Overheating experienced by UK households (heatwave 2022)

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Climate change and extreme heat

Climate change is increasing the frequency and intensity of extreme heat events in Europe.

Extreme heat have impacts on societies including excess mortality, reduced wellbeing and productivity, wildfires and harvest failures (Khosla et al. 2022).

Excess mortality

Increasing cooling demand

Wildfire

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Heat-associated mortality

- The extreme heat events in summer 2022 in the UK led to 3,271 excess deaths (Wan et al, 2023; Howarth et al., 2023).

- Further analysis indicates that for the whole of 2022, more than 4,500 people died in England due to high temperatures, the largest annual figure on record (ONS, 2023).

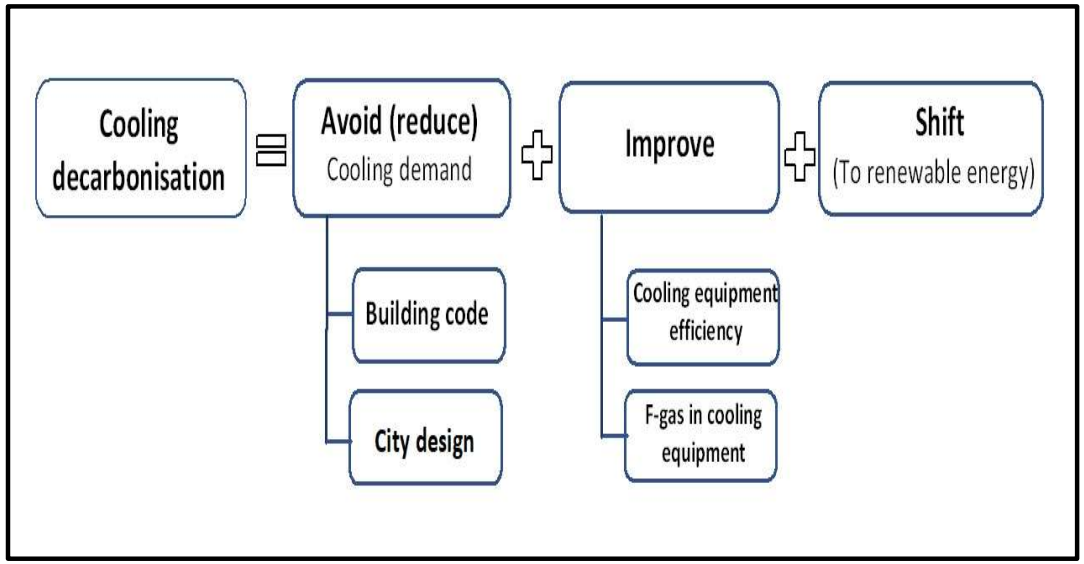
- The UK's had the **highest** heat-associated mortality during the heatwaves 2022 among European countries (Ravishankar and Howarth, 2024).

Overheating

Q1: Is UK housing stock ready for extreme heat?

UK homes are not fit for current and future heat (CCC, 2021)

Q2: Is UK Government ready for extreme heat?



Cooling and overheating is absent in the UK research and policy landscape (Khosravi et al 2023).

Research background

This research project was built on work developed by Cardiff University through the EPSRC-funded Flex-Cool-Store project where has a focus on the impacts of a growth in UK cooling demand through:

- Understanding current and future cooling demand
- How this can be managed through flexible operation
- How future demand can be met in a decarbonised electricity system.

A review of the cooling demand in the UK revealed there is limited understanding of

1. Households' cooling behaviour in domestic buildings;
2. A variety of cooling strategies households apply to respond to overheating.

Understanding **public perceptions** is useful to inform decision making!

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Objectives and methodology

An online survey was disseminated between August and September 2023 and collected data from over **1,500 UK households** to understand:

- ***Overheating experienced by households during heatwaves in summer 2022,***
- ***Type of coping strategies households applied,***
- ***Type of cooling technologies they used.***

Recruitment followed a quota sampling method (age and gender, dwelling type and region) to ensure national representativeness of the British public.

