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INFORMING PUBLIC HEALTH MESSAGING ON HEALTH AND CLIMATE CHANGE

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Front cover design

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At a glance

What we found out. The majority (over 75%) of adults are concerned about climate change. Three in ten (31%) included health impacts among their major concerns about climate change.

However, a larger proportion identified other impacts of climate change among their major concerns, including its impacts on the resources on which everyone relies like food and water (49%) and on animals and nature (46%). When asked about their single most important concern about climate change, the largest proportion (24%) selected essential resources. This was followed by 'animals and nature' (17%) and 'children' (17%). 'Health and wellbeing' was selected by 11% of survey participants. Framing the impacts of climate change in personal terms (on 'my own health and wellbeing') did not increase the proportion identifying health as an important concern or as their most important concern.

When we asked – in a separate survey – about what climate policies should focus on, a similar picture emerged. The majority selected essential resources as the single most important focus for policy, and 74% included resources in their top three priorities for policy. This was followed by animals and nature, health and wellbeing, and children. We also found that emphasising positive outcomes (e.g., stronger climate policies will mean people's health will be better in future) elicited much higher levels of support than warning of negative outcomes (without stronger policies, people's health will be worse in future). This pattern was consistent across all the different policy foci: for each one, a positive spin was preferred over a negative spin.

A separate survey established that the public prefers action to address the impacts of climate change over not taking action, regardless of whether its focus is on health or on other impacts. This survey again pointed to a preference for climate policies focused on protecting 'the resources (e.g., food and water) we all rely on', a focus that was preferred over one focused on 'people's health and wellbeing'.

Why we did this study. Climate change is an increasing risk to public health in the UK. Highlighting its health impacts is seen as a way of harnessing public concern about climate change. However, evidence on whether the public is particularly concerned about the health dimensions of climate change is limited. We did the study to help fill this gap. We also investigated whether a focus on health was associated with greater support for climate policies.

What we did. We developed a community-based approach to public involvement which ran throughout the project. Together with a set of preparatory studies (including an analysis of social media engagement with health and climate change), we undertook three surveys (Oct 2023-Apr 2024). The surveys were representative of the UK population, with an overall sample of 3380 adults aged ≥18.

What are the implications? Public engagement in climate change and support for climate polices are a prerequisite for effective action on climate change. Our study suggests that a health focus may not be the most effective way of engaging the public in climate change and increasing public support for climate action. It points, instead, to the need for a broader focus that includes the basic determinants of health, like food and water, and the natural environment that provides them.

Executive summary

Background

Climate change is an increasing risk to public health in the UK, a risk that will increase over our lifetime and across generations. Our future health - and the health of children and future generations in particular – depends on action taken in the next decade.

Effective action requires the engagement and support of the public. Public engagement in climate change depends on how the issues are presented. Similarly, public support for climate policies is likely to be influenced by multiple aspects of the policy design, including its focus.

Highlighting the health impacts of climate change is seen as a way of increasing its 'issue salience' (how important an individual considers the issue to be) and therefore helping to build public support for policies. However, UK evidence on whether the public is particularly concerned about the health dimensions of climate change is limited. Similarly, little is known about whether a focus on health and wellbeing would increase public support for climate action. Our project addresses these gaps.

Aims

Focusing on adults in the UK, the aims of the project are:

to provide evidence on the importance of a focus on health with respect to:

(i) people's concerns about climate change
(ii) people's support for climate policies

Methods

The project was supported by an innovative programme of community-based public involvement and a set of preparatory studies.

The preparatory studies included new analyses of qualitative data collected in a survey conducted as part of our earlier PH-PRU project. In this survey (n=1021), we asked participants to record in their own words, 'what comes to mind when you think of climate change?'. Our preparatory work also included a study of coverage of health and climate change on Twitter (now *X*) in March-May 2023. Additionally, we conducted a scoping review of studies employing discrete choice experiments (DCE), a method we used in one of our surveys.

We then conducted three surveys of UK adults aged ≥18 years. Quotas were set to match the UK population for age group, gender, ethnic group, educational attainment, and region/country of residence.

The surveys were designed by the project team and participants were recruited via the Qualtrics survey platform. A double-consent process was used: agreeing to being enrolled on the survey platform and then giving consent to participate in one of our surveys. The surveys were approved by the Department of Health Sciences' Research Governance Committee.

The surveys addressed the two aims of the project. They investigated the importance of a focus on health with respect to (i) people's concerns about climate change (one survey, Oct-Nov 2023, n=2009) and people's support for climate policies (two surveys, Jan 2024, n=365, and Feb-Apr 2024, n=1006).

The first survey invited participants to share their views on the importance of different concerns they may have about climate change.

The second and third surveys invited participants to share their views on what they would like climate policies to focus on. The list of potential foci included the six issues identified by participants in the first survey as the ones about which they were most concerned.

Findings

Our project provides evidence on whether people's health is among the public's major concerns about climate change.

Our preparatory studies suggest the answer is no. In our qualitative analysis of an earlier survey (n=1021), only one participant mentioned health when asked *'what comes to mind when you think about climate change?'*. Only 2% of the 668,810 Twitter posts on climate change referred to health.

In our 2023 survey of climate change concerns (n=2009), we again found that health had low issue salience: it was considered less important than other impacts of climate change.

> *While 31% of participants selected health and wellbeing among their three major concerns about the impacts of climate change, nearly half (49%) selected essential resources (food, water) and 46% included animals and nature in their top three concerns. Children were selected by 29%.*
>
> *A similar picture emerged when participants were asked to select their single most important concern about climate change. Essential resources like food and water were selected by 23% of participants, followed by animals and nature (17%), and children (17%). Health was fourth in the list of most important concerns, selected by 11% of participants.*

This pattern – of health being less important than other impacts of climate change – was consistent across groups with very different views on climate change. Among the majority that recognised the climate was changing and expressed anxiety about it, resources and animals and nature dominated their list of top concerns (selected by 47%-64%). A smaller proportion (33%-36%) included health and wellbeing.

Among those who were sceptical about climate change and generally hostile to discussions about it (11% of the sample), health had particularly low issue salience: less than one in ten included health among their top concerns.

In our surveys of what issues climate policies should focus on, we again found that issues other than people's health and wellbeing were identified as more important. In the larger survey of policy preferences (n=1006), 14% of participants selected people's health and wellbeing as the 'top issue' they would like climate policies to focus on – and 57% included health among their top three issues. But 37% selected resources as their top issue (and 74% had it among their top three), and 21% selected animals and nature (59% included this among their top three).

We found that emphasising positive outcomes (e.g., with stronger policies, people's health will be better in future) elicited much higher levels of support than avoiding negative outcomes (without stronger policies, people's health will be worse in future). Across all potential policy foci, a significantly higher proportion reported that they would be more likely to support the policy if it was presented in terms of securing benefits rather than reducing risks.

The smaller policy-focused survey (n=365) found that the public prefers action to

address the impacts of climate change to not taking action, regardless of whether its focus is on health or on other impacts. It again pointed to the importance of climate policies focused on protecting 'the resources (e.g., food, water) we all rely on', a focus that was preferred over one focused on 'people's health and wellbeing'.

Study limitations

Firstly, our evidence comes from cross-sectional studies. We therefore cannot track stability and change in individuals' views about climate change and in their preferences for climate policies over time.

Secondly, evidence on people's policy preferences is based on their responses to hypothetical choices. Our project provides insight into how the public responds to a range of options presented in a survey – rather than what they would do if presented with real policy proposals. However, as noted in the Treasury's Green Book on policy appraisal, people's stated preferences are often the only source of guidance for policy making.

Thirdly, the surveys focus on adults aged ≥18 years. Concerns about the impact of climate change on children and young people (CYP) were expressed by survey participants, particularly by parents, and by the public involvement groups. However, CYP were not directly represented. A follow-on PH-PRU project will be building the case for a stronger focus on CYP in public health research and action on climate change.

Implications of the findings

The public health community has an essential role to play in safeguarding the health of the public in a changing climate. However, it is not a responsibility they can fulfil without having the public behind them: effective action on climate change relies on public engagement in climate change and public support for climate polices.

Taken together, the findings provide little evidence that a single focus on people's health and wellbeing would increase public engagement in climate change and support for climate policies. While this focus has been advocated within the climate and health community, our findings suggest it connects less well than other issues with the public's concerns about climate change and their priorities for climate policies.

Key among these other concerns and priorities are essential resources like food and water. This emerged as the single most important concern and the top-ranked priority for climate policies to address. Food and water are, of course, key health determinants and ones that depend on healthy ecosystems – and 'animals and nature' emerged as a major climate change concern and focus for climate policies.

