Food Policy 135 (2025) 102941

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Customer awareness and perceptions of the high in fat, sugar, and salt (HFSS) placement legislation and impacts on self-reported food purchasing

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ARTICLE INFO

Keywords:
High in fat sugar and salt
HFSS legislation
Consumers
Purchasing
Supermarkets
Food insecurity

ABSTRACT

Introduction: Legislation in England restricts the placement of high in fat, sugar or salt (HFSS) products in stores and online. This is the first study to investigate shoppers' perceptions, and self-reported purchasing behaviours following its implementation.
Methods: A sample of 1968 adults, living in England, who were the primary shopper for the household completed online surveys, with oversampling of lower incomes (households earning less than £39,999 annually).
Results: Most purchased products from HFSS-dominated categories at least once/week (92.5 %). Shoppers with children or those living with food insecurity reported purchasing HFSS-dominated products more frequently and reported greater susceptibility to product placement and price-promotion strategies targeted by the current and planned HFSS legislation. The majority of shoppers surveyed were not aware of the HFSS legislation (58.7%), and most did not notice any changes to the shopping environment, either online (79.8%) or in-store (56.1%). Most felt the legislation was a good first step (71.4). However, 90% felt affordability of healthier food was as or more important than legislation of less healthy foods.
Conclusion: While shoppers supported the legislation's potential to encourage healthier food choices, they emphasised the importance of affordability. Households with children or those living with food insecurity are particularly susceptible to retail promotional strategies. To support these shoppers, future legislation should also consider promoting healthier foods to reduce dietary inequalities.

1. Introduction

The food environment, comprising physical, economic, political and sociocultural influences on food choice, contributes to poor diet and rising rates of obesity (Food Standards Agency, 2022; Lee et al., 2019; Swinburn et al., 1999; Swinburn et al., 2011; Vandenbroeck et al., 2007). As such, there have been calls to move away from individual-focused interventions to whole-systems approaches addressing wider population-level factors (Vandenbroeck et al., 2007). The UK government is one of the first to take such an approach. In 2007, the advertisement of less healthy foods and drinks was banned on children's television and other digital media (Conway, 2024). In 2018, further regulations were announced restricting the promotion and advertising of food and drinks high in fat, sugar and salt (HFSS) (Department of Health Social Care., 2023 ; Department of Health and Social Care, 2018).

In October 2022, legislation was introduced in England, restricting the placement of HFSS foods and non-alcoholic drinks in stores (i.e. at entrance, aisle end, and checkouts) and their online equivalents (Department of Health Social Care., 2023). Under the legislation, products falling into 13 categories can no longer be placed in prominent locations in-store or online. 'In-scope' products (also termed 'specified food') comprise commonly consumed foods which contribute to excess calorie intake (Department of Health Social Care., 2023). The original proposal included a ban on volume-based price promotions of HFSS products, such as multi-buys. However, citing rising cost of living, this portion of the legislation was delayed by the government in May 2022,

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https://doi.org/10.1016/j.foodpol.2025.102941
Received 16 May 2025; Received in revised form 18 July 2025; Accepted 6 August 2025
Available online 16 August 2025

until October 2025.

The HFSS legislation aims to reduce the prominence of less healthy food and drink products within supermarkets to discourage impulse purchasing, effectively directing customers towards healthier food choices through subtle changes to the food environment or 'choice architecture' (Harbers et al., 2020). This type of policy contrasts with other interventions, such as education, taxes or bans, by prompting behaviour in largely non-conscious ways (Department of Health Social Care., 2023). The HFSS legislation prevents retailers from using product placement 'nudges' to increase purchasing of in-scope less healthy food and drinks. Targeting choice architecture is an attractive policy tool because it offers a less prescriptive approach to legislation, by preserving an element of free choice (Thaler & Sunstein, 2009). Numerous studies have explored environmentally targeted interventions within supermarkets, including 'nudges' to encourage healthier purchases, such as placing healthier foods in prominent locations, with promising results (Cameron et al., 2016). However, fewer studies have focussed on reducing the promotion of less healthy foods and the evidence regarding the effectiveness of such interventions on dietary outcomes is limited (Cameron et al., 2016; Shaw et al., 2022).

The current UK food system promotes consumption of HFSS foods through *availability* but also through *affordability* (Johnstone & Lonnie, 2023). Healthier foods are estimated to be more than double the cost per calorie compared to less healthy foods (The Food Foundation, 2025). Rates of food insecurity, which occurs when people do not have reliable access to sufficient nutritious, affordable food, have risen sharply over recent years, disproportionally impacting those on low incomes, and families with children (The Food Foundation, 2025). As a result, people experiencing food insecurity often purchase cheap, energy-dense HFSS foods, which promote excess weight and widen existing health inequalities (Johnstone & Lonnie, 2023). Experiencing barriers within the food environment, including barriers to food affordability and accessibility (e.g. distance to food retailers or access to transport), have been associated with greater food insecurity (Stone et al., 2025) and poorer dietary quality in low-income populations (Wolfson et al., 2019). Limited time to shop for and prepare nutritious food pose additional barriers for households experiencing FI (Wolfson et al., 2019). In a recent study exploring barriers to purchasing healthier foods, participants living with obesity and food insecurity were asked to rank the helpfulness of multiple retailer-based interventions in supporting healthier purchases. Discount and price-based promotions of healthy foods were perceived as the most helpful both in-store and online, while location-based promotions were ranked much lower (Stone et al., 2025).

Measures modifying food environments, such as the HFSS legislation, are considered more likely to reduce health inequalities than measures targeting individual behaviour change. Interventions targeting knowledge or behaviour at the level of the individual require the use of personal resources (i.e. time, cognitive or financial resources) to comply with the intervention aims and benefit from potential positive health outcomes. Contrastingly, interventions focussed on the wider food environment (such as the HFSS legislation) require little or no personal resources from individuals for benefits to be achieved. Given personal resources are not equitable across the population, an individual's ability to act in accordance with targeted behaviour change interventions is likely to be influenced by range of social and economic factors (Garrott et al., 2024). Whereas the HFSS product placement legislation, which places less reliance on inequitably distributed personal resources, could be considered a progressive policy, less likely to widen existing health inequalities. However, there is limited evidence for differential impacts on health inequities from different types of obesity related policies (i.e. individually versus structurally targeted) (Olstad et al., 2016) and the perceived impact of the HFSS legislation among people living with food insecurity remains unknown.

This present study forms part of a wider evaluation of the impacts of the HFSS product placement restrictions in England using supermarket sales data, alongside survey and interview data from key stakeholders (Jenneson et al., 2024). The supermarket sales data will be used to evaluate changes in HFSS product sales following the implementation of the legislation. However, store-level sales data cannot provide insight into interpretations or perceptions of the legislation. This customer study, alongside our investigation into the retail sector's response, are important for understanding the context in which the policy was implemented and how it was received by key stakeholders and consumers. Although the legislation targeted the food environment, public support for national health policy remains important. If the legislation is effective in reducing sales of less healthy foods, while going unnoticed (as intended), then policy makers, the retail sector and the general public can be reassured that structural interventions targeting supermarket architecture have the potential to positively impact health without negatively affecting individuals.

