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RESEARCH ARTICLE

Is there a public mandate for restricting advertising of high-carbon products and services?: Citizens' jury and public polling evidence from the UK

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Abstract

Meeting internationally-agreed climate targets requires changes to patterns of consumption of goods and services which result in high levels of greenhouse gas emissions, such as petrol and diesel cars, flights, meat and dairy products. Previous experience with advertising controls for tobacco, unhealthy food and gambling, for example, suggests these could play a role in shifting consumption behaviours and thus achieving decarbonisation targets. This paper assess public support for such controls in the United Kingdom. We present evidence from a mixed method study combining a deliberative citizens' jury and a large nationally representative poll. We find majority support for the principle of greater restrictions on advertising of high carbon products and services. The most popular form of intervention tested is a 'traffic light' labelling system and the least popular is an outright ban. We identify five distinct positions on the issue, ranging from objecting to all proposals to strongly supporting all proposals. We conclude by discussing the implications of our evidence for political efforts to increase controls on advertising of high-carbon products and services.

1. Introduction

To meet the internationally agreed targets set by the Paris Agreement and limit dangerous climate change, emissions of anthropogenic greenhouse gases (GHGs) must fall rapidly. This requires changes to consumption patterns, including a reduction in the consumption of goods and services which lead to high GHG emissions, such as, for example, air travel, driving in petrol or diesel cars, and consumption of meat and dairy products [1].

Previous efforts to shift consumption, for reasons of health or wellbeing, have included restrictions on advertising as part of a wider strategy. Many countries now impose restrictions on the advertising of tobacco, unhealthy foods and gambling, for

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example. It is therefore important to ask whether similar approaches should be used as part of overall strategies to reduce GHG emissions.

To assess the potential of restricting advertising to achieve climate goals, two questions must be considered: would it work; and would it have public support? The paper reviews evidence on the first question, would it work? Then the main empirical contribution of this paper is on the second question: is there public support? This question is crucial as measures to regulate advertising would need to be introduced by democratically elected governments, who would need to seek a mandate for such action.

The paper presents evidence from a mixed-method study of the UK, to examine in detail whether there is public support for additional advertising regulations for high-carbon products and services. Section 2 summarises existing evidence on the efficacy of advertising regulation, and describes existing regulation. In Section 3, the theoretical and methodological orientation of the paper is established. In terms of theory, the paper draws on the tradition of deliberative democratic thinking, and specifically, the use of democratic innovations such as citizens' juries. This approach is particularly important when considering proposals which have a direct impact on people's lives, or which prescribe certain behaviours. Methodologically, the paper combines a citizens' jury, which involves a small sample of people and provides detailed qualitative data; with a large-N poll of c.2000 people. Section 4 covers the results, which show significant support for additional regulation of advertising as part of the net zero transition. Overall support for the principle of more regulation, and for specifical proposals for reform, was remarkably consistent between the two data sources. A carbon labelling system on adverts is the most popular proposal. A full ban on adverts for high-carbon goods and services is least popular, although still garners significant support and is more popular than no change. Differences in views are also analysed, with five distinct clusters of attitudes identified. Section 5 discusses the implication of our findings for policymakers in the context of advertising regulation and for climate policy more broadly.

2. Regulating advertising to achieve social and environmental goals

There is a growing debate over whether restrictions on the advertising of fossil fuel companies and high-carbon products and services are needed. Most prominently, the UN Secretary General Antonio Guterres, stated that all countries should ban the advertisement of fossil fuels, calling fossil fuel companies the 'Godfathers of climate chaos' [2]. In 2022, France brought in an advertising ban on all fossil fuel companies, though this only covers direct promotion and does not extend to high-carbon products and services [3]. Many more municipalities have pledged to restrict adverts for products and services such as flights, though to our knowledge these commitments have largely yet to be enacted [4].

These moves have been advocated by campaigners and research organisations who make the case that advertising promotes excessive consumption, both through driving sales, and through reinforcing social norms that legitimate high-carbon lifestyles [5,6]. They also claim that within certain product classes, advertising has

pushed people towards higher-carbon options. A key example offered is the growing market share of large SUVs in Europe and the US [7]. The core demand of campaigners is for bans on advertising and promotion of specific high-carbon products and services, similar to those in force on tobacco products (so-called 'category bans').

These demands are opposed by industry groupings, who are broadly resistant to category bans. Their core argument is that advertising mainly works by determining market share of a specific company or brand, not the overall size of the market. They argue the sector therefore has a vital role to play in the energy transition by, for example, promoting electric vehicles [6,8]. Thus, the argument that advertising increases consumption per se is rejected, and the argument that advertising drives people towards higher-carbon options within product classes is flipped on its head. Such lobbyists also question the efficacy of advertising restrictions as a policy tool, highlighting the other structural factors that determine people's consumption choices. Another frequently used argument is that a company's right to advertise is an expression of its right to free speech [9]. A presumption in favour of free speech suggests a high bar needs to be set for governments looking to restrict what can and cannot be advertised. Even in situations where this threshold is crossed, the sector argues that a more effective policy approach is to directly target the product or service. This could involve, for example, mandating an end date for the sale of new petrol and diesel cars.

These debates suffer from the fact that advertising restrictions on high-carbon products and services are relatively new. There is therefore limited research on their efficacy, and participants in present debates must rely on insights from different sectors. The two sectors where there is the longest running precedent in advertising restrictions are tobacco products and high-fat sugar and salt (HFSS) foods. Though there are many examples of advertising interventions in these sectors, discerning their impact is difficult. The specific design of interventions, the context in which they are introduced, and the broader policy mix they are part of varies significantly. Impacts also occur across different timescales (compare, for example, immediate consumption changes with gradual changes in social norms), and data is not always available to capture these different dynamics. This makes constructing reliable statistical tests of the efficacy of different advertising interventions challenging. Some of the efficacy literature has also been produced by authors with significant ties to the industries targeted by restrictions (see, e.g., Bartlett and McCambridge [10]).

