

Evaluation of public policy interventions in the food retail environment on diet and health.

Name: Laura Scott

Student Number: X00193524



Thesis Submission

MSc Food Business Management and Technology

Department of Science

Technological University Dublin

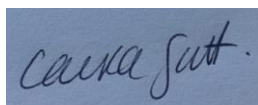
Supervisor: Cal McCarthy

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Declaration

I hereby certify that the material, which I now submit for assessment on the programme of study leading to the award of M.Sc., is entirely my own work and has not been taken from the work of others save to the extent that such work has been cited and acknowledged within the text of my own work. No portion of work contained in this thesis has been submitted in support of an application for another degree or qualification to this or any other institution.

Signed:

A blue rectangular box containing a handwritten signature in cursive script that reads "Laura Scott".

Date: 10/08/2023

Laura Scott

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Firstly, I would like to thank my wonderful supervisor Cal McCarthy who has been incredibly supportive throughout this process. Your continuous support has been greatly appreciated.

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Abstract

Across the world countries have introduced a variety of public health policies to improve diet and nutrition among their populations. This study aims to understand best practices in public policy interventions and the impact they have had on diet and health within the food retail environment.

The following study identifies public health and nutrition policies across European countries which have proven to be most impactful. It identifies any advancements that have been suggested in literature for future policy makers to consider. This study focuses on policy which impacts the food retail environment explored through the marketing 4 P's. Food retail provides insight into consumers nutritional purchasing behaviours and is an extremely influential environment. This study will focus on nutritional policies which impact purchasing decisions in food retail stores.

The nutritional policies discussed were classified using the marketing "4P's" approach Price (taxes and subsidies), Product (reformulation and food labelling), Place (food retail) and Promotion (food retail advertising).

Price: The results are mostly positive while introduced differently, some countries tax sugar other countries tax salt. Usually, these taxes impact industry more and manufacturers absorb most of the cost or reformulate their products. Most subsidies target children through schools not instore. The WHO have suggested new subsidies concepts which could increase consumption of fruit and vegetables. Research has suggested a red meat tax could positively impact diet and health.

Product: Product reformulation is widely suggested as a successful measure which will help reduce obesity. Research has shown a modest impact as voluntary reformulation is most common and often hinders real results. Food labelling, information and nutritional guidelines are extremely common but with meek results. Countries across North and South America have seen best results with warning labels on food and drink products.

Place: Retailers control the space in which food is sold and often use tactics to entice the sale of one product over another. Studies have shown that when space is prioritised for healthier food products instore consumption increases. Utilising various 'nudging' tactics may encourage the sale of healthier foods.

Promotion: Several steps have been taken to protect children across traditional media but regulations for social media are lacking. Research highlights the urgent need for an improvement on mandatory policies. Some in store measures have been taken by some retailers to protect children against enticing product packaging. Research suggests nutrient profiling as possible solution to regulate advertising.

All the “4 P’s” have a varying degree of influence on the food retail environment and consumer purchasing decisions. Overall public policy was found to be most effective when mandatory guidelines and targets were set. Fiscal policies were more effective than informative strategies but met with the most opposition from industry. Education is a key interlinking factor to policy success.

Most European countries are engaged in implementing policies to improve diet and health. However, some countries including Ireland have fallen short in implementing effective policies across all the 4 P’s. Currently, much work needs to be done to implement powerful public policy to improve diet and health to reduce obesity. This study has found that change happens when several mandatory policies are introduced which dictate food retailers’ behaviour. The food retail environment plays a key role in consumers purchasing decisions and provides a key backdrop to educate consumers and bring about real change.

Abbreviations

BMI	Body Mass Index
EU	European Union
FRTF	Food Reformulation Task Force
HFSS	High Fat Salt & Sugar
SSDT	Sugar Sweetened Drinks Tax
WHO	World Health Organization
FOP	Front of Pack Labelling
GDA	Guided Daily Allowance
TLL	Traffic Light Labelling

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Chapter One

Introduction

1.1 Obesity

Obesity has been increasing over the past few decades and has now become one of the largest threats to global public health. Obesity rates have reached “epidemic” proportions across Europe and are still rising. The World Health Organisation estimates obesity and overweight has increased over the past ten years by 21%. Since 1975 it has increased by 138%. Obesity and overweight currently affects nearly one in three children and almost 60% of adults. The COVID-19 pandemic has accelerated the crisis among many demographics particularly among children and adolescents. Obesity is a complex and multifactorial disease and is linked to several noncommunicable diseases. Obesity can be interconnected to musculoskeletal complications, cardiovascular risk as well as the effects on metabolic effects and mental health. Thirteen types of cancer can be linked to obesity, including endometrium, liver, gallbladder, kidney, colorectum, pancreas, meningioma breast, ovary, gastric cardia, , multiple myeloma, thyroid and oesophagus. Obesity is reported to be responsible for at least 200,000 new cancer cases per year across Europe and is predicted to continue to rise. It is estimated that overweight and obesity is the leading cause of death and disability in the EU. It is reported obesity causes 1.2 million deaths per year, more than 13% of the total mortality in the EU (Breda et al, 2020; FSAI, 2022; World Health Organization. Regional Office for Europe, 2022).

Of the 53 European countries, Ireland currently ranks 9th for obesity in adults with 66% of men and 55% of women currently obese. Among children, 34% of 5- to 9-year-olds are overweight (Cullen, 2022; Hi-Ireland, 2016).

This development of chronic illnesses is detrimental to not only the individuals who find themselves ill but also the health care system and the financial economy. Obesity costs around €70 billion a year to EU member state countries in direct healthcare costs. Globally the cost of obesity is estimated to be between as €118 to €236 billion. In Ireland, studies have revealed that obesity and overweight costs the €1.13 billion every year. The largest portion of this cost is for direct healthcare such as hospital time or doctor visits (Cuschieri and Mamo 2016; Dee et al., 2015).

Obesity can be caused by several factors which accumulate over a number years in both adults and children. The contributing factors include, access to healthy and affordable food, environment, leisure activity, physical activity, cultural and societal norms, exercise, genetic make-up and lifestyle choices. However, there is conclusive research that shows poor dietary behaviours as the major driver of obesity. The contributing factors

to poor diet includes a lack of nutrient dense low-calorie foods combined with over-consumption of low nutrient and high calorie foods and drinks (Food Safety Authority of Ireland, 2022; Schlicht, Van Woudenberg and Buijzen, 2022).

The message consistently delivered by medical professionals is that overweight and obesity in society is fundamentally preventable. Research on obesity calls for further taxes and restrictions on the sale of products high in fat, sugar and salt (Cullen, 2022; Pancrazi et al, 2022; Vogel et al, 2021; Schlicht, 2022).

1.2 Processed Foods

The western diet is considered a contributing factor to obesity levels. The western diet is heavily influenced by ultra- processed and processed foods. These ultra-processed foods are usually created to be particularly appetising and usually have HFSS content compared with non-processed foods. Processed foods are usually cheaper and more convenient for consumers. If a person consumes a diet high in processed foods it is predicted they may be 45% more likely to become obese or overweight (Grech et al, 2022; Hall et al, 2019; New Food, 2022).

In Europe, the average person consumes roughly 12% processed foods every day. The UK have the highest consumption rate amounting to nearly 51% of their diet (Mertens, Colizzi and Peñalvo, 2021). Portugal and Italy have the lowest consumption levels of ultra processed foods at 10.2% and 13.4% respectively. Ireland's average shopping basket contains 45.9% ultra processed foods making Ireland the third highest consumer after Britain (Cleary, 2018).

Government policies have been criticised for not being proactive enough at enforcing rules and regulations to monitor and control the sale of ultra processed food and drinks. People are not consuming enough fruit and vegetables and government are slow to implement restrictions. There is calls for legislation to be reviewed to limit the advertising of ultra processed foods and provide restrictions to manufacturers in regards to what can be printed on pack. There are also calls for an improvement in the accessibility of healthier foods instore while decreasing the space allocated to unhealthy foods (Cleary, 2018; Hall et al, 2019; Healthy-Ireland-Survey, 2021).

The Climate and Health Alliance, blame a lack of government policies to shape a healthy food environment on the current situation. They describe a 'slow motion disaster' whereby people are consuming excessive red meat, processed meat and other ultra-

processed foods combined with a lack of fruit, vegetables, wholegrains, plant proteins, and seafood (Cox, 2023).

Although policies on reformulation have been introduced to help combat processed foods, they are largely unmeasurable which is evident in the results. Academics and those in the medical field are asking for a more objective measurement tools comparing the scope, scale and speed of food reformulation. New products, line extensions, snacking occasions, portion sizes and flavours are blurring the line between producing healthier products are creating more ultra processed foods hidden behind 'healthy' branding and marketing (Campbell et al, 2023; Cox, 2023).

This study aims to identify what policies have been introduced that are effectively driving change to reduce the overconsumption of processed foods.

1.3 Role of the Food Industry

As majority of government policy surrounding nutrition is voluntary, success of policy targets largely depends on the cooperation from food and drink manufacturers and retailers. The food and drinks industry have committed to voluntarily making changes in line with government policies concerning product reformulation, nutrition labelling, better instore practices with retailers, and better marketing practices (Cullerton et al, 2019).

Food and drink companies have received negative attention regarding their food nutritional policies. Facing criticism regarding their marketing & CSR campaigns and engagement with government during policy creation. Awareness is increasing with consumers with regards to corporate CSR practices such as woke washing, pinkwashing, lean washing and greenwashing. Companies develop a CSR policy to mask a non-favourable public issue and market this to deflect against any change in interest in corporate agendas. Many ultra processed food companies have been heavily criticised for their CSR and marketing initiatives whereby they position themselves as industry leaders in nutrition even though their products are part of the problem. For example, Coca Cola was exposed for their 'Movement is Happiness Campaign' when internal documents were leaked. These documents detailed the aim of the campaign was to side-line attackers after their products were deemed unhealthy due to their high sugar content and linked to diabetes (Sainsbury et al, 2020; Campbell et al, 2023; Cullerton et al, 2019).

Many organisations have been accused of corporate social denial, denying they are part of the problem and finding a suitable loophole to new nutritional policies. For example, Coca

Cola faced several concerns surrounding their funding of think tanks, astroturf groups to oppose policy and science. Coca Cola have counteracted disputes that aspartame used in their diet drinks to claim no sugar has been linked to various health issues such as cancers and optic health (Pell et al., 2021). In 2023, WHO announced the ingredient aspartame is carcinogenic and should be avoided (Cullen 2023).

The food and drinks industry has received scrutiny for abusing the process of policy making, through donations, special interest in particular policies or undermining the public health policies. Their criticism of government policies allows them to defend their market positions of or sale of current products. However, in order not to lose credibility the food industry had no other choice but to adhere to government policy over the past decade. They have spoken of the significant changes they have been making to their portfolios (Gregory, 2023; Lacy-Nichols, Scrinis and Carey, 2020).

The industry has rebutted many times that that the lack of clarity, voluntary implementation and lack of monitoring capabilities. They then use this as a reason for their lack of accountability (Lacy-Nichols, Scrinis and Carey, 2020).

This study will look at the effect some voluntary and involuntary nutrition policies have had on manufacturers food and drink products within the food retail store.

1.4 Understanding food choices

The term obesogenic environment is used to explain how a variety of everyday factors have influenced the obesity pandemic globally (Hobbs and Radley, 2020).

Beyond our individual preferences there are several factors which influence our food choices such as sociocultural, community environment, agricultural industry and market, governmental and global. Each of these influences bring about different strengths, uncertainties, limitations and recommendations. These factors can be considered by policy makers as potential targets, facilitators, barriers, effect modifiers of food policies (Hobbs and Radley, 2020; Mozaffarian et al.,2018).

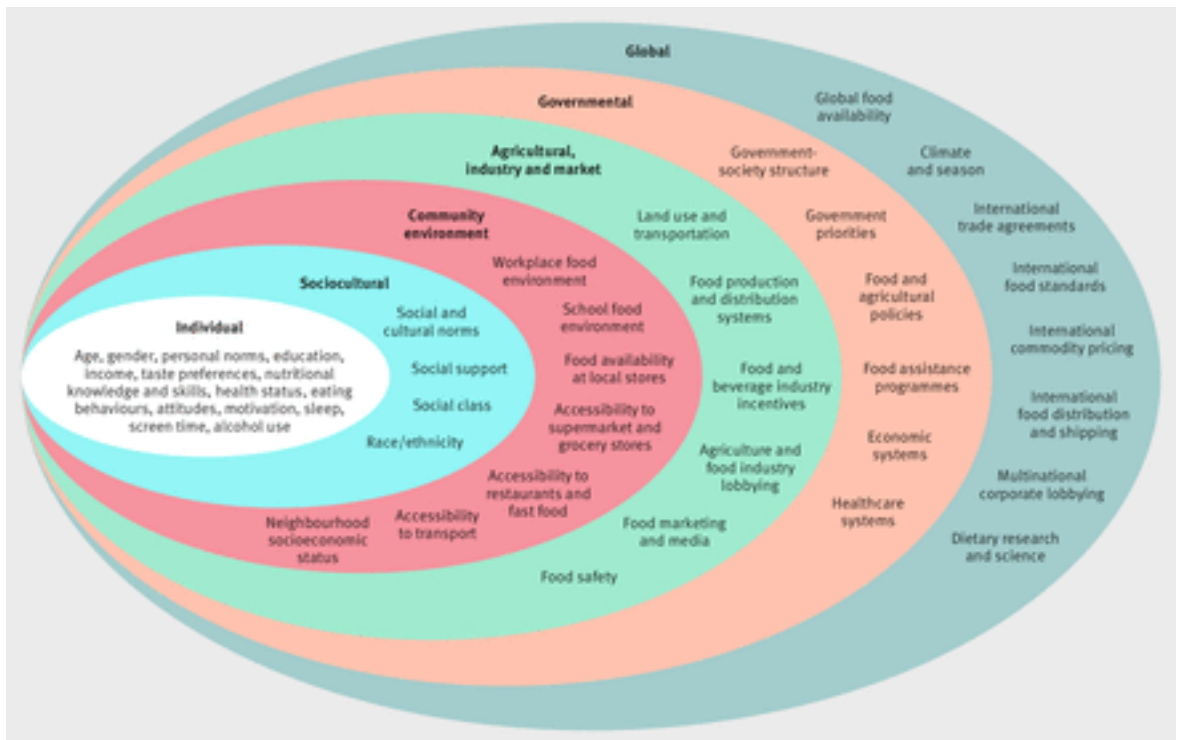


Figure 1.1: ‘Multi-layered influences beyond personal knowledge and preference alter food choices certain environments can impact key drivers in food intake’ (Mozaffarian et al.,2018).

This framework suggests a community-based approach may provide widespread benefits when trying to tackle obesity. Research has shown that community-based approach, are deemed most effective when combatting a societal issue. This approach can be particularly useful as it identifies how consumers can be influenced if they do not possess the education to make an informed decision., while highlighting the importance education plays in decision making. It is particularly relevant for vulnerable groups of society such as low socio-economic populations, children and adolescents. (Bemelmans et al, 2014 Mozaffarian et al.,2018; Foltz et al, 2012; Vasques et al, 2014).

When creating nutrition policy all aspects must be considered to decide on probability of success. Policy makers may be able to engineer factors of an individual’s community environment to help prevent or reduce obesity drivers (Mozaffarian et al.,2018; Foltz et al, 2012; Vasques et al, 2014).

The WHO recommendations and government policies will need to influence societal behaviour to ensure they can protect children from the power of influential food companies (World Health Organization. Regional Office for Europe, 2022).

1.5 Food Retail Environment

The food retail environment can be defined as “the collective physical, economic, policy, and sociocultural surroundings; opportunities; and conditions that influence people’s food and beverage choices and nutritional status” (Vargas, 2020). The food retail environment has transitioned over decades from ‘hunter gather societies, agrarian societies and finally developed into urban societies’. As society shifts from famines to the abundance of ultra processed of unhealthy foods, so does the populations physical activity levels and dietary patterns. It has a large influential factor in an individual’s food choices. Consumer choices are influenced by the socio-economic, cultural and physical structure of the food retail environment. Factors such as affordability, promotion, availability, convenience, and quality interacting to determine food choice (Brower 2021; Marien da Costa Peres et al, 2020; Turner et al, 2020).

Food stores play a significant role in food purchasing, stores act as a venue for various food choices. Studies have detailed the significance retail stores play in influencing consumer decisions. If retailers place products in visible areas they see higher sales for these products (Larsen et al, 2022). The role visibility and availability play in retail stores could provide an opportunity for better promotion of healthy foods to improve consumers purchasing decisions. Retailers use several strategies such as sensory cues, promotions and layout to subtly influence consumers, usually with little regard to nutritional value of food but the sole focus to maximise profit. Many consumers are not aware of these strategies, but they do have a direct impact. A study examining associations between the food environment and overweight and obesity found a 77% direct association between the two. Showing the easier the access to healthier foods the increased likelihood of obesity and overweight shoppers (Brouwer et al, 2021; Marien da Costa Peres et al, 2020; Royal Society Public Health, 2019). Supermarkets can influence a consumer to veer from their diet if attempting to lose weight. One in five participants of a survey believed the supermarket had the power to sway them off track from their diets. A quarter of women in a survey perceived promotional offers at the supermarket caused them to gain weight. (Walker, 2020).

Consumers rarely walk through the whole store and tend to only visit aisles they need to and gravitate towards the open spaces. Each shelf and displays are a touch point to encourage a sale. Research shows that the most influential places in the store are end aisle displays, freestanding floor displays as the average shopper will spend more seconds at

these areas than any other place in store. Understanding these dynamics are critical to develop policy strategies to improve consumers diet and health (Larsen et al, 2022).

Policy holders need to understand the role retailers can play in to improve consumers healthy through better nutrition. Governments need to be more proactive with regulating the retail store. Understanding the significance of environmental cues as critical factors in healthy food promotion. Despite a wide variety of research on individual policy measures, research measuring the impact government policy has had on food environments and consequential impact on diets or health is limited (Marien da Costa Peres et al, 2020; Turner et al, 2020). This research will therefore examine how physical food environments may influence access to healthy diets.

1.6 Current Nutritional Policies Ireland

Currently 60% of countries within the EU have a strategic plan for reducing obesity. A study evaluated the implementation the WHO European Food and Nutrition Action Plan among fifty European countries. It examined the progress being made and highlights what priorities would be relevant for future nutrition policy frameworks. It also provides an opportunity for additional research to analysis if what has been implemented is working to reduce obesity rates and improve health and diet of European populations. 80% of countries in the WHO region are implementing some nutritional policies. 82% began running a media campaign to communicate the benefits of healthier diets. Of these campaigns 39% focuses on reducing sodium consumption while 38% focused on fruit and vegetable consumption. Less commonly used objectives were providing mass media information on how to read nutritional labels (Breda et al, 2020; Cox, 2021; Harrington et al, 2020; World Health Organization. Regional Office for Europe, 2022).

Table 1.1 Objectives and main actions of the WHO European Food and Nutrition Action Plan (Breda et al, 2020).

Objective	Main actions
Create healthy food and drink environments.	Facilitate healthier food choices in schools, including setting standards for the foods available. Promote the use of easy-to-understand or interpretative, consumer-friendly labelling on the fronts of packages and healthy retail environments. Improve the nutritional quality of foods and beverages available in supply, through product reformulation including salt reduction programmes and the ban or virtual elimination of trans fatty acids from the food supply. Adapt measures to reduce the overall impact on children of all forms of marketing of foods high in energy, saturated fats, trans fatty acids, sugar or salt, including through nutrient profiling.
Promote the gains of a healthy diet throughout life, especially for the most vulnerable groups.	Implement targeted fiscal measures to influence diets, considering their impact on vulnerable groups. Promote healthy diet and nutrition before conception, including the provision of nutrition recommendations related to preconception, pregnancy and post-partum. Increase measures to protect, promote, support and address barriers to adequate breastfeeding, and provide appropriate complementary feeding; Adopt national guidelines, in addition to monitoring and establishing standards for the marketing of complementary foods, counselling on exclusive breastfeeding as per WHO recommendations (<i>Infant and young child feeding, no date</i>); Implement the International Code of Marketing of Breast-milk Substitutes (the Code) and the Baby-Friendly Hospital Initiative (or similar standards) and include comprehensive monitoring of these. Consider strategic communication with the public to improve the ability of citizens to make healthy choices, taking into account the needs of different age groups, genders and socioeconomic groups. This can include education on nutrition and health diets, media campaigns, dietary guidelines, the use of social media and new techniques to promote healthy food choices and healthier lifestyles.
Reinforce health systems to promote healthy diets.	Provision of education and counselling on nutrition and healthy diets for prevention of overweight, obesity and diet-related noncommunicable diseases in primary health care, including elements of behaviour change and considering effective measures to reach at-risk groups. Improve nutrition capacity and training for relevant health professionals to enable the provision of high-quality nutrition services in health care settings.
Support surveillance, monitoring, evaluation and research.	Strengthen and expand nationally representative diet and nutrition surveys and to ensure the availability of anthropometric data, particularly for children under five years. Establish and maintain food consumption databases and anthropometric surveillance systems that allow disaggregation by socioeconomic status and gender.