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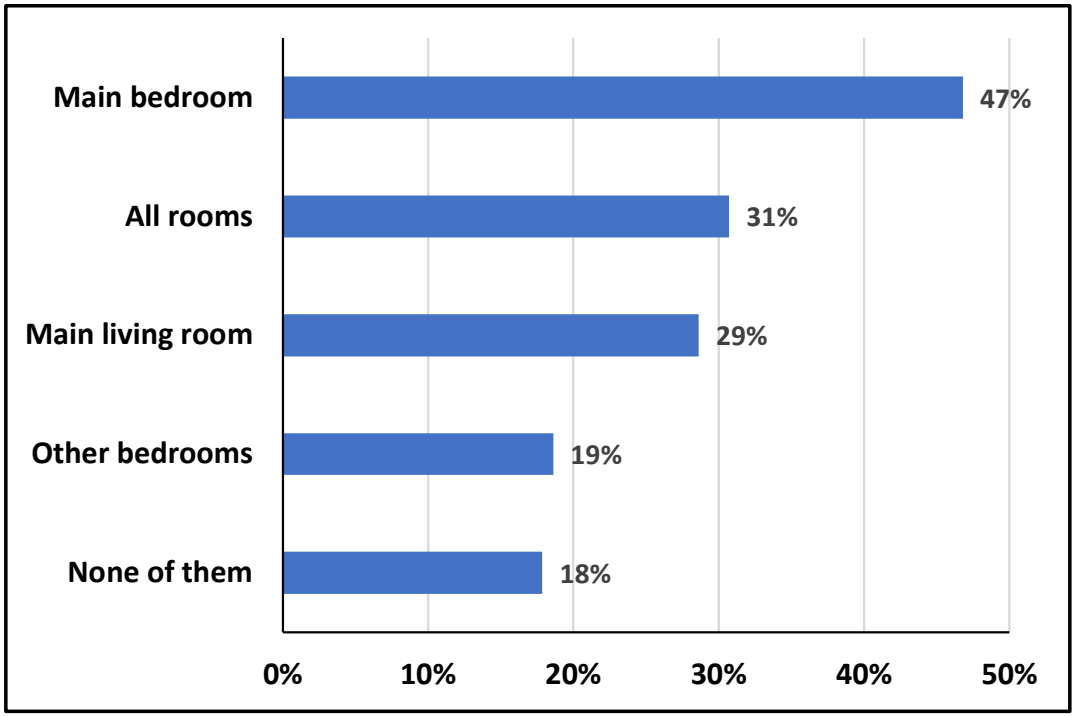
UK Households' reported Overheating

Householders were asked whether they find it 'uncomfortably warm' in any of their rooms during the 2022 summer heatwaves.

82% of households reported 'uncomfortably warm' during the summer.



Percentage of households reported 'uncomfortably warm' per room

'*Uncomfortably warm*' was adopted to describe a thermal sensation associated with indoor overheating.

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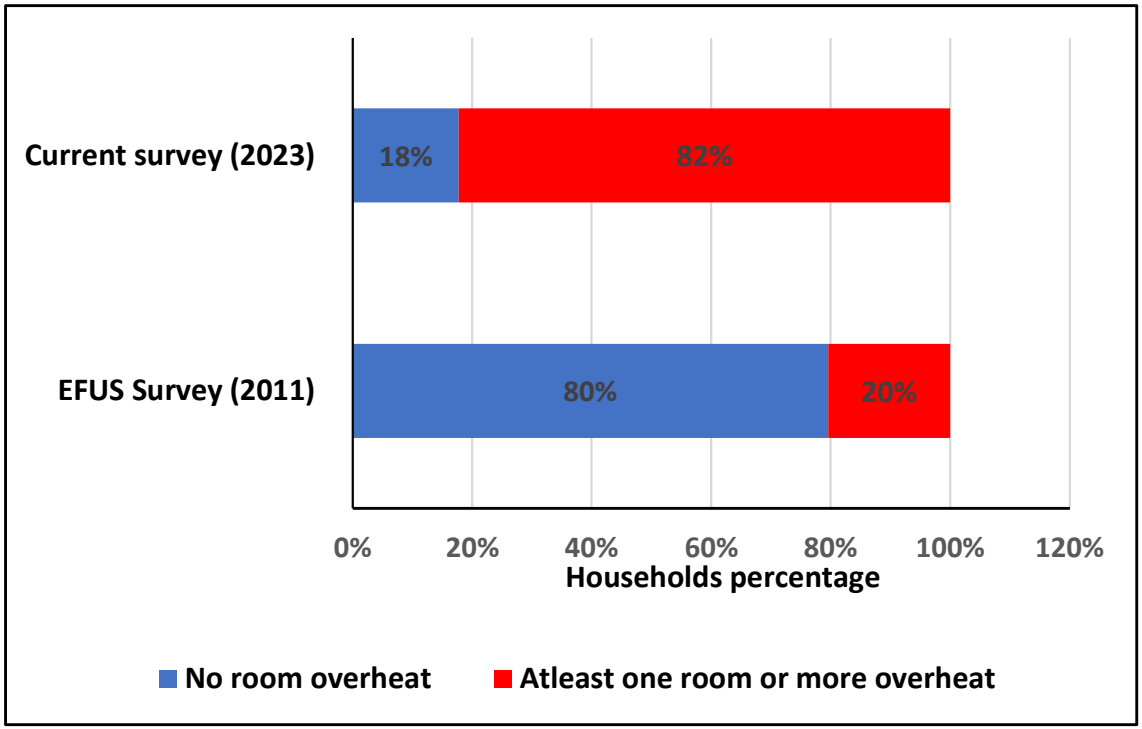
UK Households' Overheating challenges over last decade:

A comparative analysis was conducted with data from the Energy Follow Up Survey 2011.



Percentage of overheating reported by UK households in 2011 and 2022

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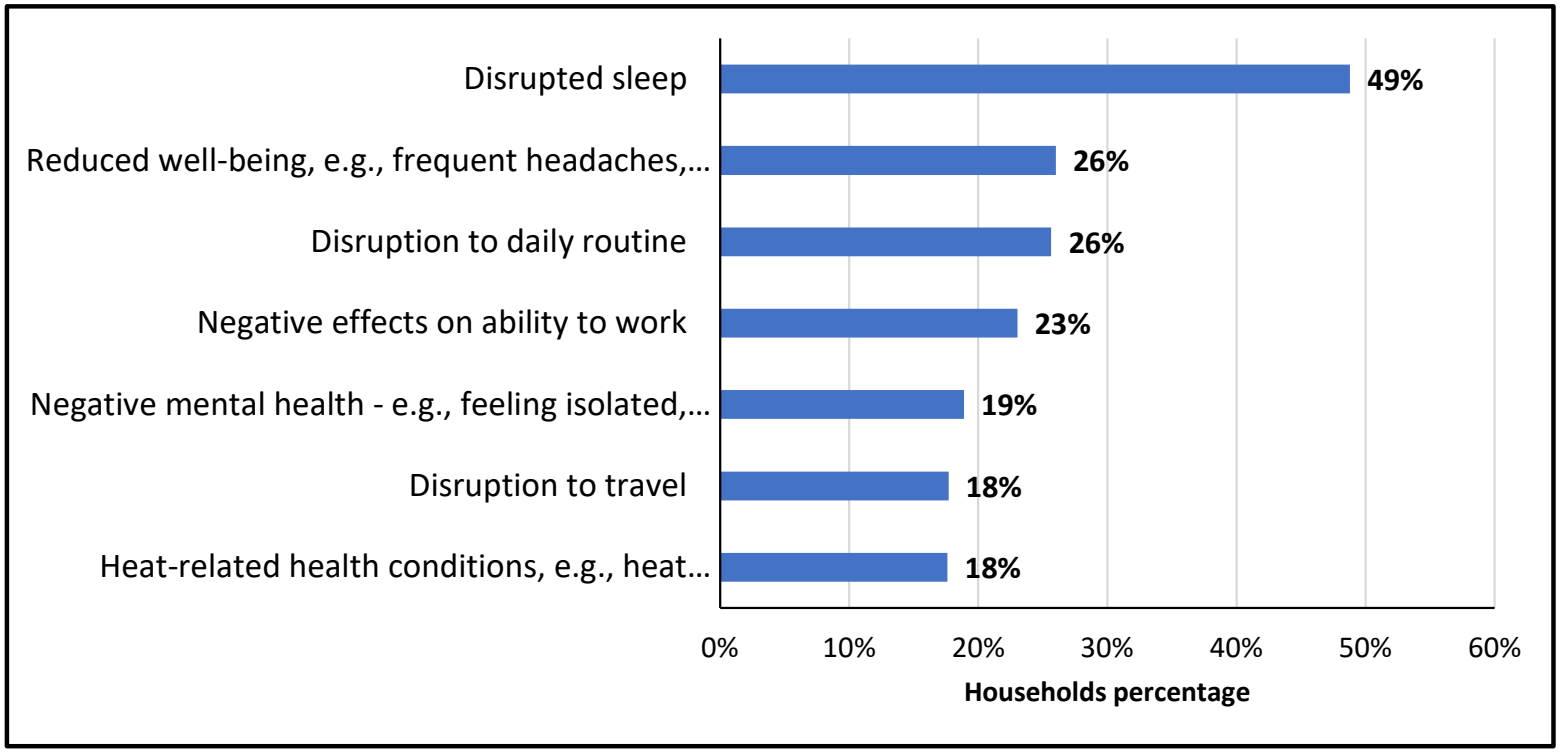
Impacts of heatwaves last summer (2022)