The HFSS legislation is the first to target product promotion in the retail sector. Any public health legislation can be controversial, with critics typically decrying paternalistic inhibition of free will and the 'nanny state' (Smith et al., 2015). While a qualitative study of female consumers (n = 35) conducted pre-implementation found some concern about government interference in free choice, most viewed the legislation positively, expecting it to promote healthier food choices (Dhuria et al., 2023). To date, no research has been conducted post-implementation to explore customers' awareness, understanding or perceptions of the HFSS legislation or its impact on self-reported purchasing behaviours, particularly among those living with food insecurity. This study addresses this gap and aims to answer the following research questions:

(1) How frequently do customers report purchasing of HFSS products following the introduction of the HFSS legislation? Does this vary by customer demographics?
(2) Does self-reported susceptibility to retailer strategies (product placement and price promotions) for the sale of HFSS products vary based on customer demographic characteristics?
(3) Are customers aware of the HFSS legislation and changes to supermarkets following the HFSS legislation? Does this vary by customer demographics?
(4) To what extent are customers in favour of the HFSS legislation?

2. Methods

This study was pre-registered on the Open Science Framework (Fildes, 2024) and is available online at doi: 10.17605/OSF.IO/KTSZA.

2.1. Participant sample

A sample of 2000 adults, living in England, who identified as the primary grocery shopper (defined as the main grocery shopper for the food the household eats), henceforth referred to as 'shopper', were recruited in June 2024 to take part in an online survey via the survey recruitment company Prolific Academic, using quota sampling to ensure representation across a range of household incomes, with deliberate oversampling of lower incomes (households earning less than £39,999), to capture views from those more likely to be living with food insecurity. To meet inclusion criteria, participants needed to reside in England, be the primary household grocery shopper and be 18–65 years old. Attention checks (n = 2) were built into the survey (e.g. "Please select 'strongly agree' to show you are paying attention and are not a robot.") and participants failing at least one attention check were excluded. A reCAPTCHA was also used at the start of the study to protect against bots and malicious programs. Ethical approval was obtained from the University of Leeds School of Psychology Ethics Committee, PSCETHS-1005. All participants provided informed consent and were compensated for time spent completing the survey to the value of £11.28 per hour.

2.2. Data collection measures

The full list of survey questions available in the published protocol for this study (Fildes, 2024). Throughout the survey, participants who reported primarily shopping in-store were asked about in-store shopping environments and behaviours, whereas those who reported undertaking their main shopping online were asked about the online shopping environment.

2.2.1. Demographics

Participants were asked to provide demographic information including their age (in years), gender, ethnicity, number of adults and children (including the age of the children) in their household, first 3–4 characters of postcode, height and weight (to calculate Body Mass Index), country of residence, household income, employment status, if they are the primary food shopper for their household, their primary supermarket used for food shopping, primary method used for food shopping (e.g. online or in store) and frequency of shopping. For analyses, households were dichotomised into those with no children and those with one or more child in the household.

2.2.2. Food insecurity

Household food insecurity was assessed using the 18-item USDA Household Food Security Survey Module (USDA, 2012). This is an 18-item scale focussing on food accessibility to assess food security status, with adult and child specific questions. For analyses, all respondents who scored 0–2 were classified as food secure, and those scoring 3 + were classified as food insecure.

2.2.3. Anthropometrics

Reported height and weight values were used to calculate BMI, which was categorised as: underweight < 18.5 kg/m^2, healthy weight 18.5–24.9 kg/m^2, overweight 25.0–29.9 kg/m^2, obese > 30.0 kg/m^2. Biologically implausible BMIs, defined according to previous research (weight < 30 or > 400 kg, height < 1.2 m or > 2.2 m, BMI < 14 or > 70 kg/m^2), were recoded to missing. For analyses, participants were dichotomised as those living with overweight or obesity (BMI ≥ 25) and those without overweight or obesity (BMI < 25).

2.2.4. Purchasing of HFSS products

Participants were asked about their shopping habits, including how frequently they purchased products in HFSS-dominated categories (response options ranged from 'never' to 'every day'). HFSS-dominated food categories were based on the 13 categories that are restricted as part of the HFSS legislation (Department of Health Social Care., 2023). These are: soft drinks with added sugar, savoury snacks, breakfast cereals, confectionery, ice creams and ice lollies, cakes and cupcakes, sweet biscuits, morning goods, desserts and puddings, yoghurts, pizza, potato-based products, ready meals. In this survey, these categories were used as a proxy for HFSS status, as these categories commonly contain HFSS products. However, it is important to note that not all products within these food categories will be classified as HFSS based on the NPM score. When we refer to HFSS foods in the findings of this research, we are referring to the HFSS-dominated food categories that were used a proxy for HFSS status.

Participants were also asked to report if the frequency of purchasing has changed since the introduction of the HFSS legislation, and if they have found it more difficult to locate products in HFSS-dominated categories when food shopping.

2.2.5. Susceptibility to product placement

Participants were asked to state how likely they are to purchase products in prominent locations and which products they are likely to purchase in these locations (1 = Very unlikely to purchase, 5 = Very likely to purchase). They were also asked to report the perceived impact of product placement on their shopping behaviours.

2.2.6. Susceptibility to price promotions

Participants were asked to indicate the extent to which price promotions affect their shopping decisions using the following response options (1 = Much less likely to buy a product, 2 = Less likely to buy a product, 3 = No change, 4 = More likely to buy a product, 5 = Much more likely to buy a product). Participants were also asked to indicate the type of food products that they usually buy on price promotions.

2.2.7. Awareness of the HFSS legislation

Participants were asked to indicate if they had heard of the government legislation introduced in October 2022, and to state which restrictions they thought were included in the legislation, from a list of examples that included both genuine restrictions implemented as part of the legislation and restrictions not included in the 2022 legislation.

2.2.8. Awareness of changes to supermarkets following the HFSS legislation

Participants were asked to indicate if they had noticed any changes in different aspects of their in-store or online supermarket shopping environments following the introduction of the HFSS legislation in October 2022.

2.2.9. Attitudes towards and perceived impact of HFSS legislation

To assess shoppers' perceptions of the potential impact of the HFSS legislation, participants were asked to state the extent to which they agree or disagree with five statements on a 5-point Likert scale (Strongly Disagree to Strongly Agree). The statements were developed based on key themes from previous research (Dhuria et al., 2023; Muir et al., 2023).

Participants were asked to report how they think the restriction on unhealthy foods affects their shopping habits using a 5-point Likert scale (Much less likely to purchase unhealthy foods to Much more likely to purchase unhealthy foods).

