Food Policy 136 (2025) 102946

Contents lists available at ScienceDirect

Food Policy

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

Public support for food subsidy and tax scenarios to promote healthy and sustainable diets: Evidence from deliberative forums in two UK locations

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ARTICLE INFO

Keywords:
Food taxes
Food subsidies
Fiscal policy
Population health
Public support
Acceptability
Deliberation

ABSTRACT

Governments can utilise fiscal measures, through subsidies and taxes, to promote healthy and environmentally sustainable food choices. Despite their potential, implementing subsidies and taxes is often contested because of the cost, anticipated efficacy, ideological basis of these policies, and the wide range of ways they might be implemented. Deliberative methods are useful for converging debate to understand whether and how policy decisions on contentious issues are supported by the public. In October 2023, we held two deliberative forums with members of the public in UK locations experiencing high rates of deprivation: one in Govanhill, Glasgow (n = 13) and one in Bridlington (n = 11). We developed 16 food subsidy or tax scenarios from a systematic scoping review of the literature. We presented scientific evidence on related issues and facilitated deliberations, culminating in each forum ranking their preferred subsidy or tax scenarios. Though each forum's preferences differed, overall participants favoured the implementation of a population-wide tax on high carbon foods, preferred more subsidy than tax scenarios, and preferred population-wide policies to policies that targeted people experiencing low income. Our findings demonstrate the public's interest in government fiscal action to create a fairer, healthier, and more sustainable food system.

1. Introduction

Urgent action is required to develop healthier and environmentally sustainable food systems, given that food systems are responsible for a third of greenhouse gas emissions (Crippa et al., 2021), and diet-related ill-health is the leading cause of death globally (GBD Risk Factors Collaborators, 2020). One major component driving choice is food price. Yet in the United Kingdom (UK), unhealthy diets (e.g., those high in saturated fats, salt and/or sugar) are cheaper than healthy diets (e.g., those high in fruit, vegetables, fibre) (Darmon and Drewnowski, 2015; Rao et al., 2013; The Food Foundation, 2025). In recent years, food prices have risen at their fastest pace for over 40 years, with the annual rate of UK food and non-alcoholic beverage (hereafter food) consumer price index inflation increasing from 6.7 % to 19.1 % between April 2022 and March 2023 (Office for National Statistics, 2023). In part due to inflationary pressure, the proportion of households classed as food insecure rose from 6 % in 2021/22 to 10 % in 2022/23 (United Kingdom Food Security Report 2024), illustrating the potential for the high costs of healthy diets to exacerbate existing diet-related health inequalities.

As enforced measures (e.g., policies made compulsory by government) tend to achieve greater effect than voluntary measures (e.g., voluntary calorie reduction) (Chambers et al., 2015), and interventions

Abbreviations: DF, Deliberative forum; UK, United Kingdom.

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https://doi.org/10.1016/j.foodpol.2025.102946
Received 16 May 2025; Received in revised form 25 July 2025; Accepted 17 August 2025
Available online 10 October 2025

requiring minimal as opposed to high personal resource may be more likely to be effective and equitable (Adams et al., 2016), the UK Government could use policies that alter the prices of different foods to improve population health and environmental outcomes. Fiscal policies are key mechanisms through which governments can influence food prices, primarily by manipulating government expenditure (subsidies) and revenue (taxes) associated with the production or sale of a food. Globally, there are over 110 existing food subsidy or tax policies that explicitly aim to improve diet-related health (International, n.d.). In addition to affecting price, the announcement and implementation of a subsidy or tax policy often instigates other systemic changes (e.g., product reformulation, changes to product marketing, health signalling, changes to sales of products unaffected by the policy (Alvarado et al., 2023)), that accumulate to determine how far a policy positively or negatively affects food-related outcomes. Systematic reviews of studies evaluating food taxes found them to be effective at decreasing sales, purchases, and intakes of taxed foods, especially when taxes were combined with subsidies on healthy foods; and subsidies were found to increase sales of subsidised food significantly (Andreyeva et al., 2022a, 2022b; Pineda et al., 2024). Nonetheless, it's feasible that such taxes can lead to substitute purchases of less healthy alternatives that are exempt from the policy e.g., alcoholic beverages when increasing the price of sugary drinks (Quirmbach et al., 2018), or have more or less equitable impacts (Coggon and Adams, 2021). The UK government has precedent for implementing food subsidies and taxes (i.e., UK Soft Drinks Industry Levy) (HM Treasury, 2016), which has improved diet-related health outcomes (Rogers et al., 2023), and is projected to reduce some health inequalities (Cobiac et al., 2024), to the extent that further have been proposed (e.g., expansion of the Levy to less healthy foods) (Department for Environment Food & Rural Affairs, 2021). Though there are no subsidies or taxes in the UK that explicitly intend to improve the environmental impacts of food, studies have demonstrated their potential to outperform health-only subsidies or taxes (Faccioli et al., 2022), by, for example, increasing value-added taxes on meat and dairy (Springmann et al., 2025).

Sufficient public support for policies is important for grounding policymaking in democratic values, and for creating an environment conducive to implementation and enforcement (Marteau, 2023). The UK public supported the Soft Drinks Industry Levy around its time of implementation (68 %–70 % support in 2017–2019) (Adams et al., 2021), and evidence suggests they support potential food taxes and regulations affecting food companies (Food Farming & Countryside Commission, 2023). Such findings have been replicated for health-related fiscal policies in some (e.g., South Korea (Kim et al., 2019)), but not all (e.g., New Zealand (Signal et al., 2018)) other settings. Differing perspectives across the food system on government measures such as fiscal policies often slows or even obstructs their implementation (Marteau, 2023). For example, debates around whether and how the state should intervene in individuals' food practices (often on the grounds of individualist discourse e.g., personal choice and responsibility, fairness), and the state's actions are trusted or of legitimate interest, are common (Karreman et al., 2023; Smith et al., 2021). Implementation is further complicated by the influence of the food industry, who are known to oppose policies that could restrict their profitability (e.g., marketing restrictions) with tactics to influence public debate such as media campaigns, undermining underpinning sciences (Du et al., 2018), and discrediting measures on the grounds of "paternalism" (Steele et al., 2021).

Policymakers are increasingly using deliberative methods (e.g., citizens' juries, assemblies, etc.) to support policymaking (Marteau, 2023), as they allow integration of a sample of citizens' views into democratic decision making and are particularly suited to complex, divisive problems (Wells et al., 2021; Wise, 2017). One feature distinguishing deliberative methods from other participatory approaches is the provision of evidence to participants. Evidence provision may lead to greater support for policies, since support is influenced by the extent that policy impacts are communicated (Mantzari et al., 2022), and to a more valid measure of values (Marteau, 2023; Schoon and Chi, 2022). Through evidence-informed debate of opposing views, deliberative methods have the ultimate aim of creating a legitimate group decision (Blacksher, 2013; Wise, 2017). Whilst methods that aggregate individual opinions (e.g., surveys, polls) risk presenting self-interested views that reflect ignorance about a topic (Whitty et al., 2014), deliberation that explores differing vantage points encourages consideration of the interdependence between the individual and broader societal consequences of decisions (Schoon and Chi, 2022). Such methods are thus particularly well suited to food system governance decision making (Fesenfeld et al., 2023), since the needs, functions and outcomes of the food system are often in tension (Thompson et al., 2020). Evidence also shows that deliberative methods create momentum around climate action (Wells et al., 2021). Various food policies have been the subject of deliberation (Anaf et al., 2018; Moretto et al., 2014; Street et al., 2017, Henderson et al., 2013; Timotijevic and Raats, 2007, Ubertino et al., 2024) including in the UK recently (Department for Environment Food & Rural Affairs, 2021; Food Farming & Countryside Commission, 2024), and such methods have substantial scope to complement the work of existing democratic institutions (Candel, 2022; Fesenfeld et al., 2023).

In this study, we used a deliberative method called deliberative forums (DFs) with members of the UK public to understand preferences for food subsidy and tax policy scenarios that could promote healthier and more sustainable food choices, and which the UK government could implement, and reasons underpinning these preferences. These DFs were integrated in a wider programme of work called the CO-designing for healthy People and Planet: food Economic policy Research (COPPER) project (https://fundingawards.nihr.ac.uk/award/NIHR133887), which seeks to co-design food subsidy and tax scenarios with members of the public and policymakers.

