10; high: RRR 1.13, 95% CI: 1.11, 1.16), compared with being a non-consumer. There were also associations between some of the sociodemographic characteristics included as covariates and SSB consumption. Females (compared to males) and people with high educational attainment (compared to low attainment) were less likely to be high SSB consumers. Meanwhile, younger individuals and those classified as ethnic minorities (compared to majorities) were more likely to be low or high SSB consumers.

Country variations in consumption were also present and are described in Table 8. Compared with the UK, Australian (RRR 1.40, 95% CI: 1.21, 1.62), Canadian (RRR 1.37, 95% CI: 1.18, 1.59), and Mexican (RRR 2.26, 95% CI: 1.91, 2.69) participants were more likely to be low SSB consumers than non-consumers. This pattern persisted for likelihood of high SSB consumption for Australia (RRR 1.72, 95% CI: 1.48, 1.99) and Mexico (RRR 4.33, 95% CI: 3.65, 5.14) compared to no consumption. Participants from the USA participants were less likely than Australian (RRR 0.77, 95% CI: 0.67, 0.89) and Canadian participants (RRR 0.77, 95% CI: 0.68, 0.87) to be low SSB consumers than non-consumers, but this only persisted at high SSB consumption for Australia (RRR 0.65, 95% CI: 0.56, 0.75). Mexican participants were more likely to be low or high consumers than non-consumers compared with all countries included in the study.

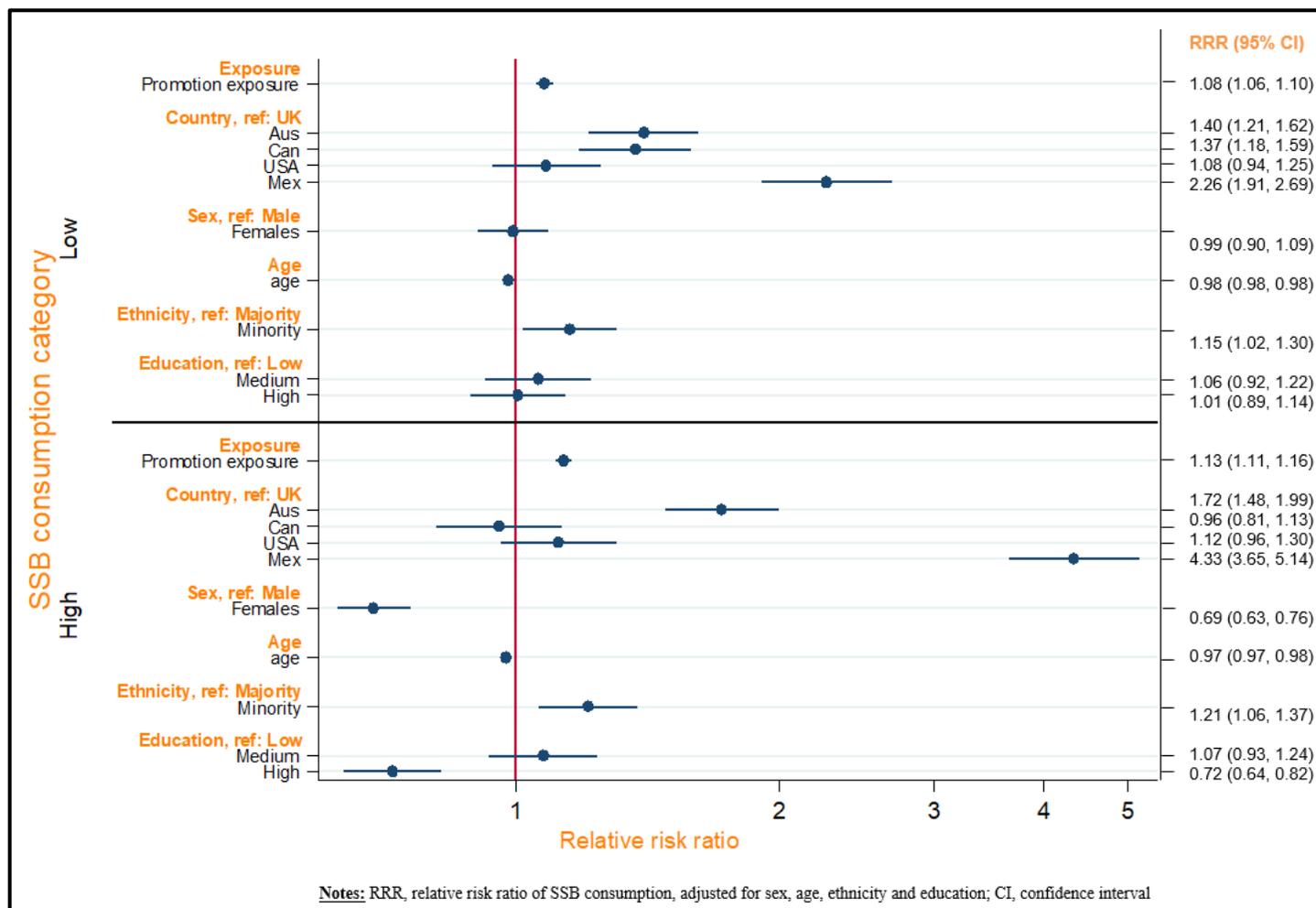


Figure 5 Forest plot summarising associations between self-reported exposure to SSB promotions and SSB consumption, estimated by multinomial logistic regression with adjustment for sociodemographic characteristics (n = 15,515; ref: no SSB consumption)

Table 8 Between country contrasts of the associations between total self-reported exposure to SSB promotions and SSB consumption using multinomial logistic regression (n = 15,515, ref: no SSB consumption, only country estimates printed)

Likelihood of SSB Consumption Compared with No Consumption			
	RRR	Low 95% CI	High 95% CI
No SSB Consumption (n = 5,265), ref			
Low SSB Consumption (n = 5,117)			
Australia vs. UK	1.40	1.21	1.62
Canada vs. UK	1.37	1.18	1.59
USA vs. UK	1.08	0.94	1.25
Mexico vs. UK	2.26	1.91	2.69
Canada vs. Australia	0.98	0.84	1.13
USA vs. Australia	0.77	0.67	0.89
Mexico vs. Australia	1.62	1.36	1.93
USA vs. Canada	0.77	0.68	0.87
Mexico vs. Canada	1.68	1.45	1.95
Mexico vs. USA	2.09	1.77	2.47
High SSB consumption (n = 5,133)			
Australia vs. UK	1.72	1.48	1.99
Canada vs. UK	0.96	0.81	1.13
USA vs. UK	1.12	0.96	1.30
Mexico vs. UK	4.33	3.65	5.14
Canada vs. Australia	0.56	0.47	0.65
USA vs. Australia	0.65	0.56	0.75
Mexico vs. Australia	2.52	2.13	2.99
USA vs. Canada	1.08	0.95	1.24
Mexico vs. Canada	4.40	3.78	5.13
Mexico vs. USA	3.88	3.30	4.56

Notes: Relative risk ratio (RRR), confidence interval (CI), adjusted for sex, age, ethnicity, and education. Reference country presented second.

3.4.3 Exposure to different types of SSB promotion and SSB consumption

Figure 5 shows the associations between exposure to different types of SSB promotion and SSB consumption, after adjustment for socio-demographic factors. Increased exposure to digital promotions was associated with increased likelihood of both low and high SSB consumption compared with non-consumption (low: RRR 1.19, 95% CI: 1.05, 1.34; high: RRR 1.52, 95% CI: 1.34, 1.71), and similarly for traditional promotions (low: RRR 1.29, 95% CI: 1.16, 1.43; high: RRR 1.40, 95% CI: 1.26, 1.56). Exposure to SSB promotion in the functional environment was only significantly associated with a likelihood of high SSB consumption (RRR 1.21, 95% CI: 1.07, 1.38), compared with no SSB consumption.

3.4.4 Country variations in the relationships between exposure to SSB promotion and SSB consumption

There was inconsistent evidence to show that associations between exposure to SSB promotions and SSB consumption varied across countries. There was no evidence that the relationship between total exposure to SSB promotions and SSB consumption ($p = 0.36$) varied between countries, nor for the relationship between exposure to promotions in the functional environment and SSB consumption ($p = 0.07$). However, there was some evidence that the relationships between exposure to digital promotions, traditional promotions, and promotions in the recreational environment and SSB consumption varied between countries ($p < 0.0001$ respectively). To elucidate these differences, we fitted country-stratified models, which are summarised in an online supplementary file (Appendix 3.2). In short, only the USA and Mexico had significant associations with both low and high SSB consumption when exposed to digital promotions; the UK was significant at high SSB consumption only. For exposure to traditional promotions, only the USA and Australia had significant associations with both low and high SSB consumption; Canada was significant at only low SSB consumption. For exposure to promotions in the recreational environment, there were no significant country-stratified associations with SSB consumption.

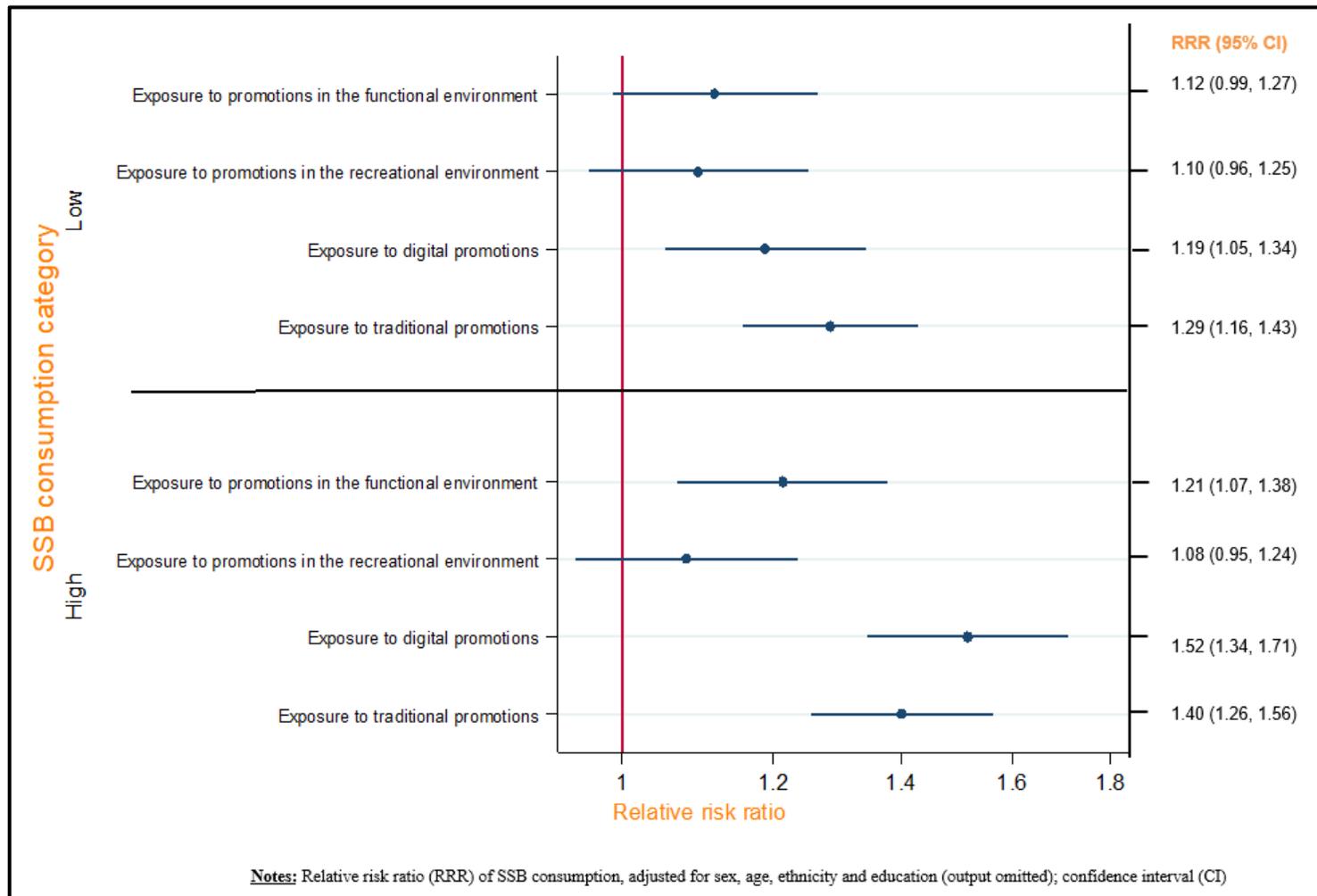


Figure 6 Forest plot summarising the association between self-reported exposure to different types of SSB promotions and SSB consumption, estimated by multinomial logistic regression with adjustment for sociodemographic characteristics (n = 15,515; ref: no SSB consumption)

3.5 Discussion

3.5.1 Summary of findings

To our knowledge, this is the first study to explore the relationship between self-reported exposure to a range of SSB promotions and SSB consumption in a diverse international sample of adults and whether this differs by type of exposure or country. We found that increased self-reported exposure to SSB promotions was associated with a greater likelihood of SSB consumption. Of the various types of promotions investigated in the study, exposure to digital and traditional promotions had the strongest associations with SSB consumption. We also found some evidence that the strength of association between self-reported exposure to digital promotions, traditional promotions, and promotions in the recreational environment and SSB consumption varied between countries in the study.

3.5.2 Strengths and limitations of methods

The strengths of the IFPS design have been reported elsewhere.⁸⁵ Using IFPS data facilitated the inclusion of a large and diverse population sample of adults from countries with varying efforts to reduce exposure to beverage marketing and reduce consumption of sugary drinks. This increases the generalisability of our findings. Unlike existing literature that tends to focus on specific forms of promotion (for example, television advertising),²⁵⁴ we included a broad range of promotion exposures. Using the validated BFQ increased the internal validity of our results.²⁵⁸ However, recruitment using non-probability sampling limited the ability of our analyses to provide nationally representative findings, as did sociodemographic differences between participants in the total and analytical sample. Applying sampling weights throughout helped reduce the threat to generalisability; imputation may have further reduced the potential for this to introduce bias. All variables were self-reported, which could introduce recall and social desirability bias.²⁶³ The potential for social desirability bias was minimised by collecting data online.²⁶⁴ The survey was conducted in December; early winter in the UK, USA, Canada, and Mexico, but early summer in Australia. As SSB intake is likely to be higher in summer,¹⁷⁸ this may introduce differential seasonal effects between countries. It is also unclear how participants interpreted the questions on exposure to SSB ‘advertising and promotions’; some may have employed more expansive definitions to include marketing via product, price, and placement. This may have introduced further bias if there were systematic differences in how people interpreted the questions, according to either their

exposure or SSB consumption. Finally, measures of exposure to promotions were not validated, albeit similar questions have been used elsewhere.²⁶⁵

3.5.3 Comparison to previous research and interpretation of findings

Our findings extend existing studies of exposure to SSB promotions and consumption, which have tended to focus on specific sociodemographic groups, for example, young people and children.^{156,266,267} Our findings that self-reported exposure was positively associated with SSB consumption is consistent with the limited existing epidemiological evidence that focuses specifically on this topic,^{133,268–271} as well as the wider literature, which reports a more generic association between exposure to food and drink marketing and consumption in general.^{126,127,186} The results extend previous work on exposure to SSB promotion by including participants across sociodemographic groups and including countries with different food policies. That the overall finding of an association between self-reported promotion exposure and SSB consumption did not vary between countries with different food environments and policy contexts increases confidence that this is a generalisable finding. Our cross-sectional analyses were unable to demonstrate any putative causal pathways, and it is possible that reverse causation is operating with higher SSB consumers being more likely to notice and so report marketing exposure. However, the high expenditure of soft-drinks firms on marketing provides support for the hypothesis that exposure to promotions of SSBs leads to their consumption. The interpretation of a causal relationship is further supported by numerous experimental studies on exposure to both SSB marketing specifically and food and drink marketing more generally.^{126,127,186}

The fact that the study's findings depend on self-reported exposure to SSB promotions adds another dimension to their interpretation. Assessing exposure using a self-report method has been used in similar research examining the relationship between components of marketing and consumption.²⁶⁵ However, memory of marketing exposure is multidimensional, of which recall and recognition might only capture a small proportion;¹⁴³ specifically, the extent that advertising messages have been encoded in memory and the ability to access that information.²⁷² Meanwhile, consumers are typically less good at gauging the influence of marketing on implicit attitudes,²⁷³ even though some evidence suggests that implicit memory may be more important than explicit recall to soft drinks choice.²⁷⁴ In this light, it is unclear how well our results reflect the association between implicit influences of SSB promotion and marketing more generally and SSB consumption. Future research could address this by seeking to comprehensively measure

exposure to all components of marketing; albeit these methods might come with their own logistical challenges and a risk of overestimating implicit exposure.

To our knowledge, evidence of variation in the strength of association between exposure to SSB promotions and consumption is a novel finding. We found that self-reported exposure to more interactive modes of promotion (digital and traditional) were associated with greater SSB consumption. In contrast, exposure to promotion in the environment that may be more passively consumed were it not conclusively associated with SSB consumption.²⁷⁵ This may relate to the volume or intensity of exposure that participants experienced within each of these modes. Whilst we measured any exposure versus none, we did not explicitly capture variations in volume and intensity, and these may have been greater amongst those reporting exposure to any digital and traditional promotions. However, it is possible that exposure to a higher volume or intensity of promotion may increase likelihood of self-reported recall to exposure. Such an effect may introduce measurement error to the measure of exposure included in this study.

