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Brief communication: How well are Londoners prepared for flooding? An assessment of risk mitigation actions and a pilot comparison of perceived and modelled flood likelihood

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Abstract. Surface water flooding probability in London is high but little is known about how aware Londoners are of their exposure. 183 online survey responses showed large differences between perceived flood likelihood and modelled flood probability for respondents' homes (where the latter could be confidently determined - full addresses cannot be collected due to ethical constraints, which limited sample size and representativeness): 54.6% overestimated their flood likelihood, 19.7% underestimated, and 25.7% were accurate. Residents in high flood probability locations underestimated their exposure. Self-reported flood probability knowledge increased perception accuracy. Climate change concern was linked to flood probability overestimation and implementation of risk mitigation actions.

1 Introduction

London manages river flooding well with only 27,800 properties assessed as "high" probability of river flooding, which is 0.6% of all London properties (Environment Agency, 2025). However, 319,800 properties are assessed as "high" probability of surface water flooding, representing 7.4% of all London properties (*ibid.*). Furthermore, London has specific flood vulnerabilities: the London Underground acts as a sink for surface water e.g. 66 different tube stations were flooded in 2014-2021 (GLA, 2021); and high property prices have led to many basements being converted into flats (apartments) in London, approximately 56,000 of which are assessed as vulnerable to flooding (GLA, 2025). This flood likelihood will grow in the future, with the UK's Climate Change Risk Assessment showing that 'expected annual damages' from surface water flooding in England could increase by up to 2.3 times (i.e. 130% increase) by the 2080s (assuming high population growth, 4°C climate change by 2100, and reduced adaptation actions) or be limited to a 34% increase (low population, 2 °C, enhanced adaptation actions) by the 2080s (Russell and Sayers, 2022).

In such a situation, it is important to understand how well residents understand their chances of flooding so that they can make informed decisions on managing their risk and responding to warnings, and so that appropriate policies and interventions can be developed. Indeed, there is considerable literature on understanding what drives people's perception of their flood probability and their subsequent mitigation actions – see reviews by Taylor et al. (2014) and Lechowska (2022) –

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and that research points to complicated relationships between perceived flood likelihood, previous experiences of being flooding and the actions that people may or may not take to manage their risk. For example: Wachinger et al. (2013) and Kuhlicke et al. (2020) found that it cannot be assumed that improving people's understanding of their exposure will lead to increased risk management actions; and Bubeck et al. (2012), in reviewing the literature, uncovered almost no examples where increased understanding of risk led to better preparation but that previous experience of being flooding was a strong indicator of risk management actions.

However, there is much less research quantitively comparing perceived flood likelihood with 'actual', or modelled, flood likelihood in order to assess whether this impacts adaptation responses. The studies that do make such comparisons draw different conclusions: Botzen et al. (2015) and Mol et al. (2020) identified residents overestimating flooding likelihood in New York city and the Dutch river delta, respectively; Bakkensen and Barrage (2022) and Royal and Walls (2019) found evidence of underestimates of flood likelihood in Rhode Island and Maryland floodplain residents, respectively; and Turner and Landry (2024) found that accurate, over- and under-estimates were all similarly represented in their survey of residents of the U.S. East Coast. It should be noted that collecting the information from survey participants in order to assess their modelled flood likelihood, particularly highly spatially variable surface water flooding, has issues as research ethics constraints often mean that the level of detail required (i.e. full addresses) would identify participants and cannot be collected.

Given the particular hazard and vulnerability profile in London, alongside the lack of research on perception accuracy in this area and the constraints on certain methods, we will address these research questions:

- Can sufficient information be collected from online survey participants to adequately assess their modelled flood likelihood?
- If so, do London residents accurately perceive their flood probability compared with modelled flood probability?
- Does self-reported flood knowledge and climate change concern influence the accuracy of flood probability perception?
- Is there a link between flood preparedness action and perceived flood probability or climate change concern?

2 Data and methods

To address these research questions, we targeted a survey at residents of the 'London postal district'.[1] We collected sufficient location data to assess their home's modelled flood likelihood to a high level of confidence from the UK government's public tool for checking "flood risk" (GOV.UK, 2026), although the tool actually reports flood likelihood or probability.