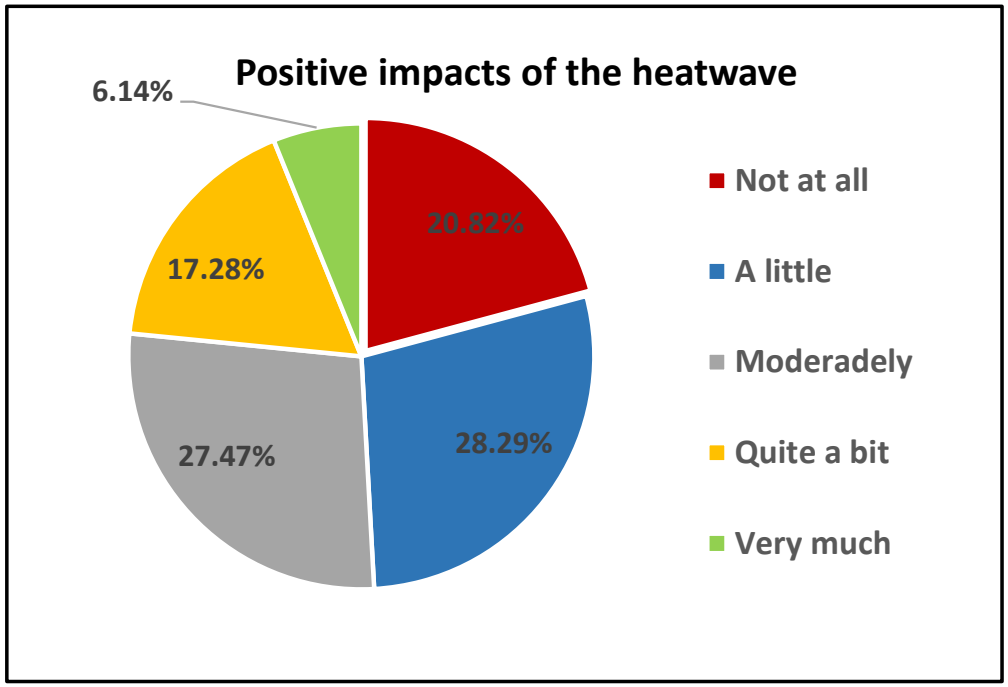
Impacts of heatwaves experienced by UK households during summer 2022