We also did not associate our findings with the fact that most promotion expenditure tends to go towards traditional promotion (e.g., television²⁷⁶), and increasingly towards digital.¹⁵⁵ Interactive modes of promotion may also be more likely to be recalled than others,²⁷² and digital promotion is known to use data analytics to target specific consumers with creative and interactive techniques that have proven highly powerful.^{146,149} Measuring and quantifying marketing exposure using more objective methods, as attempted elsewhere,¹⁴¹ may help to distinguish between these possibilities. Nonetheless, it is important to acknowledge that the complex technology ecosystem used for digital marketing renders it challenging to objectively measure,^{146,150} and control.^{146,150}

Our attempts to differentiate exposure to different types of promotion may also be overly simplistic. Firms are concerned with building “brand equity” through marketing: “everything that exists in the minds of the customer with respect to a brand (e.g., thoughts, feelings, experiences, images, perceptions, beliefs, and attitudes)”.¹¹⁶ This means that firms rely on different components of marketing to work together synergistically, rather than assuming different and separate effects of different modalities. Future research could seek to use brand-level data to understand how different forms of SSB marketing – including promotion – work synergistically to influence SSB consumption.

Existing evidence from the IFPS shows that exposure to SSB promotions varies by country,²⁵⁵ but clarifying whether the association between marketing exposure and SSB consumption differs by country is important for translating the understanding of SSB consumption and regulation internationally. There are several possible explanations for inconsistent evidence of country variations in this study, including the fact that the content of these SSB promotions are likely to vary by country. Given that the effectiveness of marketing is understood to be a function of exposure and power,²³⁷ cross-country differences in the volume of exposure or persuasive power for these promotions may account for the small variations we found in this dataset. Repeating these analyses with a more diverse set of countries, incorporating a measure for persuasive power (e.g., persuasive techniques²⁷⁷), and attempting to understand the extent to which this varies by the company enacting the marketing, could further clarify these variations. This could inform public health policymakers wishing to know whether they should apply international evidence to inform local policy decisions.

In addition to answering the central research questions, analyses also provided insight into the relationship between sociodemographic characteristics and SSB consumption. SSB consumption was higher among males, people with lower educational attainment, younger individuals, and those in ethnic minority groups. All these findings are consistent with wider literature,²⁶⁰ increasing our confidence in the external validity of our main findings.

3.5.4 Implications of findings and future research

Substantial existing evidence links SSB consumption with poor health outcomes.^{15,250} By finding an association between exposure to SSB promotions and SSB consumption, this study adds weight to existing calls to restrict SSB marketing for the benefit of public health.¹⁵⁵ To provide further justification for such restrictions, future research should clarify whether this relationship is causal and extends to other components of marketing. As “mere exposure theory” suggests that product choice may be mediated by repetition of exposure to marketing,²⁷⁴ future studies could extend the present research to quantify and understand the effects of the degree of exposure to promotion. The wear-out effects of repetition of marketing exposure could also be studied by exploring non-linear relationships between marketing exposure and consumption,²⁷⁴ which was not accounted for in the present study. Further developing understanding of the relationship between SSB marketing and consumption could help policymakers develop multicomponent

strategies to address SSB consumption, such as that currently being modelled in Chile.²⁷⁸ For example, if SSB taxes lead to unintended changes to marketing, they could be introduced alongside greater SSB marketing restrictions.

Our results also provide some evidence that SSB marketing restrictions should particularly focus on traditional and digital forms of promotion. Further research should seek to confirm this and explore causal mechanisms for the variations in the effects we found between different types of promotion exposure. The possibility of different types of marketing working synergistically to affect consumption should also be explored. However, our findings suggest that current attempts to restrict SSB marketing that focus overwhelmingly on television advertising could be undermined by reactive increases in say, digital advertising, which are similarly associated with SSB consumption.¹⁸⁰ Taking a broader approach to marketing regulation might ultimately prove more effective.

Given that competitive edge depends on novelty, we should expect to see continued innovation in ways that sugary drinks firms seek to promote their products (such as advergames¹³⁰) and future research should seek to understand the impact of this on SSB consumption. While we found inconsistent evidence of the difference in the strength of association between self-reported exposure to SSB promotion and consumption between the countries included, future research could test this in a more heterogeneous set of countries.

3.6 Conclusions

We found a positive association between self-reported exposure to SSB promotions and SSB consumption among adults in the UK, Australia, Canada, USA, and Mexico. The strength of this association varied by type of promotion exposure: exposure to digital and traditional promotions was associated with greater SSB consumption, whilst there was a mixed picture of associations for promotions in the functional and recreational environment. There was also some evidence that these associations varied by country. Using a self-reported measure of exposure and not measuring the intensity of exposure are key limitations of the study. Nonetheless, efforts to restrict marketing of SSBs should focus on a wider range of marketing than just television promotions and should reflect country context.

3.7 Reflection on overarching research questions and systems map

This chapter has provided evidence to address the second research question of this dissertation: are marketing changes likely to influence the outcomes of SBTs? Despite not being able to ascribe a causal relationship to analyses presented in this chapter, finding one feature of marketing – promotion – to be related to the consumption of sugary beverages in diverse contexts lends credence to the hypothesis that changes to this form of marketing following an SBT could affect beverage consumption behaviours.

This chapter has provided evidence for one hypothesised mechanism in the system surrounding the SDIL, through which changes to marketing could influence the outcomes of an SBT. In the next chapter, I explore circumstances and decision-making that underpins changes to marketing – including promotion – following an SBT.

4 ANTICIPATING CHANGES TO MARKETING FOLLOWING SUGARY BEVERAGE TAXATION

In the last chapter, I found the promotion and consumption of sugary beverages are related. Chapter 2 highlighted that promotion is one of many components of marketing that should be understood to take effect together. Though I was unable to demonstrate a causal relationship, it may be possible that changes to marketing following a sugar beverage tax (SBT) influence sugary beverage consumption. However, from existing literature it is unclear whether and how soft drinks companies decide to change their marketing following an SBT. This chapter using the UK Soft Drinks Industry Levy (SDIL) as a case study for developing evidence to address this gap in knowledge.

4.1 Abstract

The World Health Organization recommends that countries implement fiscal policies to reduce the health impacts of sugary beverages, yet few studies have fully examined the responses of industry to these policies. We aimed to explore the changes that soft drinks companies make to their marketing following introduction of a sugary beverage tax. Following introduction of the SDIL in 2018, we undertook one-to-one telephone interviews with six UK stakeholders from academia, civil society and industry (total n = 18), who had cross-sectoral experience of soft drinks companies' strategic decision-making or marketing. Interviews were transcribed and thematically analysed. Themes were organised into a theoretical framework that depicts a cyclical process of soft drinks company marketing decision-making, accelerated by the SDIL. Decisions about marketing affect a product's position, or niche, in the market and were primarily intended to maintain profits. A product's position is established through various marketing activities including reformulation and price variation, and non-marketing activities like lobbying. A soft drinks company's selection of marketing activities appeared to be

influenced by their internal context, such as brand strength, and external context, such as consumer trends and policy. The theoretical framework suggests that marketing responses following the SDIL were coordinated and context-dependent, potentially explaining heterogeneity in responses across the industry, and which could be prospectively tested to develop more nuanced policies in future.

4.2 Introduction

Sugar consumption, particularly in liquid form, is an independent risk factor for non-communicable diseases (NCDs) like type II diabetes and heart disease.²⁴³ The World Health Organization identifies an SBT as a ‘best buy’ to address NCDs.⁴⁶ SBTs can affect product prices,²⁷⁹ and reduce sugary drink purchases,²⁸⁰ but questions concerning their mechanism of action and optimal design remain unanswered.⁵⁰

Some studies have found that despite relatively acute price changes, the impact of SBTs on purchases accumulate over time,⁶⁵ suggesting price increases are not the sole mechanism of action. SBTs are hypothesised to prompt multiple system-level changes,^{67,76} or ‘spillover’ effects. Some spillover effects, such as when a tax indicating to consumers the negative health effects of sugary drinks, are likely to serve the public health purposes of these taxes, while others such as such as increased promotion of sugary drinks may undermine them. Amassing evidence to understand the nature and impact of reactions across the system in which an SBT acts could inform the design of optimal policy.^{67,80}

Soft drinks companies may respond to an SBT by making decisions about their products, prices, promotion or placement,^{67,76} broadly understood as ‘marketing’ (the ‘4Ps’, or marketing mix).¹¹² Marketing is defined as, “the activity, set of institutions and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners, and society at large”.¹¹⁵ There is substantial evidence that food marketing can lead to changes in preferences, choices and consumption.^{126,127,186} Though less evidence focuses specifically on soft drinks marketing, an emerging literature confirms a similar link (see Chapter 3).^{2,136} If soft drinks companies respond to taxes by changing their products’ marketing, particularly for drinks high in sugar, there may be important repercussions for the public health impacts of such policies.¹⁷⁷ While evaluations of SBTs have focused on beverage composition and price changes,⁴⁵ and some emerging evidence explores changes to advertisements,¹⁷⁵ we are not aware of

studies that have explored changes in marketing, more broadly conceived, following an SBT.

Companies are thought to respond to an SBT by continually testing strategies to find a new equilibrium at which they maximise growth and profits.⁷¹ That a company's strategy could combine the use of multiple activities across the marketing mix, perhaps used differently across a portfolio of many drinks with variable sugar content, has not been explored to date. One potential reason for little evidence about marketing changes may be the absence of clear understanding of the process involved. Developing understanding of this process may help explain why the cost of a tax is often only partly passed onto consumers,⁹¹ and why companies may differ in their responses. Developing a company-level understanding of marketing changes following SBTs could clarify how these policies might be adapted to ensure their health effects are promoted by, and resilient to, responses from the soft drinks market.

Using the SDIL as context for this study, we aimed to contribute towards enhancing this evidence by exploring how soft drinks companies may change their wider marketing strategies in response to SBTs.

4.3 Methods

We undertook one-to-one, semi-structured qualitative interviews with stakeholders from academia, civil society, and industry. Interview transcripts were thematically analysed to develop a theoretical framework used to hypothesise how soft drinks companies might react to taxation. We situated the study in a pragmatist epistemological approach,²⁸¹ accepting there may be multiple realities for soft drinks companies and given our focus on solving practical problems. Reporting adheres to the Consolidated Criteria for Qualitative Research (Appendix 4.1).²⁸²

4.3.1 Interviewees and recruitment

Recruitment and data collection took place in January to May 2019. To inform recruitment and interviews, authors HF and TP theorised ways that soft drinks 'companies' (hereafter used to describe any producer or retailer of sugary drinks responsible for product marketing) might change their marketing in response to the SDIL. Ideas were grouped into a simplified, hypothesised process of marketing change: we anticipated the SDIL would prompt industry strategic decision-making followed by the selection and implementation of marketing activities (Figure 7 and Appendix 4.2). These

expectations were informed by reading peer-reviewed and grey literature published around the announcement and implementation of the SDIL. Using Figure 7, our criteria for study inclusion were: individuals with self-described first- or second-hand experience of soft drinks companies' decision-making or marketing.

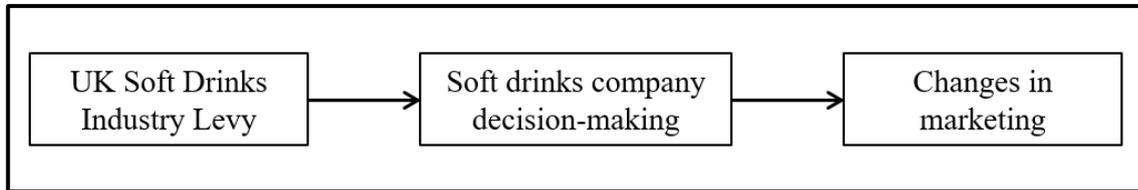


Figure 7 Hypothesised process of marketing change

We purposively sought views across three sectors we thought likely to have different, relevant perspectives: academia, civil society, and industry. Academics from public health, policy, and marketing fields were included; civil society representatives were identified based on experience with policy proposals for diet and obesity; ‘industry’ included any individual with recent or current experience of producing, retailing, or marketing soft drinks.

Interviewees were iteratively recruited using seed and snowball sampling. The seed list consisted of the study teams existing contacts supplemented by searching for relevant organisations using internet searches and LinkedIn, a professional social media platform (<https://www.linkedin.com/>). Preliminary telephone calls and emails helped determine whether potential interviewees met inclusion criteria. Potential interviewees were sent an invitation and interviewee information sheet by email, with the opportunity to ask questions before scheduling an interview. Reminder emails were sent if we received no response within two weeks of their initial invitation. Individuals were classified as ‘non-respondents’ if they failed to reply in a further two weeks. To facilitate snowball sampling, interviewees were asked to share details of relevant contacts following their interview. Non-responses and invitation rejections were recorded.

4.3.2 Data collection

On the day preceding scheduled interviews, interviewees were sent the hypothesised process (Figure 7) and an accompanying narrative (Appendix 4.2) by email. All interviewees elected to complete telephone interviews. Some academic interviewees were professionally known to the interviewer (HF). Interviewees were aware of the interviewer’s name, and research interests: food industry in dietary public health policies. It was assumed that interviewees were interviewed alone, though this was not verified.

Interviews followed a semi-structured interview guide based on Figure 7 (Appendix 4.3). The guide was piloted in the first two interviews,²⁸³ prompting only minor amendments, and pilot interviews were subsumed into the main analysis. Interviews were audio-recorded and transcribed verbatim, and brief field notes made to aid interpretation. We employed the concept of inductive thematic saturation to determine the total sample size.²⁸⁴ We decided *a priori* to complete 15-25 interviewees with equal representation across interviewee groups. As data collection and analysis advanced, we determined a sample size of 18 to approximate saturation, as there were mounting instances of the same codes and no new ones developing.²⁸⁵

4.3.3 Analysis

Analysis drew on the framework method and is summarised in Figure 8.²⁸⁶ The hypothesised process (Figure 7) formed a basis for codes. Themes were used to develop a theoretical framework.

Data analysis began alongside interviews in four iterative, non-exclusive steps: immersion, coding, creating categories, and identifying themes.²⁸⁷ As we were seeking elaboration and clarification of our hypothesised process, analyses melded inductive and deductive reasoning.²⁸⁸ HF became immersed and familiar with the data by reading and re-reading transcripts. Descriptive labels, or ‘codes’, were applied to transcript segments that appeared to address our research interests,²⁸⁷ and broadly grouped as industry decision-making or manifestations of marketing change. Categories were created when similarities between codes were identified, from which we sought explanations and interpretations in order to identify ‘themes’. Themes are interpretative concepts that describe or explain parts of the data.²⁸⁶

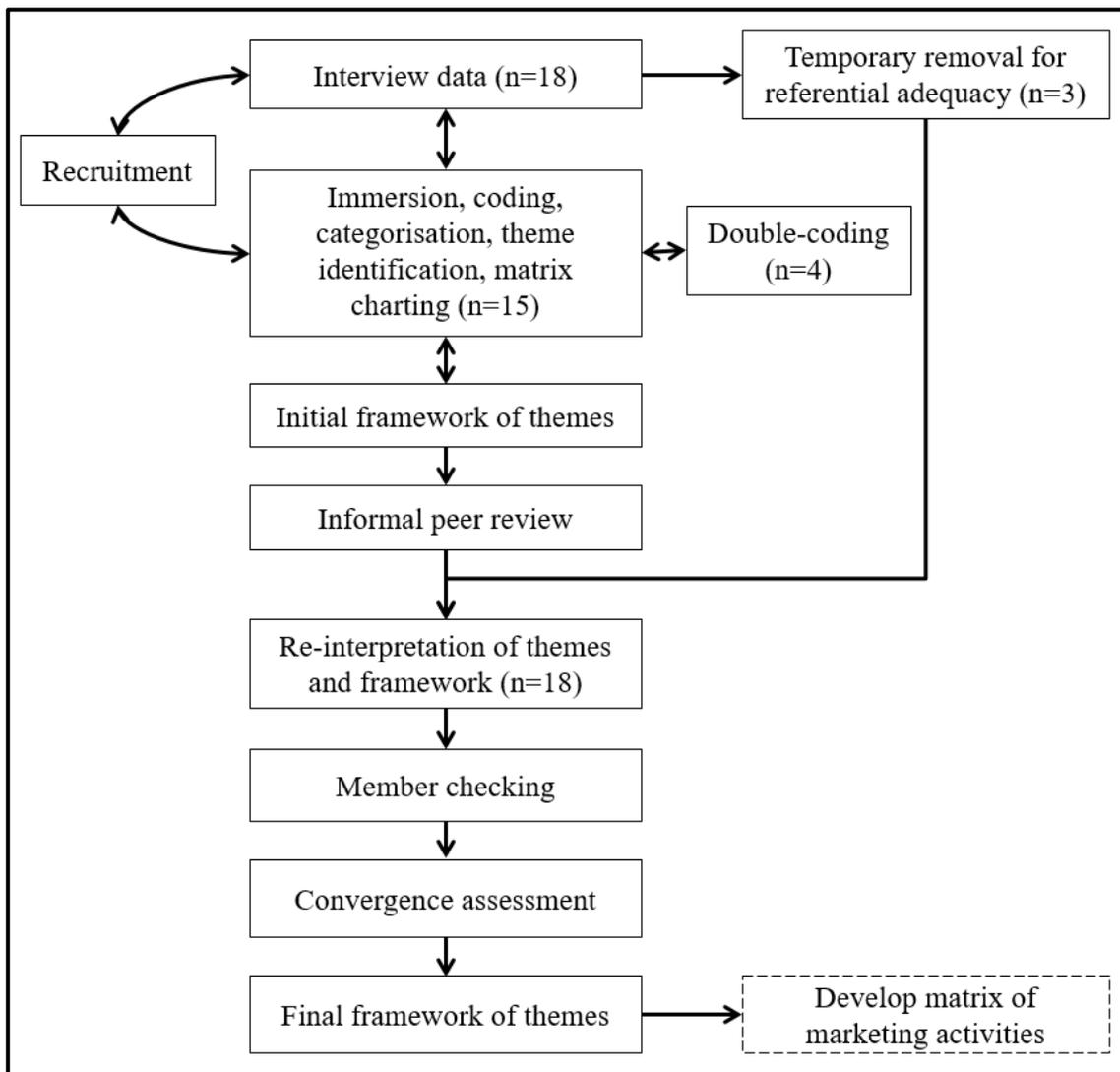


Figure 8 Summary of data analysis procedure

HF, JA and MW then sought relationships between themes with reference to the original hypothesised process of marketing change, in order to produce a revised theoretical framework. To complete the framework method, data were charted in a matrix that facilitated comparison between interviewee groups, culminating in an adapted convergence coding assessment.²⁸⁹ To support the generation of creative, meaningful insights,²⁹⁰ we used a combination of digital tools (Microsoft Excel, NVivo²⁰⁸) and diagramming.