They were also asked the extent to which they thought different organisations were responsible for supporting customers to buy healthier foods and if they felt the legislation would help fight unhealthy eating on a 5-point Likert scale (Strongly Disagree to Strongly Agree) and to rank in order of most to least who (individuals, supermarkets, manufacturers, or government) they feel has the biggest responsibility in supporting customers to make healthier choices.

2.3. Statistical analysis

All analyses were undertaken in R version 4.4.1. Standardised betas are reported to provide comparable effect sizes for all analyses. The alpha level was set at < 0.05. The statistical methods were preregistered on OSF (Fildes, 2024). We revised our statistical approach in two ways in response to reviewer feedback. First, we additionally adjusted for household size in the analysis examining frequency of purchasing. Second, we used multivariable regressions adjusting for covariates rather than bivariate unadjusted analysis to address the second research question. This approach reduces the number of statistical tests and adjusts for covariates.

2.3.1. RQ1: How frequently do customers report purchasing products in HFSS-dominated categories following the introduction of the HFSS legislation? Does this vary by customer demographics?

Descriptive statistics were used to examine the frequency of purchasing each of the 13 HFSS-dominated product categories following the introduction of the legislation. Following this, a series of multivariable linear regressions examined associations between customer demographics (Independent variables: food insecurity status, weight status, and households with children versus without) and the frequency of purchasing the HFSS-dominated product categories (dependent variables). Separate models were run for each of the 13 HFSS-dominated product categories. Models were adjusted for gender, age, ethnicity and household size.

2.3.2. RQ2: Does self-reported susceptibility to retailer strategies (product placement and price promotions) for the sale of HFSS products vary based on customer demographic characteristics?

A series of multivariable linear regressions examined associated between customer demographics (Independent variables: food insecurity status, by weight status, in households with or without children) and self-reported susceptibility to two types of retailer sales strategies: (a) product placement and (b) price promotions, of HFSS-dominated product categories.).

2.3.3. RQ3: To what extent are customers aware of the HFSS legislation and changes in supermarkets following the HFSS legislation implementation? and does awareness vary by customer demographics?

Descriptive statistics examined customers awareness of the HFSS legislation and changes to supermarkets (both in-store and online) following implementation. Multivariable logistic regressions then examined whether legislation awareness varies by customer demographics. Models were adjusted for gender, age, and ethnicity.

2.3.4. RQ4: To what extent are customers in favour of the HFSS legislation?

Descriptive statistics examined the extent to which customers are in favour of the HFSS legislation, felt it supports healthier food choices and who they believe is responsible for supporting customers to make healthier choices.

3. Results

In total, 2000 adults completed the online survey via Qualtrics (Qualtrics XM // The Leading Experience Management Software, n.d). Those who failed at least one attention check (n = 32, 1.6 %), were excluded, leaving an analysis sample of 1968. Of these, 34.8 % had at least one child and 57.3 % were living with overweight or obesity. 24.2 % reported experiencing food insecurity, higher than the 13.6 % UK prevalence reported by the Food Foundation in June 2024 (The Food Foundation, 2023). All participants were the primary household shopper, with 72.9 % shopping in-store (Table 1).

3.1. RQ1: Purchasing of HFSS products

Fig. 1 summarises the frequency of purchasing products from HFSS-dominated categories. 92.5 % of participants reported purchasing products from at least one of the HFSS-dominated categories once or more per week.

Participants experiencing food insecurity reported more frequently purchasing soft drinks, pizzas, potato-based products, and ready meals, but less frequently purchasing morning goods compared to food secure participants. Participants with overweight or obesity reported greater frequency of purchasing soft drinks, savoury snacks, ice creams and ice lollies, compared to those of a normal weight status. Participants with children reported purchasing products in all HFSS-dominated categories more frequently, except ready meals and desserts and puddings, compared to those without children (Table 2).

3.2. RQ2: Susceptibility to product placement and price promotions

Households with children who shopped in-store reported being more likely to purchase products at the store entrance, checkout, and aisle end, compared to households without children. While those with children who shopped online were more likely to purchase products advertised on the advert banners e.g. pop-ups than those without children (Table 3).

There was no significant difference in susceptibility to location-based promotions in store for participants experiencing food insecurity versus food secure participants. Participants experiencing food insecurity shopping online reported being more likely to purchase products on the homepage, offers page and advert banners e.g. pop-ups (Table 3).

Table 1
Characteristics of the customer survey sample (n = 1968).

Characteristics	Mean (SD) or N (%)
Age	43.07 (13.7)
Gender[a]	
Male	806 (41.0)
Female	1143 (58.0)
In another way / prefer not to say	19 (1.0)
Household composition	
Household size	2.67 (1.3)
1	387 (19.7)
2	667 (33.9)
3+	914 (53.6)
Number of adults in household	2.14 (1.7)
1	489 (24.8)
2	1076 (54.7)
3+	403 (20.5)
Number of adults with children	684 (34.8)
Number of children in household	
0	1284 (65.2)
1	313 (15.9)
2	282 (14.3)
3+	89 (4.6)
Annual household income	
< £13,000	209 (10.6)
£13,000–£18,999	194 (9.9)
£19,000–25,999	262 (13.3)
£26,000–31,999	184 (9.3)
£32,000–47,999	297 (15.1)
£48,000–63,999	190 (9.7)
£64,000–£74,999	118 (6.0)
£75,000–£82,499	94 (4.8)
£82,500–£90,000	76 (3.9)
£90,000–£100,000	86 (4.4)
>£100,000	234 (11.9)
Ethnicity[b]	
White	1680 (85.6)
Mixed	68 (3.5)
Asian or Asian British	113 (5.8)
Black or Black British	90 (4.6)
Other ethnicity	12 (0.6)
Employment	
Employed (full or part-time)	1016 (51.6)
Not working (i.e. parental leave, long-term sick or disability, retired or a carer)	781 (39.7)
Unemployed	89 (4.5)
Full-time or part-time education	82 (4.2)
Geographical region of residence	
North East of England	99 (5.0)
North West of England	276 (14.0)
West Midlands	211 (10.7)
East Midlands	187 (9.5)
East of England	195 (9.9)
Yorkshire and the Humber	218 (11.1)
London	260 (13.2)
South East of England	327 (16.6)
South West of England	194 (9.9)
Weight status[c]	
Underweight (<18.5 kg/m^2)	51 (2.6)
Normal weight (18.5–24.9 kg/m^2)	772 (40.0)
Living with overweight (25–29.9 kg/m^2)	609 (31.5)
Living with Obesity (>30 kg/m^2)	499 (25.8)

(continued on next page)

Table 1 (*continued*)

Characteristics	Mean (SD) or N (%)
Healthy Start Vouchers	
Do not receive	1922 (97.7)
Receive	38 (1.9)
Prefer not to say	8 (0.4)
Household food insecurity	
Food insecure	477 (24.2)
Food secure	1491 (75.8)
Primary supermarket	
Asda	279 (14.2)
Tesco	485 (24.6)
Morrisons	125 (6.4)
Sainsbury's	286 (14.5)
Co-operative	5 (0.3)
Waitrose	39 (2.0)
Ocado	42 (2.2)
Aldi	362 (18.4)
Lidl	216 (11.0)
Iceland	22 (1.1)
Other (e.g. M&S, Booths, Farm foods, etc.)	24 (1.2)
Does not do main shop at supermarket	82 (4.2)
Mode of shopping	
In-store shopper	1434 (72.9)
Online shopper	534 (27.1)

[a] 19 participants stated that identified 'in another way' or 'Preferred not to say' so were recoded to 'missing'.