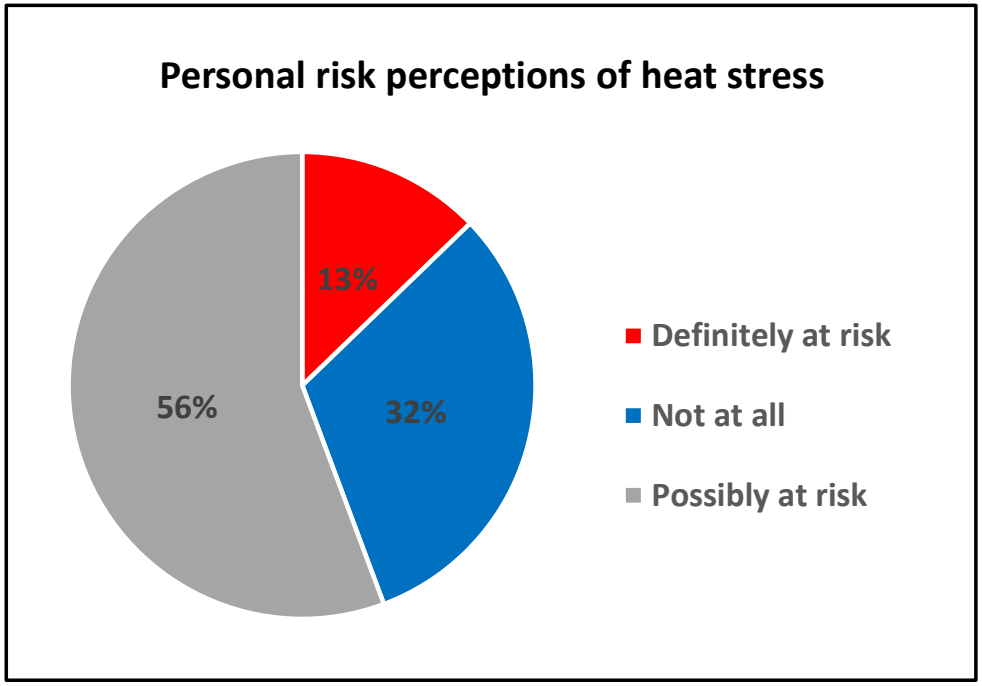
- Sleep quality disruption was the most frequently cited negative impact (49%)
- Reduced well-being, such as frequent headaches, fatigue, disruption to daily routine (26%).

According to Heat mortality monitoring report :

- There were an estimated 3000 deaths associated with the 5 periods of heat across the summer 2022 (UKHSA, 2023).
- Nearly 85% of heat related mortality occurred in adults 65+ years (Public Health England, 2022).

Risk perceptions of heat (2022)





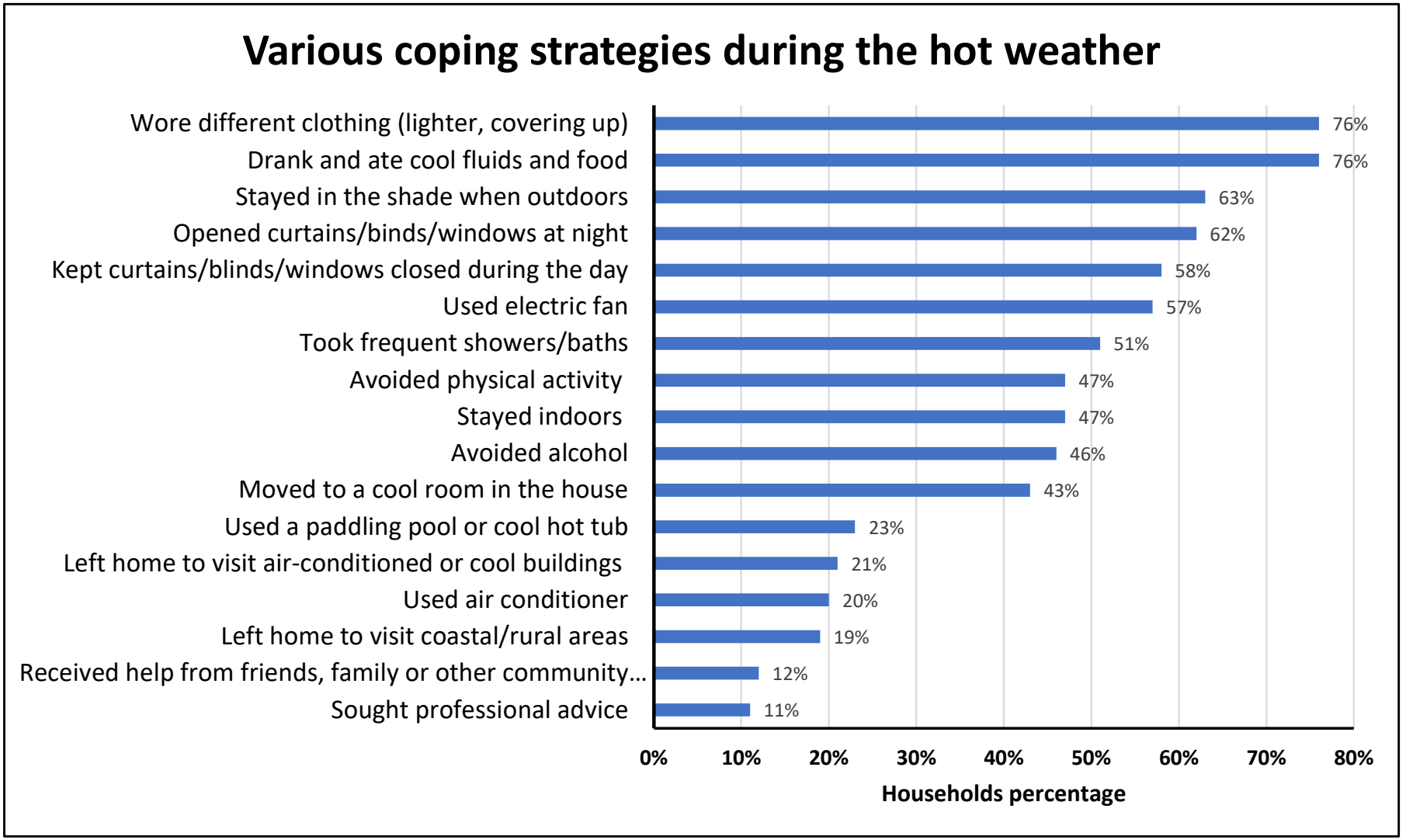
23% of the sample thought that heatwave had positive impact on their life.