HF, who has experience conducting and analysing qualitative research,²¹⁰ developed initial themes. A subset of transcripts (n = 4) were double-coded (JA = 2, MW = 2) and discussed in a data clinic, minimising the influence of researchers' perspectives on findings.²⁹¹ Referential adequacy was achieved by excluding three transcripts from initial coding.²⁰⁴ Several potential frameworks were shared with the research team (TP, LL, FG)

and a wider research group prompting reinterpretation of some themes, after which the excluded transcripts were reintroduced to verify findings against ‘fresh data’.

Finally, member-checking entailed sending a summary of findings to interviewees by email to ask how well they reflected interviewees’ experiences and views (Appendix 4.4).²⁹² Reminder emails were sent after two weeks; we assumed interviewees had no further comments if we received no response within a further week. Comments were collated and discussed by the authors, prompting minor amendments to the theoretical framework and some refinement and consolidation of themes.

4.3.4 Ethics

A favourable opinion on the study was obtained from the University of Cambridge Humanities and Social Science Research Ethics Committee (approved 16 May 2018, ref: 18/165).

4.4 Results

4.4.1 Interviewee recruitment and characteristics

We interviewed 6 professionals from academia (ACA01-ACA06), 6 from civil society (CIV07-CIV12), and 6 from industry (IND13-IND18). To preserve anonymity, we report a summary of interviewee characteristics for each group in Table 9. Potential industry interviewees were least likely to respond to initial contact (25% response vs. 100% in academia, 62% in civil society). Industry was the only interview group to offer referrals that successfully permitted snowball sampling ($n = 2$). Interviews lasted between 20 and 51 minutes (mean: 33 minutes).

Table 9 Participant characteristics

Interviewee numbers	First contact n	First response n (%)	Referrals n (%)	Interviews n (%)	Summary of interviewee characteristics
Academia ACA01- ACA06	10	10 (100)	0	6 (60)	Marketing researchers with experience of public health; public health and policy researchers with experience of marketing; marketing and strategy researchers.
Civil society CIV07 - CIV12	13	8 (62)	0	6 (46)	Experience in social marketing, food campaigning, researching SBTs, consumer or policy advocacy for health.
Industry IND13- IND18	70	17 (24)	2 (3)	6 (9)	CEO of a small soft drinks company; marketers for medium-size soft drinks companies; former employee of a large soft drinks company; marketing strategists.

Notes: ‘First contact’: initial contact made by email, telephone, or LinkedIn to an organisation or individual; ‘First responses’: reply to initial contact from an organisation or individual; ‘referrals’: individuals successfully recruited into the study by snowball sampling; percentages are proportions of initial contact.

Table 10 presents a description of themes and supporting categories with example quotations. Themes were robust to reintroducing the three transcripts archived for referential adequacy (CIV10, CIV12, IND18). When a summary of findings was sent to interviewees (Appendix 4.4), 11 provided feedback (61%). In response, we developed a matrix to depict the relationships between company context and specific marketing activities (Table 11), alongside an accompanying narrative. Convergence assessment found no areas of dissonance between interviewee groups; areas of silence appeared to reflect interviewees’ relative expertise.

Table 10 Description of themes and constituent categories with illustrative quotations

Themes	Description of theme and constituent categories (in bold)	Illustrative quotations of theme
On-going monitoring	Companies use various tools to continually monitor the market, to identify opportunities and threats for achieving a competitive commercial advantage.	“horizon scanning...the trend that’s going to hit the in the next year, two years, three years, and how can I make a sustainable product portfolio” [IND15]
Identify stimuli	Companies identify stimuli – like the SDIL – in their context that encourage an accelerated review of their products’ market position to capitalise on marketing opportunities.	“when these kind of things come into play they’re not new news...the only change when the levy was announced was it gave us a deadline to complete that work” [IND14]
Determine products’ market position	Careful, iterative decision-making, often involving cross-departmental input, informs a product’s position in the wider market.	“if you imagine it like a mixing desk in an audio studio...how do I mix this to create the maximum return for my shareholders?” [CIV07]
Purchase soft drinks	Companies will coordinate their activities in a way that retains profit, since this is their overwhelming concern.	“the idea that this was some kind of financial catastrophe has proven very untrue” [CIV10]
Internal context	Factors within a soft drinks company are monitored to inform marketing decisions. Marketing changes must be consistent with brand identity . Higher brand strength may lead to price increases and diversification, while lower brand strength may lead to reformulation. Capacity and willingness within a company determines the feasibility of activities: larger companies have more resource but may be less agile. A company’s concern for reputation may mean they want to ‘do the right thing’. Learning from experiences of responding to similar stimuli determines how a companies’ optimism in their response to the latest stimuli. Companies with a large portfolio can spread risk, meaning they have less incentive to reformulate.	<p>“if you’ve spent decades telling people this is what the Real Thing tastes like, the harder it is to actually change” [IND17]</p> <p>“it’s very much capacity-led... we can’t handle doing campaigns and new product development at the same time” [IND14]</p> <p>“having had that experience, you know, both industry and to a certain extent, governments were like, oh okay...we know what to do now in these situations” [CIV07]</p> <p>“if a brand has a kind of portfolio of products, they might have looked at, ‘well we allocate our marketing spend slightly differently...can we move them onto milk-based drinks or juice-based drinks?’” [CIV12]</p>

Themes	Description of theme and constituent categories (in bold)	Illustrative quotations of theme
External context	<p>Factors outside a company that may influence its market performance are monitored. These include competitor activity, as success depends on relative performance, and a stimulus may provide an opportunity to differentiate. Consumer preferences are important because they are bi-directly associated with purchasing. Retailers are influential because they negotiate and enact some marketing activities, including price promotions. Suppliers influence feasibility of reformulation and new product development. Perceptions of the direction that policy and regulation may take influences responses to stimuli.</p>	<p>“it’s an iterative, circular process of organisations driving consumer wants, and these becoming consumer needs, and then organisations fulfilling consumer needs” [CIV07]</p> <p>“if the retailers think that your price is going to stop people buying the product the retailers will negotiate very hard with you” [ACA01]</p> <p>“it may be that the threat of [sugar company] putting their prices up holds more of a threat than the levy, in which case you keep the sugar and pay the levy because otherwise you’re going to get screwed” [ACA01]</p> <p>“we had seen the introduction of that schools’ legislation [which restricted what products could be sold in schools] as being kind of almost a forbearing of what might come” [IND14]</p>
Marketing	<p>Companies make changes across the marketing mix to position a product. Activities include reformulation, where companies reduce the sugar content of levy-eligible drinks to avoid paying the full levy cost. Increasing the price of products enables companies to pass [at least some] cost of the levy to consumers. Some companies will develop or acquire new products, perhaps because there are no existing consumer taste expectations. Companies could also change messaging in their marketing, developing messages about health, continuity, heritage, or choice. Changing product packaging, perhaps across brands in the portfolio, can help communicate these messages. Reducing portion size may encounter less resistance than reformulation, though more easily achieved once smaller product sizes are normalised. PR campaigns, such as those focused on sport, could promote drinks and boost reputation. Though technically possible, changing the distribution and changing the placement of products is difficult to negotiate.</p>	<p>“don’t change your packaging, don’t do a press release, just quietly get rid of the sugar and nobody notices if you do it well” [CIV10]</p> <p>“a lot of it has been buying up other companies that have mid or low-calorie beverages and adding them to their portfolio” [CIV11]</p> <p>“almost kind of de-risking it by putting all their brands on pretty much the same platform, and saying effectively, you choose” [IND17]</p> <p>“focusing on portion size is the right solution...the alternative, which is to tinker with the formula is a really bad idea” [ACA06]</p> <p>“if you can’t push the problem away..[then you could] invest in CSR type activities, public education activities, things which can give your company a healthier look” [ACA05].</p> <p>“they always sell through retailers, and so how the retailers respond is very important” [ACA06]</p>

Themes	Description of theme and constituent categories (in bold)	Illustrative quotations of theme
Non-marketing activity	Companies also use activities that do not directly affect the relationship between a product and prospective consumer to position their products in a market. This includes framing either themselves or the stimuli in a way that protects profits, and lobbying , possibly against further regulations; these are likely to contrast with their communication to the public.	“(example) soft drinks don’t contribute to dental caries, the problem is it’s the parents who don’t supervise the children brushing their teeth” [ACA05] “they undoubtedly would have argued against it or argued for a different approach” [IND16]

Notes: PR campaign public relation campaign; CSR corporate social responsibility

Table 11 Factors in a soft drinks company’s internal and external context that possibly increase the likelihood of a marketing response

		Marketing response								
		Reformulation	Develop or acquire new products	Change messaging	Increase product price	Reduce portion size	New PR campaigns	Change distribution	Change placement	Change packaging
Factor in the external context	Competitor activity	If competitors reformulate	If competitors develop/acquire new products	-	If competitors increase price	If competitors reduce size	-	-	-	-
	Consumer preference	If interested in health, not wary of artificial sweeteners	If interested in health, low-sugar variants likely	If interested in health, health messaging likely	If below the consumer psychological threshold	If smaller products considered acceptable	If interested in health, health campaigns likely	-	-	-
	Policy and regulation	If responded to policy before or think more will follow	If think similar policy will follow, low-sugar variants	If wary of policy, create ‘health’ and ‘choice’ messaging	-	-	-	-	-	-
	Influential retailers	-	-	-	If aligns with retailers’ goals	-	-	-	If aligns with retailers’ goals	-
	Influential suppliers	If sugar suppliers are not influential	-	-	If sugar suppliers are not influential	-	-	-	-	-

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		Marketing response								
		Reformulation	Develop or acquire new products	Change messaging	Increase product price	Reduce portion size	New PR campaigns	Change distribution	Change placement	Change packaging
Factors in the internal context	Brand identity	If identity not tied to sugar	If identity tied to sugar	If identity tied to sugar, messaging likely to be about continuity, heritage	If identity tied to sugar, more likely than reformulation	If identity tied to sugar, more likely than reformulation	If identity tied to sugar, sport or choice campaign likely	-	-	-
	Brand strength	If a weak brand	If a strong brand	If a weak brand that is easier to change	If a strong or 'luxury' brand	If a strong brand	-	-	If a strong brand	-
	Capacity and willingness	Less agile, lack infrastructure or willingness	May be easier to acquire products than develop new ones	If sufficient resource to support new campaign	If internal dynamics are supportive	If sufficient infrastructure and willingness	If company has international presence	If company has international presence	-	If sufficient resource available
	Concern with reputation	If concerned with appearing responsible	-	If want to appear healthy, health messaging likely	-	-	If want to appear healthy, sport or health campaigns	-	-	-
	Learning from experience	If reformulated successfully before	-	-	-	-	-	-	-	-

Marketing response									
	Reformulation	Develop or acquire new products	Change messaging	Increase product price	Reduce portion size	New PR campaigns	Change distribution	Change placement	Change packaging
Size of portfolio	If no low-sugar variants in portfolio	If no low-sugar variants in portfolio	Choice messaging if low-sugar variants in portfolio	-	-	-	-	-	-

Notes: Read as: marketing response that is likely to happen if a contextual factor is present e.g., reformulation is likely to happen if competitors reformulate

4.4.2 Company context and marketing responses following the SDIL

Interviewees agreed that companies would respond to the SDIL using varied forms of marketing in combination:

“[marketing] is very much a recipe and you don’t bake a cake and then think, “now we’ll add the sugar”; you work out the recipe first and then bake the cake...it doesn’t make any sense to make decisions about one without considering the others” [ACA03].

Information that includes point-of-sale data, market research, and observing competitor activity at trade shows, facilitate continuous evaluation of factors within a company – their internal context – and factors outside of a company – external context. This monitoring informs a company’s assessment of their performance, enabling them to both identify and respond to stimuli like the SDIL. Interviewees reported that the SDIL sped-up the process of monitoring, marketing decision-making and activities to position a product in the market:

“catalysts to me are things that are accelerating change...100% [the SDIL] is a catalyst” [IND18].

The motivation for changing marketing in response to context and stimuli is to retain profit:

“marketing will do whatever it takes in order to maintain the bottom line” [ACA05].

4.4.2.1 Reformulation

The most extensively described marketing response to the SDIL was reformulating levy-eligible soft drinks to reduce sugar content and avoid paying the levy. Whether a company could reformulate and protect profits appeared to depend on several contextual factors. Brand strength, which is the perception and value invested in a brand, significantly influenced reformulation. Customers were described as less price-sensitive to stronger brands, preferring to pay a higher price than consume a reformulated product, particularly if the brand strength is strongly connected to consumers’ perception of taste. Reformulation was more feasible for brands whose identity has been traditionally orientated around healthiness, whereas interviewees reported that companies with a heritage tied to sugar can receive ‘backlash’ to reformulation (*“sugar was the whole point of it” [ACA02]*).

Consumer preferences, and particularly trends for healthiness and lower sugar products, were also described to facilitate reformulation:

“there’s a big section of the market that is interested in health and reducing sugar, you could say that that’s influenced the market more than the SDIL”
[ACA02].

Reformulation was thought to help protect the reputation of a company who wanted to be seen to be ‘doing the right thing’ in the eyes of external stakeholders such as consumers and policymakers. However, interviewees also said that some companies were wary of replacing sugar with artificial sweeteners because of consumers’ fears about their health effects.

A company’s capital also affected likelihood of reformulation: those with substantial physical production infrastructure were thought to be less agile to formulation changes. Though sufficient capital was also considered necessary to finance reformulation, one interviewee from academia expressed scepticism when describing how soft drinks companies appeared capable of easily switching production techniques to accommodate other consumer trends. Sugar suppliers were also said to affect a company’s likelihood of reformulation, as they could respond to reduced demand by raising prices, negating any financial incentive of removing sugar. Practical factors related to the size of a company were also reported to influence a soft drinks company’s ability to reformulate. Larger companies with portfolios consisting of both high and low sugar products were thought less likely to reformulate, as they already have lower sugar alternatives on the market.

Interviewees noted that some reformulation pre-empted the SDIL announcement, but also explained that companies probably explored other options before reformulating (*“move through a range of backstops...never move immediately to the reformulation stage”* [ACA05]). Interviewees also described a *“last mover advantage”*, with some companies waiting to observe the results of competitors’ reformulation before committing, and possibly supporting formulation-specific legislation that ‘levels the playing field’ by encouraging simultaneous action. Normalisation of reformulation by a few significant companies may have encourage wider adoption.

Interviewees described how experience of successfully responding to other legislation may have reduced resistance to reformulation. One interviewee described how their company’s reformulation following school food legislation them had prepared them for the SDIL [IND14], recognising the role of consistent legislation as a mechanism of effect.

4.4.2.2 Develop or acquire new products

Another commonly discussed marketing response to the SDIL was portfolio expansion by developing or acquiring new products. New products included a wider range of less traditional offerings, such as ready-to-drink coffees. Like reformulation, some of this diversification was thought to pre-date the SDIL and reflected a focus on protecting profits by both “*maintaining the [price-insensitive] heavy user*” [ACA05], of core brands while also selling lower-sugar alternatives to health conscious or price-sensitive consumers.

As with reformulation, an existing portfolio consisting of levy-exempt drinks was thought to result in less pressure for diversification. Interviewees described a decreasing marginal return to increasing portfolio size, as large portfolios risk diluting the power of flagship products. Brand strength and identity also influenced the nature and likelihood of acquiring or developing new products. Interviewees thought it easier for companies to acquire than change existing products, if those products had a strong taste expectation among consumers:

“a combination of both the classic heritage premium product kind of thing together with introducing new brands” [ACA02].

The nature of a company’s physical and financial capital may have also determined whether companies developed or acquire new products. For some, it may be quicker and less costly to acquire products than to develop new ones.

Perceptions about future policy and consumer trends also influenced diversification, with some companies thought to be ‘future-proofing’ their portfolio through expansion. One industry interviewee noted that the normalisation of lower-sugar drinks was leading some companies to search for alternative ways to identify their products as ‘healthy’, adding vitamins, fibre or protein:

“no added sugar’ just isn’t cutting it for [consumers] anymore” [IND14].