“The European Commission is tackling obesity through several programmes and initiatives. The latest EU health programme, EU4Health, is the EU’s largest policy to date in monetary terms, with a budget of €5.3 billion. EU4Health provides funding to national authorities, health organisations and other bodies through grants and public procurement, contributing to a healthier Europe” (European Commission, 2022). Many have warned of risks associated with limited weight-focused public health interventions (Breda et al, 2020; Richmond et al, 2021).

As per figure 2, The World Cancer Research Fund 2023 have developed a nutrition policy status for each country within the EU. Ireland has implemented eight out of the ten nourish policy areas however they are only achieving a green score in one area. This green score relates to public awareness of healthy eating through social marketing and communication campaigns. Currently Ireland meets up to 99% of policy design in four of forty-one areas (WCRF International, 2023).

N	Nutrients on back of pack	●	S	Planning restrictions regarding food service outlets around schools	×	
	Front of pack labels	×		Planning restrictions on food service outlets	×	
	Warning labels	●		Initiatives to increase the availability of healthier food in stores and food service outlets	×	
	Rules on nutrient claims	●		H	Measures to support food producers to increase healthy food and decrease unhealthy food in the supply chain	×
	Rules on health claims	●			Measures to support food manufacturers to increase healthy food and decrease unhealthy food in the supply chain	×
O	Food and drink available in schools, including restrictions on unhealthy foods	●	Measures to support food retailers to increase healthy food and decrease unhealthy food in the supply chain		×	
	Measures relating to sugar-sweetened beverage provision in schools	●	Governance structures for multi-sectoral/stakeholder engagement		×	
	Fruit and vegetables initiatives in schools	●	Nutrition standards for public procurement		×	
	Food and drink available in immediate vicinity of schools	×	Supporting urban agriculture in health and planning policies	×		
	Unhealthy food in out-of-education locations	●	Community food production	×		
U	Health-related food taxes or tariffs	●	I	Development and communication of food-based dietary guidelines	●	
	Income related subsidies or initiatives to increase affordability and accessibility of healthy food	×		Public awareness, mass media and informational campaigns and social marketing on healthy eating	●	
	Targeted subsidies or initiatives to increase affordability and accessibility of healthy food	●	N	Nutrition advice and counselling in primary care	●	
R	Marketing to young people through advertising	●		Nutrition advice and counselling in school healthcare setting	×	
	Direct marketing to young people	●	G	Nutrition education in curricula	●	
	Marketing through sponsorship to young people	●		Training for educators	×	
	Marketing to young people through point of sale measures	×		Training for health professionals	●	
	Marketing to young people through product placement and branding	●		Cooking skills	●	
	Marketing to young people through product design and packaging	×		Training in schools in growing food	●	
	Marketing in/or around schools	●	Training for caterers	×		
I	Limit or removal of specific nutrients in food products	●				

Figure 1.2: Breakdown of policy index results (WCRF International, 2023).

NO POLICIES IDENTIFIED	POOR	FAIR	MODERATE	GOOD	EXCELLENT
N	Nutrition label standards and regulations on the use of claims and implied claims on food				MODERATE
O	Offer healthy food and set standards in public institutions and other specific settings				MODERATE
U	Use economic tools to address food affordability and purchase incentives				FAIR
R	Restrict food advertising and other forms of commercial promotion				FAIR
I	Improve nutritional quality of the whole food supply				MODERATE
S	Set incentives and rules to create a healthy retail and food service environment				NO POLICIES IDENTIFIED
H	Harness supply chain and actions across sectors to ensure coherence with health				NO POLICIES IDENTIFIED
I	Inform people about food and nutrition through public awareness				GOOD
N	Nutrition advice and counselling in healthcare settings				FAIR
G	Give nutrition education and skills				FAIR

Figure 1.3: Overview of nutrition policy status in Ireland (WCRF International, 2023).

Ireland received a moderate assessment for ‘limits or removal of specific nutrients in food products and nutrient labels’ (WCRF International, 2023). Beyond EU level, Ireland has no actions for nutrition labelling specific to their population. They do not have any policy which limits young people’s exposure to food marketing and advertising through point-of-sale measures and product packaging. Currently there is no policy to improve the retail environment. It was strongly recommended that much more needs to be addressed regarding the accessibility of healthier foods to complement the existing SSDT beverage tax. Based on these findings Ireland needs to examine their food retail environment and understand which policies are working best and what work needs to be done (Shaw et al, 2020; WCRF International, 2023).

Policies For Tackling Obesity and Creating Healthier Food Environments in Ireland 2020, reviewed Irish governments policies and concluded several areas that government policies were lacking. Among these areas they addressed there was “no visible progress towards the creation of policies that encourage availability of outlets selling nutritious foods” (Vargas, 2020). They were also urged to ringfence revenue from SSDT tax, this could be used for health food subsidies and public health initiatives (Harrington et al, 2020).

It is predicted 85,000 children among today’s generation will die prematurely due to being overweight and obese (Cox, 2021). Currently Irish government aim to reduce childhood obesity by just half of 1 per cent per annum up to 2025. Seven in ten Irish people believe that the government is not doing enough (Cox, 2021).

Given the volume of growth of the obesity epidemic a varied cross functional approach is needed to tackle the problem. Alongside a comprehensive framework as no single intervention can stop obesity on its own. National governments and the food industry have the greatest capacity to change food environments and population diets. Strong and focused government policies which result in actions that are essential improve diets and reduce chronic disease. Some global governments, have demonstrated the ability to create policy which brings impactful change and improve the healthiness of food environments. Many countries have been slow to implement any action to improve food environments as they may not believe it has been needed to date. This study will identify some best practices that have had impactful results and how this can serve as best practice of

benchmarks for Ireland and other countries (Cox, 2021; Harrington et al, 2020; World Health Organization. Regional Office for Europe, 2022).

Chapter 2

Materials and Methods

2.1 Methods – Study Design

This section provides a framework for the methods used to evaluate public policy interventions in the food retail environment on diet and health. The research methods have been a blend of information on policy and data obtained from government and nongovernment organisational sources including gov.ie, WHO and European Commission. It has also been a blend of research articles from Google Scholar examining the impact these policies have had under each of the 4’P’s (price, product, place, promotion). It also includes desk-based study of peer reviewed published scientific journals.

2.2 Thesis Outline of Research

Research has proven that there is a direct connection between the consumption of HFSS food and drinks and the likelihood of being obese or overweight. Obesity is linked to chronic illness and preventable diseases. Following on from these studies there is a variety of research examining individual regulations policy makers can introduce to positively impact diet and health. It is evident from this research that there is a gap in understanding which policies are most effective working in tandem. There is a lack of research examining policy and proactive change under the 4 P’s applied to food retail environment. Therefore, the research question, presented in this study is the evaluation of public policy interventions in the food retail environment on diet and health. This question will focus on the retail environment as it is the most common place whereby most consumers purchase their food and drinks. The food environment provides will provide a backdrop to analysis changes that have been made by policy makers and their successes and challenges. This research question will discuss regulatory policies through 4 P’s analysis. Focusing on nutritional policies which impact purchasing decisions in food retail stores. The nutritional policies discussed were classified using the marketing “4P’s” approach Price (taxes and subsidies), Product (reformulation and food labelling), Place (food retail) and Promotion (food retail advertising).

Chapter One will review the importance of managing obesity and overweight in society, the emergence and dangers of processed food HFSS. It will provide background on the influence of obesogenic environments including the food retail environments and identify current policy and regulations in Ireland compared to the rest of Europe. Chapter Two will summarise the methodology and study design, to address the research question. It will outline the research steps taken to identify necessary relevant literature for the

purpose of this study. Chapter Three will outline the results and findings of the research relative to the evaluation of public policy interventions in the food retail environment on diet and health. It will discuss each of the 4 P's including key success and challenges relevant to the study within the food retail environment. It will also discuss a finding from the literature highlighting the importance of education. Chapter Four will critically review and discuss the findings, drawing substantiated conclusions on the accuracy of the research question posed.

2.3 The Scope

The scope of this research question concentrates on the evaluation of public policy interventions in the food retail environment on diet and health with the literature analysed through the 4 Ps of marketing. The scope will explore the role each of the 4 P's play in providing substantial policies which will help reduce obesity levels across Europe. The nutritional policies discussed were classified using the marketing "4P's" approach Price (taxes and subsidies), Product (reformulation and food labelling), Place (food retail) and Promotion (food retail advertising). It will examine the synergies that price, product, place and promotion must work together to achieve best results. The scope of this research will include literature and research of the most prevalent measures and policies which have been implemented or have been proven to be highly effective in studies.

2.4 Selection of Studies

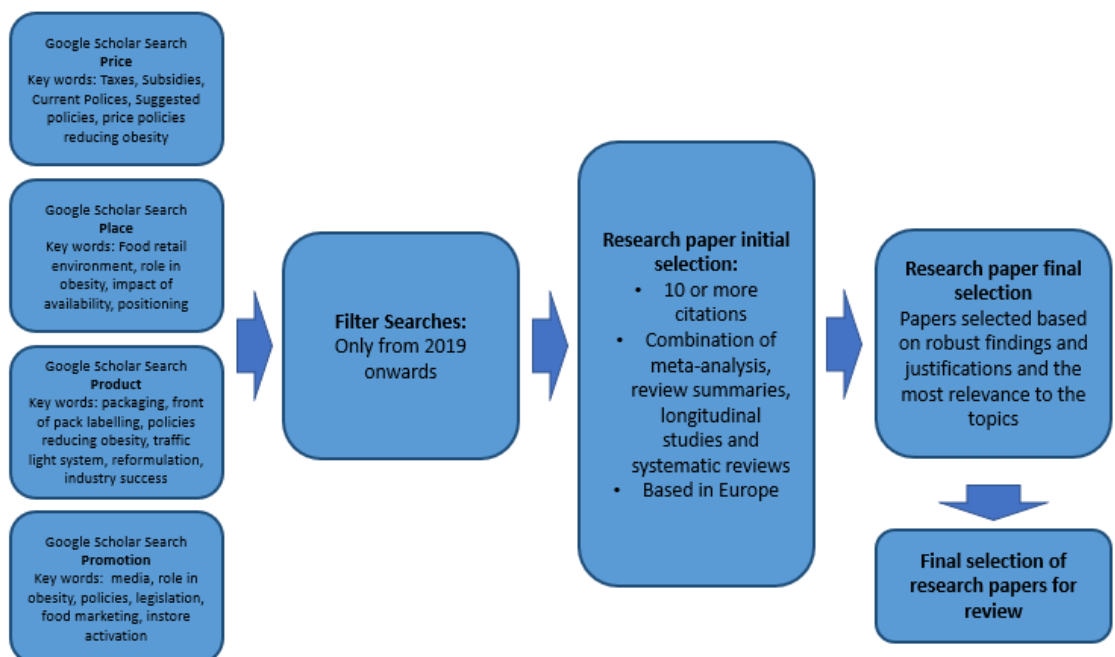


Figure 2.1: Summary of the methodology of selection of research papers

Studies were considered for the thesis based on the relevance of the study and ability to showcase the success or failure of a public policy intervention within the specific area of the 4 P's. The search was primarily focused on the four key headings and grouped in subheadings. The studies needed to be proportionately cited, regarding published date (>10 citations) and published in reputable journals. When the studies were gathered, the correct annotations had to be collated for use in discussion of results.

2.5 Study Limitations

Given the different areas of research, eliminating certain data from the study was difficult. There were opportunities to further expand the literature discussed.

Chapter 3

Results

3.1 Price

Price has a strong influence on food choice. Some argue it is the single most important factor to many of the population when making a food purchasing decision. In theory, governments can increase or decrease the market price of food or drink products using mandatory fiscal policies. The most widely adopted strategies by governments has been utilising taxes and subsidies to impact price. To increase the price of a good the government can introduce various taxes. To keep prices low, they can introduce different subsidies along the food chain to reduce the overall cost of goods. These can include farming grants, trade incentives, food waste targets and rewards and general manufacturing policies. These strategies or incentives are aimed to reduce the price of healthier food products (Harris et al, 2020). The following section identifies different policy interventions which can be identified in food and drink products in a food retail environment and the impact analysed.

3.1.1 Taxes

Generally, through taxes or subsidies governments can try influence food consumption choices and affect overall availability (Harris et al, 2020).

Financial policies such as tax increases can be implemented as a mandatory tool to disincentivise the purchase of certain products. Making some goods more expensive than others to discourage people from purchasing them. These can be referred to as corrective taxes aiming to correct the fact that market price may not fully reflect all the costs of consumption to wider society. These costs include treatment of diseases linked to poor diet, excess alcohol consumption and smoking which are funded primarily through healthcare systems. Corrective taxes have been used in other categories linked to high likelihood of disease such as cigarettes and alcohol (Griffith, O'Connell and Smith, 2022).

Discouraging consumption of specific foods through financial measures is controversial and can be politically challenging. It is argued these taxes largely affect only lower income individuals. However, as obesity affects this cohort significantly more than other demographics, government often justify these taxes as a progressive step to improve health and nutrition (Griffith, O'Connell and Smith, 2022; World Health Organization. Regional Office for Europe, 2022).

The introduction of subsidies help reduce the cost of the final product and have been suggested as an incentive for people to purchase and consume healthier products. Subsidies on foods such as fruit and vegetables or wholegrain products may increase consumption. To date subsidies have not been publicly acknowledged as a method used to counteract the obesity crisis and increase consumption of healthier foods. As subsidies reduce the cost to the general public it has received less public pushback than food taxes (Lauber et al, 2022; Thow et al., 2022).

3.1.2 Sugar Sweetened Drinks Tax SSdT

The WHO have directly linked full sugar soft drinks to obesity therefore a tax was necessary to improve global health. Recommending that high sugar drinks should be taxed in order to reduce consumption and encouraged reformulation. The introduction of taxes on sugar sweetened beverages has been the most widely implemented government policy to combat obesity (Harris et al, 2020; World Health Organization. Regional Office for Europe, 2022).

In 1922 Norway began taxing drinks containing added sugar. Since then, as obesity grew as a global concern more countries began to implement sugar taxes. As of 2022, 19% of countries within the WHO have introduced SSdT taxes. Ten countries within the EU have implemented the SSdT tax including Belgium, Finland, France, UK, Ireland, Hungary, Latvia, Monaco, Norway and Portugal (World Health Organization. Regional Office for Europe, 2022). SSdT is largely underused as a method to combat obesity rates in countries. Every country in the EU which implemented SSdT targeted industry and not consumers. France, Hungary, Ireland, Latvia, Norway, Portugal and the UK introduced SSdT did so with the explicit aim to reduce sugar consumption of the population. Other countries such as Belgium and Finland were introduced by policy holders in order to meet an explicit reformulation target through differential tax rates with thresholds based on sugar content as per figure 5 (Southey, 2022; Thow, 2022).

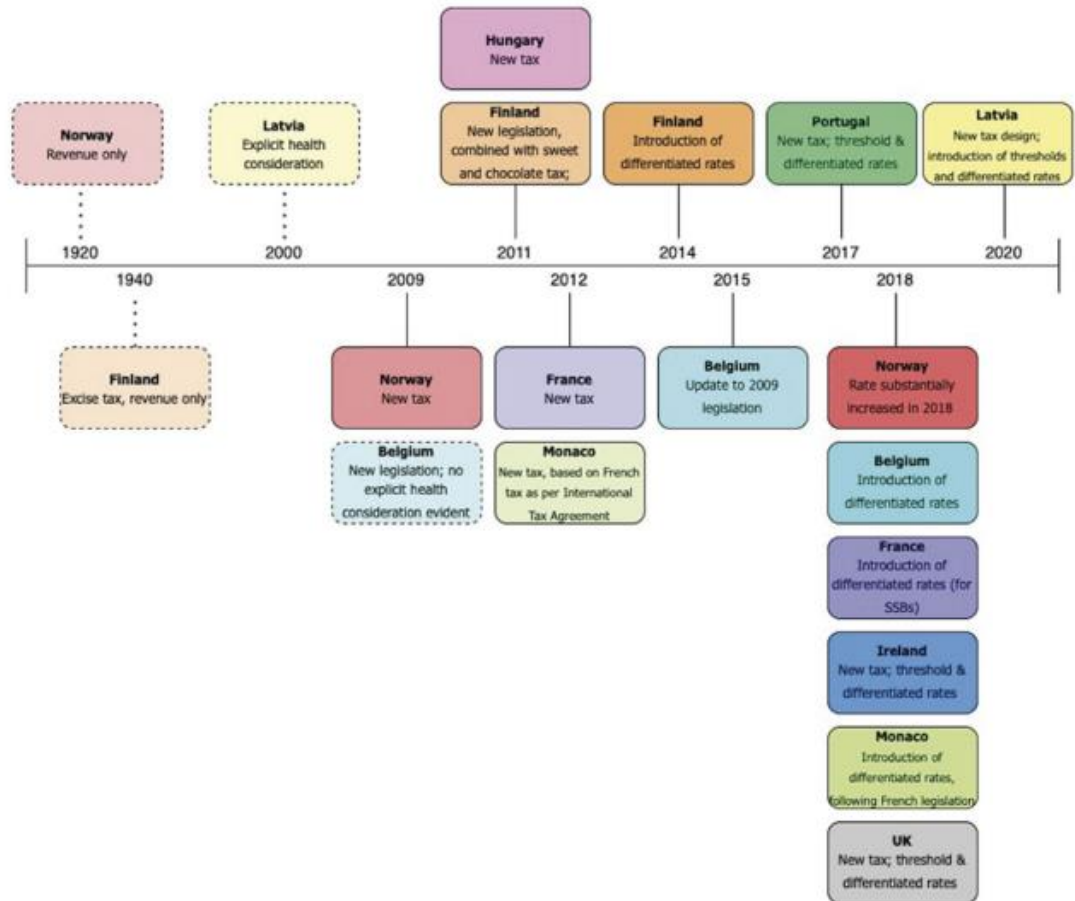


Figure 3.1: Timeline of SSdT taxes in the European Region (Thow et al, 2022).

SSdT was adopted by engagement between both economic and health policy makers, and in some countries this policy was then influenced by external industry and public health stakeholders. For those countries within the EU who adopted SSdT taxes, there was a high degree of political interest in health at the core while forming fiscal policies. While for some countries SSdT motivations were driven by financial means, significant budget deficits, medical workforce crisis or cultural sector crisis. Research has shown that countries which focuses on SSdT for health policies often linked it to reformation objectives and meet less public scrutiny. It was evident in the case of six countries that SSdT was linked to reducing a budget deficit. The motivation was usually met with greater opposition by stakeholders and the general public as the policy was perceived as less likely to benefit an individual’s health but the governments revenue. Motivation is important to public perception and likelihood to accept new legislation (Lauber et al, 2022; Southey, 2022; Thow et al., 2022).