32% don't consider heatwave as a risk.

UK people tend to associate hot weather with 'good times'

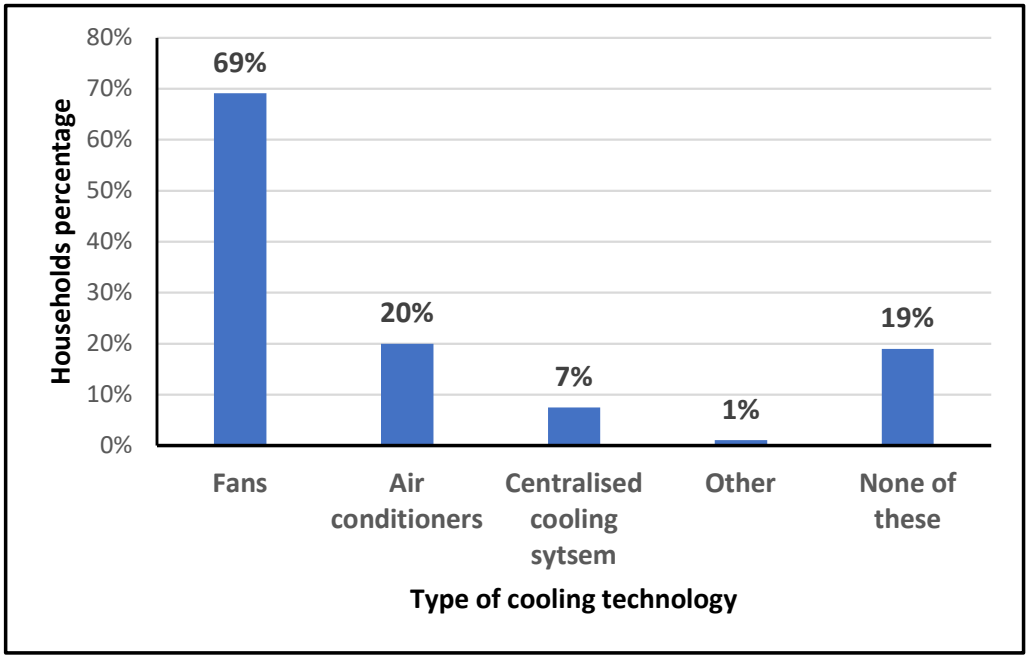
Guardian, July 2022

UK' households coping strategies during the hot weather in the 2022 heatwave

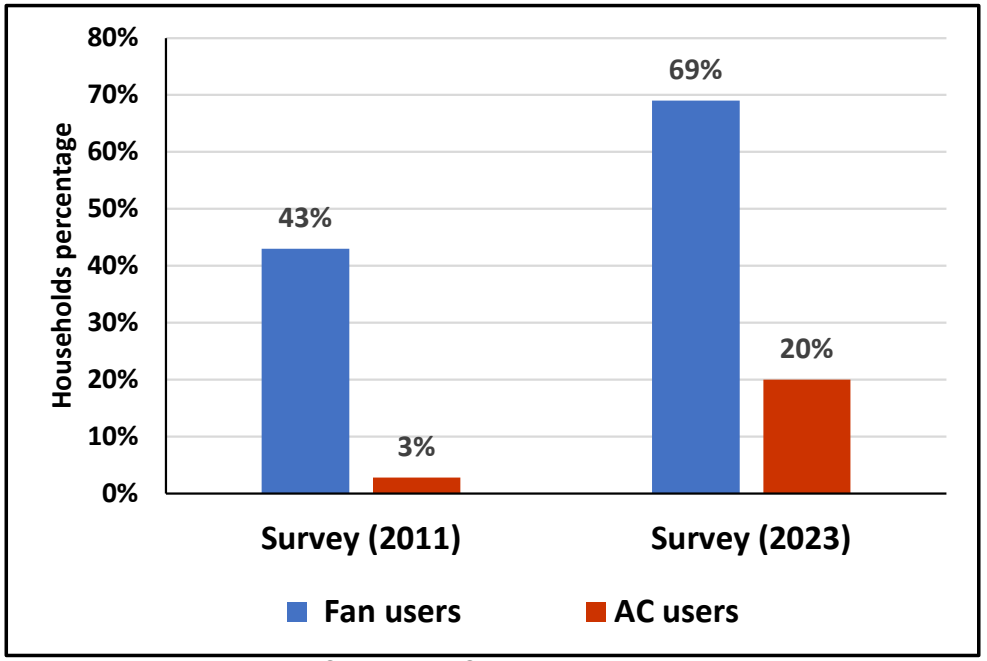


- Changing behaviour and daily routines were the dominant heat strategies used by participants,