4.4.2.3 Change messaging

Some companies were reported to change the overall essence of their communications to stakeholders, including consumers and policymakers, following the SDIL. As communications are enacted through activities across the marketing mix, the nature of messaging in response to the SDIL depended on other marketing decisions. Though some companies also chose to enact new messaging campaigns, it was noted that campaigns are often costly and so may only be a feasible option for larger companies. One industry

interviewee described how their company had to choose between developing a new product and launching a new messaging campaign [IND14].

Frequently described marketing messages centred around health, continuity, heritage and choice. For those companies concerned about consumer preferences, reputation and health-focused policies, their messaging was more likely to focus on health:

“we’ve reformulated, we care’, you know, ‘we want to help the obesity crisis’, they can use that as a kind of social marketing campaign” [ACA01].

Given perceived concerns about the health impacts of artificial sweeteners, it was thought that health messaging would be cautious about explicitly mentioning these. An interviewee also explained that brands are often marketed using multiple messages, for example a lead message (such as health) supported by one or two others (choice, heritage). Changing the messaging may involve reordering their hierarchy, rather than developing new messages altogether.

Interviewees thought it would be harder for strong or unique brands to dramatically change their messaging without undermining the brand. In these cases, a focus on continuity and heritage that reassured consumers was considered preferable:

“protecting the heritage, protecting the kind of uniqueness of certain brands” [ACA02].

Whilst most messaging is brand-specific, some may take place across portfolios. Interviewees described how a company had unified the messaging across their portfolio, possibly to position sugar consumption as a consumer choice that their portfolio could accommodate and continue to promote high-sugar variants by stealth.

4.4.2.4 Increase product price

Increasing the price of levy-eligible products in response to the SDIL was considered more likely and successful for strong brands, as they have the least price-sensitive consumers. As with reformulation, interviewees also thought it possible that price changes could be subject to ‘domino effects’, with a few companies having to blaze a trail before others rapidly followed suit.

The intermediary role of retailers was also considered important in relation to brand strength and price increases: *“negotiating a price increase into the retail trade is a, it’s like a dance” [CIV07].* Stronger brands were considered more able to negotiate lower margins with retailers because they are viewed as ‘commodity products’ that define

particular retail areas for customers ('the soft drinks aisle'). Retailers can demand higher margins from weaker brands because not selling these is unlikely to impact overall custom.

Varying brand strength within a company's portfolio, combined with negotiations with multiple retailers (who themselves are in competition), and company-specific calculations of margins, meant one interviewee thought there were practical difficulties in differentially pricing higher versus lower sugar drinks within and between companies. Differentially pricing high and low sugar variants within a brand was also thought to make running price promotions logistically challenging and harder to communicate to consumers. An interviewee thought this might lead companies with large portfolios of products with varying sugar content to maintain price uniformity across their portfolio [CIV07]. With many soft drinks companies operating internationally, these dynamics can play out at both a national and international level.

4.4.2.5 Reduce portion size

Reducing portion size, either separately or alongside other marketing changes, was a further potential marketing response to the SDIL. Interviewees had seen this in response to previous legislation, such as menu labelling. Whilst reducing portion size – which was mostly described in terms of reducing the package size, rather than recommended serving size – is equivalent to increasing price in terms of volume cost, one interviewee thought reducing portion size was more acceptable to consumers than increasing price as it does not pass a "*psychological threshold*" [ACA06].

As with price, interviewees suggested that reducing portion size is more acceptable to consumers of stronger brands than reformulation, and that previous negative experiences of reformulation may push some companies to prefer this alternative strategy. Again, the importance of normalisation of, in this case, smaller pack formats across the sector following the SDIL was noted [IND15], reinforcing the notion that some company-level reactions can be amplified by significant players to become a sector-wide strategy.

Limited consumer-facing messaging around smaller portion sizes was considered particularly important in ensuring the acceptability of this strategy. An interviewee reported that a company may have adopted this strategy if they were specifically measuring their performance by profits rather than volume sales.

4.4.2.6 Change distribution, placement and packaging; new public relations campaigns

Though descriptions of other marketing activities were less salient, interviewees said it was possible that every marketing lever could have changed in response to the SDIL, including distribution, placement and packaging. Interviewees also explained that large multinational companies might have recouped lost sales in the UK following the SDIL by increasing sales in other countries. As with price changes, retailers were thought to have been central in determining whether a company could reposition their products in retail outlets. The most desirable locations, such as end-of-aisle and eye-level shelves, usually cost more to occupy:

“soft drinks and other food manufacturers pay the grocery stores very large fees in order to first get on the shelf, to stay on the shelf, to get at eye level, to get on the end of aisle displays, to get in the checkout, to really be more visible and promoted, to have these very aggressive sales” [CIV11].

Again, those products with higher brand strength or companies with more financial capital were thought more able to use this lever.

Interviewees cited some brands they thought had changed their packaging in response to the levy. Changing packaging may be one aspect of a new messaging campaign. In some instances, repackaging lower sugar variants to resemble higher sugar ones more closely, may have normalised lower sugar drinks for consumers.

Interviewees touched on the potential for using public relations (PR), particularly as part of Corporate Social Responsibility (CSR) strategies in response to the SDIL, giving the example of physical activity promotion. As PR is usually expensive, interviewees thought only larger companies would have been able to use this lever.

4.4.3 Theoretical framework

Using the relationships between themes described, we further developed a theoretical framework that shows a process of marketing decision-making in which a stimulus such as the SDIL accelerated, rather than precipitated, soft drinks companies' review of a product's position in the market (at a brand or company level) (Figure 9). Both marketing activities and non-marketing activities are used to determine a product's market position, in turn influencing soft drinks purchases and profits that act as a feedback loop. Though this process is similar for each company, the differing internal and external contexts of each company means the process results in a unique combination of marketing activities

for each company: “each company will not go through the same decision...[the outcome] depends on the company” [ACA01].

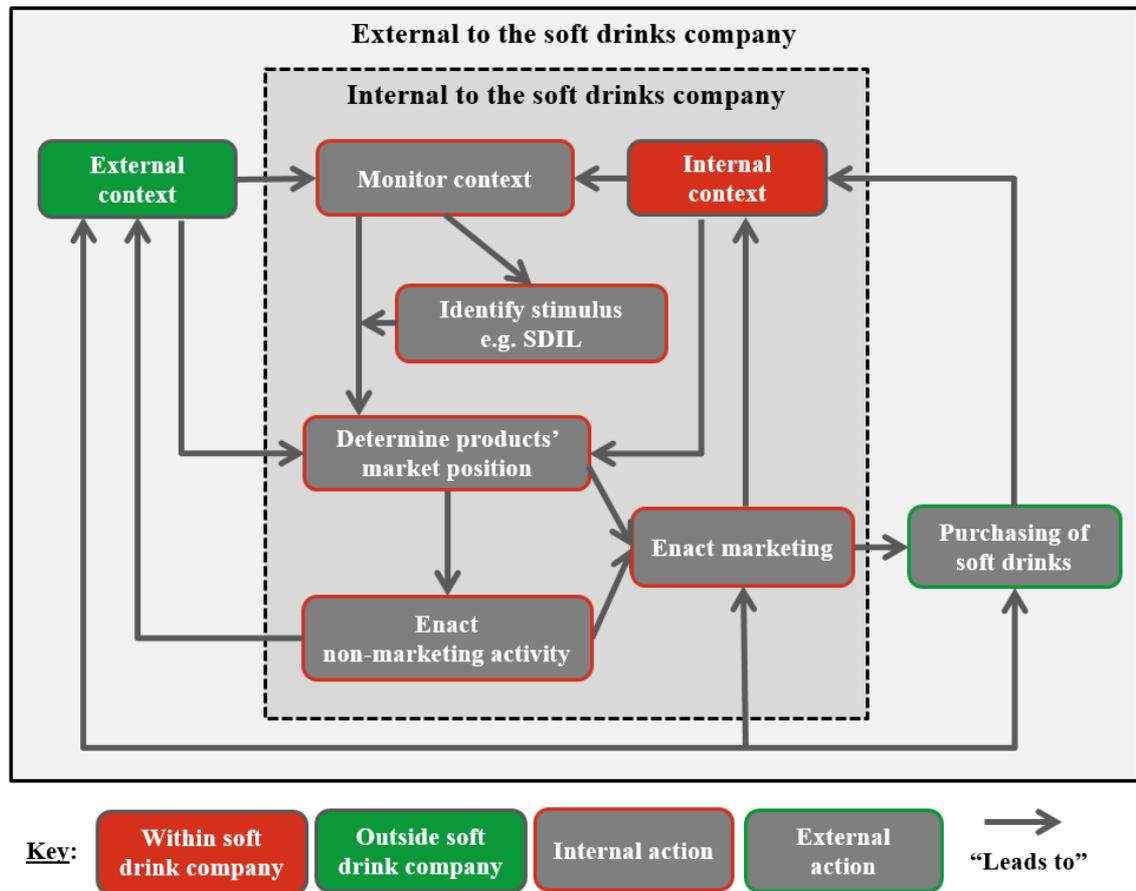


Figure 9 Theoretical framework of marketing decision-making in response to the SDIL

4.5 Discussion

4.5.1 Summary of study findings

Using the SDIL as a case study, we explored how soft drinks marketing might change in response to taxation. We found that the underlying process is iterative, influencing cyclical marketing within companies, and accelerated by the SDIL. Possible marketing changes spanned the full suite of potential marketing activities, including changes to the product, its price, placement and promotion. The exact selection of marketing activities chosen by any particular company is thought to be determined by context-specific internal and external factors. For example, companies with high- and low-sugar products in their brand portfolio appeared less likely to reformulate, while those with high brand strength, high-sugar drinks were more likely to increase prices. Understanding the role of context may help explain possible heterogeneity in marketing responses to the SDIL across the

soft drinks industry. This could help predict company-level marketing changes following SBTs with potential advantages for public health policy formulation.

4.5.2 Strengths and limitations of the study

The openness of the marketing process initially theorised by the study team helped to avoid limiting the scope of the interviews.²⁹³ Subsequent use of a data collection method sensitive to commercial pressures enabled the collection of information from a range of expert stakeholders. Stakeholders made transformational contributions to understanding the marketing decision-making process, rendering their involvement an asset to this study.

Existing professional relationships between the study team and some interviewees increased sampling specificity but may have introduced confirmation bias. This was reduced by including interviewees previously unknown to the interviewer in each of the three participant groups. Employing an alternative set of methods or interviewees may have led to different findings. Collecting data one year after the SDIL was implemented may have increased the credibility, with interviewees referencing marketing they knew to have occurred. However, this may have also introduced recall bias and limited expansive thinking. Focusing on the SDIL may have limited the transferability of findings to taxation policies designed differently.⁴⁵ Exploring marketing responses to other stimuli, including SBTs elsewhere, would determine the relevance of the theoretical framework to other policies and contexts.

Establishing credibility of the specific concepts and processes in our final theoretical framework was helped by triangulation between researchers,²⁹⁴ and across a diverse set of stakeholder groups.²³⁶ Comparing the contribution from each interviewee group using an adapted convergence assessment highlighted differences in contribution rather than sentiment,²⁸⁹ suggesting that our study findings may resonate in other contexts. Our findings proved robust to validity testing using referential adequacy and member-checking,²⁰⁴ further increasing their credibility.

4.5.3 Comparison to existing literature

By employing a broad conceptualisation of marketing, this study has extended existing literature that both implicitly and explicitly explores marketing changes following an SBT. Changes to price and product composition following SBTs have been reported for several countries,^{91,295,296} but often this is not explicitly considered in relation to other

marketing activities that may influence the health outcomes of such taxes.^{175,177} The theoretical framework we developed is specific to SBTs but echoes elements of existing marketing change models, such as the role of context and continuous market feedback,^{297,298} which increases the credibility of the model. The marketing field has called for greater focus on evaluating the combined impact of marketing.²⁹⁹ Responding to this call with a theoretical framework that is consistent with marketers' understanding of integrated marketing communications and specificity to SBTs may form a basis for understanding important but separate bodies of literature.

SBTs are often assumed to lead to an increase in sugary beverage prices,³⁰⁰ yet our findings suggest this may not follow for every company. The framework emphasises that events like the SDIL are one of many factors considered when determining the form and nature of marketing. Reviewing their context in totality may result in a soft drinks company making either no changes to their activity, changes that either conflict or align with public health goals, or changes that are quickly augmented based on 'feedback' from sales figures. Emerging evidence confirms that some impacts of the SDIL, such as on company gross domestic product,⁸³ are small or short-lived, and appear to reflect inward investment in marketing activities. Exploring circumstances leading to the alignment of commercial and public health goals could inform the design of SBTs that are robust to industry resistance and counteraction.⁷¹ For example, our study highlighted that soft drinks companies were more likely to reformulate sugary beverages following the SDIL if they thought there was consumer interest in low sugar products and political appetite for further regulation. This resonates with existing research that demonstrates the potential role of public support for SBTs.⁸⁵

4.5.4 Interpretation and implications

The theoretical framework proposes that using a broader concept of marketing leads to a better understanding of industry behaviour in response to public health policy. This understanding could help develop integrated policy strategies that pre-empt and mitigate industry responses that undermine the public health goals of SBTs. For example, our theoretical framework suggests a soft drinks company could resist a reduction in their sales following tax-induced price increases, by changing their product packaging, thus diluting any public health benefit of the price increase. Introducing mandatory labelling legislation alongside SBTs, such as in Chile,¹⁸³ could help avoid this.

The SDIL was specifically intended to encourage companies to reduce portion sizes and reformulate high sugar drinks to lower sugar alternatives.⁶² To our knowledge, our study is the first to explore circumstances in which an SBT might elicit specific responses, like these, from soft drinks companies. Factors that might drive a company to reformulate following taxation include their competitors' reaction, consumers' interests, previous positive experience of responding to policy, and a brand identity not tied to sugar. A company appeared more likely to reduce portion sizes if this was considered acceptable to consumers, they had high brand strength, access to the required infrastructure, and a brand identity tied to sugar. Though we explored these factors at a company-level, they allude to the role of changes across the industry in determining the overall influence of the soft drinks industry on the health outcomes of SBTs. For example, competitors' reactions helped to normalise and perpetuate certain responses, making industry leaders particularly influential. Incentivising positive reactions from industry leaders may thus maximise the potential of future fiscal interventions.

The role of soft drinks companies' external context in determining their marketing response to taxation suggests it may be possible to influence these environments to achieve particular responses. We found that a soft drinks company considers trends in policy implementation when reacting to a single policy like the SDIL. This suggests that measures like the suite of complementary legislation and regulation set out in the second chapter of the UK Government's Childhood Obesity Plan,²⁸ are harder for a company to negate. Such extensive legislation may therefore be more likely to elicit responses from industry aligned with policymakers' objectives than a single measure. Our finding that companies also determine their response based on concern for their reputation suggests that positioning an SBT in the context of the benefits derived from its revenue might be another way that policymakers can encourage certain responses from industry, which corroborates with previous evidence demonstrating the importance of framing.³⁰¹

4.5.5 Unanswered questions and future work

As the value of theory depends on testing and application in practice,³⁰² it would be beneficial to explicitly test our framework with findings emerging from the SDIL evaluation as well as those from other SBTs and taxes on less healthy foods. In addition to the emerging evidence already outlined, evidence at a company- rather than industry-level will be required to further test the role of contextual factors in determining a company's marketing reactions to the SDIL. To permit testing our framework using other

policies, evaluations of future dietary fiscal interventions must also incorporate an explicit focus on marketing changes in its widest sense. As the framework posits that marketing changes iteratively and in response to contextual feedback, these evaluations could employ methods sensitive to temporal changes. Though our findings suggest some contexts that may be associated with specific marketing responses, we have not explored how contexts may work together to produce a marketing mix of activities. Exploring this in future work would achieve a more detailed understanding of the influence of marketing on health outcomes.

The finding that reactions to SBTs are likely to be company-specific suggests policymakers could pay attention to individual – or groups of similar – companies, defined by characteristics like size or brand strength. Though it is difficult to exhaustively assess the behaviour of every company, perhaps policymakers could achieve more robust SBTs by devoting greater attention to market leaders responsible for the greatest volume of sugar in the market, and what is expected of them following an SBT based on their context. As the SDIL was already informed by industry consultation,³⁰³ it may be necessary for policymakers to seek alternative avenues for understanding industry behaviour.

4.6 Conclusion

By employing a broad conceptualisation of marketing, this study illustrated that soft drinks companies' marketing reactions following the SDIL were heterogeneous and dependent on company-specific context. Future work should explore what contexts can lead to marketing activities that enhance or undermine public health aims of SBTs, to inform the design of future fiscal interventions. Doing so might have more general relevance for understanding how the food and drinks industry responds to a wider range of public health regulatory interventions, and the consequences for achieving public health gain.

4.7 Reflection on overarching research questions and systems map

This chapter has presented evidence to address two of the overarching research questions of this dissertation: what does 'marketing' encompass in the context of SBTs, and are marketing changes likely to influence the outcomes of SBTs? Firstly, interviewees reported that soft drinks companies would take a wide range of marketing activities to

mitigate effects of an SBT (the SDIL) on company profits, regardless of whether they align or misalign with public health goals of the SDIL. These include commercial activities that are often measured in evaluations of SBTs, but that are rarely conceived as marketing (e.g., reformulation, price changes).

These findings resonate with those of Chapter 2, as the improved conceptual clarity of marketing proposed in Figure 4 was operationalised in Figure 9. For example, Figure 9 demonstrates the integrated nature of marketing as it illustrates that decisions about different forms of marketing are taken as part of the same cyclical decision making process. Findings in Chapter 4 develop those of Chapter 2 by being more specific to SBTs.