[b] 5 participants stated that they would 'Prefer not to say' so the ethnicity was recoded to 'missing'

[c] Anthropometric data were missing for 37 participants (1.9 %).

Participants with children reported being more likely to purchase products on multi-buy and Buy One Get One Free offers (BOGOF) than those without children (Table 4). Participants experiencing food insecurity reported being more likely to purchase products on reduced price, and everyday low-price promotions compared to food secure participants (Table 4).

There was no significant difference in susceptibility to location-based promotions (either online or in-store) between participants living with or without overweight or obesity (Table 3). However, those with overweight or obesity reported greater susceptibility to multi-buy price promotions (p = 0.015), with no difference for other promotions.

3.3. RQ3: Customers awareness

Most participants (58.7 %) were not aware of the HFSS legislation and reported not noticing any changes in-store (56.1 %) or online (79.8 %). Awareness of the HFSS legislation did not differ by household food insecurity status (OR = 1.00; 95 % CI = 0.80–1.24), weight status (OR = 1.00; 95 % CI = 0.98–1.01), or between participants with children vs those without children (OR = 1.05; 95 % CI = 0.86–1.27). However, females were more likely to be aware of the HFSS legislation than males (OR = 1.23; 95 % CI = 1.02–1.48, p = 0.028).

Of those who reported being aware of the HFSS legislation (41.3 %; n = 813), no-one correctly identified the complete list of restrictions. Participants were most aware of in-store restrictions, particularly restrictions of HFSS products at checkout areas (72.2 %), with lower awareness of online restrictions (Table 5). Over two thirds of participants stated they found it easy or very easy to locate products in each of the 13 HFSS categories despite the legislation (Table 6).

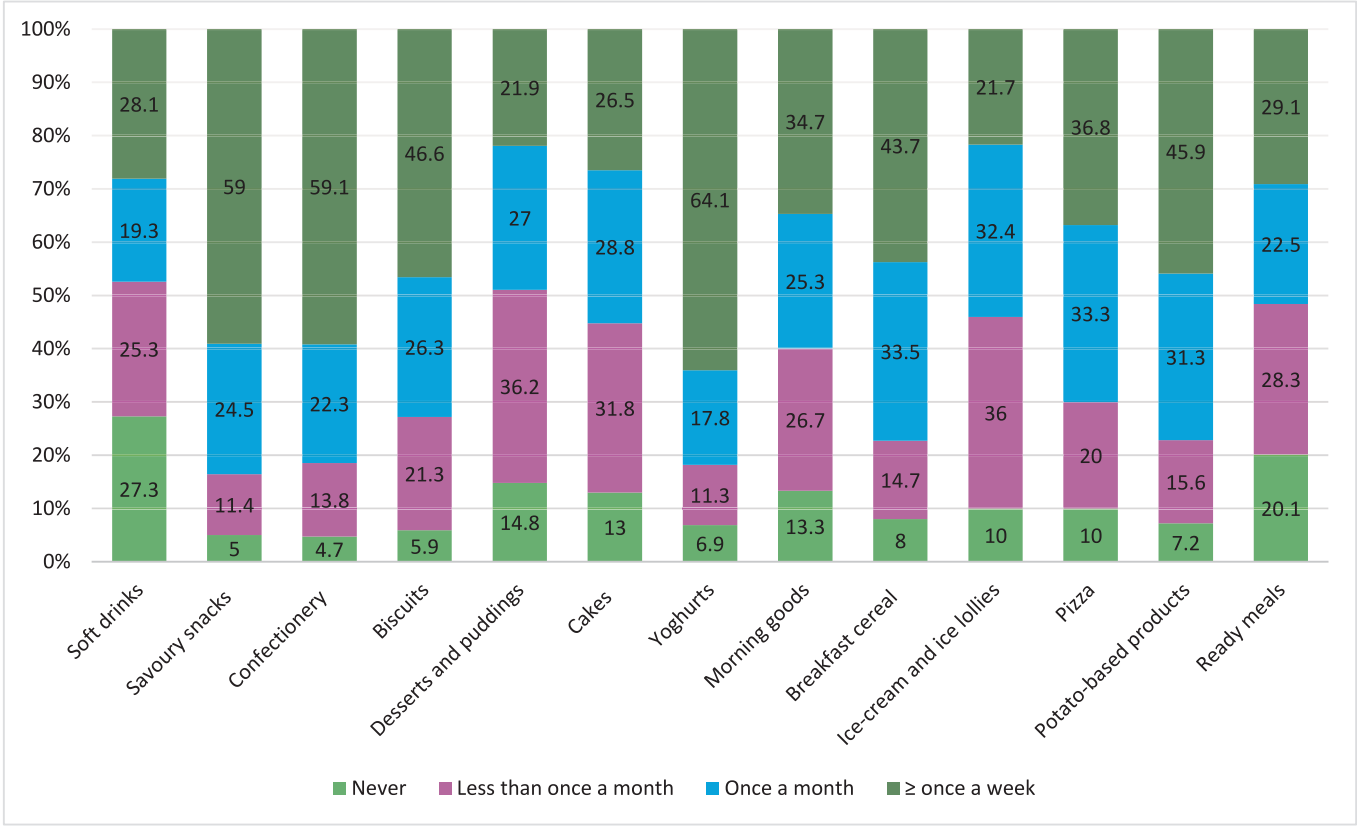

Fig. 1. Frequency of purchasing of products within the 13 HFSS-dominated categories. Data .
Source: Qualtrics customer survey - data collected June 2024

Table 2
Associations between customer demographics and the frequency of purchasing products in HFSS-dominated categories.