- 20% of householders indicated the use of AC and 69% indicated the use of fans.

Types of cooling technologies used by UK households



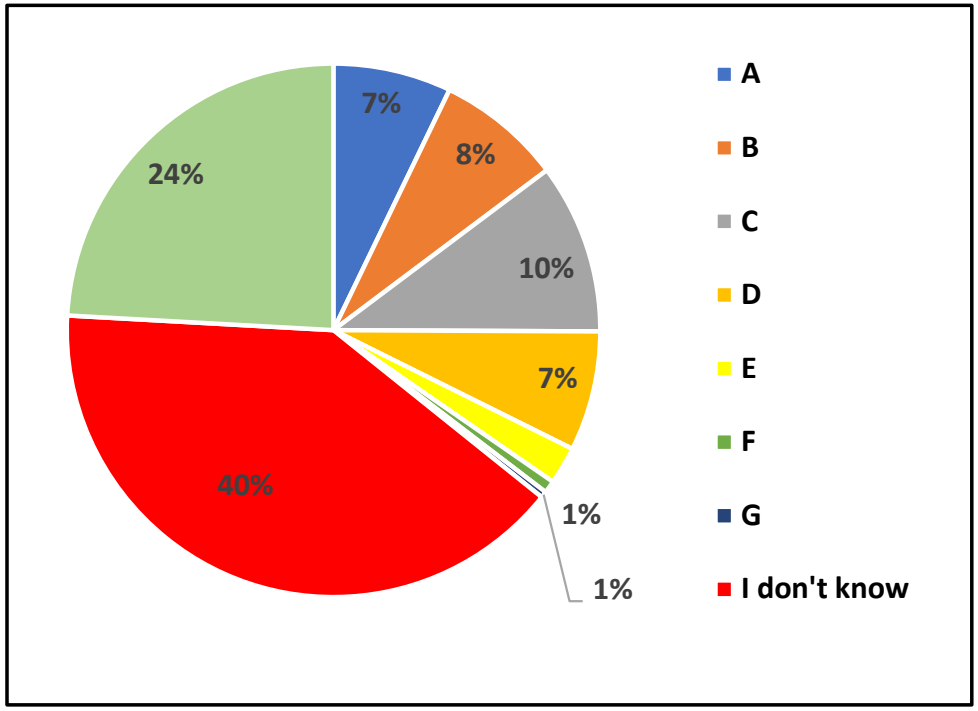
Types of cooling technologies used by UK households in summer 2022



Comparison of using fan and AC by UK household (2011 and 2022)

The Guardian, June 2023

Who has energy efficient AC?