[1] The 620 km^2 area that aligns with the E, EC, N, NW, SE, SW, W and WC postcode areas.

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This allowed us to compare this with perceived flood likelihood. By asking other questions related to flooding – e.g. previous flooding experience, climate change concerns – we were able to contextualise the perception accuracy findings.

2.1 Survey questions, distribution and quality control

An online questionnaire[2] was designed to capture data relevant to our aims, which included the following questions:

- How would you describe the flood risk level where you currently live? (Options: 'high', 'medium', 'low', 'very low', 'unsure'. Indication of return period included e.g. "High risk: floods frequently (once every 1-30 years)".)
- How well informed do you feel about the risk of flooding where you live? (Four-point scale from 'Not at all informed' to 'Very well informed'.)
- How concerned are you about the impacts of climate change in London? (Four-point scale from 'Not at all concerned' to 'Very concerned'.)
- Have you been affected by flooding in your current, or a previous, home? (Yes (directly), yes (indirectly), no.)
- How prepared do you feel your household is for a potential flood event? (Four-point scale from 'Not at all prepared' to 'Very well prepared'.)
- What preparedness actions have you taken? (Select all that apply from a list of 8 options, plus 'other' with free text response, or none.)
- Demographic information: gender; age range; postcode; type of property they live in. (Various.)

The survey was targeted at London 'postal district' residents using the Prolific platform, which was chosen as it has an adequate user base in London – nearly 3,000 active users in our chosen postcodes – and it has been assessed as one the more reliable survey platforms in terms of AI-agent survey contamination (Chen et al., 2026; Westwood and Frederick, 2026). An attention check question was included in the survey and responses that failed it were rejected from the analysis. Prolific automatically rejects responses that do not meet certain quality tags, such as very quick completion or that exhibit certain completion patterns. The survey went live on 09 December 2025 and closed on 15 December 2025 when our target sample of n=500 was reached. Where respondents submitted a postcode outside of the London 'postal district' – presumably they had moved without updating their Prolific profile – these responses were rejected (9 responses), and 22 responses were rejected for failing the attention check question, leaving 469 responses.

2.2 Determining modelled flood probability with limited information

England's official tool for checking flood probability for specific addresses (GOV.UK, 2026) was used to assess the modelled flood likelihood for the survey respondents. The tool gives present day and mid-21st Century modelled flood

[2] The research study was granted ethical approval by the Queen Mary University of London Department of Geography and Environmental Sciences Devolved School Research Ethics Committee (DSREC) on 11 November 2025 with reference number DSERC2025-050. The full survey is available in Appendix A.

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probability from surface water, and from rivers and the sea, separately; we always used surface water flood probability as this was the highest probability in all cases. Probability is reported in four different risk bands, which were also used in the survey for perceived probability so that comparable data were collected:

- High – More than a 3.3% chance of flooding each year
- Medium – Between a 1% and 3.3% chance of flooding each year
- Low – Between a 0.1% and 1% chance of flooding each year
- Very low – Less than a 0.1% chance of flooding each year

The tool requires a full address to return flood probability information as it can vary for addresses within a single postcode. As the survey collected postcodes only – collection of full addresses was not permitted within the ethical approval or Prolific's rules as participants could be easily identified with this information – only responses where the flood probability was the same for at least 75% of the addresses within each postcode (and that there was no more than two flood probability bands modelled in that postcode) were retained for analysis in the comparison study. These conditions were checked by hand in the tool. The conditions ensured we retained a reasonable number of responses yet could be confident of having accurate knowledge of each respondent's modelled flood probability. Respondents who live in flats (apartments) above the ground floor were excluded as they may interpret their flood probability as zero. This left 183 respondents where we could confidently assess their home's modelled flood probability that could be used in the comparison of the perceived and modelled data.

2.3 Method limitations

To ensure the method was robust, it was necessary to reject survey participants who live in areas with the highest spatial variability in flood probability. It is, however, reasonable to assume that those areas present the most difficulty for residents to assess their flood probability and, therefore, we introduced a bias towards areas of more uniform flood probability. Furthermore, whilst the number of active users on Prolific in the London 'postal district' (~3,000) does allow for a representative sample of the overall population of ~5,400,000, which would be 385 (Qualtrics, 2023), there is some bias in the self-selecting Prolific users: the cohort was skewed towards female (58%) and younger people (63% in the 25-44 bracket, although this is fairly representative of the London age profile). However, once responses that could not be used in the flood probability comparison were excluded, the sample size dropped below the representative sample level (183 vs. 385) as we underestimated how many responses would be rejected for the comparison phase. Nonetheless, this smaller analysis still provides an initial indication of the level of understanding of flood probability in London and allows us to comment on the use of online surveys to collect adequate to perform such a comparison study, which is important in policy and intervention development.