The results presented in this chapter also highlight that marketing changes following the SDIL vary across the soft drinks industry, by finding factors within and external to a company that contribute to their decision-making. It was noted that changes to promotion, in the form of messaging campaigns, are costly and so may only be a feasible option for larger companies. To explore this further, in the next chapter I explore whether market leading soft drinks companies responded to the SDIL by changing their advertising expenditure.

5 CHANGES IN ADVERTISING EXPENDITURE FOLLOWING THE UK SOFT DRINKS INDUSTRY LEVY

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6 DISCUSSION

6.1 Overview

Using the UK Soft Drinks Industry Levy (SDIL) as a case study to generate evidence, research presented in this dissertation addressed three overarching questions:

- (i) What does ‘marketing’ encompass in the context of sugary beverage taxes (SBTs)?
- (ii) Are marketing changes likely to influence the outcomes of SBTs?
- (iii) Did marketing change in response to the SDIL?

In the preceding chapters, I have presented results of empirical analyses and discussed findings separately. In this chapter I reflect on these findings with respect to the overarching research questions and discuss the overall strengths and limitations of the research. I also interpret findings in the context of existing literature, reflecting on the systems map produced by the National Institute of Health Research (NIHR)-funded evaluation of the SDIL.⁶⁷ Finally, I discuss policy implications of my research findings and propose unanswered questions that could be addressed in further research.

6.2 Summary of main findings

6.2.1 What does ‘marketing’ encompass in the context of SBTs?

Several reasons prompted the aim to improve understanding of what marketing entails in relation to SBTs. Firstly, though it was expected that outcomes of an SBT are influenced by reactions of related stakeholders within the surrounding complex adaptive system, it was unclear at the outset which of these reactions should be understood as marketing. There is limited research in this area, however the two studies I was aware of that explicitly explored changes in marketing following an SBT did so only by evaluating advertising and price promotions,^{175,176} possibly missing the full extent and intent of commercial responses to SBTs. Furthermore, that study focused on only a city-wide policy (Oakland, California, USA), potentially overlooking responses that might occur for a national SBT like the SDIL. Secondly, while a commercial entity may know which of their activities have been conceived as marketing, this distinction is less clear to

external stakeholders, including public health researchers. Finally, wider conceptual clarification of ‘marketing’ in public health literature focusing on food marketing was required.

To develop broad conceptual clarity about marketing, Chapter 2 explored the conceptualisation and operationalisation of marketing in public health research of food and drink marketing. This was achieved using a scoping review of reviews with application of principles of critical interpretive synthesis (CIS). The synthesis of 24 publications found that the concept of marketing has been confused in this subset of literature, particularly as individual features of marketing were inconsistently understood to take effect in an integrated way. This was exhibited through the misunderstanding of creative features of marketing that cross multiple forms of media, confusion about the distinction between each form of marketing (such as promotion), and individual forms of marketing not being understood in the context of each other. From these results, I concluded that future studies of food marketing in public health research – including those specific to SBTs – should be grounded in the understanding that separate commercial activities that pursue marketing objectives take effect synergistically.

Chapter 4 presented evidence specific to the SDIL. This evidence was developed by thematically analysing 18 interviews with representatives from academia, civil society, and industry. Analyses unearthed the breadth of marketing changes anticipated to follow the SDIL, including commercial activities that are often measured in evaluations of SBTs, but that are rarely conceived as marketing (e.g., reformulation, price changes).

Together, this evidence highlights the importance of appreciating the theoretical extent, diversity, and coordinated nature of marketing changes that follow an SBT.

6.2.2 Are marketing changes likely to influence the outcomes of SBTs?

In Chapter 2 and Chapter 4, I established that marketing – and specifically marketing changes anticipated to follow the introduction of an SBT – encompasses many commercial activities. In Chapter 3 and Chapter 5, I focused on one established form of marketing: promotion, which has been under-researched in the context of SBTs.³⁹

Chapter 3 presented evidence of associations between the promotion and consumption of sugary beverages. This was achieved by fitting multinomial logistic regression models to the 2017 International Food Policy Study, which surveyed adults across five countries (UK, Australia, Canada, USA, Mexico). Self-reported exposure to sugar-sweetened

beverage (SSB) promotions was associated with a higher likelihood of sugary beverage consumption: each additional unit of exposure meant a participant was 8% more likely to be a low-consumer and 13% more likely to be a high-consumer, relative to not consuming SSBs ($n = 15,515$). These associations were also stronger for digital and television promotions than those in the functional and recreational environment. There was some evidence that the relationship between exposure to promotions and consumption differed between countries included in the study. These analyses assert that at least one feature of marketing is associated with the consumption of sugary beverages.

Chapter 4 complemented these findings with qualitative evidence. Interviewees reported that soft drinks companies would use a range of marketing activities to mitigate effects of the SDIL on company profits. For each company, marketing activities and other non-marketing activities were selected in a circular process, that entailed reviewing unique factors in their internal context (such as brand portfolio and capital), and external context (such as competitor activity, retailers and the wider policy landscape). That these selections are made irrespective of their impact on health suggests it is theoretically feasible that marketing changes following an SBT, and the SDIL in particular, may affect a policy's health outcomes.

6.2.3 Did marketing change in response to the SDIL?

I also focused on promotion to address this question. In Chapter 4, I found that a company's financial resource influences their decisions about marketing, and in Chapter 1 I described the difficulty with quantifying features of marketing. Thus, in Chapter 5 I explored the use of advertising expenditure as a means for assessing promotional activity in the form of advertising among market-leading soft drinks companies. Though advertising does not encompass all forms of promotion, the sizable financial resource soft drinks companies direct to advertising suggests it is an important feature of their marketing activity.^{105,253}

I conducted interrupted time series analyses using advertising expenditure data from Nielsen, a market research company, to assess whether soft drinks advertising expenditure changed over a 68-month period in which the SDIL was announced and introduced. Analyses were stratified by three media groups: (i) digital and television, (ii) press and radio, (iii) cinema and out-of-home. These analyses found no evidence of changes to soft drinks advertising expenditure in response to the SDIL.

6.2.4 Reflecting on the systems map

My research has been grounded in the understanding that the effects of SBTs on public health are influenced by the complex adaptive systems in which they reside. The system surrounding the SDIL, visualised early in the NIHR-funded evaluation and later updated (T. Penney et al., unpublished data, 2021),^{67,76} was used throughout the dissertation to contextualise findings produced in each chapter. Here, I return to the systems map once more (Figure 15), to reflect on the findings presented in this dissertation.

The first observation to make from Figure 15 is that marketing, as it has been conceived in this dissertation, encompasses many of the adaptations that the food industry were anticipated to make following the announcement and implementation of the SDIL. Until recently,³⁹ such responses had not been conceived as marketing, and the two studies that explicitly assessed changes in marketing following an SBT did not adopt this conceptualisation.^{175,176} Similarly, the first version of the SDIL systems map had identified ‘marketing’ as a separate response to, say, price changes or reformulation,⁶⁷ (since amended in the latest version of the map presented in Figures 1 and 15; T. Penney et al., unpublished data, 2021). Though many studies of SBTs have explored commercial activities (e.g., price, reformulation), they have not explicitly considered them to be embedded in a wider, coordinated marketing process. Thus, applying a systems approach to my research enabled me to consider a broader range of industry activities to constitute marketing, than may be traditionally considered in public health studies of marketing. In doing so, a systems approach may have allowed me to operationalise marketing in a way that more closely mimics the conceptualisation used by the commercial food system.

Using a broader conceptualisation of marketing, as I have in this dissertation, suggests that despite finding no evidence of changes in Chapter 5, the SDIL did elicit a marketing response from soft drinks companies. For example, changes to products (e.g., reformulation⁸⁹) and price⁹¹ both constitute changes to marketing. Furthermore, evidence of the industry discourse surrounding the SDIL may also be indicative of a wider non-market response to the SDIL.⁸² Chapter 4 presented evidence to show that these responses are determined by a broader decision-making process that reflects each company’s individual context. In this way, applying a systems approach enabled me to integrate findings from wider literature with those of my own research in order to draw conclusions about marketing changes following the SDIL.

6.3 Strengths and limitations

Throughout this mixed-methods dissertation, I have used various data sources, including textual data from existing literature, secondary data, interviews, and a commercial dataset. Doing so demanded the corresponding application of diverse analysis techniques. The benefits and limitations of each approach were discussed in separate chapters. In this section, I discuss overarching strengths and limitations.

6.3.1 Using secondary and commercial datasets

Secondary data were used on multiple occasions in this dissertation: publications to facilitate the literature review in Chapter 2, the 2017 International Food Policy Study (IFPS) in Chapter 3, and Nielsen market research data in Chapter 5. Using secondary data enabled me to measure and understand phenomena at a scale that is difficult to achieve through primary data collection.

The opportunities and challenges of using third-party commercial data sources for public health nutrition research have been documented elsewhere.^{322,323} However, these are mostly reported in relation to their use for measuring consumer activity rather than food and drink industry activity, as has been the focus of this dissertation. Data from Nielsen was analysed in Chapter 5. Though Nielsen advertising data has been used to measure marketing activity in the USA,³⁰⁷ I am only aware of a single recent incidence of it being used for public health research in the UK (though not published in peer-reviewed journal);¹⁶⁹ and am not aware of it being used as a means for exploring responses to a population health intervention like an SBT. While such novelty is a strength of the research presented in Chapter 5, the absence of precedent for analysing such data was a limitation. Data are collected across a wide range of drinks and media through the use of Nielsen's expertise in market rates for advertising. Achieving this same level of expertise and extensive data gathering would have been beyond the scope of my PhD research. It is worth noting that I first attempted to gather information about advertising expenditure from soft drinks company investor and marketing reports available in the public domain. However, I found these sources provided insufficient granularity required for the analyses I intended, most likely because such detail is commercially sensitive.

Secondary datasets only offered imperfect solutions to the financial-, intellectual- and time-limitations of my PhD research. As I was neither overseeing nor designing data collection, data were not collected specifically for my research aims. For example, had I

been involved in the design of the IFPS, I would have worded the question that measured exposure to sugary beverage promotions differently (Table 6), (i) to exclude ‘chocolate milk’ from the definition so that it coincides with the classifications of the SDIL, and (ii) to clarify whether and how ‘advertising and promotions’ differ.

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In part, these issues arose because of the process for purchasing commercial data. When acquiring Nielsen data, I was unable to view the full dataset before committing to purchase. This gave limited opportunity for making a detailed statistical analysis plan *a priori*, which itself is a recognised limitation in quantitative research.²⁸³ It may be necessary for some features of commercial data to remain obscure prior to purchase for commercial data suppliers to preserve their ‘competitive edge’ against other sources. However, my experience suggests that commercial data providers could encourage wider use of their data by helping researchers see greater detail of data available to purchase, for example by publishing comprehensive data dictionaries.

6.3.2 Integrated marketing

This dissertation is grounded in the understanding that marketing in practice entails the use of multiple activities that are designed to take effect synergistically. My concern with the conceptualisation of marketing in public health literature, and whether it corresponds with marketing in practice, developed as my personal understanding of marketing

evolved. For example, I became aware that I had initially confused promotion, advertising and marketing by thinking they were synonymous. As I previously described, marketing and promotion had also been confused in an earlier iteration of the SDIL systems map.⁶⁷ My awareness of this confusion arose in the preparatory stages of my research: preliminary reading, and more substantively through my attendance of lectures in the MPhil Marketing programme at the University of Cambridge Judge Business School, led by Professor Jaideep Prabhu. Broadly, it appeared that the study of marketing in public health had greater focus on consumers' interactions with marketing, and less focus on the processes that develop, coordinate, and govern it, as in the business field. Though these differences are likely to reflect inherent discrepancies in the interests and goals of each respective field, I was keen to establish whether this confusion was limited to my misunderstanding, or reflected wider conceptual confusion in public health research. The results in Chapter 2 suggest it may be the latter. That I proceeded to apply an underlying principle of marketing that resonates with marketing in practice for the remainder of my research thus may be considered a strength of my research.

I used an introspective examination of research practice to meet my study aim relating to conceptualisation of marketing. However, the issues outlined above suggest it may be important to draw explicit comparisons with the conceptualisation and operationalisation of marketing among marketing professionals. Though this was not an explicit aim of Chapter 4, that the framework developed using stakeholder interviews also reflects a broad conceptualisation of marketing may suggest the conceptualisation I have endeavoured to apply throughout this dissertation resonates with marketing professionals.

Throughout my research, I have emphasised the importance of understanding marketing activities taking effect in synergy. I have used the SDIL systems map to help generate greater insight about marketing overall rather than that produced by the individual studies. However, I did not attempt formal configurative integration of research findings in this dissertation. In part, because integration will be conducted in work package five of the ongoing NIHR-funded evaluation.⁶⁷ Furthermore, in Chapter 2 I found an absence of specific methods for understanding the effect of integrated marketing activities in public health research of food and drink marketing (e.g., understanding the effect of price and promotion). The potential to apply existing methods for configurative integration, such as process tracing or case study research,^{239,324} could be explored in future research of marketing in integration.

6.3.3 Understanding corporate activity

This dissertation has introduced innovation to the study of both marketing in public health research, and SBTs. Primarily, it has placed a greater emphasis on understanding the real-world practice of marketing and the underpinning process than may have been the focus of previous research, as was found in Chapter 2. In doing so, the dissertation presents a new lens through which we might observe and understand why and how commercial entities respond to SBTs. Though applying a marketing perspective to SBTs has been recently proposed through the review of existing research,³⁹ this dissertation is the first research I am aware of to apply such a perspective to the design of empirical research.

Necessarily, understanding corporate activity required the involvement of commercial stakeholders, which in this dissertation, took the form of interviews with soft drinks industry representatives (Chapter 4). Their contribution to understanding marketing decision-making was substantive, particularly as they cited examples specific to the SDIL. However, this approach was limited. Firstly, I was only able to involve a small number of industry representatives. Their experiences may not generalise to those of others across the soft drinks industry. Given the difficulty I had recruiting these interviewees (100 initial contacts to achieve six interviews), their perspectives may not represent those of the companies unwilling to participate in this study. Furthermore, it is plausible that those participating in the study presented a ‘whitewashed’ version of reality; possibly omitting details that could be commercially sensitive or reputation-damaging.

Though public health researchers engaging with the food industry is not uncommon, it is common for such relationships to be problematic if their outcomes support industry goals rather than public health ones.³²⁵ As referred to earlier in this dissertation, this reflects a broader difference in the respective objectives of improving public health and maximising profits for the food industry. These two objectives have only aligned by coincidence to date.⁹⁶ However, evidence from my dissertation has highlighted the value of improving the understanding of real-world industry practices in public health research. To improve understanding further, mutually acceptable ways for gleaning insights from industry that avoid conflicts of interest will be required. Existing work is underway to clarify how this might be achieved,^{325,326} and some areas of industry are demonstrating genuine desire to shift towards a healthier food system,⁷¹ which may support such an ambition.

The SDIL anchored research in this dissertation, allowing me to contribute evidence to supplement that of the NIHR-funded evaluation for understanding whether the policy

‘worked’. A possible limitation of this approach is that it is unclear whether the findings in this dissertation will generalise to other SBTs. I attempted to draw generalisable insight by developing theoretical frameworks (Chapter 2 and Chapter 4). Using these, along with evidence emerging from SBTs in other countries and contexts, should produce a broader understanding of marketing responses to SBTs.

6.3.4 Reflexive summary

Inevitably, my own beliefs, judgements and practices influenced the research presented in this dissertation. For example, I rarely drink sugary beverages, which means my own consumption behaviours are not directly affected by SBTs. This may mean I am more accepting of SBTs as a means for reducing sugar consumption than a heavy consumer of sugary beverages might be. Furthermore, prior to my career in academia, I worked in the private sector. Such experience could mean I am more sympathetic to the intentions and practices of commercial companies than another researcher without such experience. Prior to starting my research, I had no direct experience of working in marketing. Had I approached my research with practical marketing experience, I may have made different methodological decisions e.g., focusing on an area of marketing I know to be topical to marketing practitioners. Such examples demonstrate that another researcher, with different beliefs and experiences, might have developed a different focus of research.

I view my role as a researcher to be distinct from that of an advocate. It is feasible that such position influenced my decision to focus a portion of my research on the processes that drive marketing and how we conceptualise these as researchers (Chapters 4 and 2, respectively), as I view these as important for advancing the study of marketing in public health. Had I been more concerned with public health advocacy, I might have instead chosen to focus my attention on research that might be more accessible to advocates, such as research of industry tactics following the SDIL.

6.4 Interpretation and implications

6.4.1 ‘Marketing’ in the context of SBTs

Findings presented in Chapter 2 emphasise the importance of understanding marketing to take effect across a range of activities in synergy. Interviewees in Chapter 4 also anticipated marketing responses would include commercial activities that are often measured in evaluations of SBTs, but that are rarely conceived as marketing (e.g., reformulation or price changes). Though my interview questions may have encouraged

interviewees to consider marketing expansively (Appendix 4.3), their openness and the contributions from industry marketing professionals suggest these findings have credibility. In future research, the frameworks developed in Chapter 2 and Chapter 4 could form a basis for elaboration with industry representatives with the explicit aim of comparing their conceptual understanding of marketing to that in academia. Achieving this by using a different SBT as a case study, and particularly one designed differently to the SDIL, may help identify whether the extent of marketing responses is unique to the design and context of the SDIL or common elsewhere.