Despite these difficulties, there is a growing research consensus on the efficacy of advertising bans, though less evidence for the efficacy of informational approaches such as labelling. This has been shown in several studies on the role of advertising restrictions as part of the wider policy mix that shifted societal norms away from cigarette smoking [11,12]. It has also been shown in a recent review of studies on food and beverage advertising to children [13]. This literature stresses that bans are most clearly effective when they cover all possible advertising and marketing channels, a conclusion reached by an earlier World Bank study on tobacco advertising [14]. Findings on the inefficacy of informational approaches alone, are consistent with the wider evidence on pro-environmental behaviour change [15].

2.1. Overview of current regulatory framework

In the UK, rules concerning the environmental impacts of advertising are largely developed and administered through the Advertising Standards Authority (ASA). Detailed rules are provided in the Advertising Codes, overseen by the Broadcast Committee of Advertising Practice (BCAP) in the case of broadcast (TV and radio) advertising, and the Committee of Advertising Practice (CAP) for all other types. These Committees consist of industry representatives, though the Office of Communications (Ofcom), the government regulator, retains the power to sign-off any major changes to the BCAP code. The ASA then works to monitor adverts and enforce these rules.

On environmental matters, there is a general requirement that "advertising must not encourage behaviour grossly prejudicial to the protection of the environment" [16]. There are specific rules on 'green claims', requiring a high level of substantiation for any claims to environmental standards. The ASA focuses on the content, targeting and placement of adverts. For example, the current Codes contain restrictions on placing adverts for HFSS foods near schools. Further

restrictions, such as advertising bans on specific products or services, requires legislation by parliament. For example, most forms of tobacco advertising are prohibited under the Tobacco Advertising and Promotion Act 2002.

2.2. Assessing public support

It is important to understand levels of public support for proposed measures. As described above, those within the industry may argue that they are an illegitimate target of excessive government intervention, given the right to free speech that all companies hold. Yet democratic governments need to balance this right against environmental or social aims, and levels of public support for any restrictions.

Evidence of public support for additional regulation of advertising for high-carbon products and services is relatively weak. The primary evidence comes from a small number of citizens' juries on climate issues that have recommended restrictions on advertising as part of a policy package to reduce carbon emissions. For example, the restrictions in France were originally recommended by a national climate assembly held in the country [17]. To our knowledge however, there has been no systematic attempt to assess public support for additional advertising regulations as part of the net zero transition in the UK context. It is this gap that our study seeks to fill.

2.3. Research aims and questions

Our study aims to provide a holistic account of public attitudes towards the introduction of additional advertising regulations on high-carbon products and services, as part of the UK's approach to reaching net zero emissions. The study is structured around two core research questions:

- Do the public support the principle of regulating advertising for the purposes of achieving net zero? And if so, why?
- What policies for regulating advertising for the purpose of achieving net zero have the greatest support and why?

3. Theoretical and methodological orientation

Recent years have seen an increased focus on the need to improve democratic cultures and processes, to respond effectively to the climate challenge [18,19]. Governments cannot act effectively without a democratic mandate from their electorate. Research consistently shows high and growing, levels of public concern about climate change; and support for government action to reduce GHG emissions. However, though this will not necessarily translate into support for specific measures or policies, and there is a risk of backlash if policies are implemented without debate [20,21]. There is therefore a need to enhance democratic debate and processes to understand and further build the democratic mandate for climate action [18]. This is particularly important when policy proposals mandate or encourage different behaviours, such as changing food choices or modes of travel.

These debates are informed by deliberative democratic theory, which argues that democracy should be understood as a dialogue between citizens and state, in which citizens are encouraged and empowered to participate in debates and decisions, through both informal and formal routes [22–24]. One formal route is the 'deliberative mini-public' (DMP). DMP is an umbrella term for a range of fora including Citizens' Assemblies and Citizens' Juries, which create a controlled space in which citizens can contribute to decision-making. DMPs generally share four features. First, they bring together a group of citizens who resemble the wider population, normally through random selection processes, often referred to as sortition. Second, they have a learning phase, in which participants are given information about the topic under discussion. Third, the participants deliberate, considering their own and each others' views and experiences; before, fourth, developing conclusions and recommendations [19].

In this way, DMPs can show what informed publics might think about a particular question, indicating how a wider public might think, were they exposed to the same information and debate. As such, DMPs differ from other processes such

as polls or focus groups, which capture current views from people who have not necessarily been through a process of learning or deliberation.

Recent years have seen a wave of DMPs on climate issues, many initiated by national or local governments, including national-level processes in 13 different countries, and over 150 at local level. Most of these have addressed the challenge of climate change as a whole, though there are examples of climate DMPs addressing specific issues such as housing retrofit [25,26]. DMPs have been used directly by decision making bodies and are also used as a research tool.

Though the small size of DMPs necessary to allow for the level of deliberation such bodies are prized for, it does raise several issues from both a research and democratic perspective. A core claim for a DMP is that the conclusions reached by the group should broadly match what any other group of the population, selected through the same approach, and provided with the same information, would reach if given the opportunity. Thus, what DMPs provide is 'informed' public preference, as opposed to 'raw' public preferences [26]. This is useful because it can predict how public attitudes may evolve as policy options are discussed in the public sphere and then implemented. DMPs can also ensure policies are politically palatable at the level of discourse and lived experience. However, the small number taking part poses several challenges. First, the small sample size means that attitudes might be subject to sampling bias, however much effort is made to recruit a representative sample. Outcomes may also be sensitive to the type of information presented and the way experts are integrated into deliberation [27,28]. Finally, from the point of view of a democratic mandate, many see it as illegitimate to empower small groups of citizens [23]. Thus, many political uses of DMPs have seen proposals put to the wider populus in the form of a referendum.

In the research field, research on public preferences can benefit from coupling DMPs with large-N approaches such as polling. Combining data sources gives a clearer picture of public attitudes toward policy interventions. Where both DMPs and polling suggest support for a policy, it can be assumed policy proposals will be popular both when they are announced, and also once people have had time to understand and reflect on them. Where there are differences in views, this suggests the broader public could have their minds changed on a policy if they are given time to consider and reflect on it. Discussions from within DMPs can help shed light on the type of information and frames that policy makers could use to increase support in areas where polling suggests 'raw' public opinion is not as supportive. Finally, polling data allows for statistical analysis of demographic and attitudinal factors. This information helps policy makers understand how different sections of the population are likely to respond to proposals.