Overall, the findings suggest that, rather than a single focus on people's health and wellbeing, there may be greater potential for building public engagement and support through a broader focus on protecting the essentials of life. This would integrate the public's concerns about protecting the basic determinants of health (like food and water) and the natural world that provides them. This integrated agenda could also encompass people's health and the wellbeing of children. Such an agenda would need to be refined and tested, including via community-based public involvement. But, if confirmed, it would speak directly to the remit of public health at national and local level – namely, to promote and protect the conditions in which people can live healthy lives.

Glossary

Glossary of terms

Framing: is the process through which particular aspects of a complex issue (e.g., climate change) are foregrounded ('put in the frame'). As a result, alternative ways of understanding the issue are obscured [1]. Framing is integral to public communication. Our project investigates the potential for a health framing of climate change as a way of connecting with people's concerns and increasing public support for climate policies.

Issue salience: refers to how important an individual considers an issue to be. The greater its salience, the more an individual is likely to care about the issue. Increased salience has been found to be associated with greater engagement in action to address it (e.g., support for policies) [2].

Public*:* 'public health' refers to the health of everyone in the population, whatever their age [3]. However, terms like 'public attitudes' and 'public opinions' tend to have a restricted age range. Here, the public typically refers to adults, aged ≥18 years [4, 5] or, in some surveys, aged ≥16 years [6]. The surveys in our project are restricted to adults aged ≥18 years. We use the shorthand 'public views' and 'people's preferences' when reporting data from the surveys. In the Limitations section of the report, we discuss the omission of the views and preferences of children and young people, both from our surveys and from the wider evidence base on public attitudes to health and climate change.

Valence: in psychology, valence refers to whether emotional stimuli are experienced as positive (pleasant) or negative (unpleasant) [7]. In communication research, valence refers to whether information is presented in positive or negative terms. Valence has an effect if 'people make different choices depending on whether the options they are given are described in terms of their positive outcomes (e.g. lives saved) or negative outcomes (e.g., lives lost)' [8]. In our study, we use valence to refer to policy options presented in positive or negative terms.

Glossary of methods

Discrete choice experiment (DCE): is a method which captures people's preferences between hypothetical options that vary in multiple ways [9]. DCEs are used to gain insight into people's preferences for policies that vary not only with respect to their focus (e.g., on people's health or on animals and nature), but also along other dimensions, for example, their spatial scale (e.g., local or national). We used a DCE in one of the surveys looking at public support for climate policies (aim 2 of the project).

Latent class analysis (LCA): is a form of statistical modelling that identifies unobserved (latent) subgroups within a population [10, 11]. Subgroups are identified through the patterns of association in the answers people give, for example to questions about their views on climate change. We used LCA in the survey addressing aim 1 of the project (exploring the public salience of health and other framings of climate change).

1. Background

1.1 Climate change and health

Climate change is an increasing risk to people's health in the UK [12] and the wider healthcare system [13], and one likely to widen health inequalities [14]. The lifetime risk of health-damaging exposures will increase across generations: for children and those yet to be born compared with today's adults, particularly if the upward trend in global temperatures is not halted [12, 15]. These health impacts – both on current and future generations – add urgency to the need for action on climate change.

In democratic societies, public engagement and support are the essential pillars for climate action: the mandate for action by local and national government comes from the public. Public engagement in climate change depends on how the issues are presented. Similarly, public support for climate policies is likely to be influenced by multiple aspects of their design.

Our project explores these two questions. We ask: **What dimensions of climate change matter most to people? Does a focus on these dimensions increase support for climate policy?**

1.2 Engaging the public in climate change through a health focus

Most people in the UK are concerned about climate change. In the surveys of adults we conducted for this project, 78% were concerned about climate change (44% fairly and 35% very concerned, a finding in line with other UK studies [16].

Highlighting the health impacts is seen a way of harnessing this widespread public concern about climate change [17, 18], particularly in high-income countries that, to date, have been relatively protected from the direct effects of climate change [19, 20]. It has therefore been argued that connecting climate change to people's health could help to increase public engagement in climate change and increase support for climate policies [18, 21]. As well as a general focus on people's health, it has been suggested that emphasising the implications of climate change for one's own health could increase public engagement. As advocates of this approach argue, health is 'the way we primarily and most intimately' experience climate change [18].

Framing is the term used by communication researchers to describe this process of foregrounding particular aspects of complex phenomena (see Glossary). Frames can help communicate 'why an issue might be a problem' by connecting it with people's experiences and priorities [1]. *Issue salience* is the term used to refer to how important an individual considers an issue to be (see Glossary). The greater its salience, the more an individual is likely to care about the issue. Increased salience has been found to be associated with greater engagement in action to address it (e.g., support for policies) [2]. A health framing could therefore increase the salience of climate change as an issue people care about and thus help build public support for climate policies [17, 21, 22].

However, **UK evidence on whether the public is particularly concerned about the health dimensions of climate change is limited**. In our earlier PH-PRU project on public perceptions of climate change, 61% of adults in the quantitative survey agreed that climate change was 'already having an impact on people's health' in the UK [23]. However, the project's qualitative study indicated that other dimensions of climate change, including impacts on children and on wildlife, were of greater concern [24], a conclusion consistent with evidence from a recent ONS survey [25].

The project builds on these findings. **The project focuses on the salience of a health framing of climate change (by comparing a health framing with other framings) and whether different framings are related to greater public support for climate policies**.

Additionally, the project investigates whether presenting policies in terms of reducing risks or generating benefits makes a difference to the level of public support. There is evidence that describing climate policies in positive terms (securing benefits and gains) rather than negative terms (avoiding risks and losses) elicits greater public support [26, 27]. *Valence* is the term used to describe this positive/negative dimension of how information is conveyed (see Glossary).

As well as a focus on people's overall views and policy preferences, the project pays attention to differences between population sub-groups. Here, the project builds on studies that recognise there are multiple 'publics', with differing views on climate change and climate policy. Underlying these differing views on climate change and climate policy, studies point to important differences in political orientation and trust in government [28, 29]. We use a range of analytical techniques, including Latent Class Analysis (see Glossary), to help to identify these groups.

1.3 Policy relevance

- Climate change is an increasing threat to people's health in the UK [12].
- The UK has a legally-binding target to reduce the greenhouse gas emissions driving climate change [30, 31], a reduction that will yield significant health benefits [32].
- Public engagement in climate change and support for climate policies are essential for effective action by national and local government [33, 34].
- A focus on health is seen as a way of strengthening public engagement in climate change and building support for climate action [17, 18]. A health focus could therefore provide the basis for public health messaging on climate change.
- However, there is little UK evidence on the salience of a health framing of climate change or on the effect of different framings (e.g. health; children; animals and nature) on public support for climate policies.
- The project fills this gap. Drawing on evidence from representative surveys of adults conducted between autumn 2023 and spring 2024, it provides evidence to inform public messaging on climate change. Specifically, it provides evidence on whether people are concerned about the impacts of climate change on health and wellbeing – or whether other concerns take precedence. It also provides evidence on whether people would be more likely to support climate policies if they addressed the health impacts of climate change – or if support would be greater if the policy focus was on other impacts.

2. Aims

The project aims to provide evidence to inform public communication and policies relating to climate change and health.

Its twin aims are to provide evidence on:

1. **the public salience of different framings of climate change (for example, 'health and wellbeing', 'animals and nature', 'children')**
2. **the effect of different framings on public support for climate policies**

3. Methods

3.1 Introduction

The surveys which formed the main part of the project were informed by an innovative programme of community-based public involvement study. The surveys were also informed by a set of preparatory studies. See Box 1 for a summary of the project design.