2. Methods

We held two DFs in October 2023, following a pilot DF in April 2022. The DFs drew on principles from deliberative focus groups, as we were interested in eliciting views from under-represented groups more so than from a nationally representative sample; and from citizens' juries, as we followed a process of evidence presentation and interrogation to support participants reaching a policy decision (Ozanne et al., 2009). Each DF lasted two days (9:00am–3:15 pm), and participants used evidence and deliberation to arrive at a collective ranking for the food subsidy and taxation policy scenarios they considered best able to improve the accessibility of healthy, sustainable food. We aggregated the results of each DF to produce an overall policy scenario ranking, and audio recorded and thematically analysed the deliberations that led to these rankings.

2.1. Selection of locations for deliberative forums

We held our first DF in Govanhill, Glasgow (hereafter "Glasgow") and our second in Bridlington, East Yorkshire. We were particularly keen to involve participants less likely to have a voice in policymaking, so these locations were selected since they experience some of the highest rates of deprivation according to the 2019 Index of Multiple Deprivation (Ministry of Housing Communities & Local Government, 2019). For example, Bridlington scores worse than average for employment, crime, health and education, while Govanhill has particularly high rates of children living in low income families (Department for Work & Pensions, 2024). These locations also differ in key characteristics e.g., Govanhill is a densely populated inner-city location, whereas Bridlington is a rural, seaside town.

Researchers made visits to Glasgow (HF) and Bridlington (PS) in November 2022 to help prepare the DFs. In each visit, HF and PS met with key partner organisations–Govanhill Community Baths Trust in Glasgow and Bridlington Community Hub in Bridlington,

respectively–to plan recruitment (e.g., local organisations to distribute recruitment flyers, context of local community) and identify locations to host the DFs (e.g., check facilities, layout of space).

2.2. Pilot deliberative forum

Five members of the public who were ambassadors for the Food Foundation–activists with lived experiences of food system issues–participated in a pilot held at the [organisation name] offices in London. Each participant was remunerated at the rate of living wage (£75 for the whole pilot). The pilot was a condensed version of the DF, lasting for one instead of two days (10:00am–5:00 pm), in which key elements of the DF were trialled e.g., warm-up activities, deliberation. Key learning from the pilot included introducing the project and its aims more thoroughly, dividing participants into small groups to discuss the evidence presented, and making the presentation of policy scenarios more accessible by using flashcards. We sent pilot participants a summary of this learning.

2.3. Developing food subsidy and tax scenarios

We were keen that the policies debated by members of the public were only those relevant to public discourse on this topic e.g., those that have been debated by policymakers or studied by researchers. Therefore, we conducted a scoping review to identify existing or proposed taxes or subsidies worldwide that aim to improve the health or environmental impact of food, the results of which are presented elsewhere (Buckell et al. 2024). More than 600 discrete policies were identified, so we combined similar policies based on attribute (e.g., target food or population). These were further refined by the COPPER team to consider those recently discussed in the UK context and thus could be more feasibly implemented, to produce eight subsidy and eight taxation policy scenarios, details of which are included in Table 1.

Each participant was issued a policy flashcard deck in their participant pack at the start of the DF (see Supplementary A), which included graphics, example foods, and information about who has implemented or proposed each policy scenario. The scenarios did not include any specification about the rate of the tax (e.g., 20 %, £0.01/litre), the specific design of the policy (e.g., *ad valorem*), or a full specification of foods excluded or included under the tax. We feared there would be insufficient time to debate such details given the relatively short duration of the DFs, and also considered some of these details overly complicated for participants unfamiliar with this research area. Instead, we explained to participants that a subsequent stage of the project would entail further specification of the policy scenarios in consultation with policymakers involved in the project (Policy Review Board).

The end of the flashcard deck also included the option for participants to develop "a new food related tax or subsidy", or rank "no new food related tax" or "no new food related subsidy". Providing the new tax or subsidy addressed the central policy problem, no limits were set on what this should consist of. Policy 9 was included as a "wild card": an intentionally extreme or unfeasible policy to encourage reflection on implicit assumptions and overcome established mind-sets (Mendonça et al., 2004). Facilitators made clear to participants that they were free to amend any of the policy flashcards.

Table 1
Summary of food subsidy and taxation policy scenarios derived from literature that participants deliberated.

Policy number	Subsidy or tax	Target food	Population affected by policy
1	Tax	Snack foods	Population
2	Tax	Foods that are high in fat, sugar or salt and low in fibre, minerals and vitamins	Population
3	Tax	Red meat and processed red meat (any red meat that is cured, salted, smoked etc.)	Population
4	Tax	Foods high in sugar	Population
5	Tax	Foods high in saturated fat	Population
6	Tax	Foods high in calories	Population
7	Tax	Foods high in salt	Population
8	Tax	High carbon foods	Population
9	Subsidy	Free fruit and vegetables	Population
10	Subsidy	Fruits and vegetables	Households living in low income
11	Subsidy	Fresh and frozen meat; fresh, frozen and canned fish	Population
12	Subsidy	Fresh and frozen meat; fresh, frozen and canned fish	Households living in low income
13	Subsidy	Any food that has a healthy nutritional profile	Population
14	Subsidy	Any food that has a healthy nutritional profile	Households living in low income
15	Subsidy	Any food	Households living in low income
16	Subsidy	Low carbon foods	Population

2.4. Recruitment

We learned from preparatory location visits that some people in the local communities may not speak or read English as a first language, may not be digitally literate or have access to the internet, and may have financial barriers or child caring responsibilities that prevent participation. In response, we: (i) translated recruitment posters and provisioned to translate DF materials to languages other than English, and produced a video version of the participant information sheet; (ii) provided opportunities for participants to register for the project without the internet (e.g., completing the online registration/consent forms over the phone); (ii) remunerated participants at the rate of minimum wage for their involvement (£150 per person per forum) and paid travel expenses; and (iii) held the DFs on weekdays and within school hours (9:15am–3:15 pm).

We aimed to recruit 12–15 participants for each DF, since this is a recommended and manageable number of participants (Street et al., 2014), and avoids the resource demands of a larger group (Whitty et al., 2014). To be eligible for inclusion, participants had to be aged 18 and over, resident in the UK, and have sufficient proficiency in spoken English to enable discussion. Initially, we intended for participants to live within approximately 10 miles of each DF location. However, when recruitment was slower than intended we were more flexible with this requirement to ensure sufficient sample size (still living within the same town/city). We defined those less likely to have a voice in policymaking as having one or more of the following characteristics: from a low-income household, non-white ethnicity, and single parent households. Had we been oversubscribed, we would have prioritised involving these individuals.

We recruited participants by emailing information about our study (text for insertion in mailing list emails, recruitment poster, and recruitment image for social media) to local organisations (e.g., special interest groups, volunteer groups, religious organisations) and asking them to share it with their email lists, social media accounts, or equivalent. Information included a summary of the project and DF, eligibility requirements, and details for interested people to contact HF by phone or email. Our local partner organisations also distributed paper copies of posters to relevant notice boards; and in Glasgow this included posters translated into popular local languages, Arabic and Urdu.

Those contacting HF were sent the participant information sheet, the link to the participant information video hosted on the Nuffield Department of Primary Care Health Sciences' YouTube channel, the privacy notice, a link to the COPPER project website, and a link to an online registration form hosted by Microsoft Forms. The registration form first checked if the interested person fulfilled the eligibility criteria: those that did not meet the eligibility criteria exited the form. The rest of

the form collected demographic information about participants (age, gender, ethnicity, family income, number of children in household, whether a single parent), access requirements (e.g., difficulty hearing or reading printed information etc.) (Rios et al., 2016), practical considerations (e.g., dietary requirements, access to prayer room etc.), contact information, and consent to be contacted if selected. Those registering were also asked to share information about the study with their contacts, to permit snowball recruitment.

Everyone who registered was offered a short phone call with a team member (HF) before consenting, to build rapport, remind potential participants what the study entailed, and to give opportunity to ask remaining questions. After the call, potential participants were sent an email confirming their selection for the DF and containing final practical information about attending (e.g., location, arrival times, travel options), and a link to the online consent form hosted in Microsoft Forms. Those completing the form were formally admitted to the study and were sent a PDF copy of their completed consent form. To mitigate dropout, participants were sent a reminder email the day before each DF.