Given these considerations, we opted to collect data through a citizens' jury, and then use the jury findings to inform the design of a larger public attitudes poll. Both processes were granted ethical approval by the ethical committee of the two authors host institution.

3.1. Ethics statement

This study received ethical approval from the Faculty of Science and Technology Research Ethics Committee of Lancaster University.

3.2. Jury: Data collection and analysis

The citizens' jury was made up of 25 people selected to be broadly representative of the UK, in terms of gender, age, ethnicity, disability status, educational attainment, level of concern about climate change and political affiliation (see S1 Text for further information about recruitment and S1 Table for full demographics of final sample). The sample did however skew urban, as we failed to recruit participants from rural areas. To minimise travel times for participants, all were also recruited from the greater Manchester area. Participants were recruited between 14th and the 31st August 2023 via the Sortition Foundation. Prior to taking part, all participants gave their written informed consent. All participants were paid for their time. We also convened an advisory board consisting of academics, civil servants,

advertising industry representatives and advertising reform campaigners. The jury was overseen by an independent evaluator who observed the meetings of both the steering group and the jury, and provided ongoing advice to the project team.

The jury met five times over three months in 2023. In sessions one to three, participants learned about the relationship between advertising, consumption and greenhouse gas emissions, with speakers from government advisers, industry and campaign groups. Given the contentious evidence regarding the impact of advertising on consumption, and the efficacy of different interventions, panellists heard from two different speakers on each of these issues. One representing the position of the advertising section, and the other representing the position of pro-regulation civil society organisations. These speakers were asked to explain who they worked for when introducing their evidence, and panellists were told they would be hearing different perspectives on these issues. Sessions four and five focused on developing and refining proposals for managing the advertising of high-carbon products and services. Three proposals were developed, as reported in the results below. Following the final session, participants were sent a voting booklet for them to express their individual opinions on the proposals. The booklet used a three-tier rating system that was also adopted throughout the jury: 'I support this', 'I could live with this', 'I don't support this'. This booklet included additional questions related to the administration of the proposals.

All jury sessions were audio-recorded, transcribed and coded using Nvivo. We adopted a form of thematic content analysis informed by Thomas' general inductive approach to the analysis of qualitative data (see Thomas [29]). Transcripts were analysed with the two research questions in mind. A first round of coding was done inductively to identify key themes related both to the general principle of regulating advertising in the context of net zero, and views on the specific proposals discussed in the jury. Each of the authors coded a sample of transcripts independently, to develop two initial codebooks. These were compared, and differences discussed to compile a final codebook used for the rest of the analysis. Following this, all material was divided between the researchers and coded in full using the final codebook. From this, a smaller number of key themes were derived. These themes are reported in full elsewhere and are used here to help inform the narrative part of the results section [30].

The jury thus yielded four sources of data:

- The specific proposals as proposed and developed by the jury (J1)
- The level of support for different proposals expressed through the final voting booklets (J2)
- Themes derived via coding related to the general principle of regulating advertising for achieving net zero (J3)
- Themes derived via coding related to the specific proposals developed by the jury (J4)

3.3. Polling: data collection and analysis

Following the jury, we tested the proposals through a poll of a nationally representative sample of approximately 2000 (n = 1939 following data cleaning) adults from Great Britain. The survey was conducted between 8th and 10th May, 2024 and administered by Yonder Data Solutions. All participants had given their written informed consent to take part in the survey. We considered proposal three to have two distinct elements and so separated these in the polling (details below). We also included two further options: 'do nothing', and a category ban. These options were discussed by the jury, but not included in their final proposals. Respondents were not told about the citizens' jury and were told only that the data was being collected for a university research project.

For each proposal, respondents were asked to express both their support for the proposal, and their belief that the proposal would 'help reduce consumption of high-carbon products and services' (henceforth referred to as 'efficacy belief'). Scores were given on a 11-point scale, from zero (strongly disagree) to ten (strongly agree), with five representing a

neutral centre point. Data were also collected on levels of concern about climate change, attitudes towards the advertising sector, and political worldview; alongside a range of demographic data including age; gender; educational attainment; and social class. Data were collected in the week of 6 May 2024 by a third-party consultancy as part of their standard omnibus survey.

An initial visual inspection of proposal support data revealed several apparent distinct patterns being used by respondents. A lot of the difference in responses to specific proposals seemed to derive from the respondent's overall disposition towards regulating advertising for net zero; with less attention being paid to the specifics of each proposal. We thus understood these patterns as indicative of respondents' disposition toward the principle of additional regulation, though they also provided insights into support for specific proposals. Our approach to identifying demographic determinants of support therefore centred on understanding these different patterns in the first instance. We used cluster analysis to help identify different answering patterns. Cluster analysis uses an algorithm to identify groups of similar sets of data points within a wider data set. In this case, we used it to identify different groups of poll respondents who share distinct types of answer to the questions. The algorithm identifies clusters with the smallest level of difference between responses, within that group (further information about our approach to cluster analysis is provided in S2 Text).

Following identification of clusters, we used chi-squared tests to identify significant demographic and attitudinal markers for each cluster. That is, within-cluster frequency of responses for each marker were compared with the frequency observed in the full sample. Markers tested were: gender, age, education level, social class, political worldview, level of concern about climate change, and attitudes towards the advertising sector. Factor analysis was also used to convert the battery of questions regarding attitudes to the advertising industry into two factor scores for each respondent. Statements expressing a negative sentiment loaded onto one factor, statements expressing a positive sentiment loaded onto another (see S3 Text for all relevant polling questions and S4 Text for information about treatment of the data).