Table 3.1: Details of SSDT at the time of adoption (Thow et al., 2022)

Country	Tax type (name)	Tax design	Tax base at time of adoption	Tax rates at time of adoption	Objective/rationale for the tax	Earmarking
Belgium ^a 2015	Excise tax	Specific (volumetric), flat rate (product type)	Non-alcoholic beverages (sugar sweetened or other sweeteners) Substances intended for preparation	6.8133€/hectolitre for all non-alcoholic beverages (sugar sweetened or other sweeteners)	Fiscal; Implicit health consideration (public and parliamentary discussion)	
Finland ^b 2011	Excise tax (The Soft Drinks Tax Act)	Specific (sugar content), flat rate (product type)	Non-alcoholic beverages—including soy and oat drinks, sports drinks (unsweetened <0.5% sugar, sugar sweetened >0.5% sugar) Fruit and vegetable juices Substances intended for preparation	75 cents/kg or 7.5 cents/l for liquids. 75 cents/kg for solid ingredients of soft drinks	Fiscal; Implicit health consideration, with inclusion in sugary product tax and public discussion	
France ^c 2012	Levy ('contribution')	Specific (volumetric), flat rate	SSB include soft drinks, fruit beverages, vitamin water, flavoured milk; tax also applies to non-alcoholic beverages with artificial sweeteners	7.16€/hectolitre	Fiscal; Explicit health considerations	Social security including health care and (initially) support to the agriculture sector (formal)
Hungary ^d 2011	Excise tax (public health product tax)	Specific (volumetric), flat rate (product type)	Non-alcoholic beverages (such as soft drinks, energy drinks) Substances intended for preparation Flavoured alcoholic beverages (sugar sweetened or sweeteners)	5HUF/l for >8 g sugar/100 ml 250HUF/l for energy drinks	Fiscal; Explicit health considerations	Public health fund (formal) Health workers wages (informal)
Ireland ^e 2018	Excise tax (sugar-sweetened drinks tax)	Specific (sugar content), tiered/differentiated rates	Non-alcoholic beverages (sugar sweetened); substances intended for preparation	16.26€/hectolitre for 5–8 g sugar/100 ml; 24.39€/hectolitre for >8 g sugar/100 ml	Reformulation; Explicit health considerations	
Latvia ^f 2020	Excise tax	Specific (sugar content), tiered rate	Non-alcoholic beverages (unsweetened and sugar sweetened)	100 ml 7.4€/hectolitre for <8 g/100 ml 14€/hectolitre for ≥8 g/100 ml	Fiscal; Reformulation; Explicit health considerations from pre-existing tax	
Monaco ^g 2012	Specific tax	Specific (volumetric), flat rate	Non-alcoholic beverages, water or fruit and vegetable juices with added sugar	7.16€/hectolitre	No country-specific policy decision (International Tax Agreement)	
Norway ^h 2009	Excise tax (non-alcoholic beverage tax)	Specific (volumetric), flat rate (product type)	Non-alcoholic beverages (sugar sweetened or other sweetener) Substances intended for preparation	NOK2.71/l for non-alcoholic beverages NOK16.53/l for syrups	Fiscal; Explicit health consideration (health policy)	
Portugal ⁱ 2017	Excise tax	Specific (sugar content), tiered/differentiated rates	Non-alcoholic beverages (sugar sweetened or other sweeteners); substances intended for preparation	8.22€/hectolitre for <80 g sugar/l 16.46€/hectolitre for ≥80 g sugar/l	Fiscal; Explicit health considerations	National Health Service (formal)
UK ^j 2018	Levy (soft drinks industry levy)	Specific (sugar content), tiered/differentiated rates	Non-alcoholic beverages (sugar sweetened and unsweetened)	18p for 5–8 g of total sugar/100 ml; 24p for >8 g of total sugar/100 ml	Reformulation; Explicit health considerations	Commitment to support school-based health programmes (informal) ^k

Adaptation of SSDT policies has not been met without resistance from industry. There was heavy opposition from manufacturers regarding SSDT across the world. They argued that SSDT will have a negative economic impact on industry in particular employment. They challenged government motives as some countries benefited from

these taxes to compensate other aspects of the economy, taxes would be regressive negatively impacting consumers. There would be problems with implementation and tax revenue was not earmarked. Many state that as the government interest in SSDT was too high to sway against taxes, the industry agreed to work alongside policies makers and in turn they were able to influence policy design. Industry were able to negotiate their concerns with policy makers to influence the final policies in many countries. “Industry was able to influence policy in several ways: notably exclusion of beverages containing non-sugar sweeteners, small-medium enterprises; and domestic fruit producers” (Thow et al, 2022). It was evident in five countries that beverage companies were able to leverage the SSDT taxes with the launch of ‘sugar-free’ innovation containing sugar free sweeteners. Since the launch of the SSDT, there has been calls for policy makers to include non-sugar sweeteners in this tax (Lauber et al, 2022; Southey, 2022; Thow et al., 2022).

Table 3.2: Industry arguments against SSDT taxation (Thow et al., 2022)

Argument	Countries in which argument was evident
The SSB tax will have a negative economic impact on industry, particularly in relation to employment	All countries
Criticized the selected tax base and/or rate as not aligned to health objective, too high, etc.	All countries
The taxes would be ineffective in achieving their health objectives	Belgium, Finland, France, Hungary, Ireland, Portugal and the UK
Future problems with implementation in, such as the likelihood of cross-border shopping or difficulties in attaining full compliance	Belgium, Finland, Ireland, Portugal and the UK
The tax would be regressive and thus have a negative impact on consumers	Finland, France, Hungary, Ireland and Portugal
The tax singled out beverages and/or the beverage industry for differential taxation, and would imply (explicitly in France and Hungary) that these products were ‘worse’ than others	Belgium, Finland, France and Hungary (notably, these were earlier taxes)
As the tax revenue was not earmarked, the tax was not a valid health intervention	Belgium and France

Research examining industry response to SSDT in Ireland noted the reaction from industry. Many beverage brands have built the responsibility of providing ‘healthier’ beverage offerings into their core company ethos. They emphasise their responsibility to market and position themselves as ‘industry leaders’, voluntarily leading change. These policies began when SSDT was rumoured to come into policy in 2011. Coca Cola have voiced they “firmly believe that government should work in partnership with the food and drink industry, as well as other sectors to support meaningful change. They want to drive change in a variety of areas including portion control, reformulation, education, and food labelling however they were strongly against the implementation of SSDT” (Campbell et al, 2020). PepsiCo also urged the “government to reconsider the taxes and to build on the voluntary efforts which the industry had demonstrated to date. They firmly believe a unified agreement could have been reached” (Lauber et al, 2022; Thow et al., 2022).

Contrary to much objection, this highlights that government led policy when forced upon industry does result in change. Voluntary policy leads a much wider playing field for companies to influence what they want the outcome to be. Retail Ireland argued that retailers simply respond to consumer demand, that they do not create it. “Everyone understands that fruit and vegetables are a healthier choice than confectionary, yet many people continue to choose chocolate as a snack rather than an apple. Retailers are realistic and understand that consumers are not always going to go for the healthiest option” (RetailIreland, 2016).

Those who support this tax often cite the increased taxes on cigarettes and the success this had in reducing the number of smokers globally. However, some debate food and cigarettes are incomparable. Claiming the comparison is unfair due to incomparable health risks from sugar and tobacco (Cedeno, 2019).

3.1.3 Complexity of SSDT

The largest challenge faced when analysing the results of the SSDT tax across Europe is the lack of substantial data to justify some claimed successes. While intervention studies noted significant expected positive results the actual data has been more complex.

A study compared trends of total volume sales pre and post implementation. The study discovered that the total volume of soft drinks purchased remained the same. However as per table 4, consumers switched from high sugar to ‘diet’ or ‘no sugar’ alternatives. This equated a decrease by around 30 g per household per week equivalent to three teaspoons per person per week (Rogers et al, 2023).

Table 3.4: Unadjusted mean (sd) volume of, and amount of sugar in, purchased drinks and confectionery per household per week pre- and post-announcement of the Soft Drinks Industry Levy, March 2014 to March 2018 (Rogers et al, 2023).

Category	Mean (sd) volume (ml/g)		Mean (sd) amount of sugar (g)	
	Pre-SDIL announcement	Post-SDIL announcement	Pre-SDIL announcement	Post-SDIL announcement
All soft drinks (i.e. excluding alcohol)	7595.2 (295.3)	7547.5 (466.1)	336.7 (23.6)	363.6 (17.1)
Liabile drinks				
Higher tier ($\geq 8\text{g}$ sugar per 100ml)	880.4 (128.1)	680.3 (136.4)	97.7 (14.1)	75.5 (14.8)
Lower tier ($\geq 5\text{g}$ - $< 8\text{g}$ sugar per 100ml)	154.6 (32.2)	147.0 (36.50)	10.0 (2.15)	9.69 (2.37)
No levy ($< 5\text{g}$ sugar per 100ml)	1811.4 (168.9)	1876.0 (215.8)	11.8 (1.56)	12.5 (2.72)
$> 0\text{g}$ to $< 5\text{g}$ sugar per 100ml	784.9 (78.3)	768.4 (92.2)	11.8 (1.56)	12.5 (2.72)
0g sugar per 100ml	1026.5 (104.5)	1107.5 (132.1)	0	0
Bottled water	590.9 (72.4)	714.2 (90.6)	0	0
Exempt drinks				
Alcoholic drinks	1873.8 (380.4)	1872.2 (455.7)	-	-
Milk and milk based drinks	3546.4 (136.9)	3540.4 (155.4)	172.5 (6.60)	171.8 (7.59)
No added sugar fruit juices	516.6 (29.2)	501.9 (43.6)	50.9 (3.0)	48.6 (4.2)
Drinks sold as powders (g)	94.9 (11.7)	87.7 (10.6)	20.6 (3.17)	18.5 (3.12)
Confectionery (g)	308.4 (91.5)	303.2 (92.7)	173.3 (51.2)	170.1 (52.1)
Toiletries	122.6 (8.07)	119.7 (8.2)	-	-

SDIL: soft drinks industry levy

Looking at demographics the sugar tax had a measurable effect on older girls' obesity levels, leading to an 8% drop in obesity in year 6 – preventing 5,234 cases of obesity a year in this group alone. However, there was no effect on boys in the same age cohort. Many researchers believe that this difference could be because young boys are usually more susceptible to marketing tactics while girls more likely than boys to make healthier food and drink choices (Rogers et al, 2023; White et al., 2020).

Different studies have shown that the portion of drinks available in the high sugar category decreased in the two years after the sugar tax was implemented. Industry had no choice but to reformulate their products to adapt to the change, consumer behaviour matched what was available to purchase as opposed to deliberately changing behaviour. (Rogers, 2023; Scarborough et al, 2020)

Research concludes that not all tax increases were passed on to the consumers as higher retail prices making the measurability difficult. Across examined research these public policy interventions have had a positive impact on reducing sugar consumption. However, all research examined for this study on the impact of sugar tax has noted that these policies alone will not reduce the consumption of high sugar products. They believe they need to work in synergy with a reduction in the costs of healthier foods to deliver impactful results. Researchers also highlight the need for policy makers to communicate

why these changes are happening to educate people on why there is price increases (Lauber et al, 2022; Rogers, 2023; Scarborough et al, 2020; Thow et al., 2022).

3.1.4 Subsidies

Given the relatively overall low cost of an individual purchasing a high sugar food product many sceptics of sugar taxes argue that financial disincentive is not large enough for the individual not to purchase the product. Taxes and subsidies are more found to be particularly effective working together in promoting consumption of healthier products, particularly among lower income families. An alternative strategy to SSDT taxes is to increase consumption of healthier unprocessed foods. To increase affordability of less processed foods and ingredients the government could look at introducing subsidies to lower the production costs of these foods. Many believe the next priority for policy should be subsidising fruits & vegetables (Adams, 2020; Goukens & Anne et al, 2022; Mozaffarian et al, 2018; Pfreundschuh, 2021).

In Europe, 12% of adults consume the RDA fruit and vegetables per day. There have been several recommendations from the WHO addressing fruit and vegetable intake and policies recommendations to customers. In 2015, they stated that countries should consider the introduction of targeted subsidies to increase the fruit and vegetable consumption of vulnerable groups. They suggested that government policies included subsidies in nutrition assistance programs. In 2016, stated that evidence suggests that 10% - 30% reduction in prices of fruit and vegetables is effective in increasing consumption. They show that while individual effect of fruit and vegetable subsidies on individuals can vary, overall diet of the population improves which results in improvement of overall health (European Commission, 2021; Department of Health, 2022; World Health Organization. Regional Office for Europe, 2022).

The United Nations declared 2021 was the ‘Year of Fruit & Vegetables’. It was raised to highlight the importance of fruit & vegetables in human nutrition, food security and health alongside achieving the United Nations Sustainable Development Goals (Dijkslag, 2022).



Figure 3.2: Sustainable Development Goals related to fruit and vegetables (Dijkslag, 2022).

Given financial pressures on global supply chain the food industry will be unable to keep costs low without impacting the producers. The government will need to be involved in order to reduce end costs to the public. Supply chain costs can distort the relative price of fruit and vegetables by at least 40%. The impact of this is that consumers on average will purchase 15% less fruit and vegetables than they would have if these sold at marginal cost (Dijkslag, 2022; Thorley, 2022).

3.1.5 Considering Fruit and Vegetable Subsidies

UK based research presented that consumers are paying 40% more than marginal cost for fruit and vegetables. The research put forth an argument that a government subsidy of 25% the cost of fruit and vegetables would help improve people's eating habits. They stated that such an increase would close the gap between the average amounts of fruits and vegetables consumed and the recommended intake by as much as a third (Thorley, 2022).

UK health problems caused by obesity cost the NHS £6.1 billion predicted to increase to £9.7 billion by 2050. In their research they examined Nielsen figures of the total fruits & vegetable market in the UK estimating that UK supermarkets sold about £10.4 billion every year. Economists argue for a subsidy around 25% of total sales equating to £2.5 billion per year significantly less than the cost of obesity. They believe their research findings if implemented would benefit every single individual in society (Pancrazi et al 2022; Thorley, 2022).

Similarly, a separate study in Amsterdam examined the effects a fruit and vegetable subsidy would have in promoting a more sustainable and healthier diet in society. The study examined a 10% subsidy on fruit and vegetables and a 15% or 30% tax on meat with a 30-year time horizon. The study shown that 10% fruit and vegetables subsidy could have positive outcomes such as increased quality of life and reduced healthcare costs. It is predicted to provide a benefit of between €1800–€3300 million. With the changes analysed from this study they believe they can increase consumption by ten percent per day (Broeks, 2020; Pancrazi, et al, 2022).

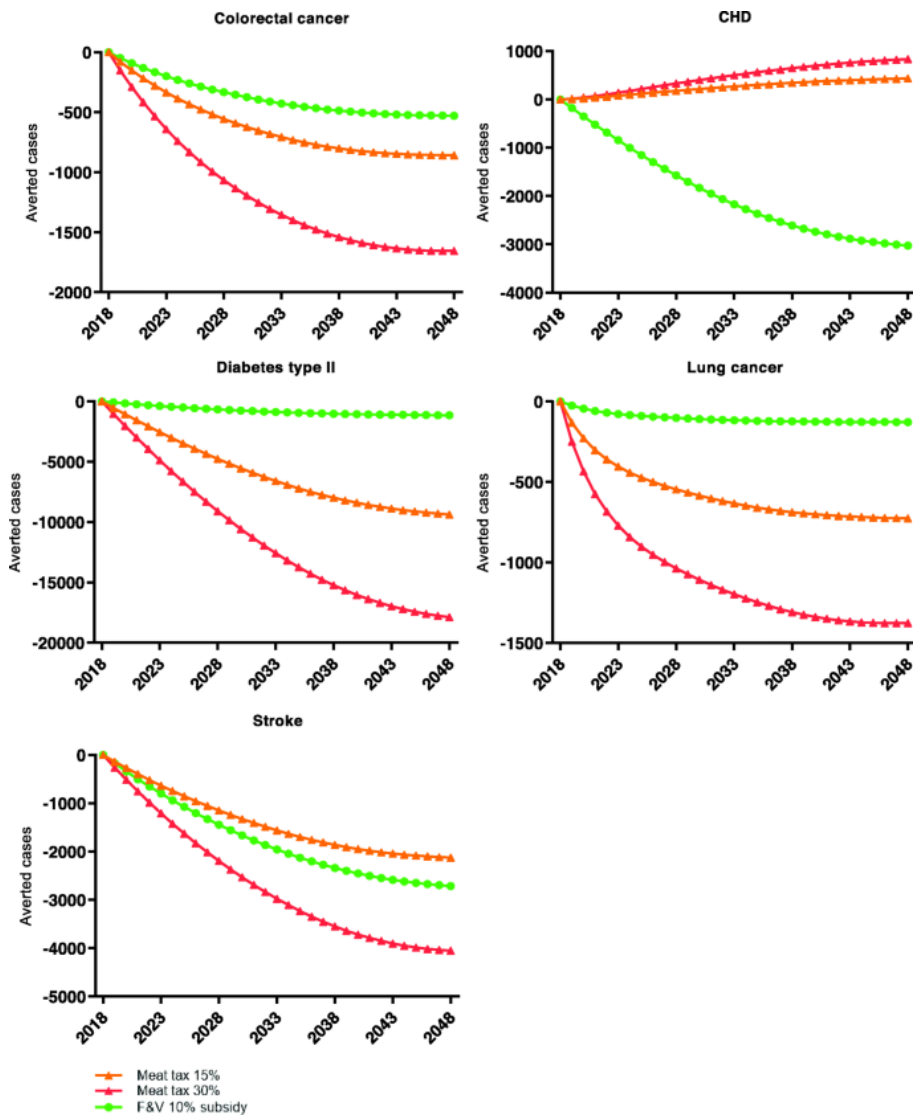


Figure 3.3: Suggested avoided cases of chronic diseases following amended food-pricing scenarios compared to the reference scenario (Broeks, 2020).

Figure 7, details the potential impact fruit and vegetables subsidies could have on reducing illness in society. It highlights an 8.6% decrease for all discussed health categories over 30 years if policy makers were to introduce a 15% taxation scenario. It significantly reduces the likelihood of stroke cases, predicting nearly 3586 less cases by 2048 (Broeks, 2020).

In addition, the findings of a recent longitudinal cohort study, supports the theory that lowering the cost barrier to accessing fruits and vegetables can potentially cause a measurable increase in dietary consumption of these foods. The study showed that when participants were educated on nutritional requirements and then offered subsidiary support there was an increase in fruit and vegetable consumption (Berkowitz et al, 2021).

3.1.6 Considering a Red Meat Tax

Another area policy makers could consider is the introduction of a meat tax. There is emerging literature arguing red and processed meats are carcinogenic and should be treated in a similar capacity to sugar. In 2020, health costs that can be linked to red and processed meat is €334 billion (Broeks, 2020).

A research study by Broeks, 2020, created a theory whereby they increased the prices of red and processed meat. They created a varied increase dependant on low- or high-income countries from 1% – 100%. Processed meat on average increasing the process by 25% and red meat on average increased by 4%. Like the SSDT there results shown a reduction in consumption. Processed meat consumption reduced by 16% on average however red meat remained relatively stable. It was noted that consumers switched to red meat when the price increased on processed meats. Most importantly, the mortality rate from red meat decreased by 9%, health costs decreased by 14% across the spectrum of low and middle income countries (Broeks, 2020).

The study outlined some key health findings over a longer trajectory, which can be taken as a key learning to policy makers. Over the course of 25 years a meat tax could eliminate nearly thirty thousand cases of type 2 diabetes. They predicted a financial saving between 3100 to 12300 million over the 25 years. A meat tax would also see substantial benefits to the environment. (Broeks, 2020; Green et al., 2013).

Like any taxes suggested for food they are a controversial topic as many are concerned about the most vulnerable in society. A meat tax may not be realistic given the necessity test. The EU state that the legal analysis depends on how the tax is to be levied, and that if carefully designed, a meat tax is proportionate and compatible with international and EU law (Bähr, 2015). Complexity of such a tax on the agricultural industry has meant governments have widely ignored the meat tax suggestions to date. Many argue that a sustainable food security should not come at the cost of freedom from state interference (Simmonds & Vallgarda, 2021).