2.5. Deliberative forums

Upon advice from those performing similar studies (Smith et al., 2021), we rented public meeting spaces to host the DFs, to make all participants feel comfortable attending. The facilitation team consisted of six members in Glasgow (HF, PS, LY, JR, MS, AC) and five in Bridlington (HF, PS, LY, JR, AC). Facilitation team members adopted recommended specific roles (Smith et al., 2021): moderator (e.g., time keeping, introducing activities, operating recorders; HF), expert advisor (e.g., responding to questions about evidence videos; PS), protagonist (e.g., to provoke debate and expansive thinking; MS), and facilitators (e.g., for small groups and activities; LY, JR, AC). The facilitation team followed a detailed facilitation guide and held preparatory and de-brief sessions for each DF to support the team's wellbeing.

Upon arrival, participants were registered, asked if they had any additional requirements, and given participant packs that contained a participant agenda, two attitude forms, two evaluation forms, a policy flashcard deck, and the participant information sheet. We made minor adaptations to the agenda for the Bridlington forum after learning from Glasgow (see Supplementary B). Patient and Public Involvement members of the team (ST and JW) reviewed all materials used to recruitment participants and within the DF to check their suitability for use with members of the public. Both DFs consisted of key elements of deliberative events: setting the policy problem, evidence provision, and deliberation.

2.5.1. Setting the policy problem

After introducing the project and team, and completing a warm-up activity, we introduced the policy problem: "What food subsidy or tax policies should the UK government use to make healthy and sustainable food more affordable/accessible?". Participants were told that by the end of the DF, they must work together to produce a group ranking of their preferred policy scenarios; this ranking could consist of as many (e.g., all proposed policy scenarios) or as few (e.g., none) as they wished. Partway through deliberations, the group was issued 100 counters (i.e., small plastic coins) that they could use to demonstrate priority: the greater the number of counters assigned to a policy, the higher the priority. There were no restrictions on how participants could allocate the counters (e.g., to not use any counters, to use all counters on one policy, etc.). The policy problem wording was included on the participant agenda and on a poster on the wall to remind participants. We also made clear the policy relevance of the DF, explaining how we would present the ranked policies to a Policy Review Board associated with the COPPER project who have a direct contact with relevant policy discussions.

2.5.2. Evidence provision

We invited five known experts in topics relevant to the policy problem to produce evidence videos: policymaking (Professor Mike Rayner, University of Oxford), environment (Professor Rosemary Green, London School of Hygiene and Tropical Medicine), health (Dr Keren Papier, University of Oxford), economics (Professor Emma Frew, University of Birmingham), and public views (Dr John Buckell, University of Oxford). These videos are available in Supplementary C. Though we did not prescribe what each video should include, we provided each expert with briefing information: each video should last 7–10 min and include 'take home' messages at the end, and we suggested some example points that experts may wish to cover. Though the content of each video varied (e.g., Dr Buckell presented the results of a recent experimental survey, Professors Green and Frew and Dr Papier drew on a body of evidence, and Professor Rayner explained the process of policymaking), experts mostly included only academic evidence rather than other types of evidence (e.g., anecdotal or experiential). A combination of images, figures and tables were included in each video. After playing each video in the DFs, we split participants into small groups to allow for discussion and ask questions of the expert advisor (PS) within the facilitation team about the evidence.

2.5.3. Deliberation

To maximise opportunity for all participants to contribute to policy ranking, participants were divided into three small groups each with an assigned facilitator for deliberation, before reconvening to full group, facilitated deliberation. Facilitators encouraged participants to lead the process of deliberation and ranking. In small group deliberation, participants were tasked with (i) producing an initial ranking of the policies, (ii) providing reasons for this ranking, and (iii) reporting how this ranking was produced. In the full group deliberation, each small group shared the results of (i)–(iii), and the protagonist looked for similarities and differences in each group's ranking to initiate discussion leading to a full group decision. Policy flashcards and post-it notes were used to visualise and facilitate the grouping and ranking of different policies.

2.5.4. Focus groups with deliberative forum participants

On the 28th April 2025 we held two online focus groups with DF participants. Each focus group lasted 90 min, and in total 13 people participated (Glasgow = 5, Bridlington = 7). We presented full results of the DFs and discussed how the findings had been used since the DFs, in order to allow further opportunity for participant feedback and to reconfirm the results obtained in the DFs.

2.6. Data collection

The primary data collected was the policy scenario ranking in each DF, which was recorded by photographing the ranked policy flashcards and number of counters on each flashcard. Small group and full group deliberations were audio recorded, transcribed verbatim, and thematically analysed to explore reasons for the policy rankings. To understand participants' experience of the DF, participants anonymously completed paper attitude forms (Supplementary D) at the beginning and end of each DF about related topics (e.g., climate change, government policy, public health), and paper evaluation forms (Supplementary E) at the end of day one and day two of each DF. At the start of day two, we updated the group about how we responded to comments made in the day one evaluation forms.

2.7. Analysis

2.7.1. Quantitative analysis

Small sample sizes precluded statistical significance analyses. As the Glasgow forum only used 86 of their 100 available counters (they did not reach a conclusion about how to rank remaining counters), we weighted the allocated counters to total 100 by multiplying each

allocation by 100/86. We aggregated the weighted rankings of Glasgow and the unweighted ranking of Bridlington were aggregated to produce an overall policy ranking. Alongside the rankings, we report the methods used by each group for arising at the policy rankings. We aggregated Likert scale scores and closed option questions in both the attitude (questions 1 and 2, Supplementary D) and evaluation forms (questions 5,7, full forms in Supplementary E).

2.7.2. Thematic analysis

Audio recordings for the small and full group deliberations were transcribed verbatim by University of Oxford-approved external transcription companies. We checked these transcripts against the audio recordings for accuracy and uploaded revised transcripts to NVivo, a qualitative analysis software (NVivo Ltd., 2018). We applied reflexive thematic analysis (RTA) in six phases:

(1) We familiarised ourselves with the data by reading and re-reading the transcripts against audio recordings and making brief notes that could inform coding;
(2) HF systematically identified portions of text that illustrated reasons underpinning the policy rankings and applied descriptive labels ('codes') to them. The coding blended inductive and deductive orientations, as we did not have predefined codes but we did use the policies themselves as reference points. By the end of the coding, both the code names and code labels were defined. AK duplicate coded a subset of the transcripts to inform stage (3).
(3) In discussion, HF and AK constructed shared, patterned meaning across the dataset, primarily by grouping codes together into potential 'candidate' themes.
(4) Candidate themes were developed by checking them against both included text extracts and the full dataset, prompting revisions and refinement. This process also helped to develop structural complexity, whereby hierarchies and relationships between the codes were developed.
(5) Themes were refined and fully defined.
(6) We adapted step 6: instead of an analytic narrative, we report themes, constituent codes, and illustrative quotations to fully explain the findings as this can enhance the trustworthiness of research (Braun Virginia, 2021; Cloutier and Ravasi, 2021; Gale et al., 2013).

Authors HF and AO applied steps (1), (2) and (6) of RTA to open text sections of the evaluation forms (questions 1—3, 8, 9). We developed second order codes rather than full themes due to the thinness of available data (Geertz, 1973; Ryle, 1949).

2.8. Ethics

We received ethical approval from the University of Oxford's Central University Research Ethics Committee (CUREC) on 11th July 2023 (reference R85156/RE002) for the DFs and on the 24th March 2025 (reference R85156/RE003) for the focus groups.

3. Results

3.1. Participant characteristics

In total, 24 people participated in the DFs (see Table 2). With the help of our partner organisations, we shared recruitment information with a total of 56 local organisations in Glasgow and 27 in Bridlington. In response, 45 people contacted us with interest in the study (Glasgow: 27; Bridlington: 17). Of the 15 people registering to participate in Glasgow, 13 ultimately participated; all of the 11 people registered for Bridlington ultimately participated. One person withdrew from the study after consenting to participate in the Glasgow forum before it started. All participants attended every part of the DF in Bridlington. In Glasgow, one participant was absent for the second half of the first day, which meant they initially missed three evidence videos (environment, health, and economics) and did not complete the end of day one evaluation form. On day two, we played them some (environment, health) but not all (economics) of the videos they missed during breaks. A different participant in Glasgow left at 2 pm on the second day, meaning they did not contribute to the final group deliberation session.