The final step of the analysis focused on understanding differences in support between the proposals, using an ordinal regression model to control for the clusters. We hypothesized that belief in the efficacy of the proposal is the most likely determinant for explaining differences in support between proposals not captured by the clusters. For each proposal, we fit a model initially with just clusters as an explanatory variable. We then added the measure of 'efficacy belief', that is, how effective the respondents believed these measures would be (all models were ordinal logistic regressions run in the 'ordinal' package in R). For each proposal, the'just clusters' and 'cluster + efficacy belief' models were compared to understand how well they fit the underlying data (comparison was done using an ANOVA test, and the level of variance explained by each was estimated using Nagelkerke's pseudo-R^2). Thus we were testing whether and how people formed views on the proposals based on whether they believed they would be effective. For ease of interpretation of findings, we transposed the 11-point scale for support and efficacy into a five-point scale for the sake of the regression analysis using the following divisions: 0–2 = 1; 3–4 = 2; 5 = 3; 6–7 = 4; 8–10 = 5.

The polling thus yielded four sources of data:

- Clusters of general respondent types (P1)
- Demographic and attitudinal markers for clusters (P2)
- Levels of support for specific proposals (P3)
- Impact of efficacy beliefs on support for specific proposals (P4)

The results are presented in narrative form, however, for clarity, Table 1 shows which data sources were used to address each question. All statistical analysis was conducted in R version 4.4.1 [31].

Table 1. Research questions and the data sources used to answer each.

Research question	Data
Do the public support the principle of regulating advertising for the purposes of achieving net zero? And if so, why?	J1, J3, P1, P2
What policies for regulating advertising for the purpose of achieving net zero have the greatest support and why?	J1, J2, J4, P3, P4

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4. Results

4.1. Q1. Do the public support the principle of additional regulation of advertising for the purposes of achieving net zero? And if so, why?

4.1.1. Strong evidence of support for the principle of additional regulation. Both data sets reveal solid support for additional regulation of advertising as part of the transition to net zero. All but one of the jury members wanted further measures to be introduced, going beyond the current position (described in section 2.1 above). They also developed three proposals for how advertising could be further regulated to address the need to reach net zero (see Table 2).

These proposals formed the basis of the polling, though with three amendments. As discussed in the methods section, the 'child restrictions' proposal was deemed to have two elements which were split for the polling. Respondents were asked separately about subsidies for advertising of second-hand shops and refurbished goods (subsequently: 'subsidies'). The options for a 'ban' and to 'do nothing' were also added in to the polling.

In the polling, all proposals for change except the ban received at least 60% support (6–10 Likert scores), and all except the ban had at least 30% strong support (8–10 Likert scores) (see Fig 1*)*. Asked whether the current system of regulation needed to change, 15% of poll respondents strongly supported 'no change', compared to 29% who strongly opposed it. Overall, therefore, there is public support for additional regulation governing advertising of high-carbon products and services. Further results report just on the proposals for brevity, as the 'no change' responses correlated very closely with those with lowest support for proposals and so provided no additional insight.

4.1.2. Desire for information about low carbon consumption and distrust in advertising sector drive desire for additional regulation. Analysis of discussions from the citizens' jury points to several reasons why people support restriction of advertising. First, they want better education and information about climate change, and see regulations, particularly the labelling of adverts, as a way of achieving this. As one member explained,

Table 2. Details of proposals developed by the jury.

Proposal	Description
A traffic light labelling system showing the true carbon emissions of a product or service (subsequently: 'Labelling')	Adverts for products and services would carry a red, amber or green label reflecting their true lifecycle emissions. Where the advert type allows, a link would be included for people to find out more about the environmental impact of the product or service. The system would be launched with a public information campaign to educate members of the public about how the system worked and what the colours represented.
A levy or charge on advertising high-carbon products and services, with revenue reinvested into green initiatives (subsequently: 'Levy')	A charge would be levied against advertising high-carbon products and services, following the traffic light labelling system. High-carbon products and services would be in the red category, so they would pay a higher charge than amber or green rated products and services. Revenues generated would go into grants to support green initiatives.
Restrict advertising of high-carbon products and services to children (subsequently: 'Child restrictions')	Advertising high-carbon products and services to children would be restricted, particularly on social media and through influencers. Social media companies would be held responsible and could be fined. There would also be ways of encouraging people to buy less, such as subsidies for advertising of second-hand shops and refurbished goods.

https://doi.org/10.1371/journal.pclm.0000599.t002

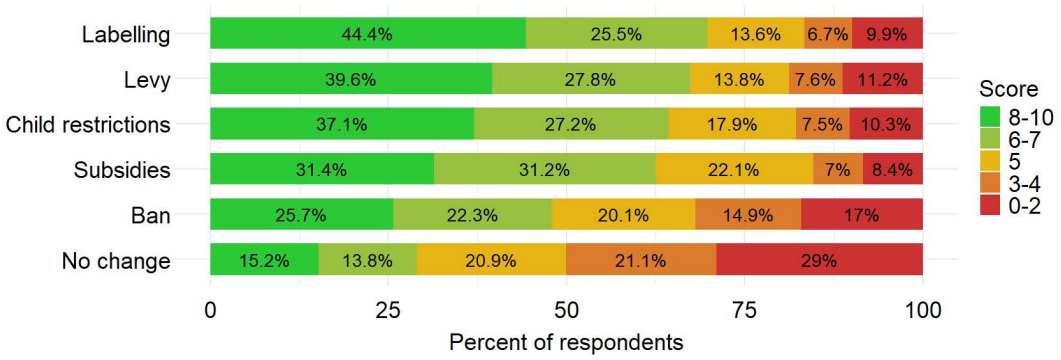

Fig 1. Polling results: Levels of support for each proposal (See S3 Text for exact question wording for each proposal).

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"While involved in the jury, I've become more aware of climate change, and I find a lot of people don't know a lot about it. I think it would be a good idea, before the adverts come on, to show the effects of climate change in this country."

Second, there are low levels of trust in both business and government, and specifically a cynicism toward advertising and green claims in particular, leading to calls for an independent body to oversee any restrictions:

"I think government and companies are joint together […] The large conglomerates, corporate companies, shareholders are mainly for the rich, and those that are in government."