Products in the 13 HFSS-dominated categories	*Customer demographics*					
	Food insecure		*Living with overweight/obesity*		*Has children*	
	β (95 % CI)	p-value	β (95 % CI)	p-value	β (95 % CI)	p-value
Soft drinks with added sugar	0.19 (0.07, 0.28)	<0.001	0.14 (0.05, 0.23)	0.002	0.14 (0.05, 0.23)	0.022
Savoury snacks	0.08 (−0.03, 0.18)	0.264	0.14 (0.05, 0.23)	0.002	0.19 (0.07, 0.31)	0.002
Breakfast cereal	0.10 (0.00, 0.21)	0.051	−0.03 (−0.12, 0.06)	0.484	0.31 (0.19, 0.43)	<0.001
Confectionery	−0.02 (−0.13, 0.09)	0.678	0.05 (−0.04, 0.14)	0.295	0.21 (0.09, 0.33)	<0.001
Ice-cream and ice lollies	−0.07 (−0.17, 0.04)	0.228	0.14 (0.05, 0.23)	0.003	0.31 (0.19, 0.43)	<0.001
Cakes	0.00 (−0.12, 0.10)	0.073	−0.01 (−0.10, 0.08)	0.775	0.27 (0.15, 0.39)	<0.001
Biscuits	−0.02 (−0.13, 0.09)	0.706	−0.04 (−0.13, 0.05)	0.364	0.28 (0.16, 0.41)	<0.001
Morning goods	−0.11 (−0.22, −0.01)	0.040	0.00 (−0.10, 0.08)	0.860	0.30 (0.18, 0.42)	<0.001
Desserts and puddings	−0.05 (−0.16, 0.06	0.381	0.04 (−0.06, 0.13)	0.443	0.11 (−0.01, 0.23)	0.072
Yoghurts	−0.10 (−0.21, 0.01)	0.064	−0.01 (−0.11, 0.08)	0.749	0.18 (0.06, 0.30)	0.003
Pizza	0.17 (0.06, 0.27)	0.001	0.08 (−0.01, 0.17)	0.079	0.34 (0.22, 0.45)	<0.001
Potato-based products	0.21 (0.11, 0.32)	0.001	0.17 (0.08, 0.26)	0.076	0.21 (0.09, 0.32)	<0.001
Ready meals	0.24 (0.13, 0.35)	<0.001	0.03 (−0.06, 0.12)	0.516	0.03 (−0.06, 0.12)	0.669

*Models are adjusted for age, gender, ethnicity and household size. Standardised betas that meet the alpha level < 0.05 are shown in bold.

Table 3
Associations between customer demographics and the susceptibility to product placement strategies.

Placement location	*Customer demographics*					
	Food insecure		*Living with overweight/obesity*		*Has children*	
	β (95 % CI)	p-value	β (95 % CI)	p-value	β (95 % CI)	p-value
Entrance	−0.02 (−0.15, 0.11)	0.758	0.07 (−0.04, 0.17)	0.221	0.22 (0.11, 0.34)	<0.001
Aisle end	0.01 (−0.12, 0.14)	0.475	0.09 (−0.02, 0.20)	0.213	0.12 (0.00, 0.24)	0.0476
Checkout	0.08 (−0.05, 0.20)	0.231	0.07 (−0.04, 0.18)	0.202	0.14 (0.02, 0.26)	0.179
Homepage	0.38 (0.17, 0.59)	<0.001	0.10 (−0.07, 0.28)	0.245	0.06 (−0.11, 0.24)	0.472
Offers page	0.28 (0.07, 0.49)	0.009	−0.09 (−0.27, 0.09)	0.313	0.06 (−0.12, 0.24)	0.502
Online checkout	0.20 (−0.01, 0.41)	0.063	−0.09 (−0.27, 0.09)	0.310	0.13 (−0.05, 0.31)	0.149
Pop-up adverts	0.25 (0.05, 0.46)	0.017	0.07 (−0.11, 0.24)	0.441	0.27 (0.09, 0.44)	0.003
Product pages	−0.03 (−0.24, 0.18)	0.763	0.10 (−0.08, 0.28)	0.262	−0.14 (−0.32, 0.04)	0.118

*Models are adjusted for age, gender, and ethnicity. Standardised betas that meet the alpha level < 0.05 are shown in bold.

3.4. RQ4: Customer perceptions

Most respondents agreed the legislation was a 'good first step' to encourage healthier food choices (71.4 %). Most also felt the legislation was likely to have more impact on shoppers who did not plan their shopping (70.8 %). When asked about their own shopping behaviours, only 23.7 % felt the legislation would make them less likely to purchase less healthy foods and 73.1 % believed it would have no impact on their own shopping habits. Nearly all (90 %) viewed affordability of healthier food was just as, or more important than the legislation of less healthy foods.

Most respondents agreed with the statement 'It's up to the individual to eat healthily and its my choice whether or not to buy healthier or less healthy foods' (71.0 %). However, the majority also agreed

Table 4
Associations between customer demographics and the susceptibility to price promotions.

Price promotion strategies	*Customer demographics*					
	Food insecure		*Living with overweight/obesity*		*Has children*	
	β (95 % CI)	p-value	β (95 % CI)	p-value	β (95 % CI)	p-value
Buy-One-Get-One-Free (BOGOF)	0.09 (−0.02, 0.20)	0.116	0.02 (−0.07, 0.11)	0.654	0.11 (0.01, 0.20)	0.033
Everyday low price	0.30 (0.20, 0.41)	<0.001	−0.06 (−0.16, 0.03)	0.182	0.07 (−0.03, 0.17)	0.149
Loyalty discount	−0.05 (−0.16, 0.06)	0.359	0.08 (−0.02, 0.17)	0.108	0.09 (0.00, 0.19)	0.059
Multi-buy	0.08 (−0.03, 0.19)	0.159	0.11 (0.02, 0.21)	0.015	0.13 (0.03, 0.23)	0.008
Reduced price	0.20 (0.09, 0.31)	<0.001	0.05 (−0.04, 0.14)	0.295	0.02 (−0.08, 0.12)	0.681

*Models are adjusted for age, gender, and ethnicity. Standardised betas that meet the alpha level < 0.05 are shown in bold.

Table 5
Knowledge of in-store and online placement-based restrictions for participants who stated they were aware of the legislation (41.3 %; N = 813).

Restricting HFSS products being displayed…*	Included in legislation?	
	Yes	No
	N (%)	N (%)
At the entrance	419 (51.5)	394 (48.5)
At the checkouts	587 (72.2)	226 (27.8)
At the end of aisle	282 (34.7)	531 (65.3)
Online product pages (searching/browsing)	76 (9.3)	737 (90.7)
Online on the offers pages	156 (19.2)	657 (80.8)
Online on the homepage	157 (19.3)	656 (80.7)
Online advert banners/pop-ups	236 (29.0)	577 (71.0)
Online during check-out process	319 (39.2)	494 (60.8)

*Participants were asked 'Which of the following restrictions do you think are included in the legislation' and provided a list which included genuine restrictions imposed as part of the legislation, alongside restrictions which were not part of the legislation (e.g.' Restricting colourful packaging'). Responses are only presented for restrictions that form part of the HFSS product placement legislation.