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3. Results

In this section we report some results from the full n=469 dataset where the respondent's address is not important (Sections 3.1 and 3.3), and some results from the sub-set of n=183 where the specific respondent address is important and the self-assessment of flood probability can be compared to the modelled flood probability data (Section 3.2).

3.1 Survey participants' perceived flood probability from the full dataset

Of the 469 responses, 80 participants (17%) reported being unsure of their flood likelihood. Of the 389 respondents who gave a response: 3.2% perceived 'high' probability; 18.8% 'medium' probability; 47.8% 'low'; and 30.2% 'very low' probability. This profile does not compare well with overall modelled probabilities (Environment Agency, 2025), which has 7.4% 'high', 5.2% medium and 87.4% 'low' or 'very low' for this area (these were not separated in Environment Agency (2025)). Our full (representative) cohort appears to be underestimating 'high', and overestimating 'medium', flood probability.

3.2 Comparison of perceived flood probability with modelled flood probability for respondents where flood probability can be determined

After removing the responses where modelled flood could not be confidently assessed, the distribution of modelled and perceived flood probability for the remaining 183 participants are shown in the first column and row of Table 1, respectively. From the modelled probabilities, it is clear that this sub-group is not reflective of the London flood probability profile: 'low' and 'very low' are over represented (97.3% vs. 87.4%); and 'medium' and 'high' are underrepresented (0.5% vs. 5.2% and 2.2% vs. 7.4%, respectively). This could be a facet of removing participants where there was high spatial variability of flood probabilities in their postcode.

Table 1 also reveals a very poor alignment between the perceived and modelled flood probabilities. Indeed, only 25.7% of the 183 survey participants accurately assessed their flood probability. Over half (54.6%) of respondents who provided their perceived probability overestimated their probability compared to the modelled flood probability, with 18% overestimating by 2 or more flood probability bands (Table 2). The remaining 19.7% underestimated their flood likelihood. Whilst this latter group is the smallest, it does introduce the greatest vulnerability into the cohort: all 5 participants who were in the 'high' or 'medium' modelled probability bands underestimated their flood likelihood; and 9.1% of the participants at 'low' probability perceived 'very low' probability. Combined with 54.6% of participants who overestimated their probability, this is evidence that the communication of flood risk to Londoners requires more attention.

More positively, where participants reported being 'very well informed' on flood risk they were more likely than other groups to be accurate (50% of 6 participants) but where participants reported being 'not at all informed' on flood risk they were more likely than other groups to underestimate flood probability (40.5% of 42 participants) and least likely to be

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accurate in assessing flood probability (16.7% of 42 participants). Age, particularly when combined with a short period in their current home, also played a key role: 60% of the 18-24 respondents underestimated their flood probability, the most of any age band. Climate change concern appears to play a role in driving the overestimation of flood probability: over 70% of those in the 25–34. 45–54 and 55–64 age brackets who believed that climate change was increasing flood probability, overestimated their flood probability.

Table 1. Contingency table (or cross-tabulation) of modelled flood probability (rows) and perceived probability (columns) from the survey for the 183 participants where modelled flood probability could be confidently assessed. Each cell shows the percentage of each survey category that fell into each modelled category e.g. 22.8% of the modelled 'very low' probability participants perceived 'very low' probability. The bold diagonal numbers indicate where modelled flood likelihood was accurately assessed. The ∨ ∨ (∧ ∧) symbols around the numbers to the left (right) of the bold diagonal numbers indicate where respondents underestimated (overestimated) their modelled flood likelihood.