Table 3 summarises participants' characteristics in each DF and overall. More people from younger age groups attended the Glasgow DF than the Bridlington DF: 93 % (n = 12) of participants in Glasgow were aged 64 years or younger compared to 18 % (n = 2) of participants in Bridlington. The majority of DF participants identified as female (75 %, n = 18), but more so in Glasgow (85 %, n = 11) than in Bridlington (64 %, n = 7). Most participants identified as white (n = 21), and only one participant had children under 18 in their household (n = 1, 4 %). Participants in Glasgow had a range of family incomes, while most in Bridlington had a family income of £20,000–£29,999 (64 %, n = 7).

In the remaining results section, we report the process undertaken by small and full groups to rank policy scenarios, the resultant small and full group rankings for policy scenarios, the thematic analysis narrative describing rationales underpinning the rankings, and a summary of the attitude and evaluation forms. Quotations are referenced according to small or full group deliberations in each location (e.g., "Glasgow small group 1"), rather than by individual.

3.2. Process of policy ranking

Most small groups started by reviewing all the policies in sequence, though one started by discussing what they wanted a tax to achieve: "maybe that could be a place to start and we can kind of have our values down …and then we can kind of keep coming back to that" [Glasgow Small Group 2]. After reviewing in sequence, some started to group policies into those they liked or disliked (e.g., those based on nutrients). All small groups reviewed every policy scenario, though most were only able to agree those preferred, rather than debate those least favoured. Only one group decided to develop their own policy in consensus [Bridlington Small Group 1] as a result of their discussion surrounding other policies, and with minimal input from the facilitator.

In the full group deliberations, each small group facilitator summarised the policies preferred by their group, the reasons they were preferred, and how those preferences were developed in discussion. The full group facilitator led a discussion about similarities between the rankings and explored the differences, to eventually agree the policies

Table 2
Summary of recruitment for each deliberative forum (organisations contacted for recruitment, number of people expressing interest, registering, consenting, and withdrawing after consent).

Deliberative forum location	Number of organisations contacted	Number of people expressing interest	Number of people registering	Number of people consenting	Number of people withdrawing after consent	Total participants
Glasgow	56	27	15	14	1	13
Bridlington	27	17	11	11	0	11
Total	**83**	**44**	**26**	**25**	**1**	**24**

Table 3
Participant characteristics.

Characteristic		Glasgow		Bridlington		Combined	
		n	%	n	%	n	%
Age	18–24 years	0	0	0	0	0	0 %
	25–34 years	4	31 %	0	0	4	17 %
	35–44 years	3	23 %	0	0	3	13 %
	45–54 years	1	8 %	0	0	1	4 %
	55–64 years	4	31 %	2	18 %	6	25 %
	65 years or over	1	8 %	9	82 %	10	42 %
	Total	13		11		24	
Gender	Male	1	8 %	4	36 %	5	21 %
	Female	11	85 %	7	64 %	18	75 %
	Non-binary	1	8 %	0	0 %	1	4 %
	Total	13		11		24	
Ethnicity*	Black, Black British, Caribbean or African	1	n/a	0	n/a	1	n/a
	Mixed or multiple ethnic groups	1	n/a	0	n/a	1	n/a
	Other ethnic group	1	n/a	0	n/a	1	n/a
	White	10	n/a	11	n/a	21	n/a
	Prefer not to say	1	n/a	0	n/a	1	n/a
Family income	Less than £10,000	1	8 %	1	9 %	2	8 %
	£10,000–£19,999	2	15 %	0	0 %	2	8 %
	£20,000–£29,999	2	15 %	7	64 %	9	38 %
	£30,000–£39,999	1	8 %	1	9 %	2	8 %
	£40,000–£49,999	0	0 %	1	9 %	1	4 %
	£50,000 and above	3	23 %	1	9 %	4	17 %
	I do not know	2	15 %	0	0 %	2	8 %
	I prefer not to say	2	15 %	0	0 %	2	8 %
	Total	13		11		24	
Children in household	2 children–single parent	1	8 %	0	0 %	1	4 %
	No children	12	92 %	11	100 %	23	96 %
	Total	13		11		24	

Notes: * Participants could select multiple ethnicity categories.

that the full group preferred. Finally, counters were assigned to the policies to rank the policies by preference. The time available precluded agreeing details of the policies that had been discussed in full groups, and there was also insufficient time to discuss in detail the policies that none of the groups preferred.

3.3. Policy scenario ranking

Table 4 shows the results of the policy scenario ranking for each full group and overall. The highest-ranking policy scenario overall was a population-wide tax on high carbon foods (42.9 counters out of a possible 200), though this was not the top ranked scenario for either location independently. Glasgow's preferred scenario was a population-wide subsidy for fruit and vegetables that are ethically sourced (34.9 counters). Bridlington's preferred policy scenario was a population-wide tax on foods that are high in fat, sugar, or salt and low in fibre, minerals and vitamins combined with a population-wide subsidy for any food that has a healthy nutritional profile (40 counters). Only Bridlington devised a new policy, which was a population-wide subsidy on local foods (15 counters). In general, tax scenarios were ranked more highly than those for subsidies, though more subsidy scenarios than tax scenarios were allocated counters. Participants preferred population-wide policies to policies that targeted low income populations.

The full group ranking was broadly consistent with the preferred policies in small groups (Supplementary F). Five of the six small groups were in favour of a high carbon food tax. A tax on foods high in fat, sugar, or salt and low in fibre, minerals and vitamins, and a population subsidy on any food that has a healthy nutritional profile, were each supported by four groups. Three groups were in favour of each a population subsidy for fruit and vegetables and a subsidy of any food for people experiencing low income. Overall, small groups favoured an equal number of taxes to subsidies.

3.4. Thematic analysis of reasons underpinning preferences

We developed 11 themes from the small and full group deliberations that preceded the policy scenario rankings, which are summarised in Table 5. Five themes relate to practicalities surrounding policymaking: *defining policies, features of policy implementation, policy target, public perception,* and *stakeholder reaction*. Four themes concern issues the policies attempt to address: *costs of food, health impact of foods, environmental impacts of foods,* and *equity and justice implications*. Two themes describe related factors affecting health and environmental impacts of food: *dietary influences*, and *other actions for healthy and sustainable food*.

3.5. Changes in attitudes and evaluation across the deliberative forums

Figs. 1 and 2 summarise the quantitative results of the attitudes forms (questions 1 and 2, see Supplementary D). Most participants agreed that they were worried about climate change and public health, and that the government should intervene to improve people's health and the environment. However, most participants disagreed that they trusted the decisions of the national government (note that these forums took place during the Conservative government led by Rishi Sunak). Participants neither agreed nor disagreed that taxes are worse than subsidies. More participants agreed that they felt well informed about public health, the healthiness of food, and the environmental impact of food after the DFs. Participants did not feel informed about how policies are made by government.

Full results of the evaluation forms are presented in Supplements G and H. Overall, participants did not feel facilitators tried to influence deliberations, though some felt a small number dominated discussions.

4. Discussion

4.1. Summary of findings

We held two DFs in Glasgow and in Bridlington with 24 members of the public, where we asked participants to deliberate evidence about the food system to decide which food subsidy or tax scenarios the UK government should implement that would be best able to make healthy and sustainable food more affordable and accessible. Across both DFs, participants preferred a population-wide tax on high carbon foods (allocated 42.9 counters out of a possible 200). The most preferred scenario in Glasgow was a population-wide subsidy for fruit and vegetables that are ethically sourced (34.88 counters), and Bridlington's most preferred scenario was a population-wide tax on foods that are high in fat, sugar, or salt and low in fibre, minerals and vitamins combined with a population-wide subsidy for any food that has a healthy nutritional profile (40 counters). An equal number of taxes and subsidy scenarios were equally favoured by the small groups, but in the overall ranking produced by full group deliberations, more subsidy scenarios than tax scenarios were allocated counters. The overall ranking also ranked taxes more highly than subsidies. Participants preferred population-wide

Table 4
Policy scenario ranking results from the deliberative forums in Glasgow and Bridlington.