Currently the EU have a policy within their farm to fork initiatives to promote sustainable and healthy diets. Countries currently operate their national Common Agricultural Policy (CAP). Under this policy it is the government's responsibility to increase under consumed products such as fruit and vegetables. The European commission has also to support research, piloting and modelling to continue to utilise the best strategies. However,

research exploring the success of farm to fork is relatively light with few interventional studies. There is limited research on the effectiveness across the European union exploring the effectiveness of subsidies in promoting the purchase of healthy foods. Many governments across Europe have not yet introduced any subsidies to the wider population. European Parliament's committee is in favour of subsidies for the EU School Scheme whereby the EU will fund 50% of the costs(EU School Programme, 2022). This is financed through EU's Common Agricultural Policy to promote and encourage consumption of fruit, vegetables and milk. Ireland has not yet introduced any cost saving measures to reduce the cost of fruit and vegetables at retail cost price (European Commission, 2022; Struttard et al, 2017).

3.2 Product

This next section will review the public policy interventions on food products within the food retail environment and their impact on consumers diet and health. Evaluating the success and challenges of food reformulation and food on pack labelling.

3.2.1 Classification of Food Reformulation

Processed foods can be reformulated to improve their nutritional content known as food reformulation. This is achieved by increasing the beneficial nutrients and reducing calories. Food reformulation is different to the fortification process is omitting the addition of nutrients, vitamins or minerals. The aim of reformulation is to improve the overall food quality available to consumers, while reducing the number nutrient dense foods available (Gressie, Sassi & Frost, 2020).

Food reformulation has been identified as per figure 3.4, as the 2nd cost-effective way to positively contribute to decline obesity levels within a country. Food reformation policies have been designed to improve the nutritional qualities of food and drinks available to consumers with the overall aim of providing a healthier portfolio of food to help combat obesity (Gressier et al, 2020; McKinsey, 2014).

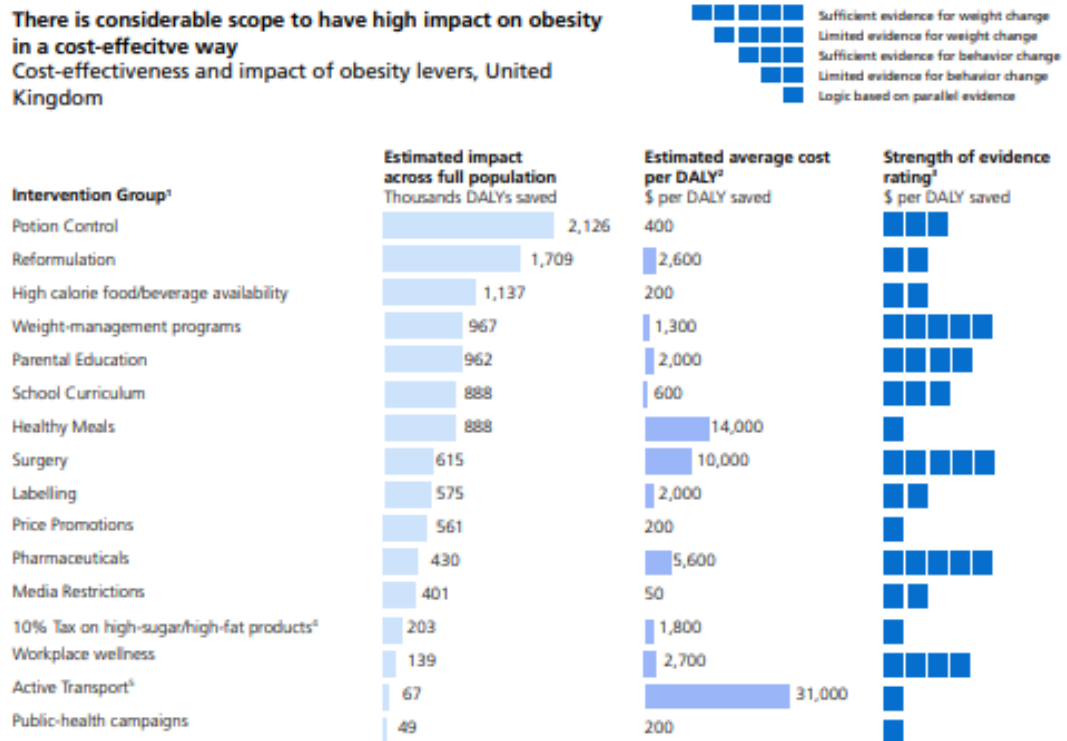


Figure 3.4: Cost-effective interventions on obesity (McKinsey, 2014)

3.2.2 Food Reformulation Europe

The global nutrition policy review questionnaire in 2017, displayed a few findings on the progress of the WHO European Food and nutrition Action Plan 2015 – 2020, almost all 94% of all European countries answered the questionnaire. 77% of countries reported activities for reformulation of food products. Figure 9, below shows the that 55% of these foods were salt reformulation followed by 37% reducing sugar, most of which were voluntary. Denmark was the first country to successfully impose a national legal limit on the content of industrial trans-fat in 2003 and now 15 countries have reported mandatory requirements in place to ban or limit the use of trans fats (Breda et al, 2020; WHO, 2023).

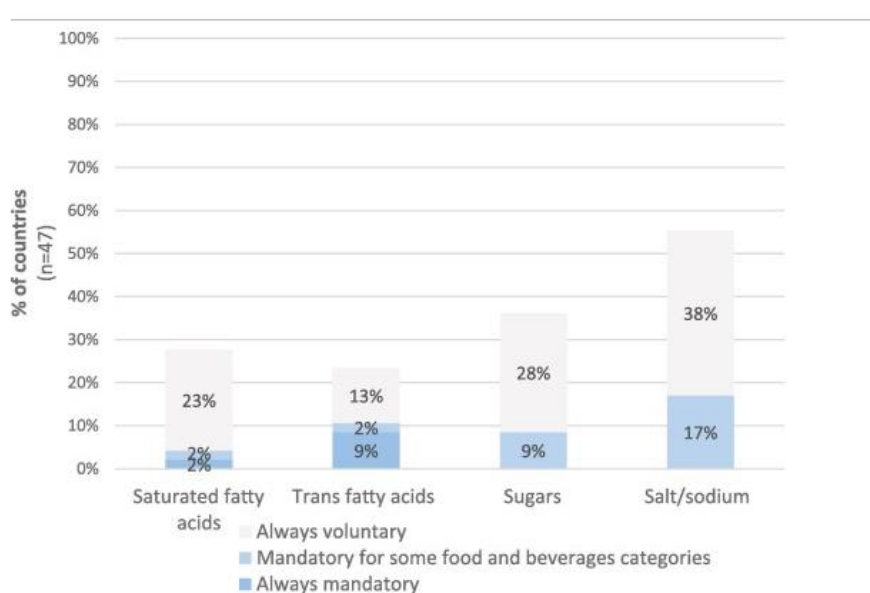


Figure 3.5: Mandatory or Voluntary reformation measures to reduce the content of specific nutrients in food and beverages (Breda et al, 2020).

A 2020 Safefood report found that 89% Irish consumers want policy makers to work with the food industry to improve nutritional quality of food. As part of Ireland's "A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016-2025" the government is to "Secure appropriate support from the commercial sector to play its part in obesity prevention" (Food Safety Authority of Ireland, 2022). Ireland have created the reformulation roadmap with a Food Reformulation Task Force (FRTF) to monitor the changes. Manufacturers need to update their websites with all updated efforts every two years. Currently the FRTF are engaging with seventy key stakeholders in the Irish food industry (Food Safety Authority of Ireland, 2022).

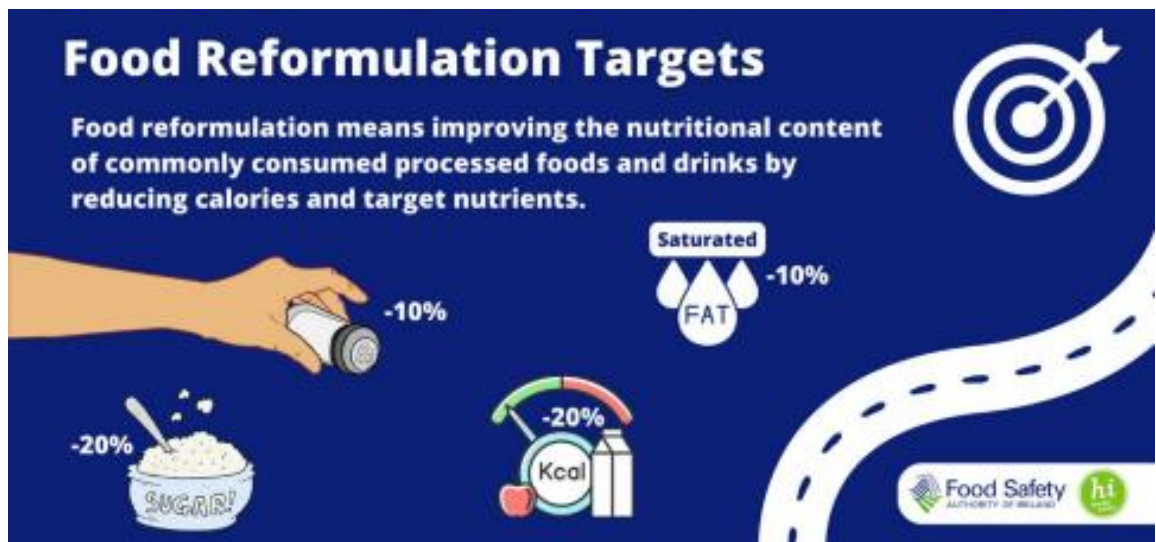


Figure 3.6: Irish Food Reformulation Targets (FSAI, 2022).

Ireland have committed to reformulation targets across several food and beverage categories with a competition target of 2025 as per figure 10. Ireland have committed to nutrient reduction targets across these set categories as per table 5 and table 6 (FSAI, 2022).

Table 3.5: Completed and proposed food and non-alcoholic beverages category for market snapshots between 2016 – 2025 (FSAI, 2022).

2016	2017	2021	2022	2023	2024	2025
Yogurt	Baby and toddler foods	Fresh dairy products and deserts	Yogurt	Soups, sauces and miscellaneous	Yogurt	Non chocolate confectionary
Breakfast cereal		Breakfast cereal	Breakfast cereal	Cheese	Breakfast cereal	Chocolate confectionary
		Delicatessen meats and similar	Non chocolate confectionary	Savouries	Delicatessen meats and similar	Cakes, pastries, buns
		Soft drinks	Chocolate confectionary		Carbonated beverages with added sugar	Biscuits
		Bread and bread products	Carbonated beverages with added sugar			
			Cakes, pastries, buns		Christmas and Halloween confectionary*	
			Biscuits			
			Savoury snacks			

Table 3.6: Proposed Food and non – alcoholic drink categories planned for nutrient analysis (FSAI, 2022).

Nutrient of Analysis	2022	2023	2024	2025
Sodium and potassium	Bread Soups and sauces	Cheese	Breakfast cereal or Delicatessen meat	Cakes, pastries, buns or Biscuits
Saturated Fat		Processed cheese	Breakfast cereal or Delicatessen meat	Cakes, pastries, buns
Sugar	Soups and sauces	Carbonated beverages with added sugar	Breakfast cereal or Yogurt	Chocolate confectionary or Non chocolate confectionary

3.2.3 Industry response to Public Policy

Food reformation policies have been designed to improve the nutritional qualities of food and drinks available to consumers with the overall aim of providing a healthier portfolio of food to help combat obesity. Industry usually launch new products and reformulating existing products. These two strategies have different reactions from consumers. Gradual reformulation does not change the range and if done slowly consumers rarely notice and manufacturers maintain sales. Research has shown changing a recipe slowly is more acceptable to consumers and usually rarely noticed (Gressier 2020; Markey et al, 2016).

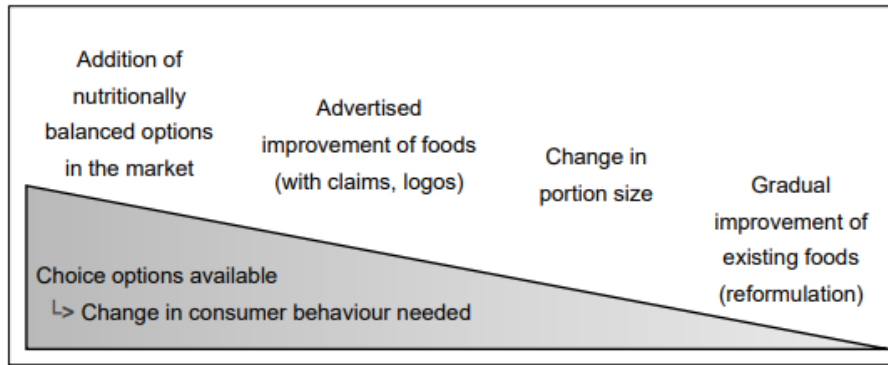


Figure 3.7: Arrangement of strategies changing the characteristics of food available for a population along a gradient of change in consumer behaviour needed to get a benefit from NPD (Gressier et al 2020).

The introduction of NPD follows various approaches, some manufacturers introduce a reformulated product to the market and leave the older version to extend the range. The success of this strategy largely depends on the co-operation of the individual to switch to nutritionally sensible options. Consumers may be unwillingly to change their consumption habits regardless of a healthier option to avoid a ‘taste cost’. For example, Heinz beans launched a new no sugar formulation but understood they would not taste the same as the original. They launched sugar free as a product extension and kept the original product. Industry publications have stated of the top five brands who included sugar reducing suffered from a decline in sales. This could possibly be due to their messaging or lack of messaging or a reluctance from consumers to steer from what they already know they like (Suthers et al, 2018; Quinn, 2018).

Some argue that when a product changes formulation or the better it should be communicated to consumers to educate them on the ‘why’ (Gressier et al 2020). However, a large portion of reformulation that has happened within companies to is not widely communicated to customers. Many reasons for this stem back to customer perception and taste concerns of food and drink brands, many consumers believe a ‘healthier’ product is not as ‘tasty’. (Afshin et al, 2019; Tedstone et al, 2018; Suthers et al, 2018; Mancino et al, 2008).



Figure 3.8: Comparison Heinz Banz versus Heinz Banz No Added Sugar (Tesco.ie, 2023).

Other brands capitalise on reformulation changes and take the opportunity to market their changes. When communicating product formulation changes to consumers new product launches containing the word ‘healthy’ improved the market position of the food companies. This can be compared to the launch of organic and fairtrade products in the market which expanded corporate profits and market shares benefitting from providing health solutions (Hans & Yun, 2017). Coca Cola’s reformation efforts identified their progressive efforts in Australia. They successfully shifted from the previous strategy of sugar free NPD to a full portfolio sugar reduction program. This approach was then adapted across their global portfolio so when the UK introduced the sugar tax, Coca Colas portfolio had dramatically reduced the sugar content of their beverages to escape the tax (Afshin et al, 2019; Tedstone et al, 2018; Suthers et al, 2018; Mancino et al, 2008; Nicholas, 2020).

3.2.4 Voluntary and Mandatory Policies

Food reformulation has been identified as one of the most effective policies to help combat obesity in society it is widely argued that this is only when mandatory targets have been set. Self-regulation allows for vast differences in results which can vary greatly across products, companies, industries and countries. It has been mentioned across literature that all public policy regarding food reformulation should be mandatory and self-regulatory policies leave too much room for interpretation and slow results (Lavery et al, 2019).

In 2011, the UK switched from mandatory to a self-regulatory “Responsibility Deal” . This introduced public-private partnerships with industry and the UK government. Self-

regulation allows for company gain as by diversifying their product offerings this may result in an increase in market share, revenue and penetration of developing markets (Laverty et al, 2019; Nicols & Williams, 2021).

Governments can promote reformulation by navigating consumers towards nutritionally balanced foods.

3.2.5 Challenges Measuring Success

Reformulation has its challenges as it is mostly voluntary with a basic tracker following the progress which has removed any sense of urgency in the targets set to-date (Food Safety Authority Ireland, 2022).

Government reformulation reports are more reactive than proactive in their reformation approaches. The Irish 2019 reformation progress report discusses CSR policies instead of creating next steps or measurable stages. Similarly, the UK reformation strategy focuses on “achievements to date” regarding sugar reduction as opposed to next steps. The lack of forward direct and goal setting diminishes the urgency of the situation, and this is reflected in many food and drink industry corporate strategies whereby they aim to have made improvements by 2025 or 2030 (Campbell et al, 2020).

A four-stage process has been implemented by the EU to monitor reformulation efforts. “Gathering data, reformulate, educate consumers and monitor and evaluate results” (EU Annex, 2015). Lack of data available to governments makes very slow progress of food reformation. A research study examining the success of the governments reformulation strategies has shown that in five national strategies there was inadequate data provided by industry to be able to determine success (EU Annex, 2015). Given the extensive resource in which food reformulation has been given by government it is crucial to understand whether the FRTF has been impactful and the results it has delivered given there is two years left to reach initiative targets. With limited to none quantitative data published regarding the results in Ireland, we can look at the various degrees of success from other markets. It is reported that Public Health Britain has spent £931,352 on data purchased from private firms to monitor results. It is predicted that manufacturers and retailers reached a 2% decline in calories and sugar, which is 3% behind their 5% target in year 1.

3.2.6 Product Labelling

Product reformation examines what is inside the product and food labelling communicates this to the consumers. Consumers can be influenced by the superficial environment cues including packaging. Educating consumers on pack information is critical to decision making for healthier purchases (Larsen et al, 2022). This next section will evaluate the success and challenges of traffic light labelling and nutritional claims.

3.2.7 Front of Pack Labelling (FOP)

The WHO recommends front of pack labelling as a policy tool to handle obesity. Led by a mix of government policies both mandatory and voluntary, food manufacturers and retailers have introduced FOP labels on their products. There is a set of guiding principles of a simplified nutrition information to consumers, helping them to make better food choices using FOP labelling developed by Codex Alimentarius Commission. There is much debate on which FOP labelling works best (Van Der Bend and Lissner, 2019).

On introduction the FOP system was met with criticism and has since been called the least effective intervention. FOP has faced criticism as they are based on benchmark averages per adult. They are displayed in serving sizes making product comparisons difficult, many missed the per serving size usually in small text underneath and confused it for the whole pack, often argued reading a Guided Daily Allowance (GDA) or Traffic Lights Labelling (TLL) requires solid nutritional knowledge (Global Food Research Program, 2020).

3.2.8 Guided Daily Allowance

GDA's are most common practice within industry and were led by the UK and followed by US, Ireland and other global countries. GDA of adult's reference intake typical values per 100g displaying the calories, sugar, fat, sat fat and salt, some manufacturers/countries colour code these.

Studies in New Zealand and Australia found GDA's were least preferred by consumers as they were deemed too hard to distinguish between healthy and unhealthy. There is conflicting studies on whether GDA's deliver the desired results (Pettigrew et al, 2017).

An FOP labelling study witnessed a decrease of 24% in soft drink consumption in the year following implementation of FOP in low- and middle-income mothers. Interestingly a year after implementation there was a significant reduction in products needing the 'high

in' sugar and salt warning labels (Corvalan et al, 2019). Indicating that through FOP labelling it allowed consumers to educate themselves on the nutritional composition of foods.

3.2.9 Traffic Light Labelling

One of the most prevalent changes to packaging was in introduction of front of pack traffic light labelling. The aim of the traffic light system is to alert consumers to a products nutritional value by displaying levels of sugar, fat, and salt in the product's ingredients using different colours. Traffic light system for labelling has been met with mixed reviews and various degrees of success. The colour system is voluntary across most of Europe. Figure X shows traffic light systems vary in complexity and appearance as there is no global uniform (Global Food Research Program, 2020).

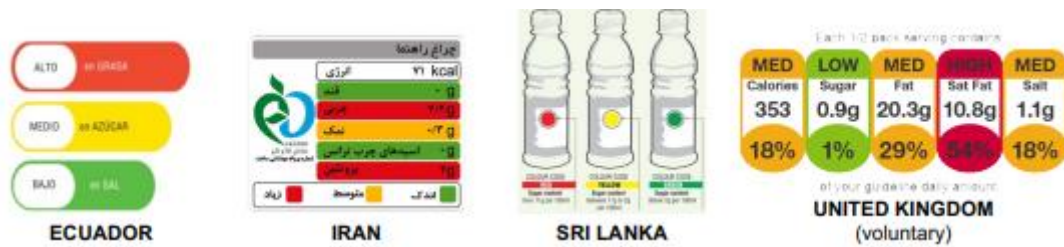


Figure 3.9: Traffic Lights System on Front of pack from four countries within the study (Global Food Research Program, 2020).