The preparatory stage had three components, each undertaken specifically for this project:

- a secondary analysis of qualitative data previously collected in a survey (n=1021) conducted as part of our earlier PH-PRU project
- a study of engagement with health and climate change on social media
- a review of previous studies employing a method, discrete choice experiments (DCEs), that we used in one of our surveys on public support for climate policies

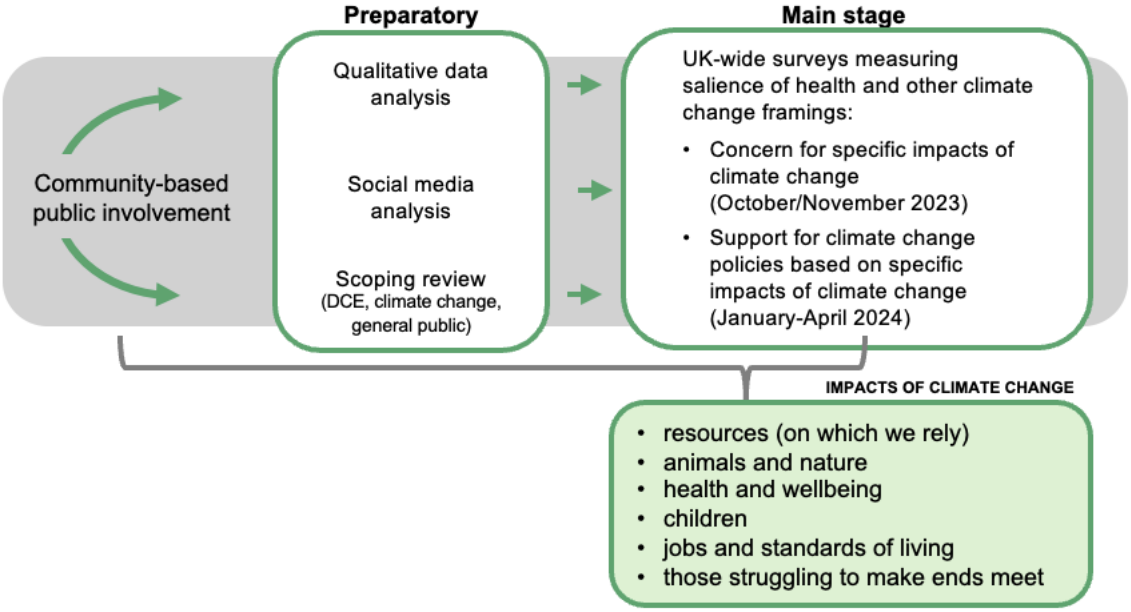
We focused on these three sources of evidence because they provided insight into:

- people's unprompted thoughts and feelings about climate change.
- how climate change and health are represented on social media, a major forum through which the public engages with issues of concern to them. In the UK, over 80% of adults are active social media users.
- how previous studies have used discrete choice experiments to capture people's preferences for climate policies and whether health was a focus of these studies.

Building on ongoing public involvement and these preparatory studies, we conducted a series of UK surveys focused on the salience of health and other framings with respect to:

(i) people's concerns about climate change (one survey, Oct-Nov 2023)
(ii) people's support for climate policies (two surveys, Jan 2024 and Feb-Apr 2024).

Box 1: project design



3.2 Community-based public involvement

Note. A paper on our approach to public involvement has been submitted to a journal (Glerum-Brooks, K. et al 'A Community-Based Approach to Public Involvement in Research', under review)

Public involvement (PI) in research is important both ethically and to enhance the quality of the research [35, 36]. But there are problems with approaches to public involvement that take place outside people's everyday environments, for example by recruiting members of the public when they interact with healthcare services or inviting them to join a public involvement panel [37].

We therefore developed an alternative approach that integrated public involvement into people's everyday lives. We involved people in the everyday settings in which they live and work, and at times when they would be having breaks in their day and chatting with colleagues and friends. Our approach was therefore both community-based and conversation-focused. Three community groups were involved in the project (Box 2A). All visits were arranged with the community leader (i.e., the vicar, the nursery manager, and the chief executive of the community development trust) who liaised with the community members.

Our community-based approach began prior to the beginning of the project (Box 2B). Our PI Lead then had two further rounds of meetings with each of the three groups (Box 2B). Each time, around 35 people were involved. Feedback on our community-based process was consistently positive, as indicated in the comments below:

> *'If you had put on a meeting, we wouldn't have come. If you were on the telly, I would have turned you over. But I enjoyed it. It got me thinking.'*

> *'It's what we need: gentle conversations. And then you came back and told us how the research was progressing. So then we felt part of a process.'*

For further details of the methodology and what we learned, see Appendix A.

Box 2: community-based public involvement

2A: community-based groups

- members of a church congregation in a village (during tea and biscuits after their church service)
- staff at a community nursery in a northern town (during work)
- members of a knitting group in a community cafe in a city area (during their group meeting)

2B: community-based sessions

- **March 2023** – prior to start of project, to learn about what people think about when they think about climate change.
- **July 2023** – to help shape the first survey and to gain their views on how to ask questions about the concerns people may have about climate change.
- **February 2024 –** to help shape the surveys on climate policies. People were asked what topics the policies should focus on and whether to formulate policies as threats or opportunities.

3.3 Preparatory stage of the project

Secondary data analysis of qualitative data from previous PH-PRU survey

One of the surveys in our earlier PH-PRU project [23] included an open-ended question on participants' thoughts about climate change. The survey was completed by 1021 participants in July 2022 and included this question (emphasis in original):

> *We are interested in what people think of when they think of climate change.* ***What comes to mind when you think of climate change?*** *In your own words, please describe below; please use as many words as you wish.*

The responses, which had not been analysed for the earlier project, shed light on the unfiltered views of the public. A searchable database of verbatim responses was constructed and searched for references to health and well-being.

Analysis of engagement with health and climate change on social media

> **Note.** This analysis has been published: Golder S, Graham H (2024) 'Social media engagement in health and climate change: an exploratory analysis of Twitter', *Environmental Research: Health*

Social media provides an interactive forum in which the public can share views and experiences on an ongoing basis. Our analysis focused on Twitter (now X), one of the UK's larger public-facing social media platforms; at the time of our study, over 40% of those aged ≥13 years were Twitter users [38]. Users can post brief messages ('tweets') of up to 280 characters and assign 'hashtags' (e.g., #climate change) to indicate their subject matter. We searched Twitter from 21 March to 11 May 2023.

Our analysis explored two questions:

- ***what proportion of tweets on climate change engage with health?*** We measured the number of health-related posts as a proportion of all climate change tweets across March to May 2023. The health search terms were based on those used in the Lancet Countdown on Health and Climate Change [39].
- ***how are climate change and health represented in these tweets?*** We undertook a content analysis of a random sample of 200 health-related posts. We developed a coding frame that identified key themes relating to health and climate change.

For further details of the methodology, see Appendix B.

Scoping review: DCE-based studies of public preferences for climate policies

One of our surveys used a DCE design to capture people's preferences for climate policies framed in different ways. To inform this survey, we searched for studies using a DCE design (or similar stated preference method) focused on the views of the general public on interventions relating to climate change.

A scoping review is a method for rapidly mapping a field of research [40]. It incorporates many of the features of a systematic review, but it does not synthesise the evidence.

We searched databases covering both economic and health disciplines, and undertook backward and forward citation searching. We reported our review according to PRISMA guidelines [41]. For further details of the methodology, see Appendix C.

3.4 Main stage of the project

The main stage of the project consisted of three UK-wide surveys of adults ≥18 years. The surveys addressed the project's two aims (see 'Main Stage' in Box 1):

(a) the salience of different framings of climate change

(b) the effect of different framings on public support for climate policies

The survey content was refined by the community-based public involvement groups. Where possible, we used question-formats that had been validated in other surveys. The surveys were approved by the Department of Health Sciences' Research Governance Committee[1].

Participants were recruited via the Qualtrics survey platform [42]. This involved a double-consent process: agreeing to being enrolled on the survey platform[2] and then giving consent to participate in one of our surveys[3]. Quotas were set to match the UK population for age group, gender, ethnic group, educational attainment, and region/country of residence.

UK survey exploring the public salience of different framings of climate change (Aim 1)

The first survey (n=2009) focused on the salience of health and other framings with respect to people's concerns about climate change. It was conducted in Oct-Nov 2023.

Participants were asked *'how concerned, if at all, are you about climate change?'*, a question used in the government's 'tracker' survey [16]. To explore the salience of health among the concerns people may have about climate change, we then asked:

> '*When you think about what might happen as a result of climate change, which of the following concern you the most? You can pick up to three.'*

The list of concerns was presented in two ways: in general terms (for example, 'people's health and wellbeing') and in personal terms (for example, 'my health and wellbeing'). As noted in the Background section, advocates of a health framing of climate change point to the potential of both a generic and a personal framing of climate change.

Participants were randomly assigned to a general or personal format; we also randomised the order in which the concerns were listed. The list of concerns (Table 1, Section 5.1) drew on wider UK evidence [25] and our previous PH-PRU project, which pointed to the salience of 'animals and nature' and 'children'. The community-based public involvement groups also identified children as a concern and, additionally, noted the importance of 'people's jobs and living standards' and impacts on vulnerable groups. The remaining concerns drew on surveys indicating that immigration and social tensions are issues of public concern [6, 43] and on evidence documenting the impact of climate change on health and on essential resources like food and water in the UK [44, 45].