Defining, and subsequently applying, a broader conceptualisation of marketing than that typically used in public health research responds to calls for greater use of cohesive systems approaches in the study of commercial food industry activities.³²⁷ Though the value of complex systems approaches has been long recognised, they have been underused.^{103,327} My research suggests that applying a marketing lens to the study of commercial responses to SBTs may be one way of operationalising complex systems approaches. Like systems thinking,^{103,327} marketing also emphasises that the effect of separate actions are greater than the sum of their parts, but with the additional benefit of being a concept understood and applied by industry.

A marketing lens could be used to ensure evaluations of policies – such as SBTs – are purposefully designed to capture the spectrum of possible commercial responses, in turn allowing the observation of a potential balloon effect.^{170,171} Doing so could inform a more comprehensive approach to regulation that pre-empts industry counteraction, and ultimately proves more effective at achieving public health goals. As conceptual clarity is often only achieved with wider uptake, demonstrating its value through such an application may help both verify and proliferate the conceptualisation of marketing used in this dissertation.

The application of a marketing conceptualisation that I believe to most resonate with its real-world practice, assumes that the characteristics of real-world marketing are definite and uncontested. However, marketers themselves have struggled to achieve absolute conceptual clarity. In this dissertation, I reported that no one theory of marketing exists (Chapter 1), discussed blurred lines between marketing and other non-market activities,¹⁰³ and understood that integrated marketing communications have been applied differently by marketing professionals and academics.¹¹⁸ Though I have attempted to highlight ways that conceptual clarity in the study of food marketing in public health research – and particularly in the context of SBTs – may be improved, it may be that marketing itself is

intrinsically difficult to define, and to reduce to methods and hypotheses. Incremental improvements to the conceptualisation of marketing in public health research may be a more realistic goal than absolute conceptual clarity.

6.4.2 The influence of marketing changes on SBT outcomes

Analyses of survey data in Chapter 3 found evidence that the promotion and consumption of sugary beverages were related. This complements other existing evidence that has found placement,¹³¹ product,¹³² and price,¹³⁵ to be related to sugary beverage purchasing and consumption. Though I could not demonstrate a causal relationship with cross-sectional analyses, finding these relationships exist in multiple countries in Chapter 3, and demonstrating the scale of soft drinks advertising expenditure in Chapter 5 (and elsewhere, e.g.,⁹⁵), contributes to causal understanding. Furthermore, the SDIL systems map,⁶⁷ and systems approaches more generally, highlight that cause-and-effect relationships within a complex system are likely to be non-linear.³² Thus, there are many possible causal pathways between changes to commercial activities following an SBT – such as promotions – and consumption of sugary beverages, possibly leading to disproportionate impacts over time.³² Results presented in Chapter 3 contribute towards understanding such pathways.

In this dissertation, I have implicitly conceived ‘effectiveness’ of the SDIL to constitute lower sugary beverage consumption in the UK. However, there is likely to be a global impact to national policies, particularly when multinational, ‘Big Food’ companies (MNCs) are affected by such policies. Chapter 4 highlighted that soft drinks MNCs will survey their global context to inform decisions about marketing. The result may be a global balloon effect, in which an SBT in a high-income country leads to an MNC redistributing their marketing and sales to lower income countries which typically have high or potential demand with fewer regulations.³²⁰ Thus, international policy coherence may be required to prevent unintended MNC counteraction, and to improve policy ‘effectiveness’ on a global scale. This could take the form of a framework convention for healthy food environments, like the World Health Organization (WHO) Framework Convention on Tobacco Control,³²⁸ which was recently proposed,³²⁹ and previously proposed for food marketing specifically.¹²⁷

Evidence I present in this dissertation emphasises that marketing only undermines an SBT if it encourages greater consumption of sugary beverages or alternatives that are less healthy. Some marketing changes that followed the SDIL were necessary for the policy

to reduce sugar consumption (e.g., reformulation). In Chapter 4, I theorised that features of a soft drinks companies' context might elicit specific commercial responses to SBTs. For example, I hypothesised that a company with sufficient financial resource and no established low-sugar brand in their portfolio, might be more likely to respond to the SDIL through reformulation. These findings suggest there may be ways for policymakers to manipulate companies' external context to encourage marketing responses that are most beneficial for health. This might entail policymakers' ensuring the wider regulatory environment is consistent with the sugar reduction efforts of an SBT. At an international level, this could take the form of a framework convention for healthy food environments (described above), but other mechanisms such as trade restrictions on sugar or advertising restrictions for HFSS products at a national level may also be of value.

To identify which marketing responses are beneficial or undermine health, and how they might be encouraged, it is also important that research continues to explore the health effects of drinks with sugar substitutes following an SBT. Evidence suggests the SDIL resulted in reformulation,⁹⁰ though it was not clear from these analyses the extent that non-nutritive sweeteners were used. Though use of non-nutritive sweeteners is a common mode of achieving reformulation, Chapter 4 revealed that some consumers remain sceptical about their health effects, possibly for good reason.¹⁵ To determine the most beneficial marketing changes to follow an SBT, it would be helpful for future research to demonstrate conclusively whether artificial sweeteners lead to negative health outcomes, and to explore ways to improve consumer perceptions of artificial sweeteners.

6.4.3 Whether marketing changed in response to the SDIL

In Chapter 5, I found no evidence of changes to advertising expenditure. However, there are many other possible ways that advertising may have changed, for which advertising expenditure would have been a poor metric. As I described in Chapter 5, there are many other ways that advertising may have changed, which are not captured by overall expenditure, including redistribution between brands and the messages contained within these adverts. Furthermore, the measure of advertising expenditure used in Chapter 5 estimates the cost that soft drinks companies were charged to feature their adverts in particular media types (e.g., television, radio, etc.), which I purposefully chose with the intention it encompasses the financial resource dedicated to influencing consumers' exposure (e.g., frequency of adverts, whether they appear in 'prime time' periods). However, this metric does not directly account for the cost of producing adverts, which

may be more indicative of power (e.g., featuring celebrities or costly creative techniques). As marketing takes effect as a function of exposure and power,¹²² future work may benefit from focusing on possible changes to the power of advertising following SBTs.

As I described earlier in this Chapter, applying the broad conceptualisation of marketing to existing evidence relating to the SDIL suggests it did elicit a marketing response from soft drinks companies, even if not via advertising expenditure. Though I am not aware of empirical, peer-reviewed evidence of changes to advertising aside from advertising expenditure, there is also anecdotal evidence such as changes in messaging in adverts.³¹⁹ Such anecdotal evidence could be used to develop hypotheses to underpin future research of advertising changes following SBTs.

Chapter 4 emphasised the importance of understanding company-level responses to SBTs, which are likely to differ because of company context. Indeed, it may be particularly valuable to appreciate company-level responses in the soft drinks industry, where market power is highly concentrated among few market leaders.⁹⁵ Such heterogeneity may be hard to detect in the industry-level evidence that has been evaluated in many SBT evaluations to date (e.g.,²⁹⁶), which risks overlooking the full extent and nature of marketing changes that follow SBTs. Though I trialled a company-level approach in my research by using evidence from Chapter 4 to inform my decision to analyse only market-leaders in Chapter 5, there is great potential for further use. To realise this potential, future SBT evaluations should gather company-level evidence.

6.5 Further unanswered questions

6.5.1 Fiscal interventions and their evaluation

Many SBTs now exist worldwide.⁴⁵ Testing my findings with evidence for SBTs that are ‘similar’ (e.g., South Africa) and ‘different’ (e.g., Barbados) in design and context to the SDIL will be important for assessing their generalisability. Doing so could examine whether features of the SDIL, such as it being a tiered excise tax and the two-year lag period between announcement and implementation, elicited a marketing response more so than for a tax without these features. Future research could also explore the value of applying a marketing lens to fiscal population health interventions for products other than sugary beverages. This could include testing the decision-making process theorised in Chapter 4 with the body of evidence that details the effects of alcohol and tobacco taxes in the UK.³³⁰ Doing so could create a more general understanding of unhealthy

commodity industries' responses to population health intervention, which may inform the design of more robust policies.

There are calls for fiscal population health interventions to be more ambitious. Taxes may be applied to other products associated with diet related ill-health, such as those high in fat,⁴⁵ and it has been proposed that the SDIL is extended across a broader range of products.³³¹ Use of fiscal policy could also be extended to concurrently correct other market failures, in addition to those contributing to poor diet. For example, the soft drinks industry is known to have significant impact on the environment as well as health: Coca-Cola was named the biggest plastic polluter in the world for three consecutive years.³³² The potential to use fiscal interventions to mutually benefit climate and health have been explored in theory,³³³ and specifically in relation to SBTs (e.g., internalising the social cost of carbon³³⁴), but not yet implemented. Findings of this dissertation emphasise the importance of measuring many possible commercial responses, and appreciating the marketing process coordinating them, to ensure such policies have a beneficial impact overall.

There is growing interest in leveraging other macro- and micro-economic policies to benefit health, in addition to fiscal ones. For example, trade policy has attracted interest for its potential to restrict the supply of products high in fat, salt and sugar within a nation's food system.³³⁵ Greater use of trade policy may be particularly beneficial for restricting consumption of sugary beverages, as there is evidence that trade policy has facilitated their proliferation to date.³³⁶ Findings presented in this thesis suggests the metric of success for such policies that affect MNCs (e.g., soft drinks companies), should not be conceived at a national-level, as there is potential for 'dumping' of unhealthy products in low-income countries. As the soft drinks industry has concentrated power among the market leaders,⁹⁵ which itself is a market failure,³⁴ the potential for greater use of competition policy in the soft drinks industry could also be explored in future research.

There is also interest in the use of complementary policies to address market failures contributing to high levels of sugary beverage consumption.³⁹ Evidence I presented in Chapter 4 theorised the potential for complementary policies to elicit favourable marketing responses following an SBT. Firstly, it demonstrated the role of consistency in policy and regulation affecting soft drinks companies' decision making. Secondly, it demonstrated the potential for a balloon effect following an SBT, as companies respond to a regulation on one feature of their activity (e.g., sugary density), with a range of activities to protect their corporate interests. As recent evidence has also demonstrated

the potential for spending – in the form of subsidies – to amplify the effect of an SBT,^{46,321,337} policymakers could consider implementing a complementary policy approach to SBTs in future.

6.5.2 Marketing research and policy

Applying a broad conceptualisation of marketing in future research, beyond that related to SBTs, may help overcome some of the methodological reductionism that I described in Chapter 1 and identified first-hand in Chapter 3. To date, many studies of marketing have explored one component, often in an ‘artificial’ setting (e.g.,¹⁵²). The findings I present in this dissertation emphasise the need to measure marketing exposure using multiple components, over time, and across various media types, which may be best achieved across multiple studies. Findings in this thesis, particularly those in Chapters 3 and 5, also emphasise the need to continue to develop methods for measuring the power of marketing; specific methods for sugary beverage marketing have recently been proposed,³⁰⁶ and could be tested in the context of SBTs.

Future research could also explore marketing strategy, which represents the blueprint for marketing activities.^{119,120} There have been recent calls to research marketing strategy,^{39,105} and research presented in Chapter 4 emphasised the contribution of decision-making to strategy. However, I am not aware of existing research that has explicitly explored marketing strategies following SBTs. In part, this may be because of the conceptual confusion around strategy that I identified in Chapter 2. To explore the potential for use of strategy to understand integrated marketing activities, for which I failed to find existing methods in Chapter 2, future research could thematically analyse strategy documents available on soft drinks company websites. However, these should be treated with care as the full marketing strategy is unlikely to be available in the public domain.

Non-market activities were not a specific focus of this thesis. However, soft drinks companies are known to use extensive non-market activities to pursue their goals, such as lobbying and influencing public health research (e.g.,^{108,338}). Boundaries between market and non-market activities are increasingly blurred, as many cross-cutting activities are used to pursue corporate interests.^{103,105} The theoretical framework I developed in Chapter 4 suggests this may be specifically true of soft drinks companies’ responses to SBTs, as decisions about market and non-market activities were part of the same process.

Thus, future research may benefit from exploring non-market responses to SBTs, in addition to marketing ones.

There may be other measures for understanding upstream decision-making within soft drinks companies that affect both market and non-market activities. For example, there is a growing body of public health research that explores the relationship between investment decisions and corporate practices.^{339,340} In the UK, ShareAction recently mobilised investors to demand healthier and safer systems, which was reported to have affected corporate decision-making for a leading supermarket.³⁴¹ Future research should continue to explore the use of investment decisions – possibly in response to SBTs – for understanding the influence of corporate activities on health. Though financial resource has the potential to appreciate corporate activity more broadly than through a singular measure, my experience trialling the use of advertising expenditure in Chapter 5 suggests it is important that such research focuses on understanding the nature, in addition to scale, of such investments.

6.6 Conclusion

The commercial food system is currently experiencing market failures, resulting in the consumption of more sugar than is recommended at great cost to public health and society. There is growing momentum for addressing these market failures with fiscal policy, particularly SBTs, yet the success of these policies depends on the reactions of related stakeholders.

In this thesis, I explored the use of marketing for understanding soft drinks company responses to SBTs, and the SDIL specifically. I found marketing to consist of a suite of commercial responses to SBTs, including those that are not usually conceived as marketing in the public health field. Marketing, in the form of promotion, was found to be related to consumption of sugary beverages, meaning there is potential for marketing changes to influence the health outcomes of an SBT. Companies were found to make decisions about marketing based on factors within and external to them. I found no evidence that soft drinks advertising expenditure changed following the SDIL, though there are many possible changes to advertising that would not have been captured by this measure.

Results of my dissertation emphasise the need for future research to appreciate that commercial activities following an SBT exist as part of a connected and coordinated whole. Using marketing as a concept for understanding these responses may be a way to

proliferate the application of systems thinking to the study of unhealthy commodity industries. Doing so could inform the design of policies that pre-empt adverse responses and even elicit commercial responses that amplify favourable health and commercial outcomes.

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8 APPENDICES

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APPENDIX 1 OTHER CONTRIBUTIONS DURING PHD RESEARCH

Yau A, Singh-Lalli H, **Forde H**, Keeble M, White M, Adams J. UK newspaper coverage of food insecurity, 2016-2019: a thematic analysis. *BMC Public Health*. Under review.

Penney T, Penn-Jones C, Pell D, Cummins S, Adhikari V, Adams J, Briggs A, **Forde H**, Mytton O, Rayner M, Rutter H, Smith R, White M. Reactions of the commercial sector to the announcement of the Soft Drinks Industry Levy: a longitudinal qualitative analysis of UK media articles, 2016-18. In prep.

Penn-Jones C, Lawlor E, **Forde H**, Penney T, Cummins S, Adams J, Briggs A, Mytton O, Rayner M, Rutter H, Smith R, White M. Exploring parliamentary debate surrounding the UK Soft Drinks Industry Levy: an applied thematic analysis. In prep.

Alvarado M, Penney T, Clifford Astbury C, **Forde H**, Adams J, White M. The evaluation of policies to improve population level diet: an approach for using integration to support causal explanation. In prep

Schulze K, Adams J, Imamura F, Eijlerskov K, Love R, Penney T, **Forde H**, Winpenny E, White M. Associations Between Ultra-Processed Food Intake and Cardiometabolic Health: a systematic review and meta-analysis. In prep.

Lawlor E, Ellis K, Adams J, **Forde H**, Foubister C, Xiao C, Jago R, Pollard T, Morris S, Summerbell C, Foley L, Cummins S, Panter J. Stakeholders' views and experiences of developing guidance for, designing, commissioning and implementing changes to the external physical environment which have the potential to promote active living: a systematic review and qualitative synthesis. In prep.

Forde H, Solomon-Moore E. A Qualitative Study to Understand the Potential Efficacy of an Information-Based Sugar Reduction Intervention among Low Socioeconomic Individuals in the UK. *Int J Environ Res Public Health*. 2019;16(3):413. doi:10.3390/ijerph16030413.

APPENDIX 2 CHAPTER 2 SUPPLEMENTARY MATERIAL

Appendix 2.1 Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

From: Tricco AC, Lillie E, Zarin W, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169(7):467-473. doi:10.7326/M18-0850.