Third, a key theme of Jury discussions was a concern about children's wellbeing, and their consumption of social media. This led to them wanting to control advertising as a way of protecting children. Last, some Jury members said they wanted restrictions because there was a need to tackle 'excessive' consumption, and instead to promote reuse and refurbishment of products. This was not a majority view, but was a key theme in discussions. These reasons that jury members put forward for restricting advertising are analysed in more detail in the sections below, when individual measures are discussed.

4.1.3. Advertising regulation alone is not seen as sufficient for driving low carbon consumption. Though people wanted advertising to be managed, jury members had relatively modest expectations about its likely impact. In their view, people's ability to choose certain products or services is limited by cost or availability, and wider cultural norms. Instead, they saw advertising restrictions as part of a wider strategy to tackle climate change and engage people. Belief in the efficacy of individual proposals was relatively high in the polling (see Fig 2). However, efficacy belief correlated closely with support for proposals. Intuitively, it is unlikely a respondent would support a proposal they do not believe is effective. However, they may not support a proposal they believe to be effective, for example if they believe it to be overly restrictive. We therefore opted not to analyse efficacy belief data at the proposal level until overall answering strategies were controlled for.

4.1.4. Climate concern, advertising disposition, political worldviews, gender and age significantly affect attitude to general principle of regulating advertising of high-carbon products and services. As described above, five clusters of response were identified in the polling data. These clusters appeared well defined, in that they explained two-thirds of the overall variance in the data.

One cluster had consistently low scores across the proposals (the 'Object' cluster; 10.16% of the sample); another gave mostly neutral scores, though with the 'Ban' having the lowest mean score ('Neutral'; 23.16% of sample); another gave broadly supportive scores across the board ('Moderate'; 23.26% of sample); and another gave consistently high scores ('Support'; 24.19% of sample). A fifth cluster was characterised by high scores for all proposals except for the ban,

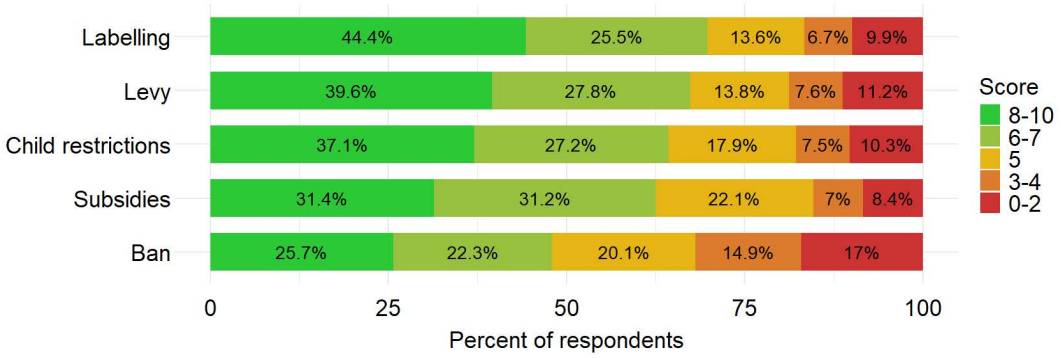

Fig 2. Levels of agreement in poll responses with the statement: "Introducing this measure would help reduce consumption of high-carbon products and services".

https://doi.org/10.1371/journal.pclm.0000599.g002

which had a mean below the neutral point ('Support all except ban'; 12.24% of sample). See Table 3 for full breakdown of within-cluster mean responses for each proposal.

Table 4 reports on significant markers for respondents in each cluster as revealed by the chi-squared tests. The Object cluster are characterized by being more likely to be older, male, right wing and being unconcerned about climate change. Those supportive across the board ('Support' cluster) are more likely to be female, left wing, and to be concerned with climate change. A key marker that distinguishes this group from the 'Support all except ban' cluster is disposition towards advertising. Only the Support cluster has a significantly more negative view of advertising than the full sample; though it should be noted that the overall sample tended towards having a negative view of advertising. Social class and educational attainment were not significant in any test.

Looking at the picture overall, some patterns emerge. Only a relatively small percentage actively oppose restrictions, and this group have particular demographic characteristics, being more likely to be male, over 60 and right wing politically. The rest of the sample is either neutral or supportive of restrictions. Broadly, those with left of centre political views are more likely to strongly support restrictions, and women are slightly more likely than men to support restrictions. The jury member opposed to restrictions expressed their view in the following terms:

> "*I don't want any change in advertising. I don't want people dictating what I can and can't do[….] How much of our lives is the government going to control? A lot of information in relation to green issues is now being contradicted by other experts saying we won't get to net zero by 2050, it's an impossibility. And, even if we do, the cost is absolutely staggering.*"

Table 3. The name, percentage of respondents and mean proposal support scores for each cluster.

Cluster name	% respondents	Mean scores				
		Ban	Labelling	Levy	Child Rest.	Subsidies
Object	10.16	0.7	1.5	1.2	1.4	2.4
Neutral	23.16	3.7	5.2	4.8	4.9	5.3
Moderate	23.26	6.9	6.5	6.7	6.8	6.0
Support all except ban	19.24	4.2	8.3	7.5	7.0	7.0
Support	24.19	8.7	9.1	9.1	9.0	8.2

https://doi.org/10.1371/journal.pclm.0000599.t003

Table 4. Demographic and attitudinal markers for each cluster.

Cluster	Demographics	Confidence level
Object	Less likely to be concerned about climate change	$p < 0.005$
	More likely to be older (>60)	$p < 0.005$
	More likely male	$p < 0.05$
	More likely right wing	$p < 0.005$
	Less likely to have a negative view of advertising	$p < 0.005$
Neutral	Less likely to be concerned about climate change	$p < 0.005$
	Less likely to be left wing	$p < 0.05$
	Less likely to have a negative view of advertising	$p < 0.005$
Moderate support	More likely to be concerned about climate change	$p < 0.005$
	More likely to be younger	$p < 0.05$
	Less likely to have a negative view of advertising	$p < 0.005$
Support all except ban	More likely to be concerned about climate change	$p < 0.005$
	More likely to be left wing	$p < 0.05$
Support	More likely to be concerned about climate change	$p < 0.005$
	More likely to be female	$p < 0.05$
	More likely to be left wing	$p < 0.005$
	More likely to have a negative view of advertising	$0 < 0.005$

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In the discussion section, we comment on the implications of these demographic differences for policy, discussing the importance of the 'Neutral' and 'Moderate support' groupings in policy formulation.