After the question inviting participants to note up to three concerns about climate change, they were asked, *'Of those you selected, which concerns you most?'.* (For participants who had only indicated one concern, this was automatically coded as their most important concern). For the analysis, we began by investigating the pattern of concerns and whether the patterns varied when concerns were presented in general or personal terms. We then explored whether there were particular sub-groups who were more likely

[1] Department of Health Sciences Research Governance Committee, date: 15 May 2023, ref HSRGC/2-23/566/A

[2] Our survey participants were recruited from adults who had consented to be part of a panel run by Qualtrics or its survey partners; panel members can withdraw consent at any time. Members of the panel members were invited to consider taking part in our survey by email, SMS, in-app notifications and via panel portal.

[3] As the surveys were anonymous, it was not possible to provide participants with a summary of findings. However, a link to further information on the project, including contact details, was included as part of the invitation and consent process.

to be concerned about particular climate change impacts. For this, we used Latent Class Analysis (LCA), a form of statistical modelling that identifies unobserved (i.e., latent) subgroups within a population [10, 11]. (See Glossary and Appendix D).

UK surveys of the effect of different framings on public support for climate policies (Aim 2)

The second and third surveys focused on public support for climate policies and whether a focus on health was associated with greater support than a different focus (e.g., on animals and nature or on essential resources like food and water).

Both surveys used terms other than 'policy', a term likely to be seen as an instrument of government (UK government and the devolved administrations). Our first survey pointed to low levels of trust in government. The majority (59%) selected the no/low trust options, potentially biasing responses to questions on actions to address climate change referred to as 'policies'. Alternative terms ('plans' in the second survey and 'action' the third survey) were therefore used instead.

The second survey (Feb-Apr 2024, n=1006) investigated the public views on:

- what issues climate change policies should focus on? Participants were asked: *'If you had a say in making plans to deal with climate change, which of the following would you most want to focus on?* and were given six issues to rank (see Box 3). The issues were those identified by participants in the first survey as the ones about which they were most concerned.
- whether it made a difference if the plans were presented in negative or positive terms (as reducing adversity or securing benefit). As noted in the Glossary, this negative-positive axis is referred to as valence and evidence suggests that valence makes a difference to people's support for policies [27, 46]. As an example, the 'valence' question focused on health is given in Box 3.

Box 3: survey on public support for climate policies: questions on focus and an example of a policy 'valence' question

Focus: *If you had a say in making plans to deal with climate change, which of the following would you most want to focus on? Please take the time to rank each of these from 1 (largest focus) to 6 (least focus).*

_____ *People's jobs and living standards*
_____ *Health and wellbeing*
_____ *Children*
_____ *The animals and nature around us*
_____ *The resources we all rely on (e.g., food, water)*
_____ *Those who are struggling to make ends meet*

Valence*: Below are two different ways of describing the same plan. One has a positive spin, the other has a negative spin. If either, which would be most likely to convince you to support the plan?*

- ***Negative:*** *without much stronger UK plans for dealing with climate change, people's health and wellbeing will suffer to a far greater extent in the future.*
- ***Positive:*** *with much stronger UK plans for dealing with climate change, people's health and wellbeing will be far better in the future.*
- ***I would not select either***

The third survey (January-February 2024, n=365) explored people's policy preferences using a discrete choice experiment (DCE). The method captures people's choices between options that vary in multiple ways (see Glossary).

In the DCE, survey participants were presented with eight pairs of hypothetical climate policies that varied across three dimensions (called 'attributes'). These were their focus (e.g., on health and wellbeing/on another issue), their spatial scale (local/national/global) and how the policy would be paid for. In making their choices, individuals therefore had to select one of the two policies that differed in their focus, scale, and payment method *and*, at the same time, make trade-offs between the different attributes (between focus, spatial scale, and payment method).

To develop the DCE, we drew on findings from our first survey and on our scoping review. Draft questions were shared with participants in our community-based public involvement groups and with members of the project team and refined in the light of feedback.

The DCE was introduced to participants by explaining that urgent action was needed to address the impacts of climate change (see Supplementary Tables, Table S1). Participant were then presented with eight pairs of hypothetical policy choices and, for each pair, were asked to choose one of the two policies, or choose an opt-out option ('no extra action').

Mixed logit modelling (MLM) and latent class conditional logit (LCL) modelling were used to examine different policy preferences. We also examined differences in the socio-demographic patterning of policy choices, including by gender, age group and education attainment (ISCED). See Appendix E for further details.

4. Findings: preparatory stage

This section summarises key findings from the analysis of qualitative data, the social media analysis, and the scoping review of DCE studies. For information on the methods used in these analyses, see section 3.3.

4.1 Secondary analysis of qualitative data

A survey in our earlier PH-PRU project included an open-ended question inviting participants to describe in their own words *What comes to mind when you think of climate change?* The survey was conducted in July 2022 (n=1021).

The responses pointed to **the low salience of health as a climate change issue.** Only one participant (0.1%) referred to health in their response:

> *'Extreme weather, accelerating damage to the planet, disrupting food security and human health and safety'.*

More frequently mentioned were animals and nature (*'The arctic and animals in danger', 'Global warming, lack of natural habitats*') and children (*'I think of my children and the world they will live in', 'Climate change is concerning, I worry about my children's future and how the world will be for them'*).

4.2 Analysis of engagement in health and climate change on social media

Note. This analysis has been published: Golder S, Graham H (2024) Social media engagement in health and climate change: an exploratory analysis of Twitter. *Environmental Research: Health*

Our analysis of Twitter pointed to **little engagement with health and climate change on social media.** During the six weeks of our study, there were 668,810 posts related to climate change. Health-related text words were included in 2.3% (15,434) of these posts. Despite health being seen as way to engage the public in climate change [17-19], only a small proportion of climate change tweets referred to health.

The content analysis pointed to **two very different representations of health and climate change.** The first represented climate change as real, with serious effects on people's health. Most tweets (77%) fell into this group. Tweets noted that '*climate change is real, and…it is one of the most serious health threats to humanity'* and *'real people are experiencing awful suffering all over the world. Climate change destroys livelihoods and health'.*

Tweets in this group drew on scientific evidence of climate change and its health effects and discussed actions to ameliorate these impacts.

The second group (23% of tweets) portrayed climate change as a hoax, with hoax-generated effects on people's mental health. Views were often strongly expressed, both in their rejection of scientific evidence and their opposition to climate action.

> *climate scientists are …dumb and corrupt people. Now they are putting together public health (oh, boy) and climate.*
>
> *Climate change is your supposed #1 cause of death followed by suicide at #2 because academics (and I use that word very generously) have convinced the gullible that the planet hates them.*
>
> *Climate change isn't causing mental health issues – the doom mongers are. It is all to do with the crazy propaganda.*

Neither sets of tweets engaged with people's experiences of health and climate change. As noted in the Background section, a health framing is advocated because it is seen to bring climate change

'closer to home' by connecting it directly with people's experiences. Yet in our study, there were no tweets that included personal experiences of climate change. This stands in contrast to the public's wider use of Twitter, where health experiences are discussed and shared with others with similar experiences [47, 48].

4.3 Scoping review: DCE-based studies of public preferences for climate policies

The scoping review focused on DCE-based studies investigating the public's preferences for climate policies.

Of the studies identified through the database searches, 47 studies met the inclusion criteria. Most studies included a European country (77%) and over a third (40%) included a North American country. Seven studies (15%) included the UK.

However, only two of the 47 studies included a focus on health (one in Switzerland and one in the UK). As this suggests, our new DCE-based survey is charting new ground. For details of the scoping review, see Appendix C.

5. Findings: public salience of different framings of climate change

This section summarises findings addressing Aim 1 of the project. It draws on evidence from the survey exploring the public salience of a health framing of climate change, conducted in Oct-Nov 2023 (n=2009).

5.1 Overview of survey findings

A large majority (78%) of the participants reported that they were concerned about climate change (44% fairly and 35% very concerned).

The survey then asked participants to identify the impacts of climate change that were of greatest concern to them (up to a maximum of three concerns). Along with health and wellbeing, they were offered nine other choices; there was also an opportunity to specify another concern or to respond that none of the listed impacts were of concern. Participants were randomly assigned to a list of concerns phrased either in general or personal terms (Table 1).

The results are presented in Figure 1. Combining responses across the two formats (general and personal), essential resources (e.g., food, water) and animals and nature were the most common concerns, selected by 49% and 46% of participants respectively. The patterns were similar across the two formats (generic and personal).

Three in ten participants included health (29%) among their top three concerns. The proportion was higher when a generic format (34%) rather than a personal format (27%) was used.

Three in ten participants placed children (31%) among their top three concerns. Here, format made a more marked difference: the proportion was higher when concerns were framed around 'children in my family' (36%) rather than 'children' (24%). The full regression analysis indicated that the odds of selecting children among the top concerns was significantly higher when a personal framing was used ('children in my family').