While TLLs, test moderately well for acceptability, understanding and improving behavioural intentions there has been several research studies which doubt their effectiveness. TLL's have been reported to be confusing for consumers as it made product comparisons difficult. Even though consumers may be able to read the labels this does not mean it will prevent them from purchasing the product. In a study where 88% of people could interpret the label correctly only 21% used to make a purchasing decision (Radosevich et al, 2020).

Some countries have built on the TLL and created on pack warning labels to ensure full transparency.

3.2.10 Warning Signs

Tórtora, Machín and Ares (2019) used an eye following technology comparing GDA's to warning signs and finding them most effective. Identifying them as most effective in attracting consumers attention, easier processed, better to identify whether a product is healthy or unhealthy. Compared to limited success of the GDA and traffic lights on full

sugar soft drinks, an Australian study linked the use of warning signs to reduction in people buying soft drinks. Similarity a research study of low-middle income families found warning labels more successful for consumer understanding. Consumers were 4.5 times more likely to identify a product with the lowest nutritional values. More vulnerable parents in low-income families i.e.. Lower income and overweight preferred a warning label for ease of use. Industry have contested warning labels classing them as too severe. However, a consumer research study identified that 93% of young adults questioned felt it warning labels were either ‘harsh enough’ or ‘about right’ (Khandpur et al, 2019).



Figure 3.10: Examples of warning signs on pack on Chile (Smith, 2016)

Evaluating the success and challenges of reformulation and FOP labelling has identified key public policy interventions which have had a positive effect on diet and health in a food retail environment.

3.3 Place

All policies previously discussed impact food and drink products which are sold through the retail store. Some research argues that the retail store itself goes widely unregulated. Retailers have often been criticised on their use of nudging. Nudging is whereby an environment is altered to trigger a desired outcome. The following section will identify areas of concern whereby researchers believe policy need to be introduced or improved. Policy surrounding retail stores is important as retail stores can influence consumers responses to healthy food (Larsen et al, 2022).

3.3.1 Store Layout and Product Positioning

Food and drink products location in store matters. Store layout can impact a consumers consumption choice of healthy and unhealthy foods and retailers purposefully place certain products in specific locations. Usually, unhealthier foods closer to the till to encourage impulse purchases or bakeries at the front of store so the smell encourages a sale. Current literature purposes policy makers apply this theory to introduce regulations which encourage the sale of healthier foods (Muir et al, 2023; Vogel et al, 2021).

For example, there was a 15.5% reduction in purchases of unhealthy food products when the availability at the checkout was removed. 76% of respondents noted a reduction in snacking on items purchased at the checkout. Similarly, when HFSS were removed from front of store and replaced with fruit and vegetables it resulted in and sales increase and decrease respectively (Muir et al, 2023). The evidence of this research indicates that making HFSS less prominent instore has the potential to change consumer health.

In an intervention study they replaced key areas instore such as aisle ends, special buys, front of store and checkouts with fruit and vegetables. Over three months they sold 1,359 less confectionary items and 6,170 more fruit and vegetables. In six months, they sold 1,575 less confectionary items and 9,820 more fruit and vegetables. The most interesting result from the study was the continuation of the trend six months after the study (Muir et al, 2023; Vogel et al, 2021). This may suggest that when consumers start to shift their consumption habits they adapt new habits and make dietary changes.

Table 5 below, identifies the research from different observational studies. 60% showed a positive association with between positioning of healthy food instore and effect on diet. This is the same as results when unhealthy food is positioned in key locations in the store such as aisle ends (Muir et al, 2023; Shaw, 2020). Studies showed positive sales outcome

when healthy foods are placed in prominent locations and noted an increase of sales (Shaw et al, 2020).

Table 3.7: Effect direction plot of observational studies (Shaw et al, 2020).

Author, year	Study design	Socioeconomic status	Sample size	Placement of healthy foods	Placement of unhealthy foods	Placement of healthy and unhealthy foods	Outcome type ^b	Effect direction and significance ^c	Risk of bias
Bodor et al (2008) ⁵⁹	CS	Low	102	A			Diet	△ ⁶	Low
Caldwell et al (2009) ⁵⁰	LT	Not provided	130	A			Diet	△ ₆	High
Caspi et al (2017) ⁶⁰	CS	Not provided	594	A		A	Sales	△ ₇	Low
				P			Sales	△ ₂	
							Sales	△ ₂	
Cohen et al (2015) ⁵¹	CS	Low	980	P	P		BMI	△ ₂	Moderate
							BMI	▽	
Franco et al (2009) ⁶⁵	CS	Varied	759	A			Diet	◇ ⁶	Low
Gustafson et al (2011) ⁵³	CS	Not provided	186	A			BMI	▽	Low
				A			Diet	▽	
Gustafson et al (2013) ⁵²	CS	Low	121	A			Diet	△ ₄	Low
Jani et al (2018) ⁵⁴	CS	Not provided	3817	A			BMI	◇ ₂	High
Jilcott Pitts et al (2017) ⁶¹	CS	Not provided	479	A			Diet	△ ₄	Low
Kerr et al (2012) ⁵⁵	CS	Varied	637		P		Sales	▲ ₂	Moderate
Martin et al (2012) ⁶²	CS	Low	372	A			Sales	▲ ₂	Low
Nakamura et al (2014) ⁵⁶	CS	Not provided	1 ^a	P	P		Sales	▲ ₂	Moderate
							Sales	▲	
Rose et al (2009) ⁶⁶	CS	Not provided	1243	A	A		BMI	◇ ₃	Low
							BMI	△ ₃	
Ruff et al (2016) ⁶³	CS	Varied	1904	P			Sales	▽ ₄	Low
				A			Sales	▲ ₅	
Sanchez-Flack et al (2017) ⁶⁴	CS	Low	369	A			Sales	▲ ₄	Moderate
Thornton et al (2010) ⁵⁸	CS	Varied	1082	A			Diet	▽ ₄	Moderate
Thornton et al (2011) ⁵⁷	CS	Varied	1007		A		Diet	◇ ₂	Moderate

^aNo. of stores rather than no. of participants.

^bSales represents sales/purchasing.

^c▲ Positive result ($P < 0.05$); △ positive result ($P > 0.05$); ▼ negative result ($P < 0.05$); ▽ negative result ($P > 0.05$); ◇ inconsistent results.

In addition to positioning POS plays a role in influencing consumer decisions. Displaying a designed display around fruit and vegetables instead of heaping them on a table positively influenced sales (Stein, 2018). Many experiments have shown that consumers perceive signage over products improves the selection as consumers perceive these to be more popular. For example, chickpeas proved to be more popular than any other bean when a sign was placed around them calling them out as the towns favourite with sales increasing by 14% (Bahana, 2017). Another piece of research examined the effect of shopping trolleys with an advertisement detailing how much the average person purchases at least five different fruit and vegetables in their weekly shop, these stores increased their fruit and vegetables sales by 10% (Payne et al, 2014). Another study looked at reconstructing the shopping trolley into two halves one for fruit and vegetables and the other for all other groceries. The result was an 18% increase in overall fruit and vegetables purchases (Wanskink, 2017). These studies were originally constructed to

prove that social norms could be influenced by retailers to change or influence consumption habits. However, these studies also highlight the importance of knowledge and education when consumers are food shopping. In most instances above, the retailers were able to influence their decision their place of purchase. This is a learning for governments and stakeholders when creating policies.

3.3.2 Public Reaction to Nudging Regulations

Nudging is using the environment to change people's behaviour without removing any choices. It has been illustrated that nudging campaigns can be very successful when incorporated into a health campaign (Goncalves et al., 2021). In the retail environment these changes can be layout changes, increasing product information or educating consumers in an enticing way. For example, Goncalves et al., 2021 referenced a tofu manufacturer who implemented an instore campaign only to educate customers how to prepare and cook tofu in under ten minutes. This resulted in an increase in sales of new customers, highlighting the importance of education and nudging as a technique (Goncalves et al., 2021).

Previous studies in UK, US and Canada, have discovered widespread customer support health support for retailer nudges to product positioning. The level of support and input of consumers perceptions of health initiatives is critical to determining their future success if implemented into policy. The study identified between 49% - 72% of participants viewed initiatives positively and welcomed the change (Gomez – Dononso et al, 2020). The public were less supportive of anything that seemed more restrictive including banning or limiting unhealthy food products form promotional spaces. In a study examining different demographics, they found older female respondents seemed to be most accepting to any changes as they are reported to have more nutrition knowledge than some other cohorts within the study. It is highlighted that those who understand harm a product causes with be more likely to accept changes to improve life quality (Diepeveen et al, 2013).

Maintaining a perception of choice was the most important factor to the public and was at the core of promoting fairness. This is important for policy makers as a sense of fairness was related to success and acceptability of policy (Bos et al, 2015; Gomez – Dononso et al, 2020). The most positive correlation was the multicomponent intervention studies. Availability and positioning of healthy foods resulted in on average 83% showing results in a positive direction The results were consistent regardless of the type of manipulated

interventions such as food demonstrations, shelf labels and promotional events (Shaw, 2020).

A study found the most supported changes were those that created more space instore for healthier and fresh foods. The least popular was for checkouts consisting of only healthy food products, consumers felt this was controlling and removed their choice from the shopping experience. Overall, the study found that those who were pre educated in nutrition were more supportive in the changes. The public tend to prefer strategies which encourage low calories choices rather than removal of choice believing them to be fairer and more acceptable (Bos et al, 2015; Gomez – Dononso et al, 2020).

These findings suggest nutritional educational greatly influences a consumers decision making process for policy makers. Placement strategies could potentially assist in encouraging better nutritional habits. There is a possibility availability and positioning could be utilised to guide consumers to healthy choices (Shaw et al, 2020).

3.3.3 Food Marketing to Children

Retailers' category strategies are developed to maximise sales and they use strategic shelf placement to target children's eye level. According to the Food Standards Agency, "nearly 90% of food and drink products on available at children's eye level in UK supermarkets were unhealthy" (Royal Society Public Health, 2019).

Research findings have shown that food and drinks manufacturers utilise several marketing techniques to appeal to children as per table 6. "73% of parents had a food request from their child while shopping and 88% of requested items were unhealthy foods. 70% of all food and drink products located in prominent areas in supermarkets are for food and drinks that contribute significantly to children's sugar and calorie intake" (Royal Society Public Health, 2019).

Table 3.8: Comparison of marketing appeals used with children's food products from 2009 and 2017 (Elliot, 2019).

Marketing Appeals	2009	2017	p-value
	n (%)	n (%)	
Fun reference	78 (22.0)	59 (15.6)	0.031 *
Character licensing	60 (17.0)	59 (15.8)	0.669
Cartoon image (front of package)	245 (69.2)	320 (85.6)	<0.001 *
Child font (cartoonish, chalk, etc.)	306 (86.4)	354 (94.7)	<0.001 *
Unusual product names, flavors	193 (54.5)	46 (12.3)	<0.001 *
Portability	196 (55.4)	201 (53.7)	0.660
Unique qualities			
Interactivity	13 (3.7)	44 (11.8)	<0.001 *
Changes color	4 (1.1)	0 (0)	0.055
Transforms	1 (0.3)	1 (0.3)	0.999
Unusual package shape	93 (23.3)	67 (17.9)	0.006 *
Unusual product shape	121 (34.2)	126 (33.7)	0.889
Kid-size product			
Product	57 (16.1)	22 (5.9)	<0.001 *
Package	61 (17.2)	14 (3.7)	<0.001 *
Product and package	90 (25.4)	16 (4.3)	<0.001 *
Games or activities on package	105 (29.7)	43 (11.5)	<0.001 *
Premium claim	52 (14.7)	54 (14.4)	0.924
Parent appeal	231 (65.3)	319 (85.3)	<0.001 *

* statistically significant.

Mothers have reported their children influence their purchasing habits more than anything else instore. Multiple observational studies identified that usually children’s persuasion techniques were successful and they mostly request sweets and snacks. If this is combined with the amount of shelf on space in supermarkets allocated to HFSS F&B, there is a high likelihood parents will be bringing home unplanned unhealthy food choices. Retailers argue that with a finite amount of space it would be impossible to restrict that all HFSS products were not in child’s eyelevel. Shelf facings can influence a consumers perception and evaluation of the brand (Harris et al, 2020; Ziegler et al, 2021).

For example, even though Lidl UK reduced the overall sugar content in their cereals by 20% they decided to remove the cartoon characters from their boxes as their products were still had a high nutrient profiling score. Lidl understood the role these characters played in influencing children in store, and they said they wanted to remove the source of pester power for parents (Sweeny, 2020).



Figure 3.11: Lidl Choco Rice before and after the packaging redesign (Sweeny, 2020).

There is a gap in research identifying the role category management could play in best organising shelf space to course correct these challenges. Interestingly an Australian draft document of their potential National Obesity Strategy addressed this shelf space challenge. It outlines space on shelf for unhealthy foods should be significantly reduced however they would recommend that these changes varied depending on the socio-economic areas. Suggesting that this action should be government-led and mandatory (Schindlmayr, 2021; Ziegler et al, 2021). These policy suggestions would also highlight that other governments are looking at introducing novelty legislation to tackle obesity at store level.

3.3.4 UK Leading the Way

Taking on board research presented by various health bodies, the British government are the first policy makers to introduce legislation which impacts retailers' food and beverage instore marketing strategies and placement. In October 2022, The UK government declared that retailers are to remove HFSS items from prominent locations instore including store entrances, queuing areas, checkouts, end of aisles, designated queuing areas or online homepages or checkout pages (Harmsworth, 2022).

In December 2021 the government passed the UK Food Regulations. These laws came into practice in December 2022, marking the first country in Europe to enforce mandatory

food laws on food retailers in the country. These Food Regulations introduced food legislation restricting the promotion of HFSS foods such as price promotions and targeted promotional space. Due to the cost-of-living crisis the legislation regarding price will not be enforced until October 2023. Failure to comply with this legislation will result in a fine of £2,500 (Harmsworth, 2022).

UK government believe that this legislation has great potential to increase the placement of healthier foods throughout the store, drive behavioural change and reduce impulse HSFF product purchases.

There has been concerns raised by industry and retailers and product exemptions, promotional exemptions and omissions of prominent promotional spaces have already been introduced to counteract the legislation which many argue has undermined its credibility. Many believe industry will exploit these ambiguities and consequently undermine the legislations health aims (Harmsworth, 2022; Muir et al, 2023). A qualitative study outlined initial feedback from stakeholders and while many seen the new legislation as a step in the right direction, there was much more support and clarity needed in order to deliver results (Muir et al, 2023).

This research supports the UK government's decision to introduce mandatory retailer guidelines. It is encouraging data for other policy makers to consider applying these steps to utilise the retail space to make changes. For this strategy to work best governments would need to liaise with retailers in order to maximise the potential successes from this strategy (Shaw et al, 2020).

3.4 Promotion

3.4.1 Food and Drink Advertising

Although food and drink advertising affects all consumers, children are the most susceptible. Children are the most vulnerable in society given their underdeveloped decision-making ability and maturity levels. The WHO have recommended that policy holders focus their efforts on developing a strategy to constrain or eradicate food marketing to children as they are one of the most vulnerable groups in society. (World Health Organization. Regional Office for Europe, 2022; Vannucci et al., 2020).

By targeting young children, unhealthy food brands can build loyalty which these children then carry into adulthood. In the US it is reported that food companies spend €72 billion on marketing through retailers, specially aimed at children. Throughout the day children are targeted through a variety of media through persuasive marketing techniques and the latest technologies. German supermarkets were studied and it was identified that 85% of foods marketed to children were unhealthy (Golden & Parker, 2020; Harris et al, 2020).

Food and drink marketers use various strategies to make their products more appealing to children, as per table 7. Unhealthy food packaging attracts children by using colours, specific letter fonts, clever use of branding and a possible slogan to catch their eye. Unlike healthier products which usually focus on the nutritional value of the product unhealthy packaging usually gives a fun and entertaining dimension to distract from product ingredients or nutritional quality of the products. These products usually promote and evoke an experience with the consumer, and they develop positive emotions towards the product. This is a dangerous form of interaction with a food product as children are not consuming the product to fill hunger but because they want to play, resulting in an overconsumption leading to obesity and overweight (Ertz & Bouhart, 2021).

Table 3.9: Different stages of cognitive changes in children and examples of adopted marketing strategies (Ertz & Bouhart, 2021).

Development period	Sensorimotor period (0-2 years)	Preoperative period (2-6 years)	Period of concrete operations (6-12 years old)	Period of formal operations (12-16 years old)
Cognitive developments	Perception of the environment depends on movements. Children understand that items continue to exist even if they don't manipulate them more.	The child masters language, can think and represents items according to shapes, symbols or words. The child acquires notions of subjective quantity and of temporality.	The child is capable of logical reasoning and critical thinking. The child knows that events posterior to their own life can occur and they can imagine those events.	The child is capable of complicated reasoning, and can fully imagine formal or abstract objects. The child's critical thinking is fairly developed to do judgments on morality.
Example of marketing strategies	Stimulate the child with some colors, music and movements to attract attention.	Exposure to the brand, to a mascot and to packaging.	Suggest a toy against consumption, an advergame, use a celebrity or a fictitious character.	Do "Greenwashing" to adopt an entertaining picture, and reduce the perceived risks and dangers for consumers.

3.4.2 Food and Drink Advertising Regulations

The EU has recognised unhealthy food and drink advertising as a public health concern for over 18 years, since the Obesity Prevention Green Paper in 2005. In 2006, the EU introduced regulation on nutrition and health claims made on foods followed by the EU Childhood Obesity Action Plan in 2014. More recently, the EU has also acknowledged that the advertising of unhealthy food has significant implications for children's rights. In 2021, EU Strategy on the Rights of the Child discusses the negative impact of food marketing on child nutrition. EU Farm to Fork Strategy has outlined that policy makers have to protect children from the advertising of HFSS across all media (European Commission 2022; European Public Health Alliance, 2021).

Policy heavily relies on self-regulation and codes of conduct within the industry. 54% of European countries have reported some self-regulated action to control the marketing of unhealthy foods (Breda et al, 2020; Smith – Taillile et al, 2019).

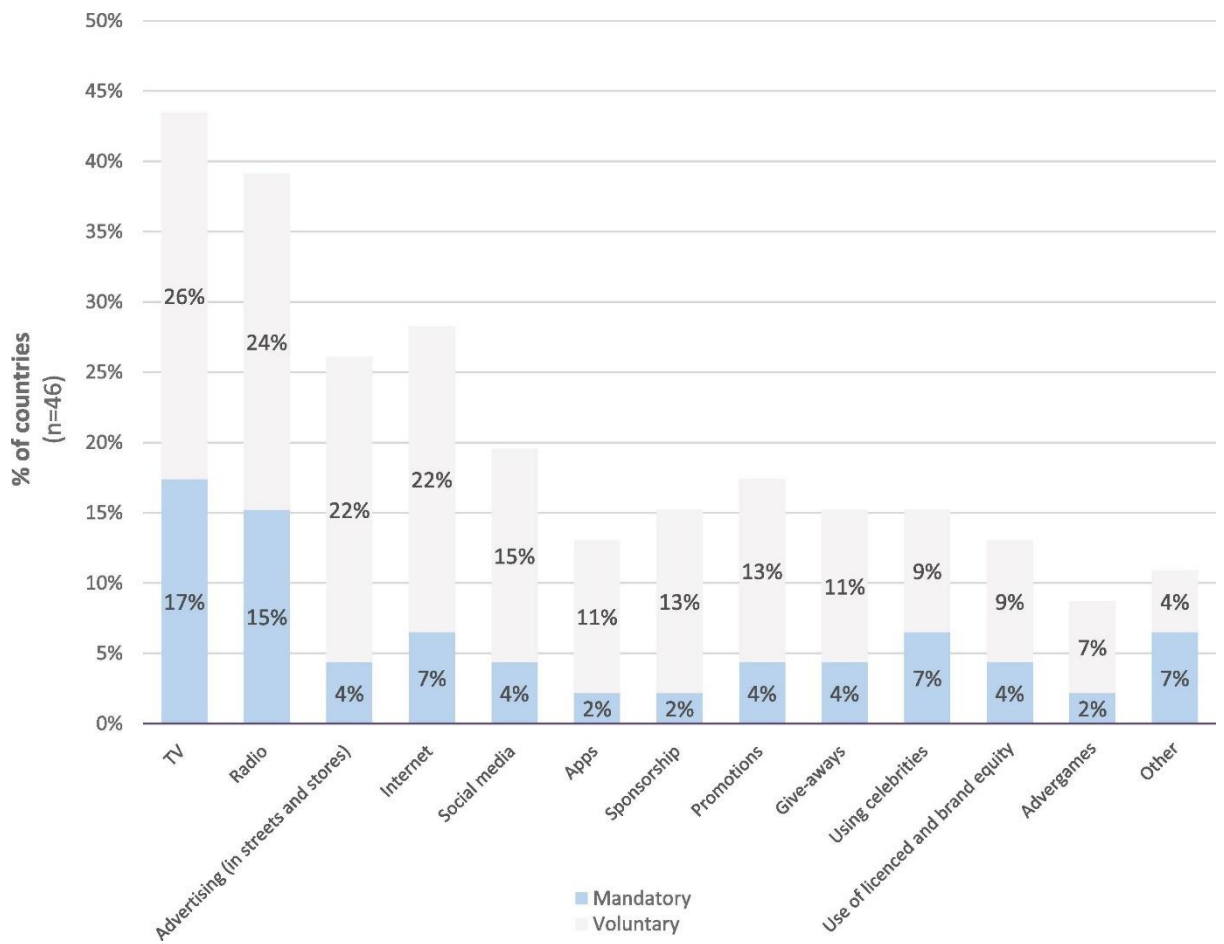


Figure 3.12: Mandatory or voluntary measures to regulate or guide marketing of food and non-alcoholic drinks to children in specific communication channels, settings and contexts (Breda et al, 2020).