Policy #	Subsidy/ tax	Target food	Population affected by policy	Bridlington counters	Bridlington notes	Glasgow counters	Glasgow counters scaled	Glasgow notes	Combined scaled	Who ranked?
8	Tax	High carbon foods	Population	15		24	27.9		**42.9**	Both
2	Tax	Foods that are high in fat, sugar, or salt and low in fibre, minerals and vitamins	Population	40	Combined with 13	n/a	n/a		**40**	BRID
9	Subsidy	Free fruits and vegetables	Population	n/a		30	34.9	Not fully free; ethically sourced (e.g., seasonal, local)	**34.9**	GLAS
16	Subsidy	Low carbon foods	Population	n/a		26	30.2		**30.2**	GLAS
3	Tax	Red meat and processed red meat	Population	20	Combined with 11	n/a	n/a		**20**	BRID
NEW	Subsidy	Local food subsidy	Population	15		n/a	n/a		**15**	BRID
10	Subsidy	Free fruits and vegetables	Low income	10		n/a	n/a		**10**	BRID
13	Subsidy	Any food that has a healthy nutritional profile	Population	*	Combined with 2	2	2.3		**2.3**	Both
14	Subsidy	Any food that has a healthy nutritional profile	Low income	n/a		2	2.3		**2.3**	GLAS
15	Subsidy	Any food	Low income	n/a		2	2.3		**2.3**	GLAS
11	Subsidy	Fresh and frozen meat; fresh, frozenand canned fish	Population	*	Combined with 3	n/a	n/a		**n/a**	BRID

Notes Presented highest to lowest counters assigned to each policy (policies that were not assigned counters are not shown). BRID: Bridlington, GLAS: Glasgow, n/a: not applicable, used when the policy was ranked by the other forum; *: a combined policy so counters represented elsewhere.

policies to policies that targeted people experiencing low income.

5. Strengths and limitations

Our study sought to explore food subsidies and taxes of relevance to public discourse, which we defined as those proposed or implemented to date. As we did not have capacity to critically assess the evidence for or against these policies, it's feasible that participants debated policies that have been proposed but since disregarded in light of evidence of their impacts e.g., a substitution effect to less healthy products.

Our research explicitly intended to involve those under-represented in policy discourse, which could help policymakers develop policies supported by, and relevant to, the populations they seek to help. We aimed to understand participants' preferences through use of deliberative methods that are better suited to converging debate on contested issues compared other preference measures, and used follow-up focus groups to add further legitimacy to our findings. We used a range of techniques to encourage participation from local communities, including videos instead of written materials, sufficient remuneration, and timing the forums during school hours. We also encouraged continued participation by building rapport with participants prior to the event by email and phone calls, providing various opportunities for participants to ask questions and fully understand the demands of the research, and creating a welcoming environment at the DFs (e.g., warm-up sessions). As it is important for participatory work such as ours to feed into policy implementation pathways to prevent perpetuating cycles of civic disengagement (Szczepańska et al., 2022), our project benefited from having a direct pathway to discourse with policymakers in the form of a Policy Review Board. Nonetheless, we did not involve as diverse a sample in terms of ethnicity, income, or gender as we had hoped to attract; a different and more diverse sample of participants is likely to have produced different outcomes. Future research should explore methods to involve more under-represented voices in policy-making decisions than we were ultimately able to in this study.

The results inevitably reflect the specific design of our DFs. The nature of the DFs placed greater emphasis on understanding how group rather than individual decision-making evolved in response to stimuli (e.g., evidence) and discussion. Attitude forms offered some, albeit limited, insight into individual-level perspectives. We facilitated with a team of five facilitators in Bridlington, instead of six facilitators in Glasgow, which may have affected how the DF was delivered. For some small groups, illustrative images on the flashcards overly directed the interpretation of the policy scenario they referred to. The recording of one small group's deliberation in Glasgow was poor quality, limiting the depth of data analysis we could conduct. We involved a range of world-leading experts in the DFs through the evidence videos, so that participants' debate was informed by accurate, relevant knowledge on topics selected by the research team. However, practical limits to the duration of the DF meant we could not involve all possibly relevant evidence, nor the range of views on each topic that could be relevant. We also prioritised the provision of academic evidence, but policy decisions are often informed by a spectrum of evidence types (e.g., narrative, lived experience) (Oliver et al., 2014). Longer DFs, involving a broader spectrum of evidence from diverse sources, may have returned a different policy scenario ranking. As was recognised by participants in their evaluation forms, the full group deliberations lacked sufficient time to exhaustively explore every policy (e.g., those not prioritised by small groups), and instead focused on exploring similarities in each small groups' prioritisation. Longer time to debate every policy may have resulted in different decisions and rationales underpinning them.

Facilitators and participants (noted in evaluation forms) observed power imbalances within the group of participants in each DF, despite the inherent attempts of consensus methods (McMillan et al., 2016), and deliberative methods in particular (Abelson et al., 2003), to achieve otherwise. These arose from both differences in prior knowledge on the topic and in confidence to put forward opinions during the DF. Imbalances risk the integrity of a DF's outcomes by encouraging the results to adhere to an individual or small number of participants' opinion(s), rather than converge to a mutually-agreeable outcome. Some participants leaving early or missing sections may have compounded power dynamics in Glasgow. We tried to mitigate power imbalances using facilitation techniques that encourage equal contribution (e.g.,

Table 5
Themes, constituent codes, and example quotations of discussion underpinning policy preference decisions.