Modelled\Perceived	Unsure (30; 16.4%)	Very low (42; 23.0%)	Low (76; 41.5%)	Medium (31; 16.9%)	High (4; 2.2%)
Very low (167; 91.3%)	15.0%	**22.8%**	∧ 43.7% ∧	∧ 16.2% ∧	∧ 2.4% ∧
Low (11; 6.0%)	18.2%	∨ 9.1% ∨	**63.6%**	∧ 9.1% ∧	∧ 0.0% ∧
Medium (1; 0.5%)	0.0%	∨ 0.0% ∨	∨ 100.0% ∨	**0.0%**	∧ 0.0% ∧
High (4; 2.2%)	0.0%	∨ 25.0% ∨	∨ 50.0% ∨	∨ 25.0% ∨	**0.0%**

Table 2. Alignment of perceived and modelled flood probability for the 183 participants where modelled flood probability could be confidently assessed and where they provided an estimate of their flood probability.

Underestimated by 2+ probability levels	Underestimated by 1 probability level	Accurate	Overestimated by 1 probability level	Overestimated by 2+ probability levels
5 (2.7%)	31 (16.9%)	47 (25.7%)	67 (36.6%)	33 (18%)

3.3 Preparedness actions from the full dataset

Of the 469 respondents, 311 (66%) report having taken no actions to prepare for the impacts of flooding. The remaining 158, noting that multiple options could be selected, reported that they had: checked flood-risk maps (76; 48%); purchased home insurance that includes flood cover (56; 35%); informed local authority of blocked drains (38; 24%); prepared a flood kit

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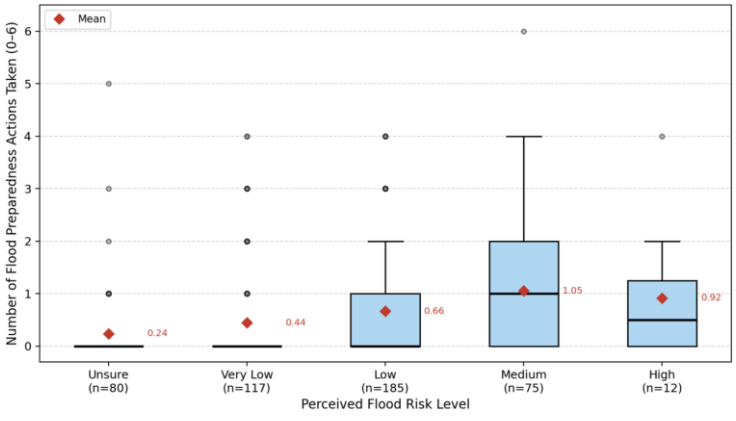
(29; 18%); prepared an emergency plan (26; 16%); signed up for flood alerts (25; 16%); planned make-shift measures (21, 13%); joined local flood action group (5; 3%); and installed property-level resilience (4; 2%). Figure 1 shows the distribution of these actions across the perceived flood likelihood levels. Here the results show that where respondents perceive that they are at some risk (i.e. the 'low', 'medium' and 'high' groups in Figure 1) then they are more likely to prepare. Respondents who reported being 'very concerned' about the impacts of climate change also had a higher mean score for the number of preparedness actions taken (0.83) compared to 'not very concerned' (0.43) and 'fairly concerned' (0.60). Overall, these results show minimal preparedness amongst the cohort. Even those who reported being 'very prepared' (n=22) or 'somewhat prepared' (n=66) still had low mean action counts (1.27 and 1.24, respectively).

Figure 1. Box-and-whisker plot showing the distribution of flood preparedness action counts for respondents at each perceived flood probability level. The y-axis shows the number of preparedness actions reported per respondent. The red diamonds indicate group means, the boxes show the interquartile range, the central bar the median, and the whiskers the full range, excluding outliers (dots). The median for 'unsure', 'very low' and 'low; is zero, indicating that the majority of respondents in these groups took no preparedness actions.



4. Discussion and conclusions

From the analysis of perceived flood probability from the full cohort and the comparison cohort, there is a robust result that residents of the London 'postal district' generally overestimate their flood likelihood, particularly those with a 'very low' probability of flooding assessing their probability as 'low' or 'medium'. This overestimation appears to be linked to climate change concern: 63.6% of those concerned with the impacts of climate change overestimate their flood probability (41.4% by 1 probability band, 22.2% by 2 or more probability bands). This is consistent with Botzen et al.'s (2015) finding that generalised environmental concern elevates perceived flood probability beyond objective probability estimations. The distinction between 'risk in general' and 'my risk specifically' is central to effective risk communication design (Spence et

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al., 2011): media coverage of climate change and flooding, while raising general concern, does not appear to provide the spatial specificity needed for accurate personal risk assessment.