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	PAGE#
TITLE			
Title	1	Identify the report as a scoping review.	35
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	35
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	36-37
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	37-38
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	38
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	39
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	39
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Appendix 2.2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	40-42
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done	40-42

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	PAGE#
		independently or in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	40-42
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	40-42
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	42-43
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	42-43
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	N/A
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	43-49
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	49-50
Limitations	20	Discuss the limitations of the scoping review process.	50
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	53
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Appendix 2.4

Appendix 2.2 Database search strategies

Embase via Ovid

1	Marketing	(marketing OR sponsorship OR advert* OR celebrit* OR promotion* OR campaign* OR brand* OR logo* OR price* OR pricing OR placement OR persua* OR “social media” OR TV OR televis* OR billboard* OR radio OR magazine* OR newspaper* OR tweet* OR Twitter OR Facebook OR Instagram OR Snapchat OR YouTube OR influencer* OR TikTok OR “Tik Tok” OR label* OR front-of-pack).ab,ti. Or marketing/ or advertising/ or food labelling/
2	Food or drink related	(food* or diet or calor* or snack* or eat* or drink* or drunk* or consum* or intak*).ab,ti. Or food intake/
3	Health-related	(unhealth* or health*).ab,ti. Or health/
4	Review	(review).ab,ti. Or “review”/
5	1 AND 2 AND 3 AND 4	
6	Other filters	Limit to English language and 2006 onwards

Medline via Ovid

1	Marketing	(marketing OR sponsorship OR advert* OR celebrit* OR promotion* OR campaign* OR brand* OR logo* OR price* OR pricing OR placement OR persua* OR “social media” OR TV OR televis* OR billboard* OR radio OR magazine* OR newspaper* OR tweet* OR Twitter OR Facebook OR Instagram OR Snapchat OR YouTube OR influencer* OR TikTok OR “Tik Tok” OR label* OR front-of-pack).ab,ti. OR marketing/ OR Advertising/ OR Food Labeling/
2	Food or drink related	(food* or diet or calor* or snack* or eat* or drink* or drunk* or consum* or intak*).ab,ti. OR eating/ OR drinking/
3	Health-related	(unhealth* or health*).ab,ti. or health/
4	Review	(review).ab,ti. OR “review”/
6	1 AND 2 AND 3 AND 4 AND 5	
6	Other filters	Limit to (English language) and 2006 onwards

Cochrane Library Reviews

1	Marketing	(marketing OR sponsorship OR advert* OR celebrit* OR promotion* OR campaign* OR brand* OR logo* OR price* OR pricing OR placement OR persua* OR “social media” OR TV OR televis* OR billboard* OR radio OR magazine* OR newspaper* OR tweet* OR Twitter OR Facebook OR Instagram OR Snapchat OR YouTube OR influencer* OR TikTok OR “Tik Tok” OR label* OR front-of-pack):ti,ab,kw OR MeSH descriptor: [Advertising] this term only OR MeSH descriptor: [Marketing] this term only OR MeSH descriptor: [Food Labeling] this term only OR MeSH descriptor: [Online Social Networking] this term only
2	Food or drink related	(food* or diet or calor* or snack* or eat* or drink* or drunk* or consum* or intak*):ti,ab,kw OR MeSH descriptor: [Eating] this term only OR MeSH descriptor: [Drinking] this term only
3	Health-related	(unhealth* OR health*):ti,ab,kw OR MeSH descriptor: [Health]
4	Review	(review):ti,ab,kw OR MeSH descriptor: [Review] this term only
5	Other filters	Jan 2006 onwards in Cochrane reviews
6	1 AND 2 AND 3 AND 4	

Web of Science

1	Marketing	TS=(marketing OR sponsorship OR advert* OR celebrit* OR promotion* OR campaign* OR brand* OR logo* OR price* OR pricing OR placement OR persua* OR “social media” OR TV OR televis* OR billboard* OR radio OR magazine* OR newspaper* OR tweet* OR Twitter OR Facebook OR Instagram OR Snapchat OR YouTube OR influencer* OR TikTok OR “Tik Tok” OR label* OR front-of-pack)
2	Food or drink related	TS= (food* or diet or calor* or snack* or eat* or drink* or drunk* or consum* or intak*)
3	Health-related	TS=(unhealth* OR health*)
4	Review	TS=(review)
5	1 AND 2 AND 3 AND 4	
6	Other filters	Language:(English) and timespan=2006-2020

PsychInfo via Ebscohost

1	Marketing	AB(marketing OR sponsorship OR advert* OR celebrit* OR promotion* OR campaign* OR brand* OR logo* OR price* OR pricing OR placement OR persua* OR “social media” OR TV OR televis* OR billboard* OR radio OR magazine* OR newspaper* OR tweet* OR Twitter OR Facebook OR Instagram OR Snapchat OR YouTube OR influencer* OR TikTok OR “Tik Tok” OR label* OR front-of-pack) OR TI(marketing OR sponsorship OR advert* OR celebrit* OR promotion* OR campaign* OR brand* OR logo* OR price* OR pricing OR placement OR persua* OR “social media” OR TV OR televis* OR billboard* OR radio OR magazine* OR newspaper* OR tweet* OR Twitter OR Facebook OR Instagram OR Snapchat OR YouTube OR influencer* OR TikTok OR “Tik Tok” OR label* OR front-of-pack) OR DE “Marketing” OR DE “Digital Marketing” OR DE “Advertising”
2	Food or drink related	AB(food* or diet or calor* or snack* or eat* or drink* or drunk* or consum* or intak*) OR TI(food* or diet or calor* or snack* or eat* or drink* or drunk* or consum* or intak*) OR DE “Food” OR DE "Beverages (Nonalcoholic)"
3	Health-related	AB(unhealth* OR health*) OR TI(unhealth* OR health*) OR DE "Health"
4	Review	AB(review) OR TI(review) OR DE "Literature Review" OR DE "Systematic Review"
5	1 AND 2 AND 3 AND 4	
	Other filters	Language: English and January 2006 onwards

Appendix 2.3 Full list of studies eligible for inclusion

Authors	Year	Title
Adeigbe et al.	2015	Food and beverage marketing to Latinos: a systematic literature review
Bennett et al.	2020	Prevalence of healthy and unhealthy food and beverage price promotions and their potential influence on shopper purchasing behaviour: a systematic review of the literature
Blake et al.	2019	Investigating business outcomes of healthy food retail strategies: a systematic scoping review
Boyland et al.	2016	Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and non-alcoholic beverage advertising on intake in children and adults
Buchanan et al.	2018	The effects of digital marketing of unhealthy commodities on young people: a systematic review
Cairns, G.	2019	A critical review of evidence on the sociocultural impacts of food marketing and policy implications
Carter et al.	2012	Availability and marketing of food and beverages to children through sports settings: a systematic review
Carter, O.B.J.	2006	The weighty issue of Australian television food advertising and childhood obesity
Castro et al.	2018	Customer purchase intentions and choice in food retail environments: a scoping review
Chapman et al.	2009	Using a research framework to identify knowledge gaps in research on food marketing to children in Australia
Chemas-Velez et al.	2020	Scoping review of studies on food marketing in Latin America: summary of existing evidence and research gaps
Critchlow et al.	2019	Digital Feast: navigating a digital marketing mix and the impact on children and young people's dietary attitudes and behaviours
Dixon et al.	2019	Sports sponsorship as a cause of obesity
Elliott and Truman ²¹⁹	2020	The power of packaging: a scoping review and assessment of child-targeted food packaging
Elliott and Truman	2019	Measuring the power of food marketing to children: a review of recent literature
Englund et al.	2020	How branded marketing and media campaigns can support a healthy diet and food well-being for Americans: evidence for 13 campaigns in the United States
Fernqvist and Ekelund	2014	Credence and the effect on consumer liking of food: a review
Folkvord and van 't Riet	2018	The persuasive effect of advergames promoting unhealthy foods among children: a meta-analysis
Glanz et al.	2012	Retail grocery store marketing strategies and obesity: an integrative review
Grier and Kumanyika	2008	The context for choice: health implications of targeted food and beverage marketing to African Americans
Gustafson et al.	2012	Measures of the consumer food store environment: a systematic review of the evidence 2000-2011

Authors	Year	Title
Hallez et al.	2020	That's my cue to eat: a systematic review of the persuasiveness of front-of-pack cues on food packages for children vs. adults
Hawkes, C.	2009	Sales promotions and food consumption
Hawkes, C.	2008	Dietary implications of supermarket development: a global perspective
Ireland et al.	2019	Exploring the relationship between Big Food corporations and professional sports clubs: a scoping review
Jenkin et al.	2014	A systematic review of persuasive marketing techniques to promote food to children on television
Kaur et al.	2020	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
Kaur et al.	2017	A systematic review, and meta-analyses, of the impact of health-related claims on dietary choices
Kelly et al.	2011	Tobacco and alcohol sponsorship of sporting events provide insights about how food and beverage sponsorship may affect children's health
Kelly et al.	2015	A hierarchy of unhealthy food promotion effects: identifying methodological approaches and knowledge gaps
Kraak and Story	2015	Influence of food companies' brand mascots and entertainment companies' cartoon media characters on children's diet and health: a systematic review and research needs
Kraak et al.	2017	Progress evaluation for the restaurant industry assessed by a voluntary marketing-mix and choice-architecture framework that offers strategies to nudge American customers toward healthy food environments, 2006-2017
McDermott et al.	2006	International food advertising, pester power and its effects
Ni Mhurchu et al.	2013	Monitoring the availability of healthy and unhealthy foods and non-alcoholic beverages in community and consumer retail food environments globally
Obesity Health Alliance	2019	Unhealthy food marketing: the impact on adults
Osei-Assibey et al.	2012	The influence of the food environment on overweight and obesity in young children: a systematic review
Perez-Ferrer, C et al.	2019	The food environment in Latin America: a systematic review with a focus on environments relevant to obesity and related chronic diseases
Pitt et al.	2017	Exploring the influence of local food environments on food behaviours: a systematic review of qualitative literature
Prowse, R.	2017	Food marketing to children in Canada: a settings-based scoping review on exposure, power and impact
Public Health England	2015	Sugar Reduction: The evidence for action. Annexe 3: A mixed method review of behaviour changes resulting from marketing strategies targeted at high sugar food and non-alcoholic drink
Public Health England	2019	Foods and drinks aimed at infants and young children: evidence and opportunities for action. Appendix 2: A rapid scoping review examining the role and impact of commercial baby foods and drinks on the diets of children aged 4-36 months

Authors	Year	Title
Pulker et al.	2018	What is known about consumer nutrition environments in Australia? A scoping review of the literature
Purnaghi Azar et al.	2018	Content analysis of advertisements related to oral health in children: a systematic review and meta-analysis
Qutteina et al.	2019	Media food marketing and eating outcomes among pre-adolescents and adolescents: a systematic review and meta-analysis
Ronit and Jensen	2014	Obesity and industry self-regulation of food and beverage marketing: a literature review
Russell et al.	2019	The effect of screen advertising on children's dietary intake: a systematic review and meta-analysis
Sadeghirad, B.	2016	Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials
Shaw et al.	2020	A systematic review of the influences of food store product placement on dietary-related outcomes
Silchenko et al.	2020	Three decades of research in health and food marketing: a systematic review
Skaczkowski et al.	2016	The effect of packaging, branding and labeling on the experience of unhealthy food and drink: a review
Smith et al.	2017	Children's and parents' opinions on the sport-related food environment: a systematic review
Smith et al.	2019	Food marketing influences children's attitudes, preferences and consumption: A systematic critical review
Smithers et al.	2014	Industry self-regulation and TV advertising of foods to Australian children
Sonntag et al.	2015	Beyond food promotion: a systematic review on the influence of the food industry on obesity-related dietary behaviour among children
Truman and Elliott	2019	Identifying food marketing to teenagers: a scoping review
Velazquez et al.	2017	Food and beverage marketing in schools: a review of the evidence
Villegas-Navas et al.	2020	The effects of foods embedded in entertainment media on children's food choices and food intake: a systematic review and meta-analyses
Vukmirovic, M.	2015	The effects of food advertising on food-related behaviours and perceptions in adults: a review
World Health Organization	2009	The extent, nature and effects of food promotion to children: a review of the evidence to December 2008
World Health Organization	2007	The extent, nature and effects of food promotion to children [electronic resource]: a review of the evidence

Appendix 2.4 List of studies included in synthesis

Author(s)	Year	Type of review	Marketing component under study	Thick or thin	Conflict of interest (CoI) declarationⁱ
Adeigbe et al.	2015	Systematic literature review; narrative presentation of results	Product, price, promotion and place	Thick	Yes – no CoI declared
Bennett et al.	2020	Systematic literature review; narrative presentation of results	Price promotions	Thick	Yes – CoI declared
Blake et al.	2019	Systematic literature review; narrative presentation of results	Retail strategies	Thin	Yes – source of funding statement
Boyland et al.	2016	Systematic review; meta-analysis	Advertising	Thick	Yes – CoI declared
Critchlow et al.	2019	Literature review; narrative presentation of results	Digital marketing	Thick	No
Elliott and Truman	2020	Systematic scoping review; narrative presentation of results	Packaging	Thick	Yes – no CoI declared
Grier and Kumanyika	2008	Systematic literature review; narrative presentation of results	Product, price, promotion and place	Thick	Yes – CoI declared
Hallez et al.	2020	Systematic literature review; narrative presentation of results	Packaging	Thick	Yes – no CoI declared
Kaur et al.	2020	Systematic literature review; meta-analyses	Price promotions	Thick	Yes – CoI declared
Kelly et al.	2015	Literature review; narrative presentation of results	Food promotion	Thick	No

Author(s)	Year	Type of review	Marketing component under study	Thick or thin	Conflict of interest (CoI) declarationⁱ
Kraak and Story	2015	Systematic literature review; narrative presentation of results	Brand mascots and media characters	Thick	Yes – no CoI declared
Ni Mhurchu et al.	2013	Systematic literature review; narrative presentation of results	Consumer retail food environments	Thin	Yes – no CoI declared
Prowse, R.	2017	Systematic scoping review; narrative presentation of results	Exposure to food marketing by setting	Thick	Yes – no CoI declared
Public Health England	2019	Systematic literature review; narrative presentation of results	Product, price, promotion and place	Thick	Yes – no CoI declared
Purnaghi Azar et al.	2018	Systematic review; meta-analysis	TV advertisements	Thick	Yes – no CoI declared
Qutteina et al.	2019	Systematic literature review; meta-analysis	Media food marketing	Thick	Yes – no CoI declared
Sadeghirad, B.	2016	Systematic review; meta-analysis	Marketing overall	Thick	Yes – no CoI declared
Silchenko et al.	2020	Systematic literature review; narrative presentation of results	Overall mapping	Thick	No
Skaczkowski et al.	2016	Literature review; narrative presentation of results	Packaging, branding and labelling	Thin	Yes – no CoI declared
Smith et al.	2017	Systematic literature review; narrative presentation of results	Sport related food environment	Thin	Yes – no CoI declared
Smithers et a.	2014	Systematic literature review; narrative presentation of results	TV advertising	Thick	Yes – CoI declared

Author(s)	Year	Type of review	Marketing component under study	Thick or thin	Conflict of interest (CoI) declaration ⁱ
Velazquez et al.	2017	Literature review; narrative presentation of results	Marketing environment in schools	Thin	Yes – no CoI declared
Villegas-Navas et al.	2020	Systematic literature review; meta-analyses	Media placement	Thick	Yes – no CoI declared
Vukmirovic, M.	2015	Literature review; narrative presentation of results	Advertising	Thick	No

ⁱ Accepted information included an explicit conflict of interest declaration or a sources of funding statement

APPENDIX 3 CHAPTER 3 SUPPLEMENTARY MATERIAL

Appendix 3.1 Differences between individuals included and excluded from the analytical sample, pre-weighting

Variable	Analytical sample, n (%)	Excluded, n (% ^c)	χ^2 or t-value ^b	p-value
SSB consumption ^a	15,515	4,342	17.86	<0.001***
None	5,149 (33)	421 (39)	-	-
Low	5,182 (33)	348 (32)	-	-
High	5,184 (33)	308 (29)	-	-
<i>Missing</i>	-	3265	-	-
Total SSB promotion exposure ^b	15,515	4,342	-3.86	0.0001***
<i>Missing</i>	-	1,139	-	-
Exposure to promotion in the functional environment ^a	15,515	4,342	0.09	0.768
Yes	5,331 (34)	1,098 (34)	-	-
No	10,184 (66)	2,123 (66)	-	-
<i>Missing</i>	-	1121	-	-
Exposure to promotion in the recreational environment ^a	15,515	4,342	0.09	0.760

Yes	4,443 (29)	931 (29)	-	-
No	11,072 (71)	2,290 (71)	-	-
<i>Missing</i>	-	1,121	-	-
Exposure to digital promotions ^a	15,515	4,342	35.57	<0.001***
Yes	5,847 (38)	1,395 (43)	-	-
No	9,668 (62)	1,826 (57)	-	-
<i>Missing</i>	-	1,121	-	-
Exposure to traditional promotions ^a	15,515	4,342	23.43	<0.001***
Yes	9,437 (61)	2,106 (65)	-	-
No	6,078 (39)	1,115 (35)	-	-
<i>Missing</i>	-	1,121	-	-
Country ^a	15,515	4,342	86.77	<0.001***
UK	2,999 (19)	1,048 (24)	-	-
Australia	3,021 (19)	746 (17)	-	-
Canada	2,570 (17)	548 (13)	-	-
USA	3,815 (25)	1,053 (24)	-	-

Mexico	3,110 (20)	947 (22)	-	-
Sex^a	15,515	4,342	42.12	<0.001***
Males	7,340 (47)	1,813 (42)	-	-
Females	8,175 (53)	2,529 (58)	-	-
Age^b	15,515	4,342	8.22	<0.001***
Ethnicity^a	15,515	4,342	8.36	0.004**
Majority	12,412 (80)	3,200 (78)	-	-
Minority	3,103 (20)	905 (22)	-	-
<i>Missing</i>	-	237	-	-
Education^a	15,515	4,342	115.64	<0.001***
Low	3,068 (20)	1,106 (26)	-	-
Medium	3,826 (25)	1,106 (26)	-	-
High	8,621 (56)	1,976 (47)	-	-
<i>Missing</i>	-	154	-	-

Notes: *p<0.1, **p<0.05, ***p<0.001; 19,857 individuals in the survey population. Individuals included in the analytical sample: n = 15,515; excluded: n = 4,342. Weights were not applied to these analyses. ^aPearson's χ^2 tested differences between those included and excluded from the analytical sample; ^bIndependent samples t-test tested differences, t value for mean included– mean excluded from sample; ^cpercentages are taken with missing values excluded from the total.