Theme	Description of theme and constituent codes (in bold)	Example quotations
Cost of food	Participants described how food **cost drives choice** and how taxes might alter that. The **cost of meat** was already seen as prohibitively expensive, given that many participants viewed meat as healthy or a staple food. **Relative cost** of food was also seen as important, both in terms of price elasticity of products themselves, and specific consumer's sensitivity to price changes. Participants were conflicted about whether the **cost of production** would increase or decrease if food was produced more locally. Production costs were also liked to the profitability of food.	*"The price of them has gone up so much now relative to other things that people are probably already starting to buy less of them."* (BRID Small Group 3) *"Being realistic, someone on a low income…they might care about the environment but if they don't have the money to buy the things that are climate friendly then we have to be realistic that they get to choose what they want, based on the low income that they've got"* (GLAS Small Group 3) *"All they're* [food businesses] *thinking about is the profit for their shareholders"* (BRID Small Group 1)
Defining policies	Participants considered the **complexity of food composition** in relation to grouping foods together (e.g., snacks), and to multi-ingredient foods for the purpose of underpinning policies. The advantages and disadvantages of **nutrient profiling-based policies** were debated, and in terms of who determined these distinctions. Participants were concerned how to **define low income** for the targeted policies, either from personal experience or for thinking it was too low.	*"I'm scared to hand over the word 'healthy' in a policy and then the government interpret it in a way that they believe it"* (GLAS Small Group 3) *"The one that worries me is where you have the word healthy or profile"* (GLAS Small Group 1) *"I am interested in the way a low income is put down in the final bullet point, because that would have been me my whole life"* (BRID Small Group 2)
Dietary influences	**Education and literacy** were discussed, including reference to food labelling and certification. Education was thought necessary to change food **norms**, with norms also affected by culture, habits, tradition, and the extent that certain foods are addictive. Education was affected by **changing advice or requirements** over time, which some considered to be affected by fashion (e.g., around concern for calories). The burden of **time** spent sourcing or cooking food was thought to be higher for low income populations. Varying **food availability** for unhealthy and healthy food was also thought to affect dietary quality. Ultimately, food **pleasure** determined dietary choices.	*"You can't change the culture overnight and you've got, if you did embark on an education programme it's going to take time for you to switch over any kind of change"* (BRID Full Group) *"It does worry me that as I say with the lower incomes and the cooking, the preparation time and everything else I just think it adds to people's budgets"* (BRID Full Group) *"But maybe we're trying to change people's taste to not accept that foods have to be very sweet"* (BRID Small Group 3) *"We were only supposed to eat one egg a week and now, we can have an egg every day if we want."" That's because they thought it was bad for your cholesterol, now they've realised that they're not"* (BRID Small Group 1) *"I'm also a believer that a little of what you fancy does you good, that is what makes life worth living"* (BRID Small Group 2)
Equality and justice implications	People's **agency** was described in relation to current dietary patterns and ability to engage in future interventions. Participants were concerned with people's **freedom to choose**, and how it is currently infringed by food cost (e.g., cost of meat), or how they perceived it might be affected by the introduction of a new fiscal policy. Participants were concerned about the **stigma** associated with policies that targeted low income populations. Concerns about whether a tax was **regressive** affected participants views of certain policies they thought more likely to impact low income populations e.g., policies including processed meat or ready meals. **Equality** implications of policies were considered nationally and internationally.	*"They're the ones that are well, stereotypically time poor, that are going to be buying like, things that are packaged and like, microwave meals, I would imagine."*(GLAS Small Group 1) *"Part of me that is in favour of no taxes because I don't believe in nanny state, I do believe in free will, I do believe in people taking responsibility for how they eat themselves…But, people need to take responsibility for themselves and influencing people's decisions, even if you can which I'm not 100 % sure you can even with taxes, I've a feeling that people will still buy what they want to buy and eat what they want in the amounts they want to eat."* (BRID Small Group 2) *"[The policy]'s just for low-income people."…"and then it's means tested and there's stigma around that." "Yes, there's a stigma."*(GLAS Small Group 1) *"There are a lot of people that haven't got cooking facilities, there are a lot of people that haven't got a kitchen, and there are a lot of people that only put stuff in the microwave because it doesn't use the electricity as much as it does putting an oven or something else on, and if you're charging them [through a tax]…"* (BRID Full group) *"Maybe it shouldn't just be low carbon because I feel that we need to give back to those countries whose land we're stripping by buying this meat, this cheap meat you know, we need to give back to them."* (GLAS Small Group 3)
Environmental impacts of food	The **environmental impact of meat** and the impact of **food transportation,** as presented in the evidence videos, was discussed extensively, with **varying degrees of agreement with the evidence**. Many recognised that dairy products and eggs carried fewer environmental harms than meat and felt they had health benefits, and so should be excluded from proposed policies. When discussing **low impact solutions,** such as vegan alternatives to milk, some were sceptical of whether they would mitigate the environmental harms of food. **Organic** food was seen to be less damaging to the	*"I just know from the information yesterday was that beef was the…Beef was the bad boy of carbon"* (GLAS Small Group 3) *"I was positively surprised to hear that actually like the transportation was not that big of a deal"*. (GLAS Small Group 1) *"If you look at the replacement for milk, such as almond milk, now the almonds are all grown in orchards in mostly California, all the water that goes onto an almond tree, is something like, one hundred times, what used to go to an orange tree. So, now California has got a serious problem with water."* (BRID Small Group 1)

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Table 5 (*continued*)

Theme	Description of theme and constituent codes (in bold)	Example quotations
	planet. Participants debated the extent that different policies addressed **simultaneously environmental and health effects** of foods, and some participants described preferring one over another.	*"you could make a rule that is has to be organic, or some other kind of, produced in a way that you're not like, eroding the soil and all that kind of thing."* (GLAS Small Group 3) *"Fruit and veg has support as a policy, fruits and veg has got the proven health benefits, so we want to try and tinker with it to bring in some environmental benefits into it as well."* (GLAS Small group 1)
Features of policy implementations	**Administration and policing** were heavily discussed, alongside the potential for side-stepping policies through **loopholes,** with many concerned about the administrative burden of targeted subsidies, and how taxation would be regulated and enforced. Some were in favour of **devolving power to local authorities.** In part this was related to **trust** in both government and **where money raised by policies goes**, but also in the research underpinning policies. Some felt that **taxing manufacturers not consumers** would lead to greater change and was fairer. Participants were clear that **political feasibility,** which included political will, affected the likelihood of policy implementation. Participants wondered how government would **afford the costs of subsidies,** and though not an explicit focus of deliberations, the **level of tax or subsidies** was discussed e.g., applying through VAT or a sliding scale, particularly in response to the wild card as participants were not keen to make foods free. Participants were keen for **comprehensive health policy,** emphasising the need for whole system changes to the food system and for policies that complemented rather than undermined each other, and favouring policies than captured many products rather than focusing on a small number.	*"I don't believe in it being targeted at low income households, I think it would cost too much to implement."* (BRID Small Group 2) *"PAR made a really good point that it essentially covers manufacturers trying to dodge a particular issue tax like salt by reformulating a product and just adding sugar instead, so that was covered by that."* (BRID Full group) *"I think what we're talking about is, moving away from general taxation by the government and bringing it back to local taxation with the local areas… because you're taking away from a big bureaucracy"* (BRID Small group 1) *"I don't think that's* [research in evidence video] *quite right either. And I know it said it was counterintuitive but that doesn't mean that I accept it."* (BRID Small group 1) *"I know the consumer pays in the long run, because the manufacturer then puts up the price, but if there were tax, if there were more taxes on the way things are produced sometimes, then it might make people who produce those items think of better ways of producing them."* (BRID Small group 2) *"The other thing is an element of trust in the government, because if you tax something and you say oh, the revenue is going to be spent on something relevant and it never is. But if something is subsidised, they have to find the money."* (GLAS Small group 1) *"To change it and the political will at this moment in time is zero, and I'm not too sure the next government who will come in, has got any more leeway than the previous one did, not with the economic situation that we find ourselves in."* (BRID Small group 1)
Health impact of food	Participants spoke of the **health impacts of specific nutrients or foods** encompassed in each policy, often referencing personal opinion or experiences**.** Participants tended to think that **calories are not a useful metric**, preferring to instead consider nutrients contained within food, and acknowledged that some people require high-calorie diets. Relatedly, **food processing** (e.g., non-caloric sweeteners) was generally perceived to be unhealthy, and some even altered proposed policies to encompasses taxes for processed products or ingredients. Participants emphasised that **moderation,** more so than restriction, is important for mitigating negative impacts of specific foods.	*"Well, fatty cuts of meat, I know I don't buy them, but it makes a meal and providing you don't put too much in it, it adds flavour, and anyone can make a stew out of really cheap cuts of meat, and it'll be nutritious."* (BRID Small Group 1) *"I think it's a difficult one because the calories obviously people need calories, but if it's mainly sweet snacks and things like that, and ready meals that might have additives and sugar in, then I question whether those are the kind of calories you want."* (BRID Small Group 3) *"And, in moderation, I mean I love a pizza with some anchovies on, and they're really salty little things. I would be really, quite upset that if small treats like that, which are also nutritious, suddenly sort of start to be three times the price, or something like that."* (BRID Small Group 2)
Other actions for healthy, sustainable food	Participant drew on **precedent** of similar, existing policies or mechanisms to support the implementation of those under consideration (e.g., Soft Drinks Industry Levy, targeting low income populations). Some thought there were **more important targets than food**, such as the energy sector. **Cooking education or facilities** was frequently mentioned as a barrier to healthy eating that might be addressed through education.	*"I think this should be higher taxes because it has proved, it's proved successful with the sugar hasn't it, to some extent?"* (BRID Small Group 2) *"Maybe there's an awful lot more that could be done under the energy bracket for instance which is huge and you've got a little bit of food and now we're going to slap a great big tax on there but all the energy gets away with it"* (BRID Full Group) *"If you're not motivated because there's nobody there to show you [how to cook] and you think you'll get into difficulty, and also if you can only afford really cheap ingredients, you'll really get into difficulty."* (BRID Small Group 3)
Policy target	Participants debated whether **carrots** (subsidies) **are better than sticks** (taxes)**:** though some were in favour of taxes, others felt they were punitive. Participants debated whether the **targeted food is fundamental** to tax (e.g., meat), and were only keen to subsidise what they considered to be staple foods, or whether it was **reductionist to focus on nutrients or ingredients** instead of whole foods. There was little agreement about whether it was fair for	*"I guess the general thing there is, we want the policy to be something that supports people having more food, not punishing people's choices."* (GLAS Small Group 3) *"I think that's the point is like, the policy gives food to people as opposed to saying to you, the food that you're eating is wrong, so you should pay more for it."* (GLAS Small Group 3) *"I just think that if you did it to all fruit and vegetables then, as I say, there are some vegetables- I mean, you get your artichokes, and your*