It is also the case that, from our comparison study, those with a modelled probability of 'medium' or 'high' all underestimated their flood likelihood. While based on small numbers, this warrants discussion even with that caveat. The pattern of underestimation among high-probability residents and overestimation among low-probability residents has been documented in other European contexts (Thieken et al., 2007, Mol et al., 2020) and in the United States (Botzen et al., 2015; Turner and Landry, 2024). The accuracy rate of 25.7% observed in this study is notably lower than the 38% reported by Turner and Landry (2024) for U.S. East Coast homeowners, and the partial accuracy observed by Mol et al. (2020) in the Netherlands, suggesting that London residents may face particular barriers to accessing or correctly interpreting official flood risk information. A parallel may be drawn with Bakkensen and Barrage's (2022) Rhode Island findings, where risk sorting — risk-averse individuals self-selecting out of flood-exposed areas — may have left a population of underestimators concentrated in high-risk zones. For London, the vulnerability introduced by underestimation is amplified by Russell et al.'s (2024) finding that most Local Flood Risk Management Strategies fail to adequately address climate-driven increases in flood risk beyond the highest-hazard zones. Our participants appeared to align with this conclusion, with only 8% agreeing or strongly agreeing that local government in London is doing enough to prepare for flooding.

Another clear result identified here was the relationship between self-reported knowledge and flood probability estimation accuracy. Accuracy rose from 16.7% at 'not at all informed', through 28.7% at 'not very informed ', 25.5% at 'somewhat informed' before reaching 50.0% at 'very well informed' (based on only 6 respondents at the final stage). This result implies that, despite identifying very low accuracy overall, there seems to be the possibility that this could be overturned with greater outreach to key individuals. This interpretation is further supported by the result that, when asked if individuals have a responsibility to prepare for floods, 11% strongly agreed and 59% agreed. Related, however, we found no association between previous flood experience and flood risk preparedness, which has been identified by Burningham et al. (2008) as a key factor, but the full cohort only had 4 respondents with direct experience of flooding and 20 with indirect experience.

Finally, despite falling short of a representative sample for some of the research, we have tested this method with a small cohort that has certain biases, and still identified some concerning conclusions. If this methodological issue were addressed it is likely that we would incorporate respondents from more spatially variable flood probability areas that would be more difficult for residents to assess. We are working on a more sophisticated survey method that can capture participants' flood probability, without breaching ethical standards of collecting precise addresses, to examine this issue more completely. If this is possible, then it would allow for a more systematic assessment to be made without having to physically visit the areas under investigation.

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Appendix A

Survey Questions: Flood Preparedness and Climate Policy Awareness in London

1. I have read the information above and consent to take part in this study. (Required to answer. Single choice.)
   - Yes, I consent

2. Please enter your Prolific ID. This allows us to confirm payment and manage withdrawal requests. You can find your Prolific ID at the top of your Prolific Participant page.

Section A: Awareness and concern

3. How well informed do you feel about the risk of flooding where you live? (Required to answer. Single choice.)
   - Very well informed
   - Somewhat informed
   - Not very informed
   - Not at all informed

4. How would you describe the flood risk level where you currently live? (Required to answer. Single choice.)
   - High risk - floods frequently (about once every 1-30 years)
   - Medium risk - floods occasionally (roughly once every 30-100 years)
   - Low risk - floods rarely (around once every 100-1,000 years)
   - No/Very low risk - never floods or maybe once every 1,000+ years
   - Unsure - not sure about the flood risk

5. Do you believe that climate change is increasing flood risk in your area? (Required to answer. Single choice.)
   - Yes
   - No
   - Unsure

6. How concerned are you about the impacts of climate change in London?Required to answer. Single choice.
   - Very concerned
   - Fairly concerned

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- Not very concerned
- Not at all concerned
- Don't know

Section B: Flood experiences and impacts

7. Have you been affected by flooding in your current home? (Required to answer. Single choice.)
- Yes, directly
- Yes, indirectly (nearby area)
- No
- Not sure