Appendix 3.2 Country-stratified models of the association between total exposure to SSB promotions and SSB consumption using multinomial logistic regression (n = 15,515; ref: no SSB consumption, only country estimates printed)

Type of promotion exposure	Country	Likelihood of SSB consumption compared with no consumption			
		RRR	Low CI	95% High CI	95% CI
Exposure to SSB promotions in the recreational environment					
No SSB consumption (n=5,265), ref					
Low SSB consumption (n=5,128)	UK	1.27	0.88	1.82	
	Australia	1.06	0.77	1.46	
	Canada	1.11	0.83	1.47	
	USA	1.22	0.95	1.57	
	Mexico	0.88	0.64	1.23	
High SSB consumption (n=5,123)	UK	1.30	0.91	1.86	
	Australia	1.07	0.78	1.47	
	Canada	1.30	0.95	1.77	
	USA	1.08	0.83	1.40	
	Mexico	0.92	0.67	1.26	
Exposure to digital SSB promotion					
No SSB consumption (n=5,265), ref					
Low SSB consumption (n=5,128)	UK	1.13	0.84	1.51	
	Australia	0.92	0.69	1.24	
	Canada	1.02	0.78	1.34	
	USA	1.38	1.09	1.74	
	Mexico	1.38	1.04	1.85	
High SSB consumption (n=5,123)	UK	1.99	1.49	2.66	
	Australia	1.20	0.91	1.59	
	Canada	1.18	0.88	1.59	
	USA	1.74	1.37	2.22	
	Mexico	1.60	1.22	2.09	
Exposure to traditional SSB promotion					
No SSB consumption (n=5,265), ref					

Type of promotion exposure	Country	Likelihood of SSB consumption compared with no consumption			
		RRR	Low CI	High CI	95% CI
Low SSB consumption (n=5,128)	UK	1.12	0.89	1.40	
	Australia	1.46	1.17	1.83	
	Canada	1.28	1.00	1.63	
	USA	1.35	1.09	1.69	
	Mexico	1.13	0.80	1.59	
High SSB consumption (n=5,123)	UK	1.22	0.97	1.54	
	Australia	1.39	1.11	1.73	
	Canada	1.25	0.95	1.64	
	USA	1.64	1.30	2.07	
	Mexico	1.32	0.96	1.83	

Notes: Relative risk ratio (RRR), adjusted for all types of marketing, sex, age, ethnicity and education (omitted)

APPENDIX 4 CHAPTER 4 SUPPLEMENTARY MATERIAL

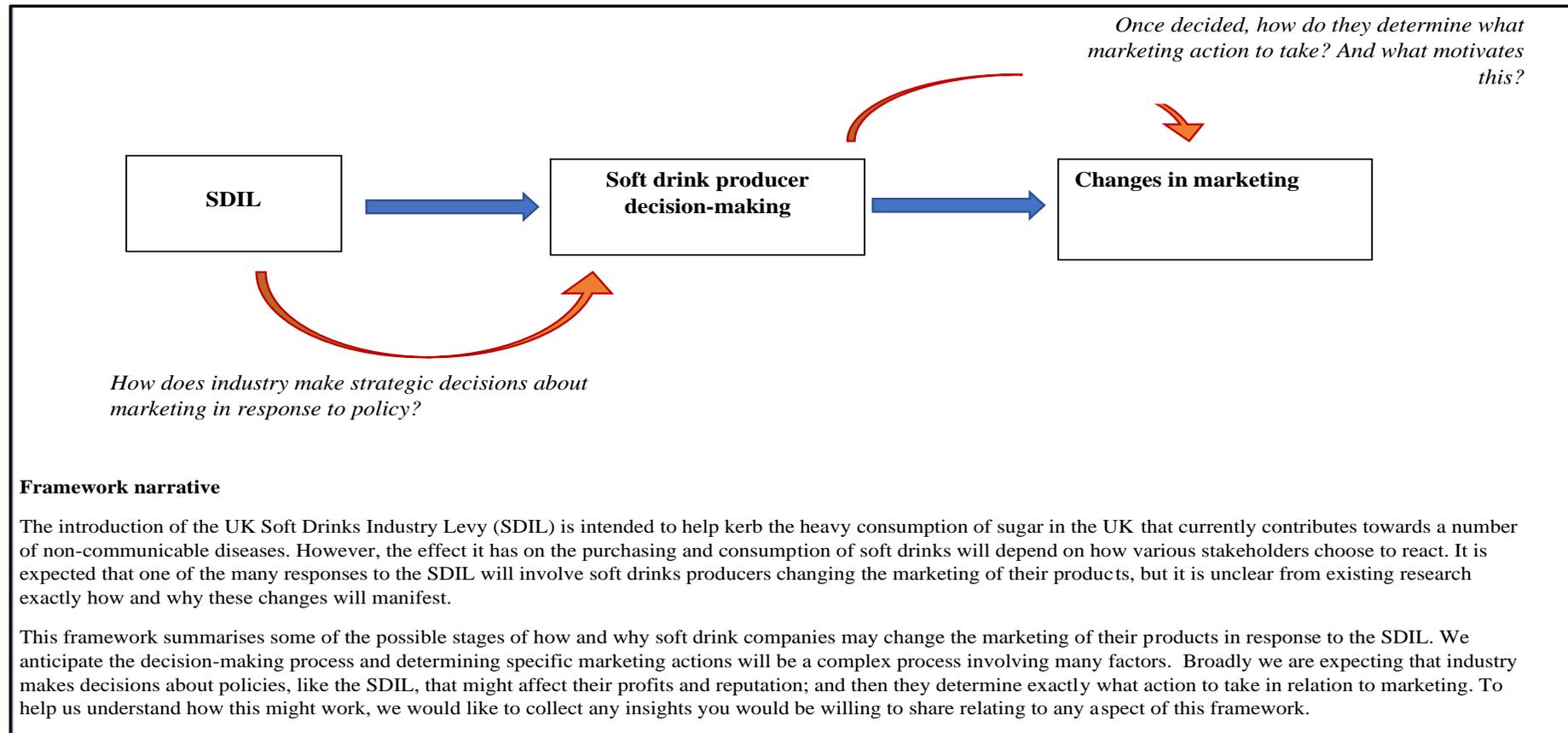
Appendix 4.1 COREQ (CONsolidated criteria for Reporting Qualitative research) Checklist

From: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349-357. doi:10.1093/intqhc/mzm042

Topic	Item	Guide question/description	Page
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	80
Credentials	2	What were the researcher's credentials? E.g., PhD, MD	i
Occupation	3	What was their occupation at the time of study?	i
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	82
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	80
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g., personal goals, reasons for doing the research	80; Appendix 4.2
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? E.g., bias, assumptions, reasons and interests in the research topic	80
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g., grounded theory, discourse analysis, ethnography, phenomenology, content analysis	79
Participant selection			
Sampling	10	How were participants selected? e.g., purposive, convenience, consecutive, snowball	80
Method of approach	11	How were participants approached? e.g., face-to-face, telephone, mail, email	80
Sample size	12	How many participants were in the study?	83
Non-participation	13	How many participants refused to participate or dropped out? Reasons?	83-84

Topic	Item	Guide question/description	Page
Setting			
Setting of data collection	14	Where was the data collected? e.g., home, clinic, workplace	80
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	80
Description of sample	16	What are the important characteristics of the sample? e.g., demographic, data, date	84
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	81, Appendix 4.3
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	81
Field notes	20	Were field notes made during and/or after the interview or focus group?	81
Duration	21	What was the duration of the interviews or focus groups?	83
Data saturation	22	Was data saturation discussed?	81
Transcripts returned	23	Were transcriptions returned to participants for comment and/or correction?	83
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	81-82
Description of the coding tree	25	Did authors provide description of the coding tree?	85-87
Derivation of themes	26	Were themes identified in advance or derived from the data?	81-82
Software	27	What software, if applicable, was used to manage the data?	82
Participant checking	28	Did participants provide feedback on the findings?	83
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g., participant number	85-96
Data and findings consistent	30	Was there consistency between the data presented and the findings?	85-96
Clarity of major themes	31	Were major themes clearly presented in the findings?	85-96
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	85-96

Appendix 4.2 Pre-interview material



Appendix 4.3 Interview guide

Note: Changes made following pilot interviews are marked in red

Icebreaker – Your role and organisation		
Check	Question	Prompt/probe
	Position, title and organisation, length of time in position	<ul style="list-style-type: none"> • What is the main role/objective of your organisation? • What are the objectives of your role within the organisation? • What are your main responsibilities?
	[IF NECESSARY] Area of specialist interest/role	<ul style="list-style-type: none"> • What are the objectives of your role within the organisation? • What are your main responsibilities?
Section 1 – Understanding of the SDIL		
Check	Question	Prompt/probe
	As we discussed, in April this last year the UK introduced a soft drinks industry levy (sometimes referred to as the “sugar tax”).	
	Before this interview, had you heard of the Levy? [IF YES] What are your thoughts on the Levy? [AC]	<ul style="list-style-type: none"> •
	<i>[Adapt according to response]</i> To confirm, the soft drinks industry levy, or “sugar tax” was announced two years prior to its introduction, in the Chancellor of the Exchequer’s budget speech of 2016. In part, this was to enable soft drinks industries to respond to this measure by various means. The levy is designed to encourage manufacturers to reduce the sugar content of their drinks, and reduce sugar consumption, in light of increasing evidence association heavy sugar intake with numerous non-communicable diseases.	
Section 2 – Industry response to the SDIL		
Check	Question	Prompt/probe
	In general, how do you think industry make decisions about policies that might affect their profits or reputation?	<ul style="list-style-type: none"> • What factors do they consider when making these decisions? • Who are the stakeholders in these decisions?

	What do you think soft drink company’s first response to the SDIL may have been?	<ul style="list-style-type: none"> • Did you hear reports of their response or their reaction at the time? • If so, where?
	<p>Policymakers and public health specialists think that the levy is likely to have various effects, and that these will vary for different groups of people. In part, this will depend on how the main stakeholders affected by the levy choose to respond. One way soft drink producers might respond is by changing the way soft drinks are marketed to consumers. We would like to ‘map’ the various decision processes and industry strategies that might explain changes in marketing, and have created a framework to initiate this process [SHOW].</p>	
	Firstly, how would you define marketing?	<ul style="list-style-type: none"> •
	What is your understanding of food and drink marketing?	<ul style="list-style-type: none"> • How do you think food and drink is commonly marketed? • What do you think are the effects of food and drink marketing? • Among which audiences/populations/consumer groups do you think marketing might be most effective? • Do you think marketing has a positive or negative influence on an individual’s ability to maintain a healthy lifestyle?
	<p><i>[Adapt/If necessary]</i> For this interview, I would like you to think about soft drink marketing as any communication that soft drink companies may have with their potential consumers. This could be include direct marketing, through television or social media advertising, to less obvious communication such as sponsorship or product placement.</p>	
Section 3 – Motivation to change marketing		
Check	Question	Prompt/probe
	To what extent do you agree that soft drink marketing is likely to change in response to the levy?	<ul style="list-style-type: none"> • Explain [adapt subsequent questions accordingly]
	What do you think are the main factors motivating soft drink producers to respond to the tax using marketing?	<ul style="list-style-type: none"> • Aside from the levy, what else do you think producers may have considered when deciding if/how to respond?
	Which stakeholders are involved in the decision of if/how to respond to the levy through marketing?	<ul style="list-style-type: none"> • Internal/external? • Relative importance?

Section 4 – Manifestation of changes to marketing		
Check	Question	Prompt/probe
	There are a variety of ways in which food and drinks products are marketed.	
	<ul style="list-style-type: none"> • What specific changes to marketing are likely to arise as a result of the tax? • 	<ul style="list-style-type: none"> • Will these relate to the message? Nature? Medium? Scale? Audience? • Do you think these changes will take place in any particular order
	<ul style="list-style-type: none"> • How will industry decide what changes to make? 	<ul style="list-style-type: none"> • What factors are likely to affect their decision?
	<ul style="list-style-type: none"> • How effective do you think these changes will be in attaining the goals of the soft drinks producers? 	<ul style="list-style-type: none"> • Explain
Concluding remarks and future research		
	<p>That is the end of the questions I have for you. [Summarise discussion] Do you have any other thoughts or anything that you would like to say about the issues discussed today, or that I haven't asked you about? Would you like a summary of the findings when available?</p> <p>I will email you in approximately two-three months for you to provide feedback on the systems map. It is likely that later in my PhD project, I will conduct more interviews to learn more about the soft drinks industry levy. Would you be interested in being contacted for future research? Thank you for taking part.</p> <p>[RECORDER OFF] Ask for snowball sampling</p>	

Appendix 4.4 Summary of findings sent to participants

Changes to soft drinks marketing after taxation

Developing a general theory



Hannah Forde, PhD Student, hf332@medschl.cam.ac.uk

October 2019

Earlier this year, you contributed to research about soft drinks marketing following introduction of the UK Soft Drinks Industry Levy (SDIL). We have used participants' contributions to develop a general theory outlining how the marketing of soft drinks might change in response to the SDIL.

Now we need your help! Please read this briefing and respond to the questions in the covering email.

Taxing sugary drinks is an increasingly popular way to try and reduce sugar consumption. In the UK, the Levy (SDIL) varies by the sugar content of drinks in order to encourage soft drink producers to reformulate their drinks.

However in order to avoid losing profit, soft drink producers may also respond to the Levy by changing the marketing of their products. As there is very little existing evidence to illustrate how marketing may change, we aimed to develop a general theory – a basic articulation for how and why things happen – to help understand the role of different stakeholders and context in processes of change.

To achieve this, we built an **Initial theory** that we shared with you earlier this year:

SDIL

→

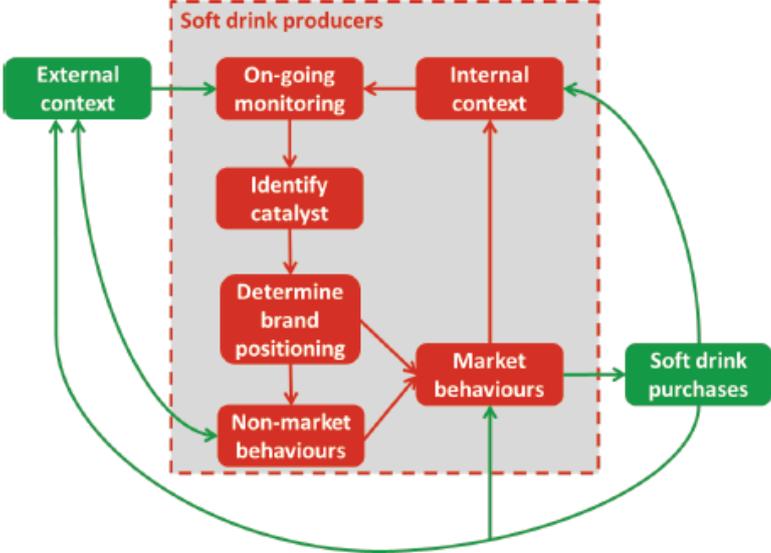
Soft drink producer decision making

→

Changes in marketing

We then conducted **18 telephone interviews** with members of industry, academia and civil society, and **analysed interview transcripts** to elaborate and develop the initial theory.

The developed theory. A visualisation is shown below, with further explanation overleaf.

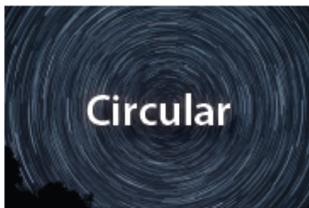


Processes of marketing change proposed in the theory

Your insight led us to the following observations.

- **Soft drink producers** continuously monitor their internal and external context, as this affects a firm's decision to change marketing and the options available to them.
- **Internal factors** for producers include brand portfolio and brand strength, human and physical capital, values. **External factors** include consumer trends, retailer activity, and other government policies.
- A culmination of trends observed in these contexts combined with a **catalyst**, like the SDIL, means a firm decides to **reposition their soft drink brand**. Brand repositioning could involve a combination of various **market and non-market behaviours**. These behaviours are co-ordinated and strategically selected.
- **Market behaviours** are those exhibited to the consumer, like reformulation, acquiring products from elsewhere, developing new products altogether, changing a product's price or packaging.
- **Non-market behaviours** do not directly affect consumers, but work to change the context of a soft drinks firm. Lobbying and using the media are examples of non-market behaviours.
- A combination of these market and non-market behaviours are intended to affect **soft drink purchases**, which in turn affects the internal and external context of a soft drinks firm, thus creating a cycle of marketing change.

Key characteristics of the developed theory



The initial theory described a linear change process of strategic planning followed by specific marketing responses.

Analysing interviewee contributions led us to believe that changes to marketing are actually circular and iterative.



There are a variety of ways that producers may change marketing in response to soft drink taxation.

The theory highlights the strategy and co-ordination underlying changes to soft drink producers' market and non-market behaviours.



The theory proposes that soft drink firms continuously monitor factors internal and external to their organisation.

Identifying a catalyst like the SDIL in their internal or external context accelerates existing evolution of changes to marketing.

Now we need your help!

In the final stage of this research, we want to check that the theory we have developed is an accurate reflection of your experiences of soft drinks marketing.

To do this, please answer by email to hf332@medschl.cam.ac.uk by 24 October 2019. Please also get in touch if you have any questions about this stage of your involvement in the research.

This research is being carried out by the University of Cambridge, and has been approved by the Humanities and Social Sciences Research Ethics Committee. If you have any questions, complaints or reservations about your participation in this study which you cannot resolve with the research lead (hf332@medschl.cam.ac.uk), you may contact the ethic committee directly at cshsoffice@admin.cam.ac.uk, quoting reference 18/165. Any complains or enquiry will be treated in confidence and investigated fully.

APPENDIX 5 CHAPTER 5 SUPPLEMENTARY MATERIAL

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