4.2. Q2. What policies for regulating advertising for the purpose of achieving net zero have the greatest support and why?

4.2.1. Labelling is the most popular policy, and a ban is the least popular. The next phase of analysis focused on understanding support for specific proposals. Fig 3 shows support in the final phase of voting from the citizen's jury. Fig 1 above presents the same information for the polling. In both cases, a labelling system gains the highest level of support, followed by a subsidy scheme. A ban is considered the least popular option in the polling, and was not selected specifically for consideration by the jury, suggesting a lower level of support.

4.2.2. A large amount of support for specific proposals is explained by disposition toward the principle of regulating advertising of high-carbon products and services. Table 5 presents the percentage of variance (Nagelkerke's pseudo-R^2) in responses to specific proposals explained with the basic OLR model with just 'clusters' as an independent variable. Clusters were treated as unordered categorical independent variables in these models, with the 'Object' cluster used as a base for comparison. For each proposal except subsidies, over half the variance in levels of support could be explained in a model just including clusters. The clusters have the greatest explanatory power for the ban, with approximately 72% of variance in support explained by belonging to a particular cluster.

4.2.3. Efficacy belief is a significant factor explaining belief for all proposals, though labelling and subsidy support is especially sensitive to efficacy belief, and bans least so. The original models were then extended to include perceived efficacy of the proposal. We assume that controlling for clusters in this way allows for a more accurate assessment of the genuine effect of efficacy belief on levels of support (more on this in discussion). In Table 6, we show the confidence level and odds ratio associated with efficacy for each proposal, as well as the overall fit of the model. In all cases adding efficacy significantly improved the overall fit of the model.

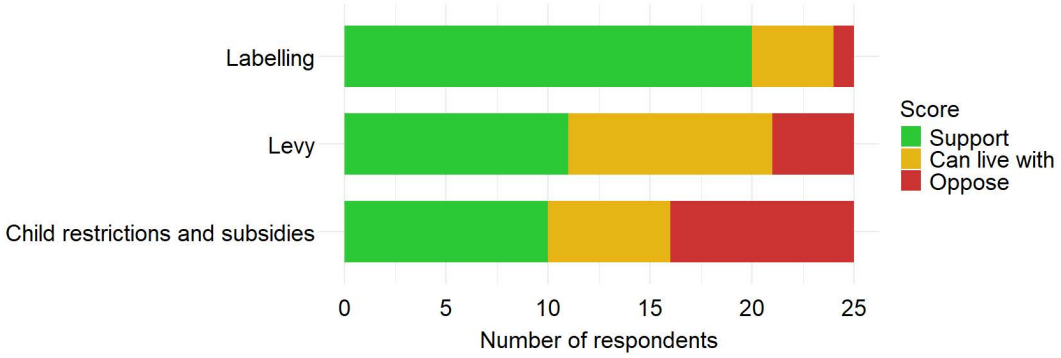

Fig 3. Results of final voting on proposals by jury members.

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Table 5. approximation of percentage of variance in support for each proposal explained by clusters. Calculated using Nagelkerke's pseudo-R^2.

Proposal	Percentage of variance
Ban	72%
Labelling	61%
Levy	64%
Child restrictions	59%
Subsidies	45%

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As Table 6 shows, the 'clusters + efficacy belief' model provides a good fit for all proposals. In other words, people's support for different proposals can generally be seen as dependent both on their views on the desirability of managing advertising (i.e., which cluster the respondent falls into) and on whether they believe each proposal would or would not be effective. However, the role of efficacy is lowest for the bans. People are less likely to use efficacy as a criterion for judging bans compared to other proposals. Once clusters are controlled for, giving a higher category of answer regarding efficacy makes participants only 12 times more likely to give a higher level of support, compared to 154 time more likely for labels and 286 times more likely for subsidies for reuse and refurbishment companies. The fit of the model for the subsidies proposal is also the most improved from the inclusion of efficacy ($R^2 = 0.45$ to $R^2 = 0.67$), though is still the worst fitting of the models. In other words, shifting someone's efficacy belief about the labelling system or a subsidy regime is much more likely to change their level of support for this proposal, as compared to the other proposals.

Table 6. The impact of efficacy on likelihood of higher support for each proposal (odds ratio) and overall fit of the model (percentage of variance).

Proposal	Confidence level	Odds ratio of efficacy	Percentage of variance
Ban	$p < 0.005$	11.85	76%
Labelling	$p < 0.005$	153.58	73%
Levy	$p < 0.005$	54.00	72%
Child restrictions	$p < 0.005$	42.75	68%
Subsidies	$p < 0.005$	285.96	67%

https://doi.org/10.1371/journal.pclm.0000599.t006

4.2.4. Deeper exploration of most and least popular proposals. Full data on each of the jury proposals is published elsewhere [30]. Here, we report on the most and least popular proposals. We discuss attitudes towards a ban because, as discussed in section 2, evidence from other areas including tobacco and unhealthy foods suggests that bans are an effective means of shifting consumption patterns, as part of a wider strategy.

Labelling. As the table shows, the labelling proposal had significant support. Jury discussions revealed that they supported labelling because they wanted impartial information about carbon emissions. They said the labelling system would be a simple way of understanding impacts, drawing parallels with health labels on food packaging; ensuring consumers could make informed choices.

> *"…it's like a universal language […] the carbon footprint for some products is almost untraceable. But a pro of this idea, is that it would be universally understood."*

Participants thought the labelling system should be accompanied by a public information campaign, and an online portal where people could explore further information about the carbon emissions associated with purchases, especially for significant purchases like a car.

Labelling was also seen as a way to encourage innovation, because participants believed that companies would not want their products to have a red label and would, therefore, innovate to bring down emissions.