Table 6
Extent to which participants found it easy or difficult to locate products by the 13 HFSS-dominated categories, following the introduction of the legislation.

Product categories	Very difficult	Difficult	Neutral	Easy	Very easy
	N (%)	N (%)	N (%)	N (%)	N (%)
Soft drinks with added sugar	12 (0.6)	60 (3.0)	557 (28.3)	666 (33.8)	673 (34.2)
Savoury snacks (e.g. crisps, tortilla chips, Bombay mix)	5 (0.3)	57 (2.9)	409 (20.8)	800 (40.7)	697 (35.4)
Breakfast cereal (e.g. ready-to-eat breakfast cereals, granola, muesli, porridge)	6 (0.3)	53 (2.7)	416 (21.1)	796 (40.4)	697 (35.4)
Confectionery (e.g. chocolate, sweets, etc)	9 (0.5)	63 (3.2)	378 (19.2)	823 (41.8)	695 (35.3)
Ice-cream and ice lollies (e.g. choc ices, ice creams and lollies, frozen yoghurts, etc.)	6 (0.3)	42 (2.1)	432 (22.0)	775 (39.4)	713 (36.2)
Cakes (e.g. sponge cakes, cupcakes, brownies, doughnuts, etc.)	4 (0.2)	60 (3.0)	508 (25.8)	776 (39.4)	620 (31.5)
Biscuits (including cereal bars, chocolate coated biscuits, shortbreads)	7 (0.4)	57 (2.9)	408 (20.7)	849 (43.1)	647 (32.9)
Morning goods (e.g. croissants, sweet pastries, crumpets, pancakes, teacakes, scones, etc.)	6 (0.3)	59 (3.0)	503 (25.6)	778 (39.5)	662 (31.6)
Desserts and puddings (e.g. sweet pies, tarts, rice puddings, custards, etc)	6 (0.3)	88 (4.5)	590 (30.0)	755 (38.4)	529 (26.9)
Yoghurts (including flavoured, fat-free, probiotic, dairy-free, etc.)	9 (0.5)	62 (3.2)	382 (19.4)	814 (41.4)	701 (35.6)
Pizza (including all chilled and frozen pizzas)	4 (0.2)	40 (2.0)	448 (22.8)	783 (39.8)	693 (35.2)
Potato-based products (e.g. fries, chips, wedges, waffles, roast potatoes, etc.)	6 (0.3)	53 (2.7)	440 (22.4)	767 (39.0)	702 (35.7)
Ready meals and meal centres (e.g. prepared meals for heating in the microwave or oven such as Chinese, Indian, pasta dishes, and battered or breaded products)	13 (0.7)	62 (3.2)	561 (28.5)	737 (37.4)	595 (30.2)

supermarkets (66.7 %) and the government (77.2 %) had a responsibility to support customers to buy healthier foods. When asked to rank who has the biggest responsibility, most felt individuals were primarily responsible (75.2 %), followed by the government (12.8 %), manufacturers (8 %) and supermarkets (4.1 %).

When asked about the products they would like to see on price promotion or in prominent locations, fruits and vegetables were most popular (83.7 %), followed by dairy products (46.7 %) and yoghurts (42.7 %). Few participants favoured products typically categorised as HFSS such as soft drinks (9.0 %), crisps (13.8 %) or biscuits (9.3 %) (Fig. 2). Over half (53.6 %) stated they would continue to purchase HFSS products if they were not on price promotion.

4. Discussion

This is the first study to explore awareness and perceptions of the HFSS legislation, as well as self-reported impacts on purchasing of HFSS products, among supermarket shoppers in England. Eighteen months following the introduction of the legislation, our findings revealed shoppers with children and those living with food insecurity self-report purchasing products in HFSS-dominated categories more frequently and being more susceptible to the prominent product placement and price-promotion-based retailer strategies targeted by HFSS legislation. In line with the legislation's intended mechanism as a nudge strategy, the majority of shoppers were unaware of the HFSS legislation, with most not noticing any changes to in-store or online shopping environments following implementation. When the legislation was explained, most respondents were positive, agreeing it was a good step towards encouraging healthier food choices. However, the majority felt that affordability of healthier food was as or more important than restricting less healthy foods and called for greater promotion of fruits and vegetables.

Most shoppers in this survey reported regularly purchasing products in HFSS-dominated categories, with higher purchasing frequencies reported by participants experiencing food insecurity (soft drinks, pizzas, potato-based products, and ready meals); those living with overweight or obesity (soft drinks and savoury snacks) and participants with children (all HFSS-dominated product categories, except ready meals). More frequent purchases of HFSS-dominated products in these groups may be partly due to financial constraints, as these products are often more affordable (lower price per calorie) (Goudie, 2023). Previous research has shown households with low incomes often deprioritise the 'healthiness' of food when making purchases due to the higher cost of healthier foods (Puddephatt et al., 2020; Robinson et al., 2022; Stone et al., 2024). However, it is also important to note that purchasing frequency does not necessarily directly correspond to the volume of foods purchased. Individuals and families with lower incomes may shop more frequently due to budget constraints preventing larger bulk purchases, or the need to buy essentials (e.g. milk) more often due to household composition (Blow et al., 2012). Our findings support and extend previous research demonstrating that households with children are more responsive to the types of volume-based price promotions targeted by planned future legislation, than households without children (Kopasker et al., 2022). In contrast, participants with food insecurity reported being more likely to respond to non-volume-based promotions such as reduced-price products or products on everyday low-price promotions compared to food secure participants, indicating the new legislation may impact this group less.

Participants with children also reported being more likely to purchase products placed in store entrances, at aisle ends, and check-out areas compared to those without children. This greater susceptibility may reflect 'pester power', whereby children try to influence their parents to purchase specific products, often less healthy food or drink products (Marshall et al., 2007). Pestering is thought to be triggered during shopping trips when children see products they like and recognise (Harris et al., 2010; Kraak & Story, 2015; Marshall et al., 2007; McDermott et al., 2006). Children's requests may be initiated by prominent product locations, making shoppers with children more susceptible to product placement strategies. However, participants with children who primarily shopped online also reported being more likely to purchase products in response to online placement promotions (i.e. advert banners and online checkout walks). As children are less likely to be directly involved in online shopping purchases, this may reflect children's food and drink requests occurring outside shopping occasions, or suggests the products typically advertised in these locations are simply more appealing to families with children. These findings highlight that families with children and people living with food insecurity may be among those most impacted by the legislation if it is shown to be effective in reducing shoppers' purchases of HFSS products.