Participants were then asked to select their **single greatest concern.** Figure 2 presents the overall results (i.e., combining the results for generic and personal formats) and then separately for the generic and personal formats. Overall, the impact of climate change on essential resources emerged as the most important

Table 1 When you think about what might happen as a result of climate change, which of the following concern you the most? You can pick up to three.

General (n=997)	**Personal** (n=1012)
How it might affect people's health and wellbeing	How it might affect **my** health and wellbeing
How it might affect animals and nature	How it might affect the animals and nature **around me**
How it might affect people's livelihoods and standard of living	How it might affect **my** livelihood and standard of living
How it might affect the resources (e.g., food, water) we all rely on	How it might affect the resources (e.g., food, water) **I rely on**
How it might affect migration (people having to move)	How it might affect migration (people having to move) **in my local area**
How it might affect social unrest and tension	How it might affect social unrest and tensions **in my local area**
How it might affect transport and travel	How it might affect transport and **how I travel**
How it might affect people's homes	How it might affect **my** home
How it might affect children	How it might affect the children **in my family**
How it might unfairly affect people who are more vulnerable	How it might unfairly affect **people I know** who are more vulnerable

Figure 1: climate change - top three impacts of concern: overall and separately for generic and personal formats (n=2009)

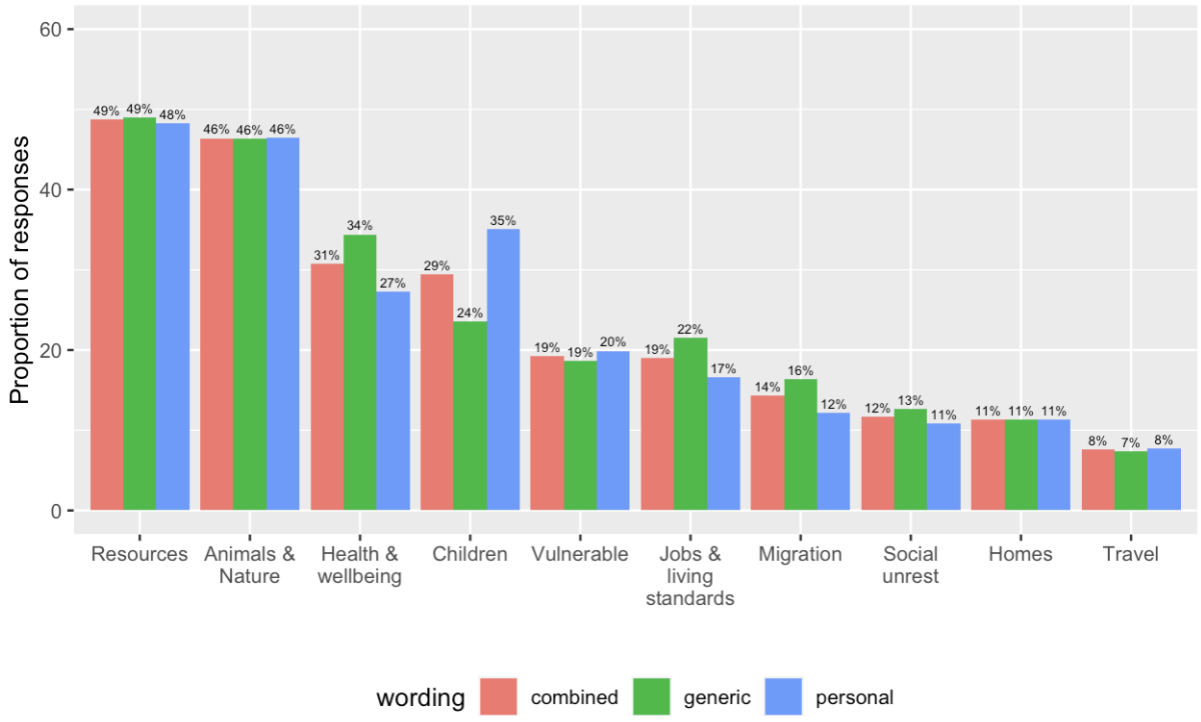
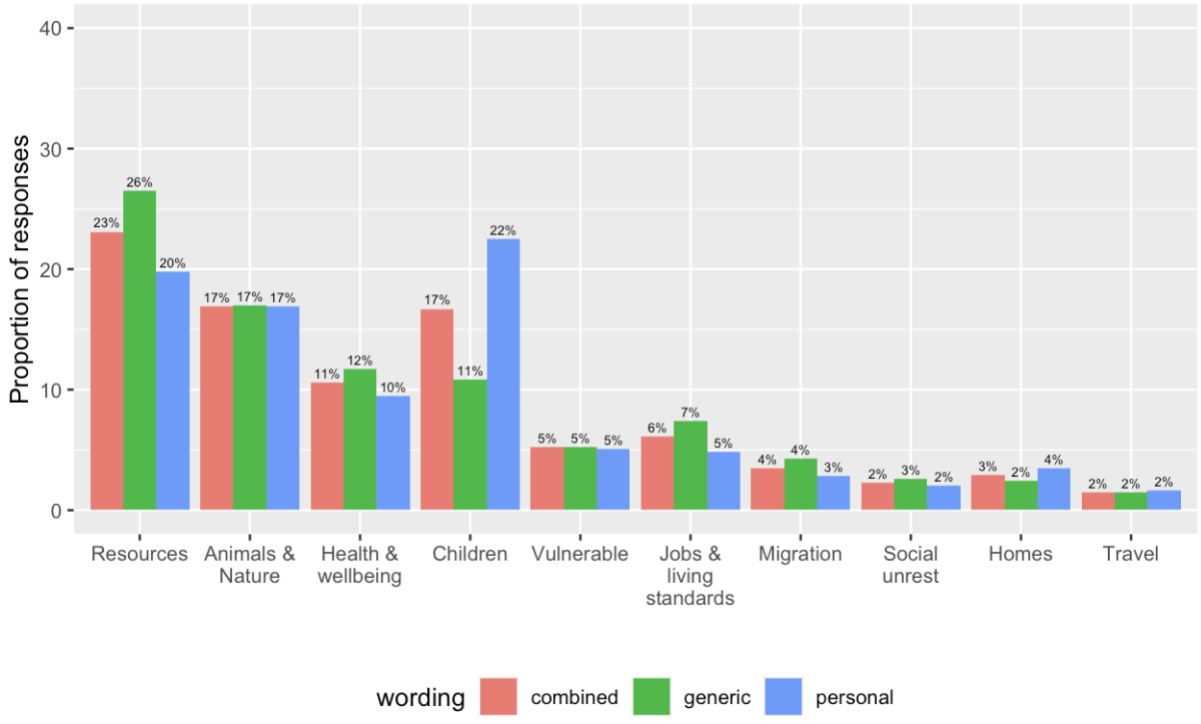


Figure 2: climate change: single most important concern (generic and personal formats combined) (n=2009)



concern (selected by 23% of participants), followed by animals and nature (17%), and children (17%).

In the generic format (how climate change 'might affect the resources e.g., food, water we all rely on'), resources were also identified as the single most important concern. It was selected by 26% of participants (Figure 2). However, when impacts were expressed in personal terms, children emerged as the single most important concern ('how it might affect the children in my family'). In this personal format, children were selected by 22% of participants (Figure 2). This personal concern for children did not exhibit a social gradient (e.g., by education and financial circumstances). It was, however, higher among parents. In the survey, over 60% of the participants were parents and 26% of parents were also grandparents.

5.2 Identifying sub-groups

We investigated whether there were subgroups that were more likely to be concerned about particular impacts of climate change – for example, health and wellbeing. For this, we undertook a Latent Class Analysis (LCA), see Glossary and Methods section 3.4. Six variables were selected for the analysis; four related to views on and emotional responses to climate change and two related to voting intention and trust in government (see Appendix D). All 2009 participants were included in the analysis.

The LCA identified five distinct sub-groups (Table 2). The groups are similar to ones identified in other studies in high-income countries, indicating that there may be shared cross-national orientations to climate change [49, 50].

Levels of trust in government were low in all five groups but were highest among the 'convinced positive' group.

The largest three groups – 'convinced indignant', 'accepting' and 'convinced positive' – recognised that the climate was changing. Together, they represented 85% of the sample.

A large majority in these groups selected the maximum of three concerns about climate change's impacts. In line with their latent class profiles (see Table 2), it points to a high degree of engagement in climate change (further details in Supplementary Tables, S2).

In these three groups, the most frequently noted concerns were resources and animals and nature (Supplementary Tables, S3). Between 47% and 64% of the groups included resources, and 45%-60% included animals and nature, in their top three concerns. A third included health among their top concerns about climate change (convinced indignant: 37%; accepting: 33%; convinced positive: 34%), proportions in line with the overall pattens of concern (Figure 2). This suggests that, while health may be a way of harnessing these groups' concerns about climate change, messages framed around other impacts, particularly resources and animals and nature, have greater salience and may therefore be more effective.