> *"…[the labelling system] can influence healthy competition between competitors […] [this] influences organisations to naturally become greener, and generate healthy competition as a result."*

There was a strong view that the labelling process would need to be managed by a body independent of both government and industry, and given the lack of trust expressed in companies, people were also worried that companies would find ways to circumvent the system. Some worried that the labels would be ignored, or would only work as part of a wider package of measures. One Jury member opposed the proposal for this reason:

> *"I don't think it would work. At the end of the day, if people can't afford to buy green, they won't. I get the idea… but, like food labels, do I listen? No, I have cake."*

In the polling, support for labelling was consistent with within-cluster support for other proposals. However, it was particularly popular within the 'Support all except ban' cluster (see Table 3). This cluster is characterised by being concerned about climate change, but not having as negative attitudes towards the advertising sector as the 'Support' group. Finally, support for labelling was second most sensitive to efficacy belief, after the subsidy proposal.

Ban on advertisements of high-carbon products and services. The option of an advertising ban was not a proposal that the Jury chose to work on in detail. However, they did discuss it. Some participants in the Jury advocated a ban, with one saying, for example,

> *"Drastic action should be taken. We should be banning the advertising of high-carbon products, there should be more education and promotion of positive environmental choices".*

Only one participant, however, wanted to discuss the option for a ban in more detail. Participants said that they saw advertising as an opportunity to educate and inform people, and therefore supported labelling instead of a ban.

In the polling data, the ban was noticeably less supported than other measures, though it did still receive majority support, with 48% supporting (6–10 score) and 32% opposing (0–4 score); 20% were neutral. As shown in Table 3, there was a cluster of poll respondents who supported all measures except a ban. We discuss possible reasons for this in the discussion section below.

5. Discussion and implications for policy

This study shows that there is strong public support for the principle of additional regulation on advertising, as part of a wider climate strategy. It therefore signals to policymakers that they could build a mandate for such action should they wish to. This is an important finding. However, there appear to be some differences between public preferences and technical analysis. As discussed in the introduction, expert consensus from study of other issues such as tobacco and food suggests that advertising bans are more effective than labelling, as part of wider initiatives to influence consumption and reduce emissions. However, bans had weaker support than other measures in our study. Here, we extrapolate from our results to discuss three important implications of our study for policy development, which may have wider relevance beyond the management of advertising. First, we look at specific demographic differences, and how policies could work for those who express neutral or weakly supportive views. We look in particular at why bans receive less support from these groups than other proposals. We then look at the complex relationship between views on efficacy, and overall support for proposed measures. Finally, we suggest wider lessons for building a democratic mandate for climate action.

5.1. The importance of neutral or weak supporters

Our cluster analysis identified five clusters, with notably different demographics, expressing different views on advertising restrictions (see Table 3). Our data from both the Jury and polling suggests that two of these groups – the 'Object' and 'Support' cluster – assess any proposal through a predisposition to reject or accept it. It is likely that this is linked to their underlying beliefs in the urgency of climate change, their views of the advertising sector, and their political worldview. In other words, opponents will oppose; strong supporters will offer their backing on a relatively unconditional basis. This accords with other research into climate concern and policy preferences, that for some groups, underlying worldviews predominate over consideration of specific policy design [32,33]. If these clusters have relatively fixed positions, then policy design and strategic communication and framing should arguably be most focussed on the remaining three clusters [20,34].

For the 'Neutral' and 'Moderate support cluster', our polling data shows that these groups are more likely to have weaker levels of climate concern and weaker political affiliation. Citizens' Jury participants also expressed near constant concerns about the trustworthiness of government and business. Taken together, this suggests that a focus on efficacy and the practical benefits of measures may be crucial to broadening support to these clusters. However, the relationship between perceived efficacy and support for proposed measures is complex, as we discuss below.

Also highly relevant for strategic communications regarding advertising bans is the 'Support all except ban' cluster. The key factor that distinguished this group from the 'Support all' cluster was that they had a relatively more positive view of the advertising sector. This suggests that focusing on perceptions of the advertising industry may be a more effective communication strategy for this cluster than directly promoting the idea of a ban on adverts for high-carbon products and services.

5.2. Perceptions of efficacy and impact on levels of support

The polling data showed a strong correlation between perceptions of efficacy, and support for measures to restrict advertising. Put simply, the most reliable predictor of whether people supported a measure was whether they thought it would be effective. Citizens' Jury discussions suggested a similar link. For example, many in the Jury expressed a view that increased information and transparency could change consumption habits and the traffic light system was the most popular proposal. For the least popular proposal, there was significant disagreement regarding whether influencing the information children received would significantly influence consumption levels. Some viewed children as a major influence on parents' attitudes and behaviours, whilst others felt their influence was negligible.

However, this correlation could be explained in two different ways, one more instrumental, the other more ideological. An instrumental position would be one in which people actively consider the efficacy of proposed measures, with their

support conditional on being convinced that the measure will work. They apply an 'efficacy test': "I will support this proposal if I am convinced it works well". Alternatively, it could be that they already have an opinion about the measure in question, such as a ban or labelling scheme, without much regard to its efficacy. They justify this position with reference to efficacy: "I support/oppose this proposal, therefore I will argue that it works well/badly". This could be seen as a form of motivated reasoning, in which people place a judgement of efficacy on a measure which they support or oppose, but this is primarily a way of justifying their viewpoint.

We attempted to tease apart these two different mechanisms linking support with efficacy belief by controlling for clusters. This analysis suggested that there is an element of instrumental rationale in people's support for all proposals. This is consistent with other research that has shown that information about efficacy can influence public support for climate mitigation policies [35]. However, this is most important for the labelling and subsidies proposals. Particularly for these policies, policy support could be built by assuring people of the efficacy of proposals, such as setting out a clear evidence base for the policy; involving independent advisors in its development; and involving citizens and interest groups in the policy development process. The context of high levels of distrust in government is important here; transparency and a focus on evidence is a necessary ingredient in overcoming distrust.