Most customers were in favour of the legislation, however, an overwhelming majority felt that the affordability of healthier foods was as, if not more, important than legislation targeting less healthy foods. This mirrors Stone et al's (2025) finding that, among people living with obesity and varying levels of food insecurity, store interventions

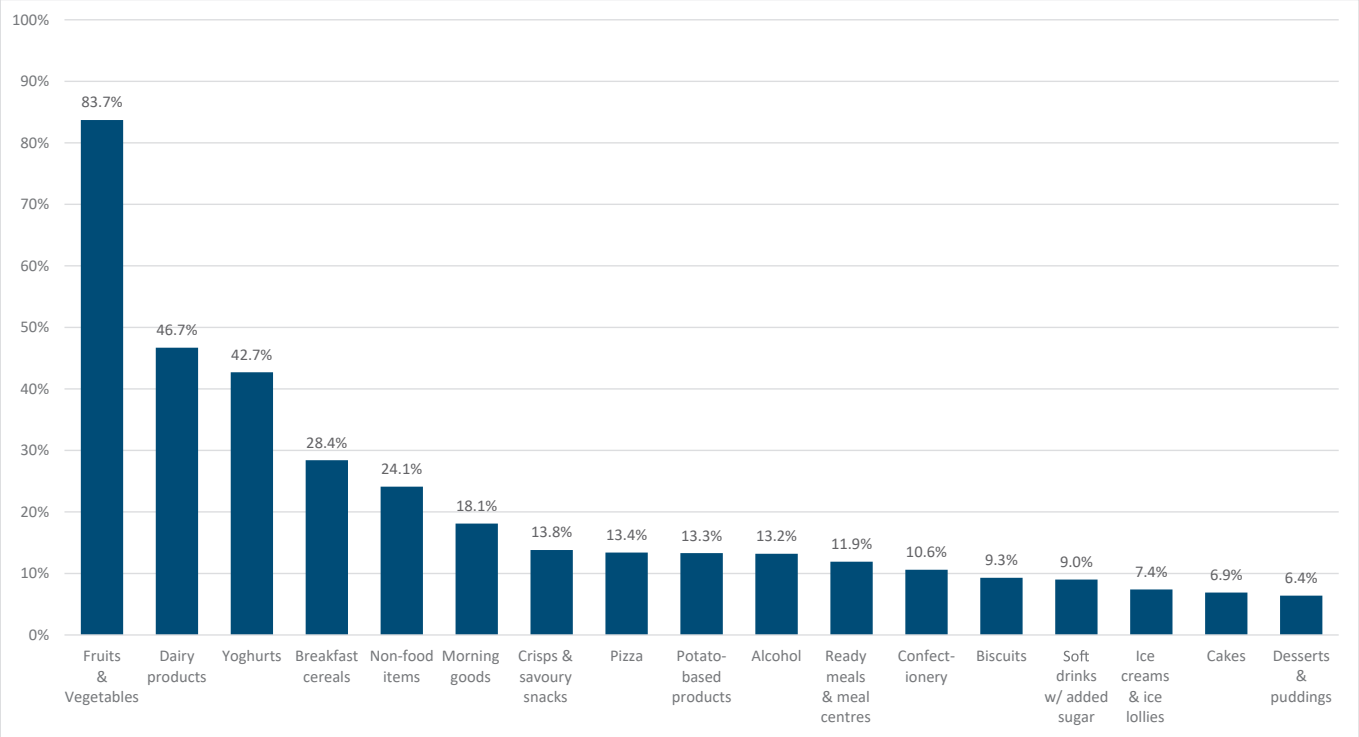

Fig. 2. Proportion (%) of participants (N = 1968) stating the product categories that they would like to see in prominent locations or on price promotions. Data . Source: Qualtrics customer survey - data collected June 2024

focussed on discounting healthier foods were ranked as most helpful (Stone et al., 2025). Many people are struggling to achieve a healthy diet in the UK (Scott et al., 2018), with affordability identified as a key barrier, especially for young families and those on low incomes (YouGov, 2023). The 2025 Broken Plate Report revealed healthier food is more than twice as expensive per calorie than less healthy food (The Food Foundation, 2025), with the poorest 5th of UK households needing to spend 45 % of their disposable income on food to meet UK dietary guidelines (Goudie, 2023). Recent figures from the Food Standards Agency showed over half of consumers felt healthy foods were unaffordable, and the only foods realistically available to them were less healthy (Food Standards Agency, 2022). Previous research exploring retailer 'top ups' of the NHS Healthy Start scheme, which provides vouchers to pregnant women, and for young children under four from low-income households, revealed increases in the number of fruit and vegetable portions purchased per customer (Thomas et al., 2023). This highlights how targeted incentives have the potential to improve dietary outcomes for vulnerable groups. If purchasing behaviour is primarily driven by affordability, then policies targeting unconscious choices triggered by the location and promotion of less healthy foods will likely be insufficient to achieve meaningful dietary change without parallel legislation to improve the affordability and accessibility of healthy foods.

The majority of shoppers surveyed were not aware of the HFSS legislation, and most did not notice any changes to the shopping environment, either online or in-store. Legislation awareness did not differ by customer characteristics, other than gender. These findings align with previous research conducted by beverage manufacturer 'Purity Soft Drinks' in 2023 which found 80 % of respondents were unaware of the legislation (Fortune, 2023). These findings are expected due to the mechanism of intervention utilised by the HFSS legislation which aimed to create subtle changes to the retail environment to discourage 'impulse purchasing' of HFSS products. The HFSS legislation targeted the structural retail environment and did not rely on individual behaviour change, therefore, public health awareness campaigns were not required to achieve health impacts. Media coverage around government HFSS policy has often focussed on separate legislation targeting advertising and price promotion restrictions, possibly because these policies are of broader interest or easier to interpret. This might further explain why despite over 40 % of the participants in the study stating they had heard of the HFSS legislation introduced in October 2022, none were able to accurately identify the specific restrictions involved.

Most shoppers also stated they could easily locate HFSS products, suggesting that the legislation has not impacted visibility or accessibility of HFSS products for customers looking to purchase these items. Again, this is unsurprising as the legislation did not seek to hide HFSS products from customers motivated to purchase them or remove free choice but aimed to reduce the prominence of pre-packaged products within 13 specified categories, that are deemed HFSS based on the NPM score. The fact the implementation of the legislation went largely unnoticed may reassure both industry and policy makers that these types of structurally targeted health policies need not negatively impact customers whilst achieving positive impacts. The legislation did not specify the alternative products that should be placed in prominent locations, therefore, retailers could legitimately position less healthy products that fell outside of the scope of the legislation in prominent locations. For example, products such as in-store bakery items or 'pick-and-mix' loose sweets and confectionary fall outside of the scope of the legislation because they are not 'pre-packaged' and despite its harmful health impacts, alcohol is similarly excluded from the legislation (Kininmonth et al., 2025). In line with this, a recent study of 3 UK supermarkets revealed that 55 % of items promoted in prime locations were HFSS products that were out-of-scope of the legislation (Hurst et al., 2025). Our findings may also reflect new strategies adopted by retailers to promote HFSS items without violating the legislation, ensuring these products remain visible to shoppers, such as the use of in-aisle promotions, free standing displays and digital advertisement for HFSS products displayed on aisle ends rather than the products themselves (Kininmonth et al., 2025). These'loopholes' have the potential to dilute the impact of the legislation and may contribute to the lack of obvious

changes to the supermarket environment revealed in our findings. Legislation mandating the prominent placement and promotion of healthy foods, rather than simply restricting the promotion of HFSS products, would help close existing legislative loopholes while supporting people to achieve a healthier diet and potentially reduce dietary inequalities.