(*continued on next page*)

Table 5 (*continued*)

Theme	Description of theme and constituent codes (in bold)	Example quotations
	subsidies to **target low income populations** instead of the population. Some groups considered how **subsidies counterbalance taxes,** and developed a programme of complementary policies that they thought were feasible. **Seasonality** was considered important for food quality, to the extent that it was included as an amendment for several subsidies.	*stuff like that subsidised and I don't think that needs to be."* (BRID Small Group 2) *"It's suggesting that health can be achieved by reducing one specific nutrient and I get that we have to consider the whole public but the public is made up of so many different people with different needs day-to-day."* (GLAS Small Group 3)
Public perception	Participants' **personal preferences,** including their political views, affected their view of some policies (e.g., for favourite foods that were targeted, dietary requirements), though some were conscious of separating these views from the decision-making. By contrast, many participants considered broader **public support or acceptability** a key determinant of taxes and subsidies, and was thought to be affected by **policy framing.**	*"I mean I've got very much my own dietary, environmental, political views, but when I'm doing this, I'm trying to take in the cultural variety and I'm not just doing this from a selfish point of view"* (GLAS Small Group 1) *"You've got to get people onside haven't you?" "Yeah, you have to convince the people…you can talk through all of them and make points and make policy decisions on all of them and come through with it, but then it really needs to be devolved down to the people, to get it to work."* (BRID Small Group 1) *"I mean the government is bad enough, how on earth, how do you actually sell a subsidy? …Because it's alright all of this, tax is dead easy you know, it's clear cut, that's what we're going to tax, that's it. For a subsidy, it can get quite woolly"* (BRID Small Group 1)
Stakeholder reactions	Participants anticipated industry responses, and in particular **reformulation,** that could reinforce or undermine the effects of a new policy. Potential unintended consequences included those **affecting consumers**, such as the development of eating disorders (in relation to calorie-based policies) and for compensatory changes in consumption that negate the benefit of a policy. **Broader economic consequences** such as employment, was used to justify not taxing certain foods (e.g., meat). Participants were concerned that excessive subsidies could lead to **food waste.**	*"There's good quality sausages full of meat…and you get rusk with a titchy little bit of meat in that just gets through the sausage labelling. If you then put a tax on all of it, because it's all processed meat, your price goes up like that, I think the manufacturers will reduce even further any of the nutrition in your actual sausage, you're going to get rusk with flavouring and the good quality sausage will be outside of people's range."* (BRID Full Group) *"I've bought things and I'm like, oh they're definitely putting less salt in this. Salt! …Does it actually make a difference? Salt manufacturers are like, 'wahey people are buying more table salt'."* (GLAS Full Group) *"All the people that are employed in the food production thing, it's hard to say that you should put a specific tax on something I think, without realising the consequences of what might happen"* (BRID Small Group 2) *"Because if it's free fruit and free vegetables, people will take a bucket full of them and they'll only eat two of them and you'll just end up with a load of waste."* (BRID Small Group 1)

Notes: BRID = Bridlington, GLAS = Glasgow.

introduction and reminder of ground rules, eliciting round-robin contributions in group activities). By solely providing evidence during the DFs, rather than as preparation beforehand, we also attempted to minimise opportunity for those participants with greater ability to prepare (e.g., time, access to computer) to wield more power in the DF.

5.1. Comparison to existing literature

Our study is the first we are aware of that applies deliberative methods to identify fiscal policy solutions to address the health and environmental consequences of the UK food system. Much of the existing literature that applies deliberative methods to food policies has been conducted in Australia (Henderson et al., 2013; Moretto et al., 2014; Anaf et al., 2018; Street et al., 2017) and has found similar support for taxes on less healthy foods (Moretto et al., 2014; Street et al., 2017), adding to the credibility of our findings. Prior applications of deliberative methods to food issues have tended to focus on solutions to either health or environmental outcomes, even though they are the product of the same food system (Department for Environment Food & Rural Affairs, 2021). Seeking policy solutions that concurrently deal with both, and that are specific to the UK policy context, could lead to more efficient policymaking with greater potential to initiate systemic changes.

There is a precedent for using deliberative methods in the context of public spending, for example through participatory value evaluation (Boxebeld et al., 2024; Mouter et al., 2021). In particular, the field of participatory (or civic) budgeting empowers citizens to choose how at least a portion of public budget is spent (Aziz and Shah, 2021; UN-HABITAT, 2004), and can enhance both transparency and democratic accountability (Brun-Martos and Lapsley, 2017). Brazil introduced the first Participatory Budget in the 1980s, and though participatory budgeting has been widely implemented since (Szczepańska et al., 2022), there has been limited adoption in the UK (Brun-Martos and Lapsley, 2017). It's recommended that for participatory budgeting to achieve its full potential, it should be presented as an essential democratic process (Brun-Martos and Lapsley, 2017), involving a real transfer of power and resource (Blakey, 2008). This corresponds with our experience in the DFs, where we found participants were most engaged with the project when we emphasised the resultant contribution the DFs would have to real-world policy decision making. We extend the previous evidence base by conducting a form of participatory budgeting research in the UK, and by focusing on national rather than the usual city-wide or regional budgetary decisions.

5.2. Interpretation and implications

Conducting this research against the backdrop of exceptionally high food prices may have encouraged the ranking of more subsidy than tax scenarios (Office for National Statistics, 2023).Despite this, several tax scenarios were ranked very highly, and more often than subsidies, suggesting that at least some members of the UK public are supportive of measures that discourage rather than incentivise certain behaviours.

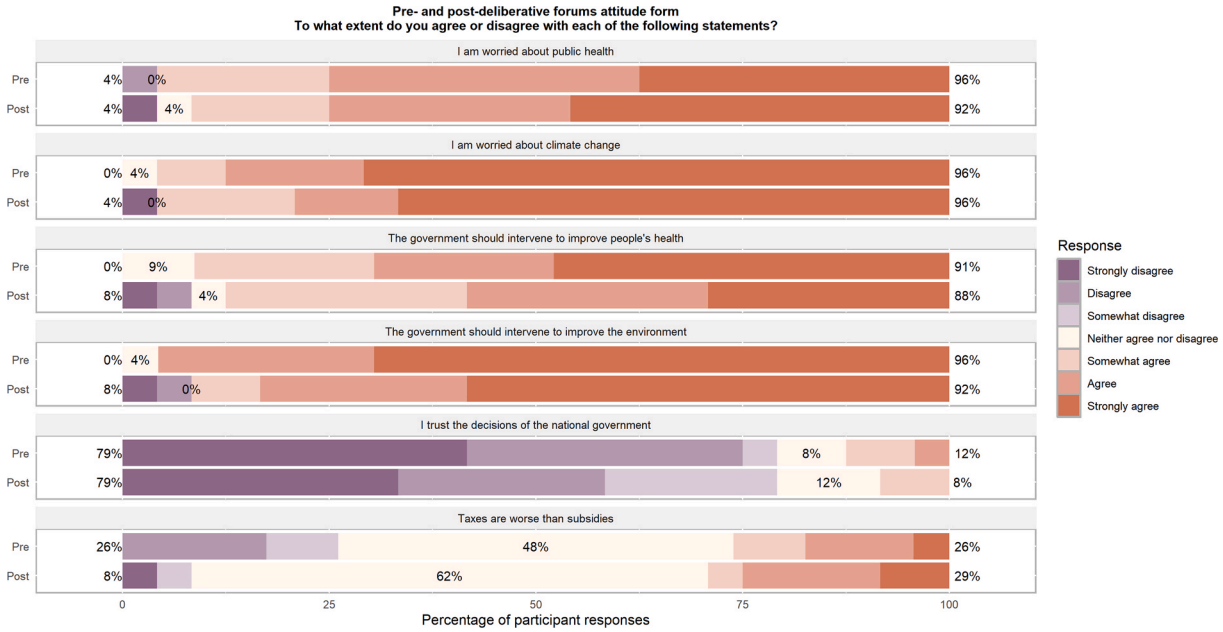

Fig. 1. Pre- and post-deliberative forums attitude form: results of question 1 "To what extent do you agree or disagree with each of the following statements?". NOTE: Pre-attitude forms refer to those completed at the start of the first day of each deliberative forum; post-attitude forms refers to those completed at the end of the second day of each deliberative forum. The % are reported for disagree aggregated, neither agree nor disagree, agree aggregated. Total responses to each statement varied from 23 - 24 participants.