5.3. Bans may be effective, but they are the least popular measure

Evidence from other sectors such as food and tobacco, suggests that bans are more effective than labelling as a policy tool. Yet in this study, there was more support for labelling and other interventions, than a ban. Bans were only popular amongst those who already held more-negative-than-average views of the advertising industry, possibly correlating with those in the jury expressing discontent with what they see as an overly consumerist society. Such worldviews are unlikely to shift radically over time, suggesting difficulty in building strong support for an advertising ban. It should however be noted that the 'Moderate support' cluster did not significantly differentiate between a ban and other proposals. This suggests at least moderate support for a ban is achievable in the absence of especially negative views about the advertising sector.

Still, the fact remains that the ban is currently the least popular option, but most likely to shift consumption patterns. How then should politicians or policymakers proceed when expert evidence and public views diverge? This is a perennial political dilemma: should representatives lead or follow their electorate? In this case, a number of potential options suggest themselves, in order of decreasing risk of backlash. The first is to accept that a ban will not be supported, and rule it out. The second is to begin with the options for which there is solid support, such as labelling of advertisements, in order to build support for a ban. The third is to introduce a ban, with careful justification and engagement, in the expectation that support will grow. Evidence from other policy areas such as congestion charging suggests that initially unpopular measures can gain support following their introduction, as people come to understand the benefits [36]. With previous advertising restrictions, particularly tobacco, a gradual approach paid dividends. However, for climate, rapid emissions reductions are necessary, meaning that a speedier, more risky option might be more appealing to policymakers.

5.4. Lessons for climate policy more generally: Building a mandate

The case of advertising restrictions illustrates a wider dilemma for climate policy. Research shows consistently that concern about climate change is high, and people are looking to government to lead. However, this general support may not translate into support for specific policies, such as an advertising ban. There is also evidence in other sectors of an 'ambition gap' between what publics support, and what is needed to adhere to the increasingly sharp decarbonisation trajectories consistent with legislated targets [37].

This points to the crucial role of political leadership. Political leaders cannot achieve climate targets simply by calibrating their policies to be politically popular, they must do the difficult political work of building a mandate for policies

people may not immediately support. There is a growing body of literature, which this paper contributes to, showing how this can be done: by understanding motivations for attitudes towards different policies and adjusting framings accordingly; by ensuring policies are designed for and with people such that concerns about fairness, cost, and accessibility are addressed; and in some cases accepting a small amount of political discontent by introducing unpopular policies where evidence suggests that support will build as policies take effect [36]. This sequencing issue is especially important, as people are more likely to accept ambitious climate policies if they have seen material benefits from previous smaller interventions [38].

More broadly, political trust in leaders and institutions is important if the public is to accept significant policy changes [39]. Efforts to rebuild trust in the policy process are crucial for building a mandate for additional climate policy action. Evidence suggests that participatory policy approaches, such as DMPs, can be part of rebuilding that trust [40, 41]. However, for this to be the case, such processes must be designed to ensure genuine citizen empowerment and responsiveness from decision makers. If processes such as DMPs are used simply as 'participation washing', this can further embed feelings of distrust. With regards advertising, our research suggests rebuilding trust would require governance reforms to ensure regulation of the sector is fully independent of industry and at arm's length from government. This fits with other research suggesting many citizens are concerned about the influence of the private sector on climate-related policy and regulation [39].

5.5. Limitations

We believe our research contributes to understanding public support for an area of climate policy that has thus far received insufficient attention. However, there are several limitations to our approach and areas that merit further investigation.

First, though we aimed to recruit the Jury to be broadly representative of the UK, we were not able to do this with regards geography. For practical reasons, all our participants were recruited from the Greater Manchester area. Partially because of this, we failed to recruit any participants with a rural postcode. This exacerbates the issues of sampling bias discussed in section 3. It is possible that a Jury recruited from a different geographical area would develop different proposals to those we went on to test with a larger sample. For example, more rural participants may hold significantly different views due to increased reliance on high-carbon forms of transport or decreased exposure to non-digital forms of advertising. However, recommendations of the Jury were not product type specific (i.e., they did not specifically target forms of transport) and the pattern of support for proposals in the Jury broadly matched the larger sample. Furthermore, our core findings regarding the desire for greater regulation and the relative unpopularity of the ban are not dependent on the issue of exactly which policies the Jury developed. They are therefore likely robust to this limitation. We do however see the need for additional in-depth qualitative research on this issue. Such work could help local authorities who in many cases are at the forefront of considering and designing measures to limit advertising for high-carbon products and services.

Second, survey responses regarding hypothetical policy options can vary from actual policy preferences once measures are introduced. There is thus a need for more experimental research that looks at policy preferences in areas where bans and other forms of advertising restrictions have been introduced. Again, local authority areas would make valuable 'laboratories' for such work.

Third, we worked separately to develop an initial codebook from the same sub-set of the material from the Jury. We then had an extensive discussion to compare codebooks and agree a final set of codes. This enabled us to check consistency between authors with regards which codes emerged. However, neither here nor once full coding was completed, did we conduct a test for inter-coder reliability.

Finally, additional time in the Jury to discuss the potential efficacy of the proposals would have been valuable. Though Jury members received some information on this earlier in the process, it was a relatively small element of the information

provided. A further round of iterating their proposals, once receiving additional expert information about their potential efficacy, would have helped ensure the final package of measures was suited to delivering the outcomes that many jury members hoped to see.

6. Conclusion

This study has demonstrated that there is a high level of support for additional regulation on the advertising of high-carbon products and services. This support is highest for informational approaches such as labelling, and lowest, though still a majority, for bans. This suggests there is the potential for political leaders to explore policy in this area to a greater extent than they are currently. Our research suggests these measures could be a popular part of a wider strategy that also addresses structural factors such as cost and accessibility. Given the radical change in social attitudes towards smoking in recent decades, it is possible such measures could also help to shift social norms away from high-carbon consumption in the longer term.

Supporting information

S1 Text. Details of jury recruitment.
(PDF)

S1 Table. Demographics of citizens' jury.
(PDF)

S2 Text. Details of cluster analysis for identifying poll answering patterns.
(PDF)

S3 Text. Polling questions.
(PDF)

S4 Text. Treatment of polling data prior to analysis.
(PDF)

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