Our finding that participants tended to believe the legislation would encourage healthier purchasing in other people but would have little impact on their own shopping habits, aligns with extensive previous research suggesting people believe interventions will be more effective in changing the behaviour of others than themselves (Bang et al., 2020; Kroese et al., 2016; Van Gestel et al., 2018). Evidence also suggests people's opinions about the acceptability of interventions are largely predicted by how effective they anticipate the intervention will be on the behaviour of others (Bang et al., 2020), with support for policy interventions found to be highest among those not engaging in the targeted behaviour (Diepeveen et al., 2013).

Previous research suggesting people often attribute primary responsibility for dietary choices to the individual (Dhuria et al., 2021; The Health Foundation, 2019) was mirrored in our study, with the individual ranked above government, manufacturers, or supermarkets when it came to responsibility. This focus on personal accountability reflects much of the discourse around obesity and dietary health over recent years. Government, industry and popular media narratives (Herrick, 2009), along with the majority of public health policies and interventions (Public Health England, 2017), have focussed on targets that place high agency on individual behaviour and overlook wider environmental determinants that shape diet and health (Theis & White, 2021). Encouragingly, most people in our survey also agreed the government and retailers had a responsibility to support customers to buy healthier foods and that the legislation was a good first step. This is in line with previous research assessing perceived responsibility for food policy internationally, finding strong support for governments taking primary responsibility for food policy and regulation, with contributions from the private sector (Pinho-Gomes et al., 2023). Furthermore, a recent report from the Food Farming & Countryside Commission similarly revealed widespread UK support for government intervention across a range of food policy areas (Food Farming & Countryside Commission, 2024).

This study represents the first characterisation of customers' awareness and perceived impacts of legislation restricting HFSS product locations in supermarkets. Strengths include the large and representative sample across all regions in England, in particular the proportion of people on lower incomes or living with food insecurity. Nearly a quarter of participants in our survey were living with food insecurity which is comparable to the 21 % reported by the Food and You 2 survey conducted in England, Wales and Northern Ireland between April and July 2024 (Moore et al., 2025). Just over a third of participants lived in households with children, which is also comparable to national statistics (Office for National Statistics, 2024), while over 57 % were living with overweight or obesity, slightly below 2022–23 prevalence estimates of 64 % (Office for Health Improvement & Disparities, 2024). This suggests the findings are generalisable to the English population. A significant limitation of this study comes from its cross-sectional, self-report survey design. Self-reported measures of purchasing behaviours are susceptible to reporting or recall biases and inaccuracies. Data were collected in June 2024, and participants were retrospectively asked whether their shopping habits had changed following the legislation's introduction in October 2022, meaning these findings are subject to additional recall bias. Also, purchasing behaviour prior to the implementation of legislation was not measured making it difficult to draw firm conclusions. The survey asked about purchasing frequency which cannot be interpreted as a measure of total volume purchased. Although we adjusted for household size, findings related to differences in frequency of HFSS purchases may simply reflect broader variation in shopping patterns between different demographic groups. However, given this legislation targeted impulse purchases made in store (or online), more frequent shoppers will have experienced the biggest reduction in exposure to product placement promotions during shopping occasions and may arguably therefore experience greater impacts. Additionally, the HFSS-dominated food categories used in this survey were based on the 13 restricted categories targeted by the HFSS legislation (Department of Health Social Care., 2023), but not all products within these categories will be classified as HFSS based on the NPM score (e.g. natural unsweetened yoghurt). This may have resulted in an overestimation of HFSS purchasing frequency which may not have been equal across the sample. There was a higher proportion of participants identifying as white compared to national statistics suggesting findings may be less representative of non-white ethnicities (Office for National Statistics, 2022). Longitudinal studies using more comprehensive measures of dietary intake or objective retail transaction data are needed to evaluate the impacts of the legislation including across diverse customer groups.

5. Conclusion

In conclusion, there was overall support for the legislation and optimism regarding its potential to influence the dietary behaviours of others, but not their own. Self-reported purchasing behaviour indicated specific customer groups, notably those with children or individuals living with food insecurity, were more likely to purchase products in HFSS-dominated categories and may be disproportionately affected by the retail strategies targeted by the HFSS legislation. This indicates that if the legislation is effective, it has the potential to contribute to a reduction in HFSS purchasing most in food insecure families, potentially narrowing existing dietary inequalities. However, these customer groups are also the most vulnerable to rising costs, underscoring the need for further intervention. Given that affordability is a key determinant of food choices, future policy should not only enforce restrictions of less healthy products but also increase the accessibility and affordability of healthier foods through targeted incentives, such as expansion of the Healthy Start scheme, and mandating promotion in prominent locations. Such policy measures are particularly crucial in the context of the ongoing cost-of-living crisis and the high prevalence of food insecurity to ensure legislation is both equitable and effective.

6. Data and code availability

The authors confirm that data generated or analysed during this study, as well as the code used to analyse the data, are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Alice R. Kininmonth: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Victoria L. Jenneson:** Writing – review & editing, Funding acquisition, Conceptualization. **Francesca Pontin:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Jason C.G. Halford:** Writing – review & editing. **Alexandra M. Johnstone:** Writing – review & editing, Funding acquisition. **Michelle A. Morris:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Alison Fildes:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Conceptualization.

Funding

This research was funded through the Transforming the UK Food System for Healthy People and a Healthy Environment SPF Programme, delivered by UKRI, in partnership with the Global Food Security Programme, BBSRC, ESRC, MRC, NERC, Defra, DHSC, OHID, Innovate UK and FSA. Grant award **BB/W018021/1**, with additional support from

IGD (the Institute of Grocery Distribution) through their Social Impact programmes on healthy and sustainable diets. The FIO Food (Food Insecurity in people living with Obesity) and DIO Food additional funding stream (Diet and Health Inequalities); these projects comprise 7 work packages, delivered by the partner institutions within the consortium.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

This project is delivered by researchers at the University of Leeds, in collaboration with UK Grocery Retail Partners. We acknowledge the wider support of the DIO Food project team, led by Professor Alexandra Johnstone at the Rowett Institute, University of Aberdeen, and the partner institutions within the FIO Food and DIO Food consortium. We also acknowledge Emily Ennis for her input into the design of the research. We acknowledge IGD for their support with project coordination and additional funding.

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