In the 'sceptical' and 'uncertain' groups (11% and 4% of the sample respectively), only a small minority selected three concerns (Supplementary Tables, S2). In the sceptical group, four in ten (39%) rejected all the listed concerns, and instead selected 'none of the above'. Less than one in ten (8%) included health among their top concerns (Table S3). Taken together, the findings underline the challenge of engaging groups sceptical about climate change. In particular, the findings suggest that a focus on health is unlikely to be an effective way of reaching and engaging this key population subgroup.

The full breakdown of concerns across the five groups is given in the Supplementary Tables (Tables S2 and S3). See also Appendix D, which analyses the social composition of the five groups.

Table 2 Profiles of the five latent class groups

Latent class group	Most likely responses
1.'Accepting' (36%)	I think the climate is probably changing, and humans and nature are equally responsible (though leaning more towards humans). I'm fairly concerned about it but not that much. I'm most likely to vote for one of the main parties and lean a bit more to Labour and the left, although I don't really trust the government. I have mixed emotions about climate change, I'm confused (i.e., don't know enough about it) and anxious, but also feel some positivity. ***[47% included resources among their top three concerns about climate change and 33% included health]***
2.'Convinced indignant' (34%)	The climate is definitely changing, and humans are responsible. I am very concerned about it. I'm most likely to vote Labour or some of the other more left-leaning parties but have very low trust in government. I'm anxious and indignant about climate change, with very little positivity. ***[64% included resources among their top three concerns about climate change and 36% included health]***
3.'Convinced positive' (15%)	I believe the climate is definitely changing and humans are responsible. I'm less strong in my opinions on this than Class 1, but equally as concerned about climate change. I'm most likely to vote for the Conservatives but may also vote for some of the other parties. I have much higher trust in government than any of the other classes. I'm anxious and indignant about climate change, but also likely to feel positive about it. ***[47% included resources among their top three concerns about climate change and 34% included health]***
4.'Sceptical unconcerned' (11%)	I'm the most sceptical about climate change, but it may be changing. If it is, it's natural causes or equal. I don't believe it's caused solely by humans, and I'm not concerned about it. I may vote for one of the main parties, with a slight lean to the Conservatives, but I am the most likely of everyone to vote for one of the smaller 'more to the right' parties. I have mixed trust in government, although it's still likely to be low. I feel hostile when I hear about climate change. ***[22% included resources among their top three concerns about climate change and 8% included health. 39% rejected all the listed concerns, selecting the response option 'none of the above']***
5.'Uncertain' (4%)	I am pretty uncertain or neutral in most of my responses. I don't know if the climate is changing, but maybe (some probably responses). I don't know who is responsible but maybe it's equal. I don't know if I'm concerned, but maybe a bit. I might vote for one of the main parties but may also be undecided or not vote, and I tend towards lower trust in government. I don't really have any emotions around climate change except for some confusion. ***[14% included resources among their top three concerns about climate change and 14% included health. 47% selected 'don't know', indicating that many struggled to identify specific concerns]***

6. Findings: public support for climate policies

This section summarises findings addressing aim 2 of the project. It draws on two surveys which explored whether different framings of climate change were associated with different levels of public support for climate policies.

The first survey examined preferences between policies focused on the six areas of greatest public concern about climate change (Figure 2). These were 'the resources we all rely on', 'health and wellbeing', 'people's jobs and living standards', 'animals and nature', 'children' and 'those who are struggling to make ends meet'. The survey also investigated whether the level of support was greater if policy outcomes were described in terms of reducing risks or securing benefits. The findings are presented in section 6.1 below.

The second survey examined people's policy preferences using a discrete choice experiment (DCE) in which survey participants needed to make choices between policies that varied across multiple dimensions (their focus, spatial level and payment method). The findings are presented in section 6.2 below.

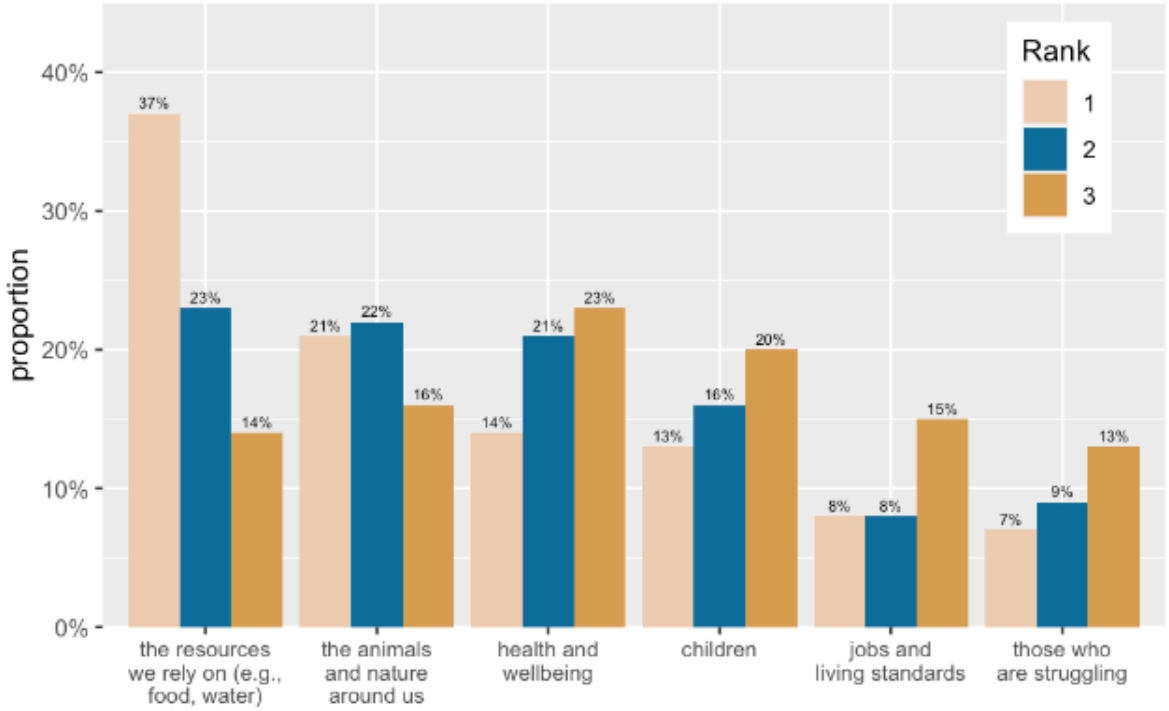
6.1 Findings from survey of people's preferences for policies to address climate change

The survey was conducted between Feb and April 2024 (n=1006). Participants were asked a series of questions regarding policies (described as 'plans') to address climate change.

Participants were asked: *'If you had a say in making plans to deal with climate change, which of the following would you most want to focus on? Please rank each of these from 1 (largest focus) to 6 (least focus)'.* See Section 3.4 for further details.

As shown in Figure 3, 'the resources we all rely on (e.g., food, water)' was most frequently selected as the top focus for policy (selected by 37% of participants), and 74% included it in their top three. 'Animals and nature' were the top-ranked focus by 21% of participants, and 59% included it in their top three. Health and wellbeing were ranked highest by 14% and 57% included it in their top three.

Figure 3: top-ranked foci for climate policies (n=1006)