8. If yes, how were you personally affected? (Tick all that apply)Required to answer. Multiple choice.
- Damage to your house
- Loss of belongings outside your home
- Loss of valuable belongings in your home
- Loss of sentimental belongings
- Physical health impacts (e.g. broken bones, illness)
- Mental health impacts (e.g. stress, depression)
- Disruption to transport to work
- Disruption to transport for personal travel
- Temporary relocation
- Financial problems
- Inability to get flood insurance
- Drop in property value or unsaleable property
- Cancellation of significant plans (e.g. holidays, life events)
- Disruption to children's education
- No significant impact
- Other

9. Do you know if your current home had ever flooded before you lived there? (Required to answer. Single choice.)
- Yes, it had flooded before I lived there
- No, it had not flooded before I lived there

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- I do not know

10. Have you been affected by flooding in a previous home? (Required to answer. Single choice.)
- Yes
- No

Section C: Household preparedness

11. How prepared do you feel your household is for a potential flood event? (Required to answer. Single choice.)
- Very prepared
- Somewhat prepared
- Not very prepared
- Not at all prepared

12. This is an attention check. To show that you are paying attention, please select 'Somewhat disagree' (Required to answer. Single choice.)
- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree
- Not sure

13. Which of the following flood-preparedness measures have you taken? Required to answer. (Multiple choice. Tick all that apply.)
- Checked flood-risk maps for my area
- Purchased home insurance that includes flood risk
- Installed property-level resilience measures (air brick covers, flood doors, waterproof sealant)
- Prepared an emergency plan
- Informing local authority of blocked drains
- Signed up for Environment Agency flood alerts
- Prepared a flood kit (e.g. first aid supplies, bottled water, wind-up radio, important documents, torch)

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- Planned make-shift measures (e.g. taking valuables upstairs, protecting doors with waterproof aluminium tape, fold curtains over the curtain rack)
- Talked to your local flood action group
- None
- Other (Type answer)

Section D: Perceptions of responsibility and resilience

14. Who do you believe has the most responsibility for ensuring the flood preparedness of homes London?(Rank the options from highest to lowest by dragging the options. (Required to answer. Ranking.)

- Borough councils
- Environment Agency
- Great London Authority (GLA)
- House builders
- National government and/or the relevant government department
- Residents, home owners and landlords

15. To what extent do you agree or disagree with the following statements? (Required to answer. Likert: strongly agree; agree; neither agree nor disagree; disagree; strongly disagree.)

- The UK government has clear policies to protect London from flooding
- Climate laws are sufficient to ensure London's long-term flood resilience
- The GLA and borough councils are doing enough to prepare for flood risk
- Individuals have a responsibility to prepare for floods

Section E: Awareness of flood sources

16. Are you aware of being exposed to flood risk in your home from any of the following sources? (Required to answer. Multiple choice. Tick all that apply.)

- Main rivers (e.g. Thames)
- Smaller rivers or tributaries
- Buried or underground rivers
- Surface water or flash floods
- Groundwater

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- Coastal flooding
- Don't know

Section F: Demographic information

17. What is your postcode? (Single line text.)

18. What type of home do you live in? (Required to answer. Single choice.)

- Detached
- Semi-detached
- Terraced
- Basement flat
- Ground-floor flat
- Upper-floor flat (1st floor and higher)
- Bungalow
- Other

19. How long have you lived at your current address in London? (Required to answer. Single choice.)

- Less than 1 year
- 1-5 years
- 6-10 years
- Over 10 years

20. Which of the following best describes your gender? (Required to answer. Single choice.)

- Man
- Woman
- Non-binary
- Prefer not to say

21. What age group are you in? (Required to answer. Single choice.)

- 18-24
- 25-34
- 35-44

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- 45-54
- 55-64
- 65+

Data availability

The survey responses, with certain demographic data removed to avoid the potential of identifying participants, is available on the Queen Mary Research Online platform: [URL and doi pending]

Author contributions

AR: conceptualisation; data curation; funding acquisition; methodology; project administration; validation; visualisation; writing (original draft preparation); writing (review and editing). PK: data curation; formal analysis; validation; visualisation; writing (original draft preparation); writing (review and editing)

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