European Public Health alliance 2021, launched an initiative with a call to action and directive to act as a catalyst to regulatory action. They detail have outlined the following steps which they believe would regulate child marketing effectively. “Define as a ‘child’ any person below the age of 18; end nutritionally poor food marketing between 6am and 11pm on broadcast media; ban such marketing entirely on all forms of digital media; prohibit the use of marketing techniques appealing to children for the promotion of these foods, including on product packaging; and use the nutrient profile model especially developed for marketing by the World Health Organization to define what a ‘nutritionally poor foods’ is” (European Public Health Alliance, 2021).

As per figure 3.12 illustrates the majority of both voluntary and mandatory regulations are surrounding traditional media. 17% of countries within the EU introduced legislation to try and reduce the amount of advertising children would see on television (Breda et al,

2020). In Ireland HFSS brands cannot advertise on any TV station that holds an audience less than 50% under 15 years of age (Golden & Parker, 2020).

However, at the same time consumers watch less television their social media exposure increases. A large portion of HFSS brands have switch a considerable portion of their media spend to social media. Brands can not only advertise their products, but they can engage in conversation direct with their consumers. It is reported that \$35.98 billion was spent in globally in 2017 on social media adverting an increase of 26% from 2016 (Bragg *et al.*, 2020). The top five most followed food and drink brands on social media globally are Coca – Cola, McDonalds, , Red Bull, KFC & Starbucks.

These marketing strategies by large influential food and drink brands may be putting adolescents at increased risk of over consumption of unhealthy foods which could lead to obesity. They aim to achieve brand preference is seeking to achieve brand preference for life. This lifelong brand loyalty could negatively impact their lifelong health. Research argues food and drink manufacturers cannot be trusted to create, enforce and regulate their own marketing. Industries are profiteering from unhealthy food marketing and current statistics would indicate that current voluntary legislation is not proving adequate to achieve the objective of reducing children’s exposure to unhealthy and protecting them from poor nutritional habits. Voluntary policies have largely been created for traditional media and are slow to introduce mandatory regulations around emerging digital platforms (European Public Health Alliance, 2021;Orzan et al.,2021; World Health Organization. Regional Office for Europe, 2022).

While digital media has been growing at exponential speeds, digital food environments have been absent from majority of mandatory regulations in the public health agenda. Currently there is no mandatory legislation surrounding food marketing on digital media (World Health Organization. Regional Office for Europe, 2022).

3.4.3 Advertising within Retail Stores

There are a few marketing techniques which are evident while walking around a food retail store. These techniques are apparent on their product branding, POS at fixture and secondary space and additional instore feature space. They leverage several mechanisms to make their products more appealing to children such as games on pack or contest, licensed characters, brand characters, and other cross promotional promotions. Studies

have shown that products that use these techniques are more than likely products HFSS (Harris et al, 2020).

In addition to packaging food these products usually follow specific placement on shelf guideline tactic. These products are strategically placed in specific lower shelf space and special displays or may be included in samples or tastings. Research has shown that the most colourful child targeted foods are usually placed at the lowest point within a child's reach. Special displays are usually primarily focused unhealthy foods. Research by Harris et al, 2020, examining the cereal category discovered 55% - 80% of shelf space in the cereal aisle was dedicated to high sugar products. Specific placement of these HFSS foods outside of their dedicated in aisle location was also a popular tactic to increase brand visibility and sales. Salty snacks, candy, sweetened cereals and sugary drinks are often placed on end aisle displays, special bins and near the checkout (Harris et al, 2020; Larsen et al, 2022).

3.4.4 Next Steps

Nutrient profiling has emerged from some countries around the world such as Chile and the UK as a measure to help implement successful self-regulated policy. A nutrient profiling model allocates points for healthy or beneficial ingredients or nutrients and deducts points for unhealthy points to achieve an overall score. Products deemed HFSS will then have to comply to more regulations when marketing their products. It could potentially provide a guide for industry if they can advertise a certain product to children or not. (Taille et al, 2019).

Policy makers could set retail objectives though conditional licensing like the cigarettes and alcohol legislations. They would have to agree to agree to certain conditions such as sales on multi packs, age limits on HFSS energy drinks or placement in certain locations (Harris et al, 2020; Taillie et al., 2019).

Policy makers need to understand and utilise the influential power of the retail environment and the impact advertising within the store can have on consumers choices. Policy makers should consider following in the UKs footsteps and regulate common in-store marketing techniques for child-targeted products, including shelf placement, special displays, and price promotions.

Implementing effective policy will not be without its challenges. Public policy experts have called for food companies to reduce these instore advertising practices but with few

repercussions and advertising in the food retail environment goes widely unregulated. Research within the EU is limited and vastly under researched with most of the research is focused on the traditional forms of media advertising such as TV or digital media (Larsen et al, 2022).

3.5 Education

Across all literature researched for this thesis there was a common theme which emerged from most papers. The role of education was always highlighted in some capacity and its role against combating obesity.

3.5.1 Patterns of Obesity

Many of our lifelong habits are formed in our early years, usually formed from the influence of our primary caregivers. Risky lifestyle practices begin in childhood and adolescence such as alcohol, smoking, poor dietary behaviour and a sedentary lifestyle. These habits will eventually impact our overall health as adults. Overweight or obesity in childhood has been related to risk of disease and obesity in adulthood. Evidence suggests that body fat and weight are engrained from a young age, setting the stage for a lifetime. There is a link between childhood obesity and adult obesity, it was discovered that three out of four obese 12-year-olds had obesity in later life. It was also found that between 48% - 74% of children in the upper 20% of weight in childhood were in the upper 20% of adults. This increased dramatically among adolescents, finding 80% of obese adolescents would become obese adults (Pyle, 2006; Troiano et al, 1995).

Not only has obesity been linked to several diseases it is also a well-established factor of premature death. Both children and adults with obesity experience increased morbidity and mortality. Mortality studies have identified education as one of the most impactful measures to reduce mortality rates. It is predicted that the number of obese people worldwide is over one billion (Troiano et al, 1995; World Health Organization. Regional Office for Europe, 2022).

3.5.2 Role of the Caregiver

There is plenty of research detailing the importance of the primary caregiver's role in a child's life and creating its societal norms. It has been proven in research that a mother or primary caregivers' knowledge of nutrition and healthy eating will influence their children. Children of a primary caregiver with a higher knowledge of nutrition are less likely to grow up obese or end up obese as adults. A mother's nutritional knowledge is imperative to supporting and raising a child (Prasetyo et al, 2023; Yabancı, 2014; Zarnowiecki, 2012).

There are several factors which can impact the health and nutrition of a child outside the home including geographical region, socio economic background and economic status.

However, by educating parents, policy makers are allowing them more freedom in their choices despite their circumstances. For example, a study which educated mothers from under privileged backgrounds found that educational interventions caused an increase in the health status of the group’s children. The education interventions through three different concepts Nutrition Education Program, nutritional strategy and nutritional clubs (Sánchez-Encalada et al, 2019).

Another research study examined the impact maternal lifestyle choices and maternal education had on the likelihood of overweight an obesity in their children as they grew up. There studies found that lifestyle choices, diet, lack of exercise and alcohol consumption affected the development of obesity in children. In their trail they found significant reductions in children overweight and obese when diet and physical activity interventions where introduced. The preferred method of delivery intervention varied with video and verbal delivery as most effective (Lambert & Wang, 2022).

Table 3.10: Participants’ Preference of Educational Delivery Modes (Lambert & Wang, 2022).

Participants’ Preference of Educational Delivery Modes (n = 36)							
Delivery modes	Testing time	Most preferable	Preferable	Somewhat preferable	A little preferable	Least preferable	<i>p</i>
Verbal	Pre	20 (55.6%)	10 (27.8%)	5 (13.9%)	1 (2.8%)	0 (0.0%)	.96
	Post	18 (50.0%)	13 (36.1%)	5 (13.9%)	0 (0.0%)	0 (0.0%)	
Brochure	Pre	17 (47.2%)	14 (38.9%)	5 (13.9%)	0 (0.0%)	0 (0.0%)	.19
	Post	14 (38.9%)	13 (36.1%)	8 (22.2%)	1 (2.8%)	0 (0.0%)	
Video	Pre	9 (25.0%)	15 (41.7%)	10 (27.8%)	2 (5.6%)	0 (0.0%)	.001**
	Post	23 (63.9%)	10 (27.8%)	3 (8.3%)	0 (0.0%)	0 (0.0%)	

A large research study discovered a positive association between mother’s lifestyle choices and likelihood of obesity in their children. Their findings highlighted the role educated parents can have on childhood obesity and how correct interventions strategies by policy holders could help reduce childhood obesity. The study found mothers with a

healthy BMI, and a low risk lifestyle reduced their children’s likelihood of obesity by 75% (Dhana et al, 2018; Scienmag, 2018).

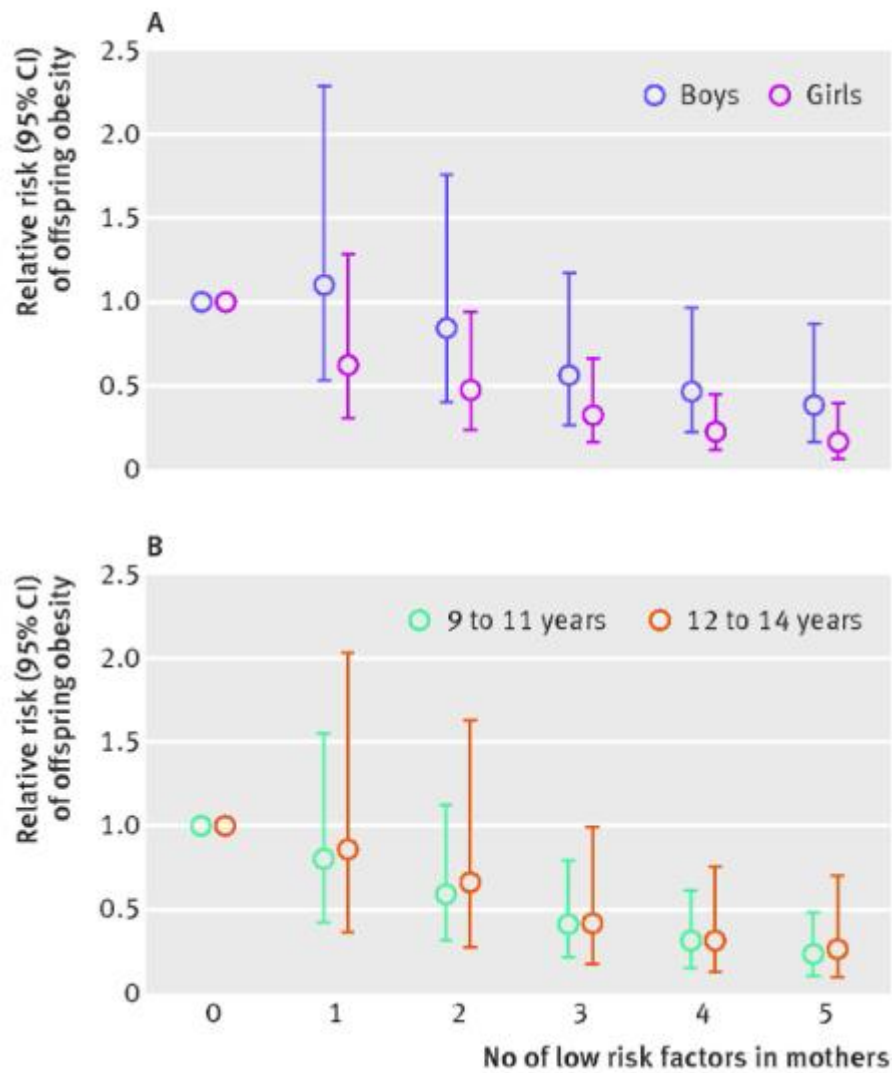


Figure 3.13: “Associations between low risk lifestyle factors and risk of offspring obesity, stratified by (A) sex and (B) age” (Dhana et al, 2018).

3.5.3 Reversal of Pester Power

Children are one of the most influential factors when accompanying adults on making purchases instore (Ziegler et al, 2021). When children enter a food retail store 89.5% of products on display are at their eye level (Royal Society Public Health, 2019). Unsurprisingly, 73% of parents had a food request from their child while shopping and 88% of requested items were unhealthy foods (Royal Society Public Health, 2019). A school in the UK introduced a scheme to help parents say no to pester power. The scheme encouraged parents to eliminate snacks, set regular mealtimes and provided classes if they needed to learn to cook. Of the 6000 parents which took part the studied identified a

reversal in 625 children's BMI, no such change was recorded in any other UK city during that time period (McDermott, 2019).

Issuing parents with the tools and information encourages them to make healthier decisions regardless of what external environment. A study by Gamburzeu et al, 2016, increased visibility and consumer appeal of inexpensive foods by focusing on advertising their nutritional qualities. The results concluded an uptake in sales of these foods. Most importantly consumers who participated in a quiz after scored considerably higher than they had before on nutritional knowledge and understanding of the labelling system (Gamburzeu et al, 2016).

Understanding the benefits and difference education can make to reducing obesity rates over a longer period for policy makers should be a focus. In addition, there is an opportunity for policy makers to utilise food retail stores to educate people about nutritional foods and overall improve people's diets.

3.5.4 Importance of Education to Reduce Obesity

Research has shown that early prevention strategies are a promising strategy to combat obesity in children. Studies have shown that when overweight students were given education on healthy lifestyle improvements it reduced the overall mean weight of the group. It recommended that such interventions at a larger scale could reduce obesity and prevent complications associated with being overweight (Haghani, 2017).

Better educating populations relating to smoking, family planning, health, obesity and general wellbeing has had proven effects to reduce mortality rates. In the US, by educating young women on best hygiene and nutrition, availability of antibiotics and access to general healthcare information infant mortality has decreased 90%, alongside maternal deaths which have decreased 99% across the last century (Pettinger, 2019).

The EU Farm to Fork strategy is the EU's current strategy to address education to children through schools. It supports educational measures but the measures themselves are created by the country and voluntarily implemented, executed and monitored. The educational measures they encourage are school gardens, tasting and cooking workshops, fund farm visits and games. The objective is to teach children about healthy eating habits through agriculture. Educating them on organic farming, sustainable production and local food chains. Farm to Fork initiatives were introduced in 2017 and to date the number of

children overweight or obese within the EU has not stalled (EU Commission 2017, World Health Organization. Regional Office for Europe, 2022).

Exploring how different categories have used education may be useful to policy makers when creating legislation and regulations to combat obesity. The most notable category that can be examined as reference is the tobacco industry. Policy makers introduced several measures including higher taxes, legal minimum age, restrictions on smoking in public places, subsidies on treatments to stop smoking, advertising campaigns and availability of cigarettes for sale. Figure 17, shows the gradual reduction of smokers in Great Britain overtime. In 1965 when advertising of cigarettes on TV was banned alongside an increase in education to the public it was matched with a significant decrease in consumption. Social norms have completely shifted due to the anti-smoking campaigns preventing the use of tobacco, reduce exposure to environmental tobacco smoke and promote cessation of use, preventing millions of smoke related deaths. In order to bring about real consumption changes policy makers needed to consider the long-term agenda. Change was facilitated through a variety of interventions over a significant period to alter people's perceptions and habits. It is noted on the research that the rates will not continue to decline on their own, the need constant intervention. Gradually as education increases among the population, people smoking decreases (Buckton et al, 2021; Pettinger, 2019).

Smoking rates decline with action

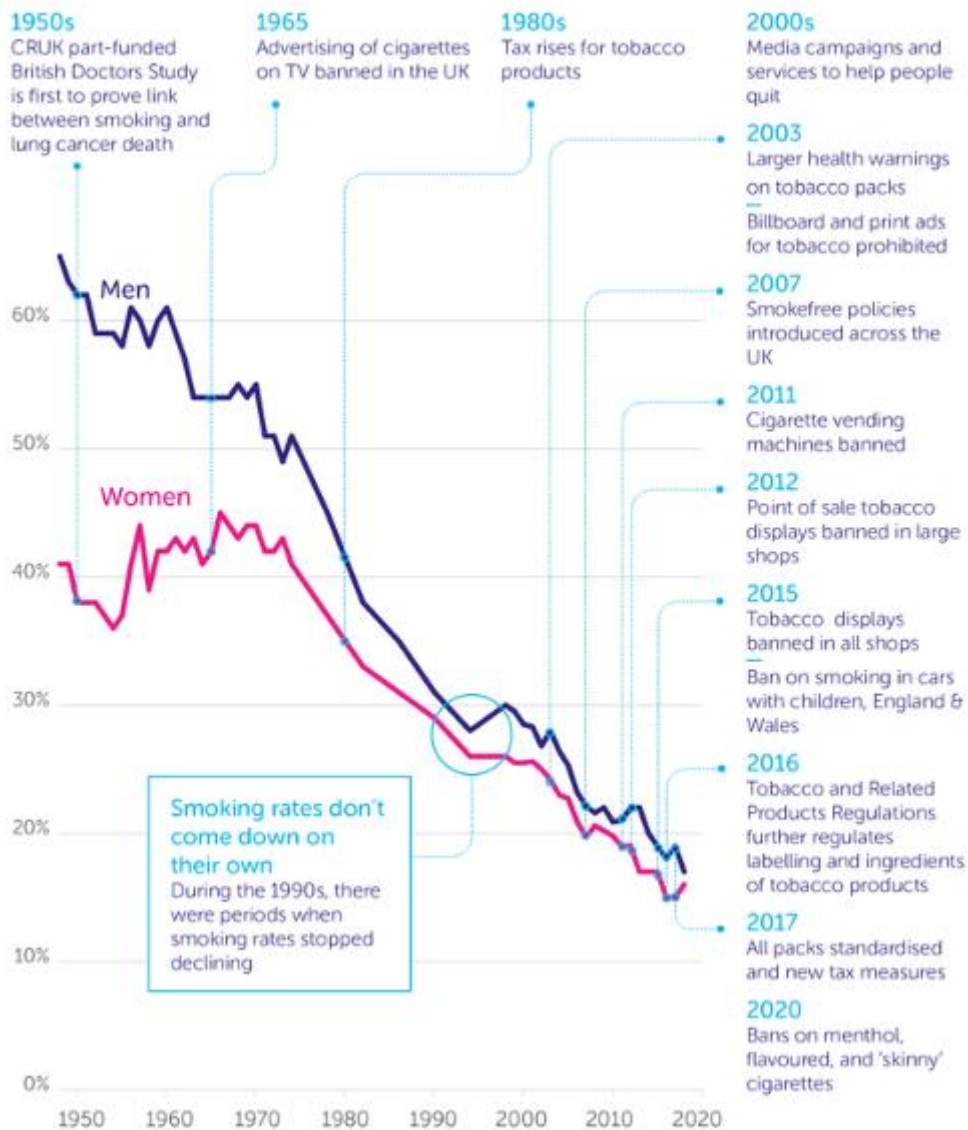


Figure 3.14: Showing the reduction of members of the public who smoke in Great Britain overtime from 1950 to 2020, including actions introduced overtime (Buckton et al, 2021).