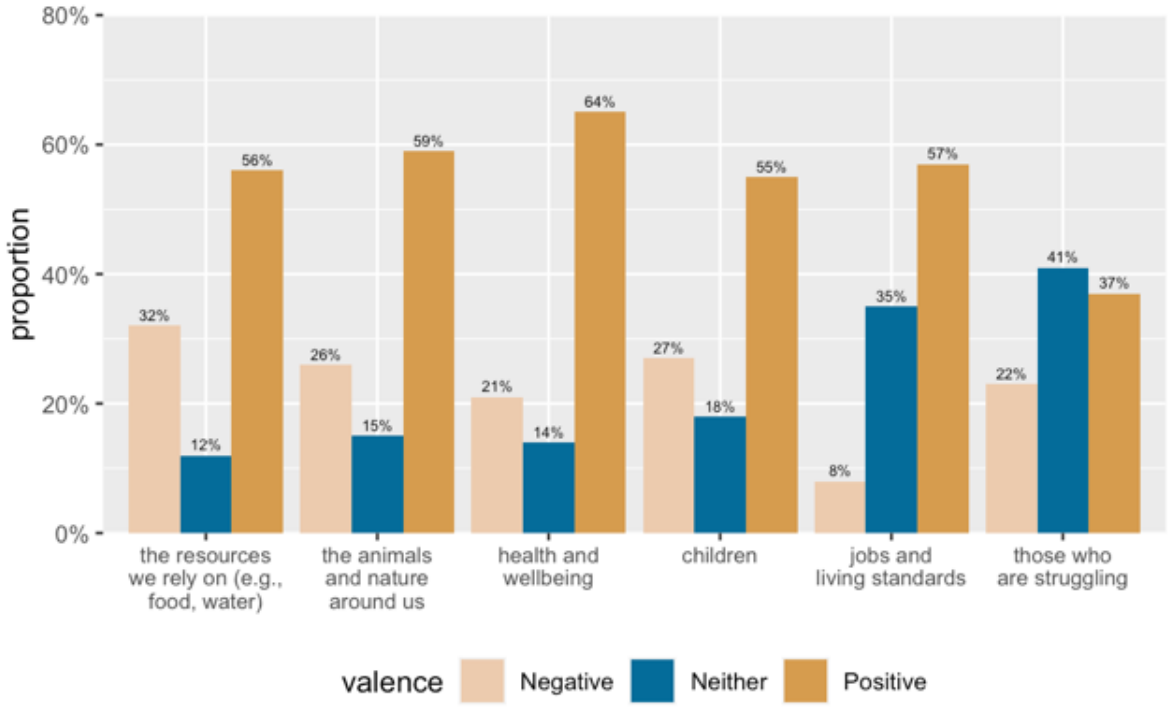


The survey also investigated whether it made a difference if action on climate change was presented in negative or positive terms (as reducing risks or securing benefits). This negative-positive orientation is referred to as valence (see Glossary). Details are given in Box 3 which also includes the 'valence' question for health. See Table S4 for the full set of valence questions.

Across all the potential policy foci, a positive framing was preferred; overall, 56% of participants considered that they would be more likely to be convinced to support the plan if it had a positive spin (securing benefits) rather than a negative spin (reducing risks). However, a large minority either preferred a negative valence (26%) or indicated that they would not select the plan regardless of its valence (18%).

The proportion of participants preferring positively framed policies was largest for plans focused on health and wellbeing. Here, 64% preferred policies with a positive spin (Figure 4).

Figure 4: participants' preferences for climate polices with positive and negative valence (n=1006)



6.2 Findings from a DCE-based survey of preferences for policies to address climate change

We used a discrete choice experiment (DCE) to elicit people's preferences for policies to address the impacts of climate change (see Methods, section 3.4). The survey was conducted in January 2024, with a final sample size of 365. Each participant was presented with eight pairs of hypothetical policies (see Supplementary Tables, Table S1). In each pair, the two policies differed with respect to:

- their focus (e.g., on health and wellbeing/another focus)
- their spatial scale (e.g., local/national)
- how the policy would be paid for (e.g., everyone pays the same/people who are better off pay more)

As well as selecting one of the two policies, participants had the option of rejecting both and selecting 'no extra action' instead.

The majority (76%) of participants chose one of the policies in all eight of the policy pairs – and only 2% chose 'no extra action' in all eight choice sets. The remaining 12% chose one of the hypothetical policies in some of eight choice sets.

These findings indicate that participants significantly preferred taking action to address the impacts of climate change to not taking action – and this was true regardless of the policy's focus, spatial scale and payment method. (See Supplementary Tables, Table S5).

To delve further into the results, we used a mixed logit model, a statistical method that takes account of how individual choices vary across multiple dimensions (focus/spatial scale/payment method). We found that participants had varying preferences for all three dimensions – focus, scale, and funding. In other words, what the policy focused on matters, where the action is taking place matters, and the payment method matters.

With respect to a policy focus on 'people's health and wellbeing', this was preferred more than one focused on 'animals and nature' – but was preferred less than one focused on 'the resources (e.g., food and water) we all rely on'. (See Table S5).

Behind this overall picture, we found that people had heterogeneous preferences for focus, scale, and payment method. Some had stronger positive preferences for one dimension (e.g., focus or scale or payment method), while others had negative preferences (Table S5). We also explored whether policy preferences varied across socio-demographic groups, including by gender, age group and educational level. For further details, see Appendix E.

7. Study limitations

Our project provides UK-based evidence on whether health and wellbeing is among the public's major concerns about climate change. We found that health has low salience: it is considered less important than other impacts of climate change. Our project also sheds light on whether the public considers health should be a key focus of climate policies. Again, we found that other issues were identified as more important.

Some limitations of the project should be noted. Firstly, our evidence comes from cross-sectional studies. We cannot therefore track stability and change in individuals' views about climate change and their preferences for climate policies over time. However, our cross-sectional evidence is derived from large samples (n=3280) using quotas representative of the UK adult population.

Secondly, our evidence on people's policy preferences is based on their responses to hypothetical choices. The surveys offer insights into how the public responds to a range of choices presented in a survey – rather than what they do if presented with real policy proposals. However, people's stated preferences are often the only source of guidance available for policy making. As the Treasury's Green Book notes, 'they are the only kind of technique suitable in many circumstances' [51]. Stated preference studies like ours also offer flexibility: we captured policy preferences across multiple dimensions, including the policy's focus, spatial scale, and payment method. We also investigated the importance of valence and found that presenting policies in positive terms (e.g., delivering benefits) rather than negative terms (e.g., reducing risks) garnered greater public support. An urgent challenge is to integrate evidence from observational studies like ours with evidence from behavioural studies. This could include, for example, tracking how the public responds when confronted with the implementation of climate policies that appeared to have their support, particularly where benefits and costs are unevenly distributed [52].

Thirdly, the surveys that formed the cornerstone of our project focus on adults aged 18 and over. Children and young people (CYP) are not directly represented. Concerns about the impact of climate change on CYP were expressed by survey participants, particularly by parents, and by the public involvement groups. As has been noted elsewhere, the views and interests of CYP are represented by adults in the media [53], in electoral systems[4] and in the structures of government [54] – despite the fact that the speed and scale of climate action across the next decade will determine their future. It has been left to social movements like the youth climate movement to push for the direct representation of CYP in research and policy-making [55]. In a follow-on project, we will be making the case for a much stronger focus on CYP in public health research and action on climate change.

[4] In England and Northern Ireland, the legal voting age is 18; in Wales, those aged ≥16 can vote in elections for Senedd Cymru (Welsh Parliament); in Scotland, those aged ≥14 can vote in elections for the Scottish Parliament and ≥16 for the UK Parliament elections. See https://www.gov.uk/how-to-vote and https://www.mygov.scot/register-to-vote-scotland

8. Conclusions

Understanding the public's concerns about climate change and their priorities for policy is essential for ethical policy-making and effective public communication.

It has been suggested that focusing on health could connect with people's concerns and increase public support for climate policies.

Our project provides up-to-date evidence on whether such a 'health framing' of climate change is in line with the public's concerns about climate change and their priorities for climate policies.

The project confirms that adults in the UK are concerned about climate change and wish to see action to address it. Only a minority are not concerned and would prefer not taking action. However, we found that health did not rank as highly as other concerns people have about climate change. Similarly, it was not as highly ranked among the issues that people identified as priorities for action. Our surveys indicate that people's concerns about climate change and priorities for climate policies focus on essential resources like food and water and on the wider natural environment (animals and nature).

This suggests that a health framing of climate change may not be the most promising way of harnessing public concerns about climate change and building support for climate policies. Our project points instead to the potential for public messaging that includes a strong focus on the essential resources on which we all depend. It suggests that public messaging that combines this focus with a broader set of impacts – including around the natural environment – may speak more directly to public concerns about climate change and their priorities for action.

9. Supplementary tables

Table S1: Overview of the Discreet Choice Experiment (DCE)

A recent report says that climate change is a growing threat because it leads to things like heat waves, droughts, and floods.

The report is saying that the actions we are taking right now to tackle this growing threat aren't enough. We need urgent action.

Click the 'Next' button to continue.

We need to make important decisions about what to do. We will take you through three of these decisions on the following slides.

The first important decision that we would like your opinion on is what to focus on.

Climate change will have effects on various aspects of our lives, including:

- Our livelihoods and standards of living
- The animals and nature around us
- Our children
- People's health and wellbeing
- The resources we need to survive

Click the 'Next' button to continue.

The second important decision we would like your opinion on is where to try and improve things.

Efforts to tackle the effects of climate change could take place at:

- The local level (our local towns or villages)
- The national level (in our country)
- The global level (worldwide)

Click the 'Next' button to continue.

The third important decision we would like your opinion on is how to pay for further action. Usually, action is paid for through the taxes we pay, but how should this be done? For example:

- everybody could pay the same amount, or
- those with more money (the better off) could pay more

Click the 'Next' button to continue.