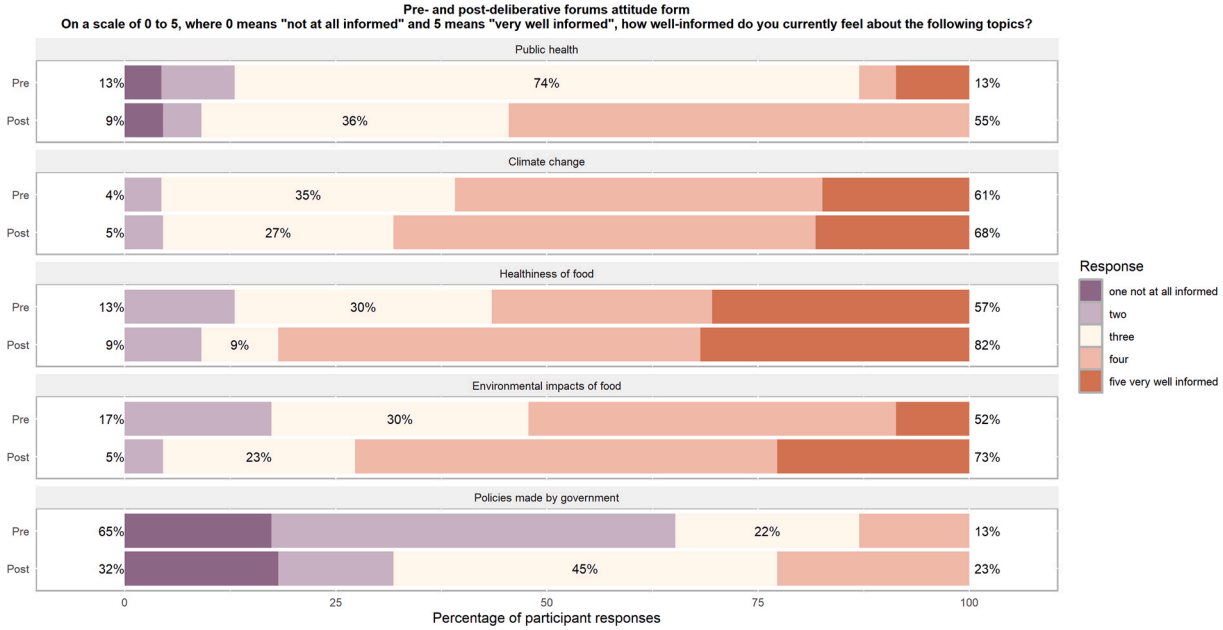

Fig. 2. Pre- and post-deliberative forums attitude form: results of question 2 "On a scale of 0 to 5, where 0 means "not at all informed" and 5 means "very well informed", how well-informed do you currently feel about the following topics?". NOTE: Pre-attitude forms refer to those completed at the start of the first day of each deliberative forum; post-attitude forms refers to those completed at the end of the second day of each deliberative forum. The % are reported for one and two aggregated, three, four and five aggregated. Total responses to each statement varied from 22 - 23 participants.

This directly contrasts with political and industry discourse that suggests taxes could harm public interests (Jawad et al., 2023). Widely accepted guidance from the Nuffield Council on Bioethics ('the intervention ladder') suggests greater underpinning evidence is required to justify the implementation of intrusive interventions (taxes) compared to less intrusive ones (subsidies) to justify their implementation to the public (Hepple, 2007), so it is possible that our method entailing the supply of evidence to the public may have influenced the ranking of taxes. The recurrent ranking of complementary policies (i.e. dual implementation of a tax and subsidy policy for a particular subset of foods) corresponds with findings in experimental literature that demonstrate greater public support for cost-neutral policies (Ejelöv et al., 2025).

The presentation of policy rankings and even thematic analyses can only present a subset of the disagreements, compromises, and spectrum of views that were shared at the DFs. In particular, even though participants agreed that they wanted a fairer food system, they found it hard to agree whether it was fair to subsidise targeted over whole populations. The presentation of targeted subsidies with different details to

those we had capacity to share in our DFs might have resulted in a more and higher ranking of food subsidies. Exploring other measures to attain a food system that achieves these underlying, shared values could be a focus of future research.

Even though we employed facilitation techniques to encourage ranking policies that would benefit society, the policy scenarios prioritised in the two DFs also reflect the views of specific participants involved. Despite the range of recruitment techniques that we deployed, fewer people experiencing low income, from an ethnic minority, or experiencing single-parenthood, participated than we had hoped would. Self-selection bias may have affected our sample of participants who all reported pre-existing concern for health and environmental issues in the attitude forms, and particularly as environmental-focused community-based research often disproportionately attract and involve white and/or middle- and upper-class populations (Anantharaman et al., n.d.). This bias risks misrepresenting the views of the 'communities' such activities seek to serve, and as the results of these activities tend to prioritise apolitical/behavioural solutions to environmental issues, they can develop a feedback cycle of who is involved and what is achieved (Anantharaman et al., n.d.). An important part of the COPPER project will involve working with public engagement specialists (LY) to develop a legacy in the communities that the DFs were held, in the hopes this will encourage participants we involved to be inspired rather than disillusioned by future participatory action, as much as the topic we focused on in the DFs.

5.3. *Future research and policy implications*

Future work could employ a range of alternative methods to explore support for new food subsidies and taxes among a wider range of publics. This could include repeating our study with other communities often marginalised from policy debate. For example, methods to assess the influence of established frames that are often used to present food subsidies and taxes (Cisneros et al., 2023), may help understand how individuals' decision-making could be changed in favour of food subsidies or taxes designed to improve the environmental and health outcomes of the food system. Prioritising a focus on *why* public support for such policies is often divided (e.g., qualitative methods), rather than *how much* the public support a policy (e.g., surveys) may be better able to overcome policy inertia in achieving healthy and sustainable food systems. Though our project benefited from engaging directly with policymakers in the Policy Review Board, whether and how our findings will contribute to the implementation of new food subsidies or taxes is unclear. Previous research has documented the complex policy process underpinning the implementation of food taxes and subsidies, for which scientific evidence is only one contributing factor (Mulcahy et al., 2022). Further work to assess the potential consequences of the policies preferred by participants is also requited to fully understand their potential to improve health and environmental consequences of the food system.

6. Conclusion

Our DFs held with 24 participants in Glasgow and Bridlington assessed preferences for a range of food subsidy and tax scenarios that could help make healthy, sustainable food more affordable or accessible in the UK. Though each DF differed in their ranking of policy scenarios, overall participants favoured the implementation of a population-wide tax on high carbon foods, ranked taxes more highly than subsidies, ranked more subsidy scenarios than tax scenarios, and preferred population-wide policies to policies that targeted people experiencing low income.

Data availability

Quantitative data are available in full upon request. The nature of the qualitative data restricts our ability to share it further.

Funding

The COPPER project is funded by the National Institute for Health and Care Research (NIHR) Public Health Research programme (Grant Reference Number NIHR133887). The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care. PS and AO are supported by the NIHR Oxford Health Biomedical Research Centre (Ref: BRC PMM Theme grant number NIHR203316).

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.

Acknowledgements

We are grateful to the participants in Glasgow and Bridlington for their participation and contribution. Thank you to Meli Vasiloudes Bayada, formerly of the Govanhill Community Baths Trust, and Devan Witter from the Bridlington Community Hub who helped us make logistical arrangements for the deliberative forums. We also thank the experts who supplied evidence videos: authors Dr John Buckell and Professor Mike Rayner, as well as Professor Emma Frew (University of Warwick), Professor Rosemary Green (London School of Hygiene and Tropical Medicine), and Dr Keren Papier (University of Oxford). Thank you to the Food Foundation, including former employee Annette Thomas, for their support throughout the development of the forums. Finally, we are grateful the wider COPPER team and steering committee, and specifically to Professor Katherine Smith (University of Strathclyde), Dr Alison Chisholm and Dr Kate Sahan (University of Oxford) for their advice in the project protocol.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodpol.2025.102946.

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