Policy makers can learn from the tobacco industry, realising that to implement real change a long-term view must be taken to tackle a public health problem. They will need to incorporate many different measures and they most importantly without relevant education change will be slow.

Chapter 4

Discussion

The purpose and objective of this study was to evaluate public policy interventions on the food retail environment on diet and health through the 4 Ps of marketing. Understanding why these policies are important is evident when examining the effect obesity is having across the world. 60% of adults are obese or overweight which has increased by 138% since 1975. Obesity is linked to several cancers all across the body and is responsible for at least 200,000 new cancer cases per year in Europe. It is estimated it can be linked to 13% of the total mortality rate in the EU (World Health Organization. Regional Office for Europe, 2022). There are a number of contributing factors to obesity such as physical activity, sedentary lifestyles but most commonly it can be caused by the over consumption of HFSS foods and drinks. Medical professionals consistently are reminding people that obesity preventable. (Cullen, 2022; Pancrazi et al, 2022). In a bid to tackle this crisis some governments across the EU have implemented various public policy interventions guided by the World Health Organisation (World Health Organization. Regional Office for Europe, 2022).

This study aimed to understand what interventions have been successful in altering consumers behaviour and improving their diet and health.

The introductory chapter of this paper provided an overview of the severity of overweight and obesity in ROI and the EU which has been caused by the over consumption of processed foods. In Ireland, the average shopping basket contains nearly 46% ultra processed foods, the second worst in the EU (Cleary, 2018). These processed foods are being created to cater to people's busy lifestyles. New products, line extensions, snacking occasions, portion sizes and flavours are blurring the line between producing healthier products are creating more ultra processed foods hidden behind 'healthy' branding and marketing (Campbell et al, 2023; Cox, 2023).

Within chapter one, the importance of the retail store environment is examined to understand the significant role it plays in a consumers decision making process. One fifth of adults believe the store can influence them to trial off from their diet when attempting to lose weight. A quarter of women believe offers on unhealthy food and drinks in supermarkets cause them to gain weight. A study examining associations between the food environment and overweight and obesity found a 77% direct association between the two (Brouwer et al, 2021).

Chapter one highlights that 30 countries within the EU have a policy for reducing overweight/obesity. However, in Ireland many people believe that government are not proactive enough. This is a common theme across the Europe, and some believe that the food industry has too much control into new policies. Taking learning from different categories mandatory policies seem to be most impactful when introducing changes, this is evident in the tobacco industry.

Chapter three outlines the framework for the methods used to evaluate public policy interventions in the food retail environment on diet and health. This study was analysed using the marketing “4P’s” Price (taxes and subsidies), Product (reformulation and food labelling), Place (food retail) and Promotion (food retail advertising).

All the “4 P’s” have a varying degree of influence on the food retail environment and consumer purchasing decisions. Depending on the type of interventions positioning and availability have proven somewhat effective. Overall public policy was found to be most effective when mandatory guidelines and targets were set. Fiscal policies were more effective than informative strategies but met with the most opposition. Above all, the education of those within the community largely impacted the success of any policy intervention.

Price: The most successful price intervention was the introduction of the SSDT. As of 2022, 19% of countries within the WHO have introduced SSDT taxes. Ten countries within the EU have implemented the SSDT tax including Belgium, Finland, France, UK, Ireland, Hungary, Latvia, Monaco, Norway and Portugal (World Health Organization. Regional Office for Europe, 2022). Arguably, the largest success of SSDT was that it forced the beverage industry to reformulate their portfolio. Studies have shown that the volume of drinks available in the full sugar category declined in the following two years after the sugar tax was implemented (Rogers, 2023; Scarborough et al, 2020). The emergence of NDP for the no or low sugar category exploded. Since the sugar tax has been introduced another public health concern has been brought to light by the WHO, the ingredient aspartame. Now, medical professionals are suggesting drinks containing artificial sweeteners should also be included in the tax.

Only 12% of adults in Europe consume the recommended daily allowance of fruit and vegetables. A fruit and vegetables subsidy could improve this and bring wider societal results such as reduced healthcare costs, increased quality of life, and higher productivity

levels (Springmann et al, 2018). The WHO have suggested new subsidies concepts which could increase consumption of fruit and vegetables. The EU farm to fork policy contains initiatives to promote sustainable and healthy diets but current statistics would suggest that more work is needed. studies suggest taxing red meat as it carcinogenic as it could improve the overall diet of populations. However it can be argued that if people were educated enough governments would not have to introduce such a tax (Broeks, 2020). Policy makers could consider capping promotional activity in retail environments when examining the role price plays in the decision making process.

Product: Product reformulation and product labelling are discussed in this study examining their success. Product reformulation is a common practice in the food industry to improve the overall nutritional composition of their food. It is often voluntary but led by an overarching policy set by government. 77% of countries reported activities for voluntary food reformulation focusing on sugar and salt. Often the food industry does not communicate these product changes to consumers and implement them gradually. The food industry has adapted to creating a new healthier range of products rather than solely improving their current products. 89% Irish consumers are in favour of the food industry and policy makers working together to achieve results (Breda et al, 2020; Food Safety Authority Ireland, 2022). Even though product reformulation is the second most popular intervention policy there is limited evidence for vast behavioural change (McKinsey, 2014).

Product and food labelling communicates nutrient qualities to the consumer. Consumers can be influenced by the superficial environment cues including packaging so educating consumers on pack information is critical to decision making for healthier purchases (Larsen et al, 2022). The largest barrier to success is consumers understanding the labelling or understanding the dietary impact of what the label is telling them. Only 21% consulted the TLL when making their food purchase decision. Research has shown that the most impactful FOP labelling is warning labels compared to TLL and GDA. Consumers were 4.5 times more likely to identify a product with the lowest nutritional values (Khandpur et al, 2019).

Similar to product reformulation although it is a popular policy choice product labelling has limited evidence for behaviour change (McKinsey, 2014). Both product reformulation and product labelling are best used in conjunction with other elements of the 4 P's. They

are evident within the product on the shelves of the retail store but are not influential enough to the vast population to be the only determinant to choice.

Place: For a consumer to purchase a product they first must navigate their way through the store. Price, product and promotion are irrelevant if the consumer cannot find the product instore or pick up an alternative product as the retailer has made this product more accessible. Retailers control the space in which food is sold and often use tactics to entice the sale of one product over another. Policy surrounding retail stores is important as retail stores can influence consumers responses to healthy food (Larsen et al, 2022). This study has highlight the importance of ‘nudging’ to influence consumer choice. Where products are situated within the store largely impacts impulse purchase choice. The entrance, aisle ends, promotional spaces and checkouts are all high footfall areas and when fruit and vegetables are placed here rather than HFSS foods, the sales of fruit and vegetables increase (Muir et al, 2023). For example, when HFSS products were removed from the checkout, there was an overall 15.5% fall in sales of these products (Vogel et al, 2021).

It is not a mandatory regulation in any country within the EU, except, recently the UK to enforce any legislation to encourage positioning instore, it is usually led by retailers. Reducing the availability of unhealthier foods instore is likely to reduce sales. There is a direct correlation between placement instore and diet. A study showed a 60% positive association between positioning of healthy food instore and effect on diet. Consumers respond to social norms and usually respond with the intended behaviour when prompted in a retail setting. Policy makers should work with retailers to create instore point of sale along with store positioning guidelines to educate and positively improve consumers nutritional knowledge overtime.

Promotion: Several steps have been taken to protect children across traditional media such as TV but regulations for social media are lacking. With the retail store food advertising is a challenge for parents. “73% of parents had a food request from their child while shopping and 88% of requested items were unhealthy foods. 70% of all food and drink products located in prominent areas in supermarkets are for food and drinks that contribute significantly to children’s sugar and calorie intake” (Royal Society Public Health, 2019). Mothers have reported their children influence their purchasing habits more than anything else instore. A study in Leeds in England, educated parents on how

best to manage unhealthy food requests from children and cooking lessons on healthier eating and they noted a decrease in parents purchasing unhealthier foods. There is a gap in research identifying the role category management could play in best organising shelf space to course correct these challenges. Policy makers should look at introducing measures outside of the retail environment such as additional support to parents, letting education guide them as opposed to retail environments.

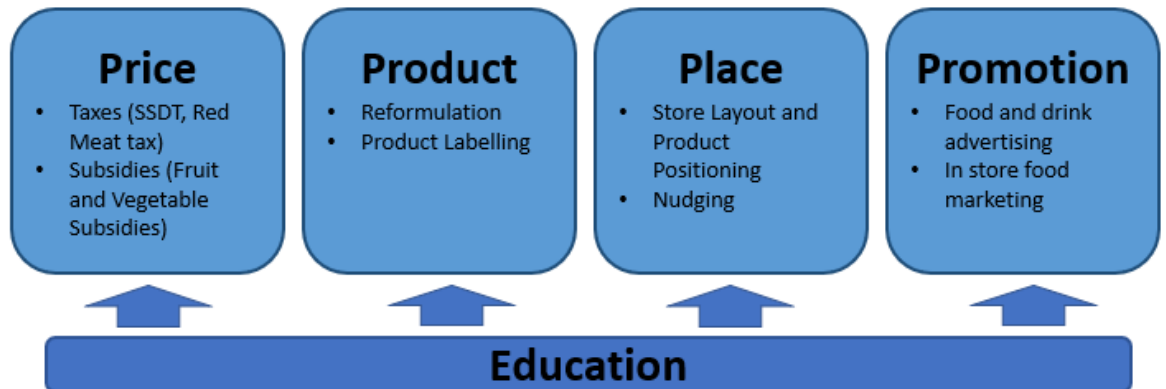


Figure 4.1: All current and suggested intervention policies classified under the 4 P’s underpinned by education.

The nutritional policies discussed were classified using the marketing “4P’s” approach Price (taxes and subsidies), Product (reformulation and food labelling), Place (food retail) and Promotion (food retail advertising). Each of these areas plays a significant role in the food retail environment on diet and health. The aim of this study was to understand what interventions had been implemented and if these interventions have been positively impactful in altering consumer purchasing behaviours and improving their diet and health. Most research papers suggest that each individual policy will make an impactful change to reverse obesity. The results have shown that although some policies have been successful in causing change in their category as an individual policy no public policy intervention introduced to date has had the power to impact purchasing decisions of the majority to reduce obesity. However, the key finding in this study indicated that the one common denominator with the success of any policy was the nutritional knowledge the public withheld to accept the changes. Educating people caused the largest shift in behaviour and continued to deliver results after the various studies had ended. This is illustrated on figure 18, the success of policy implemented under any of the 4 P’s is

underpinned by the education of the population, all successful policy is underpinned by education.

By understanding the impact the retail store has, policy makers could maximise results from their existing policies by introducing more educational materials.

- Introduce subsidies on healthier products to work alongside the taxes on unhealthier products. They could further monitor products under the sugar tax and introduce mandatory policy that these are not to be on promotion or multi-buy.
- They could introduce more mandatory guidelines for retailers with better signage instore to promote nutritional quality of foods.
- They could encourage more mandatory nutritional information to be included on pack. Such as the warning labels introduced in Chile.
- Introduce positioning and promotional guidelines to place emphasis on healthier products instore.

Chapter 5

Conclusion

This thesis presented an overview of the strategies in which policy makers have either implemented or researchers have suggested as possible solutions to combat the obesity crisis. The WHO, has highlighted the key areas in which they believe countries should focus their efforts. Currently every country in the EU is engaging in some practices to try and reverse the overweight and obese population. A large portion of these countries are implementing voluntary policies and have therefore been seen varied results. The leading takeaway from this study is:

- The role educating the public plays in fighting obesity. Majority of studies in this report examining current public policy interventions have outlined the importance of education in their findings. A large portion of behavioural studies noted the behavioural changes after the study as consumers shifted their purchasing habits.
- The positive impact mandatory policies have on the food industry. The food industry has no choice but to respond and make changes. For example, enforcing the SSdT seen the emergence of the no or low sugar category. This has been evident in the tobacco industry, should this be examined for processed meats or ultra processed foods.
- The retail environment is one of the most influential factors for consumers when making food choices. Policy makers could examine the possibility of introducing availability and positioning legislation. Making HFSS less accessible to all and providing healthier alternatives. Retailers need to follow policy for other public health concerns tobacco.

The research question set out to evaluate the public policy interventions in the food retail environment on diet and health. The key findings outlined that regulating the retail environment is not the exclusive answer. Understanding how policies complement each other while underpinned with a long-term educational strategy should result in a bigger impact. Consumer behaviour is a complex system of influences and only when each area is examined or understood might we begin to reverse the obesity epidemic. Legislation is a good first step but only when conducted in a clear and concise manor which provides clarity to policy makers, industry and the general public. Maximising the knowledge of policy makers and industry to communicate a long term roadmap to food and health.

To conclude, there are a few successful policies which have brought about change in tackling in the obesity crisis independently. However, with the speed in which overweight

and obesity is grasping the wider population policy makers need to understand how these policies work best in tandem. Taking learnings from previous public health crisis such as the tobacco industry and understanding the efforts required to bring long lasting results. They need to focus their efforts on education and position their efforts over the course of a long-term trajectory to achieve real success. The findings of this study are novel as they examine public policy through the 4P's in a retail environment, outlining the complexities of public policy interventions.

5.2 Future Work

This study focused on the public policy strategies which have been developed to reduce obesity rates.

While many studies focus on results of individual policies, future studies could examine how these policies work best in tandem with each other. The retail store provides an opportunity to speak with consumers. Future work could understand if a certain percentage of advertising space instore had to be for healthier foods would this have an impact in educating consumers. Increasing consumers nutritional knowledge was paramount to success across the research within this study.

The long-term road to success shown by policy makers to combat tobacco usage was crucial to its success. They combined several different policies to try and shift consumer perception, including the use of taxes. Future work could examine a taxing matrix based on the nutrient profiling of the food or beverage product. Based on the success of SSdT, it may force industry into fast tracking reformulation across more categories and encourage consumers to purchase less frequently.

This study identified the importance of price and promotional areas instore. Future work could examine the impact price promotional strategies have on consumption of HFSS. Retailers use price promotion to entice sales on goods, if these were removed the incentive to purchase may be reduced for consumers. Banning multi – buys or half off promotions could deliver results.

An observation from this study was the limited instore sales data available to government to understand consumer habits when policy was introduced. Future studies could work alongside industry to understand how best to generate data to measure success in a more meaningful and analytical way.

Chapter 6

References

- Bähr, C.C. (2015) “Greenhouse gas taxes on meat Products: A Legal perspective,” *Transnational Environmental Law*, 4(1), pp. 153–179. Available at: <https://doi.org/10.1017/s2047102515000011>.
- Bakogianni, I. (2019) “The EU Health Promotion and Disease Prevention Knowledge Gateway,” *European Journal of Public Health*, 29(Supplement_4). Available at: <https://doi.org/10.1093/eurpub/ckz185.602>.
- Bos, C. et al. (2015) “Consumer Acceptance of Population-Level Intervention Strategies for Healthy food Choices: The role of Perceived Effectiveness and Perceived Fairness,” *Nutrients*, 7(9), pp. 7842–7862. Available at: <https://doi.org/10.3390/nu7095370>.
- Breda, J. et al. (2020) “Towards better nutrition in Europe: Evaluating progress and defining future directions,” *Food Policy*, 96, p. 101887. Available at: <https://doi.org/10.1016/j.foodpol.2020.101887>.
- Van Der Bend, D.L.M. and Lissner, L. (2019) “Differences and Similarities between Front-of-Pack Nutrition Labels in Europe: A Comparison of Functional and Visual Aspects,” *Nutrients*, 11(3), p. 626. Available at: <https://doi.org/10.3390/nu11030626>.
- Broeks, M.J. et al. (2020) “A social cost-benefit analysis of meat taxation and a fruit and vegetables subsidy for a healthy and sustainable food consumption in the Netherlands,” *BMC Public Health*, 20(1). Available at: <https://doi.org/10.1186/s12889-020-08590-z>.
- Brouwer, I.A. et al. (2021) “Reverse thinking: taking a healthy diet perspective towards food systems transformations,” *Food Security*, 13(6), pp. 1497–1523. Available at: <https://doi.org/10.1007/s12571-021-01204-5>.
- Brouwer, I.D. et al. (2021) “Reverse thinking: taking a healthy diet perspective towards food systems transformations,” *Food Security*, 13(6), pp. 1497–1523. Available at: <https://doi.org/10.1007/s12571-021-01204-5>.
- Campbell, N. et al. (2020) “How are frames generated? Insights from the industry lobby against the sugar tax in Ireland,” *Social Science & Medicine*, 264, p. 113215. Available at: <https://doi.org/10.1016/j.socscimed.2020.113215>.
- Campbell, N. et al. (2023) “It delivers a taste bomb of pure pleasure, but ultraprocessed food is killing us,” *The Irish Times*, 30 January. Available at: <https://www.irishtimes.com/health/your-wellness/2023/01/30/it-delivers-a-taste-bomb-of-pure-pleasure-but-ultraprocessed-food-is-killing-us/>.
- Cedeno, L. (2018) *Global Implementation of Soda Taxes: Is There a Better Solution for Combatting Obesity?* Available at: <https://brooklynworks.brooklaw.edu/bjil/vol45/iss1/7/> (Accessed: July 10, 2023).
- Cleary, C. (2018) “Almost half of food in Irish shopping baskets is ultra-processed,” *The Irish Times*, 7 February. Available at: <https://www.irishtimes.com/life-and-style/food-and-drink/almost-half-of-food-in-irish-shopping-baskets-is-ultra-processed-1.3382342>.
- Corvalán, C. et al. (2018) “Structural responses to the obesity and non-communicable diseases epidemic: Update on the Chilean law of food labelling and advertising,” *Obesity Reviews*, 20(3), pp. 367–374. Available at: <https://doi.org/10.1111/obr.12802>.
- Cox, J. (2023) “Irish dietary habits ‘like a slow motion disaster’, experts warn,” *BreakingNews.ie*, 16 May. Available at: <https://www.breakingnews.ie/ireland/irish-dietary-habits-like-a-slow-motion-disaster-experts-warn-1476336.html>.

Cullen, P. (2023) “Sweetener aspartame set to be declared a possible cancer risk by WHO,” *The Irish Times*, 29 June. Available at: <https://www.irishtimes.com/health/2023/06/29/soft-drink-sweetener-aspartame-set-to-be-declared-possibly-carcinogenic-by-who-cancer-agency/>.

Cuschieri, S. and Mamo, J. (2016) “Getting to grips with the obesity epidemic in Europe,” *Sage Open Medicine*, 4, p. 205031211667040. Available at: <https://doi.org/10.1177/2050312116670406>.

Dee, A. et al. (2015) “Overweight and obesity on the island of Ireland: an estimation of costs,” *BMJ Open*, 5(3), p. e006189. Available at: <https://doi.org/10.1136/bmjopen-2014-006189>.

Department of Health (2022) Ireland tops EU countries for daily consumption of fruit and vegetables. Available at: <https://www.gov.ie/en/press-release/3cc61-ireland-tops-eu-countries-for-daily-consumption-of-fruit-and-vegetables/>.

Dhana, K. et al. (2018) “Association between maternal adherence to healthy lifestyle practices and risk of obesity in offspring: results from two prospective cohort studies of mother-child pairs in the United States,” *BMJ*, p. k2486. Available at: <https://doi.org/10.1136/bmj.k2486>.

Dijkslag, S. (2022) Which trends offer opportunities or pose threats on the European fresh fruit and vegetables market? | CBI. Available at: <https://www.cbi.eu/market-information/fresh-fruit-vegetables/trends>.