Now, thinking about those important decisions, let's imagine you are invited to choose between two possible policies to tackle the effects of climate change, Choice A and Choice B. There's also an option of taking no extra action.

Please read the following example carefully and click the 'Next' button when you have read the example.

	Choice A	Choice B	No extra action
What to focus on	Animals and nature	The resources (e.g., food and water) we all rely on	None
Where to try and improve things	Local level	National level	None
How to pay for it	People who are better off pay more	Everybody pays the same	None

Choice A suggests that we should focus on **animals and nature** at the **local** level, and that **people who are better off** should pay more for this action.

Choice B suggests that we should focus on **resources** at the **national level**, and that **everybody should pay the same** for this action.

'No extra action' means **you would rather have no new policy than what is offered in either Choice A or Choice B.**

Table S2: number of concerns identified in the five latent class groups

	Accepting		Convinced indignant		Convinced positive		Sceptical		Uncertain		Totals	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**row n**	**% (/2,009)**
Selections made												
One	85	11.81	26	3.77	22	7.48	35	15.84	13	15.29	181	9.01
Two	118	16.39	52	7.55	26	8.84	26	11.76	8	9.41	230	11.45
Three	464	64.44	603	87.52	242	82.31	60	27.15	17	20.00	1,386	68.99
"Don't know"	29	4.03	5	0.73	2	0.68	14	6.33	40	47.06	90	4.48
"None"	24	3.33	3	0.44	2	0.68	86	38.91	7	8.24	122	6.07

Table S3: patterning of climate change concerns among the five latent class groups

	Accepting		Convinced indignant		Convinced positive		Sceptical		Uncertain		Totals	
Impact/frame	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**row n**	**% (/2,009)**
Animals and Nature												
Y	321	44.58	414	60.09	147	50.00	41	18.55	10	11.76	933	46.44
N	399	55.42	275	39.91	147	50.00	180	81.45	75	88.24	1,076	53.56
Children												
Y	223	30.97	248	35.99	83	28.23	24	10.86	12	14.12	590	29.37
N	497	69.03	441	64.01	211	71.77	197	89.14	73	85.88	1,419	70.63
Health and wellbeing												
Y	236	32.78	253	36.72	101	34.35	17	7.69	12	14.12	619	30.81
N	484	67.22	436	63.28	193	65.65	204	92.31	73	85.88	1,390	69.19
Homes												
Y	79	10.97	72	10.45	52	17.69	16	7.24	8	9.41	227	11.30
N	641	89.03	617	89.55	242	82.31	205	92.76	77	90.59	1,782	88.70
Jobs and standards of living												
Y	151	20.97	138	20.03	63	21.43	22	9.95	8	9.41	382	19.01
N	569	79.03	551	79.97	231	78.57	199	90.05	77	90.59	1,627	80.99
Migration												
Y	94	13.06	95	13.79	58	19.73	36	16.29	4	4.71	287	14.29
N	626	86.94	594	86.21	236	80.27	185	83.71	81	95.29	1,722	85.71
People who are more vulnerable												
Y	123	17.08	161	23.37	71	24.15	24	10.86	7	8.24	386	19.21
N	597	82.92	528	76.63	223	75.85	197	89.14	78	91.76	1,623	80.79
Resources we rely on												
Y	337	46.81	442	64.15	137	46.60	50	22.62	12	14.12	978	48.68
N	383	53.19	247	35.85	157	53.40	171	77.38	73	85.88	1,031	51.32
Social unrest and tension												
Y	86	11.94	81	11.76	50	17.01	15	6.79	3	3.53	235	11.70
N	634	88.06	608	88.24	244	82.99	206	93.21	82	96.47	1,774	88.30
Travel and transport												
Y	62	8.61	31	4.50	37	12.59	18	8.14	4	4.71	152	7.57
N	658	91.39	658	95.50	257	87.41	203	91.86	81	95.29	1,857	92.43
None of the above												
Y	24	3.33	3	0.44	2	0.68	86	38.91	7	8.24	122	6.07
N	696	96.67	686	99.56	292	99.32	135	61.09	78	91.76	1,887	93.93
Don't know												
Y	29	4.03	5	0.73	2	0.68	14	6.33	40	47.06	90	4.48
N	691	95.97	684	99.27	292	99.32	207	93.67	45	52.94	1,919	95.52

Table S4: Support for policies to tackle climate change: valence questions

"Below are two different ways of describing the same plan. One has a positive spin, the other has a negative spin. If either, which would be most likely to convince you to support the plan?"

	Negative	***Positive***
Health and wellbeing	*Without much stronger UK plans for dealing with climate change, people's health and wellbeing will suffer to a far greater extent in the future.*	*With much stronger UK plans for dealing with climate change, people's health and wellbeing will be far better in the future.*
People's jobs and living standards	*Without much stronger UK plans for dealing with climate change, people's jobs and living standards will suffer to a far greater extent in the future.*	*With much stronger UK plans for dealing with climate change, people's jobs and living standards will be far better in the future.*
Children	*Without much stronger UK plans for dealing with climate change, children will suffer to a far greater extent in the future.*	*With much stronger UK plans for dealing with climate change, children will be far better off in the future*
The resources we rely on (e.g., food and water)	*Without much stronger UK plans for dealing with climate change, the resources we rely on (such as food and water) will be far harder to come by in the future.*	*With much stronger UK plans for dealing with climate change, the resources we rely on (such as food and water) will be far safer in the future.*
The animals and nature around us	*Without much stronger UK plans for dealing with climate change, the animals and nature around us will suffer to a far greater extent in the future.*	*With much stronger UK plans for dealing with climate change, the animals and nature around us will be far better off in the future.*
Those who are struggling to make ends meet	*Without much stronger UK plans for dealing with climate change, those who are already struggling to make ends meet will suffer to a far greater extent in the future.*	*With much stronger UK plans for dealing with climate change, those who are already struggling to make ends meet will be better off in the future.*

Table S5. Preferences for action on climate change (results of mixed logit model from DCE survey)

Column 1: Policy attributes	Column 2: Mean (S.E.)	Column 3: Standard Deviation (S.E)
Choice A vs. no extra action	1.583***	
	(0.247)	
Choice B vs. no extra action	1.689***	
	(0.233)	
Health and well-being	Reference	
Animal and nature	-0.921***	2.810***
	(0.241)	(0.258)
Livelihoods and standards of living	0.209	-1.720***
	(0.206)	(0.285)
The resources we need to survive	0.357*	1.382***
	(0.175)	(0.165)
Children and future generations	0.264	1.480***
	(0.262)	(0.294)
The local level	Reference	
The global level	0.855***	1.718***
	(0.163)	(0.187)
The national level	0.951***	0.937***
	(0.128)	(0.137)
Everybody pays the same	Reference	
People who are better off pay more	0.556**	2.494***
	(0.196)	(0.184)
Model fit		
Log likelihood	-2237.43	
McFadden's R square	0.17	
Number of observations	8760	
Number of responses	365	

*p<0.05; **p<0.01; ***P<0.001. Standard errors in parentheses.

For the policy focus (green), 'health and wellbeing' is the reference case. For the policy level (turquoise), 'the local level' is the reference case. For the method of payment (grey), 'everybody pays the same' is the reference case.

The table indicates that, with respect to focus, people prefer a policy that focuses on 'people's health and wellbeing' to one focusing on 'animals and nature'. But a policy focused on health and wellbeing is preferred less than one focused on 'the resources (e.g., food and water) we all rely on': participants had stronger positive preferences for the latter policy. Compared to policies focussed on health and wellbeing, people also had stronger preferences for policies focused on 'children and future generations' and on 'livelihoods and standards of living' but these preferences were not significant (Table S3, column 2 and 3).

With respect to level, people have stronger positive preferences for addressing climate change at the national or global level, rather than the local level. Regarding payment via taxation, people tended to prefer the progressive option ('people who are better off pay more') over 'everybody pays the same'.

Behind this overall picture, Table S5 suggests people have heterogeneous preferences for focus, scale and payment method. Some have stronger positive preferences for one dimension (e.g., focus or scale or payment method) while others have negative preferences (Table S5, column 2 and 3).

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Appendices

Appx A: Summary of project's public involvement

Appendix A. Summary of project'

Appx B: Social media engagement in health and climate change|:an exploratory analysis of Twitter

Appendix B. Social media engagement

Appx C: Scoping review of discrete choice studies of public preferences for climate policies

Appendix C. Scoping review of D

Appx D: Climate change messaging survey: latent class analysis and impact framing

Appendix D. Survey 1. Climate change m

Appx E: Eliciting the public's preferences for policies to address climate change – discrete choice experiment

Appendix E. Survey 2 Eliciting the public