EU Annex 5 (2015). Available at: https://food.ec.europa.eu/system/files/2018-07/codex_ccfl_cl-2018-24_ann-05.pdf (Accessed: August 3, 2023).

EU School Programme (2023) School fruit, vegetables and milk scheme. Available at: https://agriculture.ec.europa.eu/common-agricultural-policy/market-measures/school-fruit-vegetables-and-milk-scheme_en (Accessed: July 10, 2023)

European Commission (2021) “The EU Health Promotion and Disease Prevention Knowledge Gateway,” *European Journal of Public Health*, 29(Supplement_4). Available at: <https://doi.org/10.1093/eurpub/ckz185.602>.

European Commission (2022) Implemented policies to address fruit and vegetable intake | Knowledge for policy. Available at: https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/fruit-vegetables-7_en (Accessed: July 10, 2023).

Food Safety Authority of Ireland (2022) The Food Reformulation Task Force Progress Report 2022. Available at: <https://www.fsai.ie/getattachment/d0bdea5b-552a-4923-8109-d0ca10457141/the-food-reformulation-task-force-progress-report-2022.pdf?lang=en-IE> (Accessed: July 10, 2023).

FoodDrinkEurope (2022) “Reformulation in Portugal: good results come from co-operation and self-regulation,” *FoodDrinkEurope* [Preprint]. Available at: <https://www.fooddrinkeurope.eu/reformulation-in-portugal-good-results-come-from-co-operation-and-self-regulation/>.

Gamburzew, A. et al. (2016) “In-store marketing of inexpensive foods with good nutritional quality in disadvantaged neighborhoods: increased awareness, understanding, and purchasing,” *International Journal of Behavioral Nutrition and Physical Activity*, 13(1). Available at: <https://doi.org/10.1186/s12966-016-0427-1>.

Global Food Research Program (2020) “Front-of-Package (FOP) Food Labelling: Empowering Consumers to Make Healthy Choices.” Available at: https://www.globalfoodresearchprogram.org/wp-content/uploads/2020/08/FOP_Factsheet_UNCGFRP_2020_September_Final.pdf (Accessed: August 4, 2023).

Gómez-Donoso, C. et al. (2021) “Public support for healthy supermarket initiatives focused on product placement: a multi-country cross-sectional analysis of the 2018 International Food Policy Study,” *International Journal of Behavioral Nutrition and Physical Activity*, 18(1). Available at: <https://doi.org/10.1186/s12966-021-01149-0>.

Gonçalves, D.N. et al. (2021) “Nudging Consumers toward Healthier Food Choices: A Field Study on the Effect of Social Norms,” *Sustainability*, 13(4), p. 1660. Available at: <https://doi.org/10.3390/su13041660>.

Grech, A. et al. (2022) “A Comparison of the Australian Dietary Guidelines to the NOVA Classification System in Classifying Foods to Predict Energy Intakes and Body Mass Index,” *Nutrients*, 14(19), p. 3942. Available at: <https://doi.org/10.3390/nu14193942>.

Green, R. et al. (2013) “The effect of rising food prices on food consumption: systematic review with meta-regression,” *BMJ*, 346(jun17 1), p. f3703. Available at: <https://doi.org/10.1136/bmj.f3703>.

Gregory, A. (2023) “Aspartame sweetener to be declared possible cancer risk by WHO, say reports,” *The Guardian*, 29 June. Available at: <https://www.theguardian.com/society/2023/jun/29/aspartame-artificial-sweetener-possible-cancer-risk-carcinogenic>.

Gressier, M., Sassi, F. and Frost, G. (2020) “Healthy Foods and Healthy Diets. How Government Policies Can Steer Food Reformulation,” *Nutrients*, 12(7), p. 1992. Available at: <https://doi.org/10.3390/nu12071992>.

Griffith, R., O’Connell, M. and Smith, K. (2022) Would taxes on unhealthy foods reduce obesity? - *Economics Observatory*. Available at: <https://www.economicsobservatory.com/would-taxes-on-unhealthy-foods-reduce-obesity>

Haghani, S., Shahnazi, H. and Hassanzadeh, A. (2017) “Effects of Tailored Health Education Program on Overweight Elementary School Students’ Obesity-Related Lifestyle: A School-Based Interventional Study,” *Oman Medical Journal*, 32(2), pp. 140–147. Available at: <https://doi.org/10.5001/omj.2017.25>.

Hall, K.D. et al. (2019) “Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake,” *Cell Metabolism*, 30(1), pp. 67-77.e3. Available at: <https://doi.org/10.1016/j.cmet.2019.05.008>.

Harmsworth, M. (2022) New regulations crack down on the fight against foods high in fat, sugar and salt. Available at: <https://www.taylorwessing.com/en/insights-and-events/insights/2022/02/dl-new-regulations-crack-down-on-the-fight-against-foods-high-in-fat-sugar-and-salt> (Accessed: August 4, 2023).

Healthy Ireland Survey (2022). Available at: <https://www.gov.ie/en/publication/f9e67-healthy-ireland-survey-2022/>.

Healthy-Ireland-Survey (2021). Available at: <https://www.safefood.net/healthy-ireland-survey> (Accessed: July 9, 2023)

Hi - Ireland [GOVERNMENT PUBLICATIONS] (2016) A Healthy Weight for Ireland 2016–2025 Obesity Policy and Action Plan. Available at: <https://assets.gov.ie/7559/2d91a3564d7e487f86a8d3fa86de67da.pdf> (Accessed: August 2, 2023).

Hobbs, M. and Radley, D. (2020) “Obesogenic environments and obesity: a comment on ‘Are environmental area characteristics at birth associated with overweight and obesity in school-aged children? Findings from the SLOPE (Studying Lifecourse Obesity PrEdictors) population-based cohort in the south of England,’” *BMC Medicine*, 18(1). Available at: <https://doi.org/10.1186/s12916-020-01538-5>.

Khandpur, N. et al. (2018) “Are Front-of-Package Warning Labels More Effective at Communicating Nutrition Information than Traffic-Light Labels? A Randomized Controlled Experiment in a Brazilian Sample,” *Nutrients*, 10(6), p. 688. Available at: <https://doi.org/10.3390/nu10060688>.

Khandpur, N. et al. (2020) “Ultra-Processed Food Consumption among the Paediatric Population: An Overview and Call to Action from the European Childhood Obesity Group,” *Annals of Nutrition and Metabolism*, 76(2), pp. 109–113. Available at: <https://doi.org/10.1159/000507840>.

Lacy-Nichols, J., Scrinis, G. and Carey, R.N. (2020) “The evolution of Coca-Cola Australia’s soft drink reformulation strategy 2003–2017: A thematic analysis of corporate documents,” *Food Policy*, 90, p. 101793. Available at: <https://doi.org/10.1016/j.foodpol.2019.101793>.

Lambert A, Wang CH, Tsai PF. Prenatal Education Intervention for Increasing Knowledge and Changing Attitude Toward Offspring Obesity Risk Factors. *J Perinat Educ*. 2022 Apr 1;31(2):94-103. doi: 10.1891/JPE-2021-0007. PMID: 35386491; PMCID: PMC8970135.

Larsen, N., Sigurdsson, V. and Gunnarsson, D. (2022) “Environmental cues for healthy food marketing: The importance of in-store research into three conversions,” *Nutrition, Psychology and Brain Health*, 9. Available at: <https://doi.org/10.3389/fnut.2022.1078672>.

Lauber, K. et al. (2022) “Corporate political activity in the context of sugar-sweetened beverage tax policy in the WHO European Region,” *European Journal of Public Health*, 32(5), pp. 786–793. Available at: <https://doi.org/10.1093/eurpub/ckac117>.

Lipek, T. et al. (2015) “Obesogenic environments: environmental approaches to obesity prevention,” *Journal of Pediatric Endocrinology and Metabolism*, 28(5–6). Available at: <https://doi.org/10.1515/jpem-2015-0127>.

McDermott, F.N. (2019) “Parents taught to say ‘no’ to their kids help to cut child obesity...,” *The Irish Sun*, 1 May. Available at: <https://www.thesun.ie/news/4045352/parents-taught-to-say-no-to-their-kids-help-to-cut-child-obesity/>.

McKinsey (2014) “McKinsey: Obesity costs global society 2.0 trillion a year,” www.consultancy.co.uk, 24 November. Available at:

<https://www.consultancy.uk/news/1078/mckinsey-obesity-costs-global-society-20-trillion-a-year> (Accessed: July 10, 2023).

Mertens, E., Colizzi, C. and Peñalvo, J.L. (2021) “Ultra-processed food consumption in adults across Europe,” *European Journal of Nutrition*, 61(3), pp. 1521–1539. Available at: <https://doi.org/10.1007/s00394-021-02733-7>.

Mozaffarian, D. et al. (2018) “Role of government policy in nutrition—barriers to and opportunities for healthier eating,” *BMJ*, p. k2426. Available at: <https://doi.org/10.1136/bmj.k2426>.

Muir, S. et al. (2023) “UK government’s new placement legislation is a ‘good first step’: a rapid qualitative analysis of consumer, business, enforcement and health stakeholder perspectives,” *BMC Medicine*, 21(1). Available at: <https://doi.org/10.1186/s12916-023-02726-9>.

New Food (2022) Ultra-processed food increases obesity risk in adolescents by 45 percent. Available at: <https://www.newfoodmagazine.com/news/163869/ultra-processed-food-increases-obesity-risk-in-adolescents-by-45-percent/>.

Pancrazi, R., Van Rens, T. and Vukotic, M. (2022) “How distorted food prices discourage a healthy diet,” *Science Advances*, 8(13). Available at: <https://doi.org/10.1126/sciadv.abi8807>.

Pell, D. et al. (2021) “Changes in soft drinks purchased by British households associated with the UK soft drinks industry levy: controlled interrupted time series analysis,” *BMJ*, p. n254. Available at: <https://doi.org/10.1136/bmj.n254>.

Pettigrew, S. et al. (2017) “The types and aspects of front-of-pack food labelling schemes preferred by adults and children,” *Appetite*, 109, pp. 115–123. Available at: <https://doi.org/10.1016/j.appet.2016.11.034>.

Pettinger, T. (2019) Policies to reduce smoking. Available at: <https://www.economicshelp.org/blog/154879/economics/policies-to-reduce-smoking/>.

Pfreundschuh, S. (2022) “Making A Dent in the Obesity Equation via Coupling Sugar-Sweetened Beverage Taxes with Fruit and Vegetable Subsidies,” *Aresty Rutgers Undergraduate Research Journal*, 1(4). Available at: <https://doi.org/10.14713/arestyrurj.v1i4.209>.

Prasetyo, Y.B., Permatasari, P. and Susanti, H.D. (2023) “The effect of mothers’ nutritional education and knowledge on children’s nutritional status: a systematic review,” *International Journal of Child Care and Education Policy*, 17(1). Available at: <https://doi.org/10.1186/s40723-023-00114-7>.

Quinn, I. (2018) “As sugar reduction targets are missed what’s PHE’s next move?,” *The Grocer* [Preprint]. Available at: <https://www.thegrocer.co.uk/health/as-sugar-reduction-targets-are-missed-whats-phes-next-move/567502.article>.

Radosevich, A. et al. (2020) “Awareness, Understanding and Use of the ‘Traffic Light’ Food Labelling Policy and Educational Level in Ecuador – Findings from the National Nutrition Survey 2018,” *Current Developments in Nutrition*, 4, p. nzaa064_021. Available at: https://doi.org/10.1093/cdn/nzaa064_021.

Rettman, A. (2006) “Obesity epidemic costs EU €59 billion a year,” *EUobserver*, 6 June. Available at: <https://euobserver.com/health-and-society/21720>.

Richmond et al, 2021 Richmond TK, Thurston IB, Sonnevile KR. Weight-Focused Public Health Interventions - No Benefit, Some Harm. *JAMA Pediatr.* 2021;175(3):238--9, <http://dx.doi.org/10.1001/jamapediatrics.2020.4777>

Rogers, N.T. et al. (2023) "Correction: Anticipatory changes in British household purchases of soft drinks associated with the announcement of the Soft Drinks Industry Levy: A controlled interrupted time series analysis," *PLOS Medicine*, 20(3), p. e1004201. Available at: <https://doi.org/10.1371/journal.pmed.1004201>.

Royal Society Public Health (2019) Royal Society Public Health and Slimming World call for supermarkets to do more to tackle obesity. Available at: <https://www.rsph.org.uk/about-us/news/rsph-and-slimming-world-call-for-supermarkets-to-do-more-to-tackle-obesity.html> (Accessed: July 9, 2023).

Sainsbury, E. et al. (2020) "Explaining resistance to regulatory interventions to prevent obesity and improve nutrition: A case-study of a sugar-sweetened beverages tax in Australia," *Food Policy*, 93, p. 101904. Available at: <https://doi.org/10.1016/j.foodpol.2020.101904>.

Sánchez-Encalada, S., Talavera-Torres, M.M. and Wong-Chew, R.M. (2019) "An educational intervention to mothers improved the nutritional status of Mexican children younger than 5 years old with mild to moderate malnutrition," *Global Pediatric Health*, 6, p. 2333794X1988482. Available at: <https://doi.org/10.1177/2333794x19884827>.

Scarborough, P. et al. (2020) "Impact of the announcement and implementation of the UK Soft Drinks Industry Levy on sugar content, price, product size and number of available soft drinks in the UK, 2015-19: A controlled interrupted time series analysis," *PLOS Medicine*, 17(2), p. e1003025. Available at: <https://doi.org/10.1371/journal.pmed.1003025>.

Schindlmayr, J. (2021) "Draft National Obesity Strategy," *Dietitiansaustralia* [Preprint]. Available at: [https://dietitiansaustralia.org.au/sites/default/files/2022-01/202111-Submission-NationalObesityStrategy%20\(1\).pdf](https://dietitiansaustralia.org.au/sites/default/files/2022-01/202111-Submission-NationalObesityStrategy%20(1).pdf) (Accessed: August 4, 2023).

Schlicht, J.A., Van Woudenberg, T.J. and Buijzen, M. (2022) "Arranging the fruit basket: A computational approach towards a better understanding of adolescents' diet-related social media communications," *Acta Psychologica*, 230, p. 103738. Available at: <https://doi.org/10.1016/j.actpsy.2022.103738>.

Scienmag (2018) "Children are less likely to be obese if mothers stick to a healthy lifestyle," *SCIENMAG: Latest Science and Health News*, 4 July. Available at: <https://scienmag.com/children-are-less-likely-to-be-obese-if-mothers-stick-to-a-healthy-lifestyle/>.

Shaw, S. et al. (2020) "A systematic review of the influences of food store product placement on dietary-related outcomes," *Nutrition Reviews* [Preprint]. Available at: <https://doi.org/10.1093/nutrit/nuaa024>.

Simmonds, P. and Vallgård, S. (2021) "t's not as simple as something like sugar": values and conflict in the UK meat tax debate," *International Journal of Health Governance*, 26(3). Available at: <https://www.emerald.com/insight/content/doi/10.1108/IJHG-03-2021-0026/full/html>.

Smith, E. (2016) “Chile Battles Obesity With Stop Signs On Packaged Foods,” NPR, 12 August. Available at: <https://www.npr.org/sections/thesalt/2016/08/12/486898630/chile-battles-obesity-with-stop-signs-on-packaged-foods>.

Southey, F. (2022) How to turn the tide on ‘underused’ sugar taxation in Europe? Available at: <https://www.foodnavigator.com/Article/2022/03/25/how-to-turn-the-tide-on-underused-sugar-taxation-in-europe#>.

Springmann, M. et al. (2018) “Health-motivated taxes on red and processed meat: A modelling study on optimal tax levels and associated health impacts,” PLOS ONE, 13(11), p. e0204139. Available at: <https://doi.org/10.1371/journal.pone.0204139>.

Swinburn, B. et al. (2013) “INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): overview and key principles,” Obesity Reviews, 14, pp. 1–12. Available at: <https://doi.org/10.1111/obr.12087>.

Taillie, L.S. et al. (2019) “Governmental policies to reduce unhealthy food marketing to children,” Nutrition Reviews, 77(11), pp. 787–816. Available at: <https://doi.org/10.1093/nutrit/nuz021>.

The EU school programme (2022). Available at: <https://info.bml.gv.at/en/topics/food/the-eu-s-school-programme-for-fruit-vegetables-and-milk.html#:~:text=The%20EU%20School%20Fruit%20and,50%20%25%20of%20the%20product%20costs>. (Accessed: August 3, 2023).

The Food Information to Consumers (FIC) regulation (2022). Available at: <https://www.gov.ie/en/publication/6b865-the-food-information-to-consumers-fic-regulation/#:~:text=1169%2F2011%20or%20the%20Food,about%20the%20food%20they%20eat>.

Thorley, P. (2022) Subsidy would improve fruit and veg intake by as much as 15%, say economists. Available at: https://warwick.ac.uk/newsandevents/pressreleases/subsidy_would_improve/ (Accessed: July 10, 2023).

Thow, A.M. et al. (2022) “Sugar-sweetened beverage taxes in Europe: learning for the future,” European Journal of Public Health, 32(2), pp. 273–280. Available at: <https://doi.org/10.1093/eurpub/ckab211>.

Tórtora, G., Machín, L. and Ares, G. (2019) “Influence of nutritional warnings and other label features on consumers’ choice: Results from an eye-tracking study,” Food Research International, 119, pp. 605–611. Available at: <https://doi.org/10.1016/j.foodres.2018.10.038>.

Turner, C. et al. (2020) “Food Environment Research in Low- and Middle-Income Countries: A Systematic Scoping Review,” Advances in Nutrition, 11(2), pp. 387–397. Available at: <https://doi.org/10.1093/advances/nmz031>.

Turner, C.W. et al. (2020) “Food Environment Research in Low- and Middle-Income Countries: A Systematic Scoping Review,” Advances in Nutrition, 11(2), pp. 387–397. Available at: <https://doi.org/10.1093/advances/nmz031>.

Van Der Bend, D. and Lissner, L. (2019) “Differences and Similarities between Front-of-Pack Nutrition Labels in Europe: A Comparison of Functional and Visual Aspects,” *Nutrients*, 11(3), p. 626. Available at: <https://doi.org/10.3390/nu11030626>.

Vargas, A (2020) “Policies for tackling obesity and creating healthier food environments in Ireland: Food-EPI 2020 - Current policies & priority actions - JPI PEN” ReadKong (2020) Available at: <https://www.readkong.com/page/policies-for-tackling-obesity-and-creating-healthier-food-8147895>

Vogel, C. et al. (2021) “Altering product placement to create a healthier layout in supermarkets: Outcomes on store sales, customer purchasing, and diet in a prospective matched controlled cluster study,” *PLOS Medicine*, 18(9), p. e1003729. Available at: <https://doi.org/10.1371/journal.pmed.1003729>.

Walker, P. (2020) “Unhealthy snacks to be banned from checkouts at supermarkets in England,” *The Guardian*, 28 December. Available at: <https://www.theguardian.com/business/2020/dec/28/unhealthy-snacks-to-be-banned-from-checkouts-supermarkets-in-england>.

WCRF International (2023) Ireland: nutrition policy snapshot | WCRF International. Available at: <https://www.wcrf.org/policy/ireland-nutrition-policy-snapshot/>.

White, M. et al. (2020) “What role should the commercial food system play in promoting health through better diet?,” *BMJ*, p. m545. Available at: <https://doi.org/10.1136/bmj.m545>.

Wilson, N. et al. (2020) “Food taxes and subsidies to protect health: relevance to Aotearoa New Zealand.,” *PubMed*, 133(1511), pp. 71–85. Available at: <https://pubmed.ncbi.nlm.nih.gov/32161423>.

World Health Organization. Regional Office for Europe. (2022). WHO European Regional Obesity Report 2022. World Health Organization. Regional Office for Europe. <https://apps.who.int/iris/handle/10665/353747>. License: CC BY-NC-SA 3.0 IGO

Yabancı, N., Karakuş, S.Ş. and Kısaç, İ. (2014) “The Effects of Mother’s Nutritional Knowledge on Attitudes and Behaviors of Children about Nutrition,” *Procedia - Social and Behavioral Sciences*, 116, pp. 4477–4481. Available at: <https://doi.org/10.1016/j.sbspro.2014.01.970>.