Energy rating of households cooling systems

<u>UK householders were asked whether they know what energy labels mean?</u>

Over half of the respondents (52%) said they had no knowledge of energy labels.

We then asked them about their ACs energy rating?

- Nearly half of ACs owners were unaware of the energy rating of their device.
- 15% of ACs energy rating was A or B,
- 24% of ACs were F.

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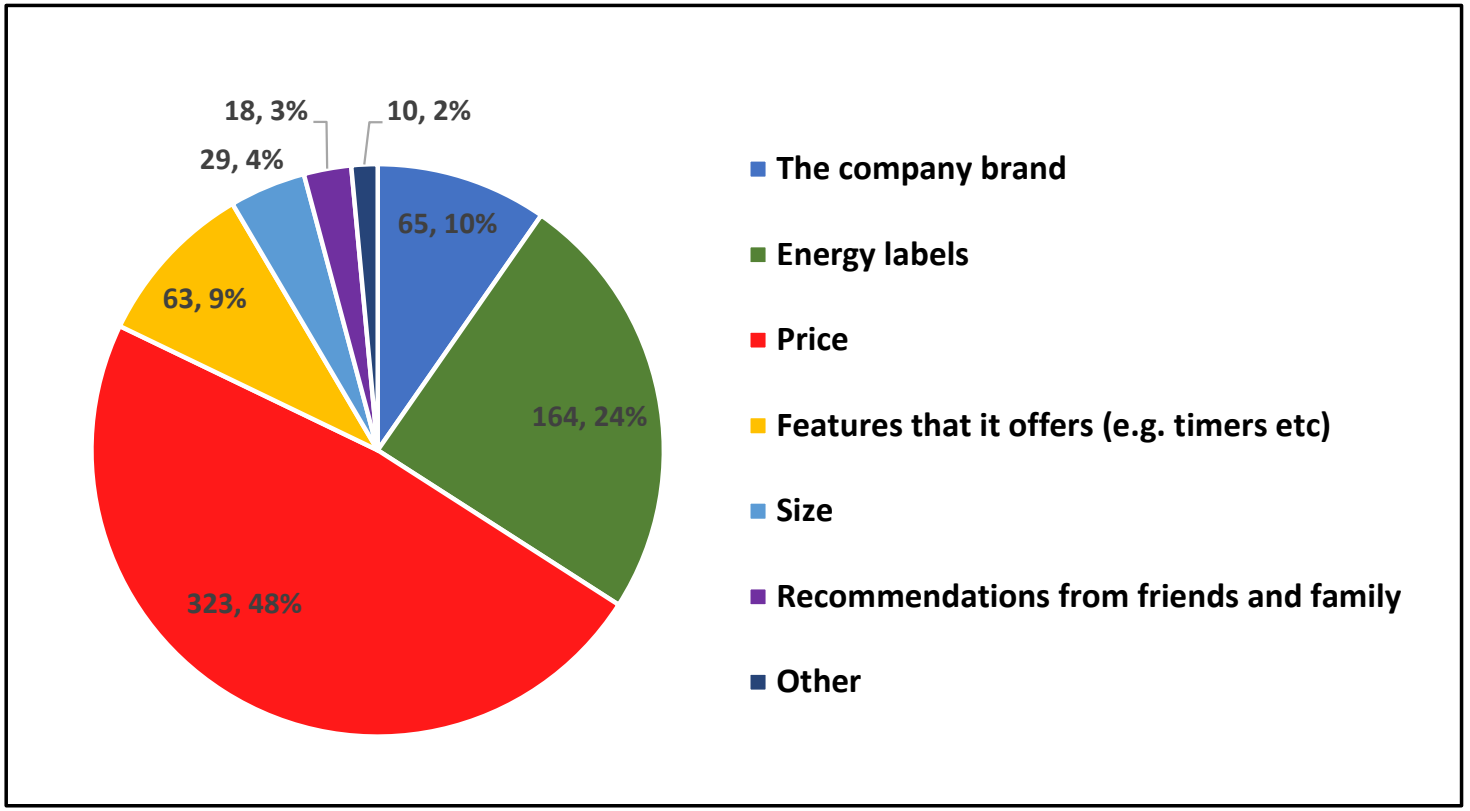
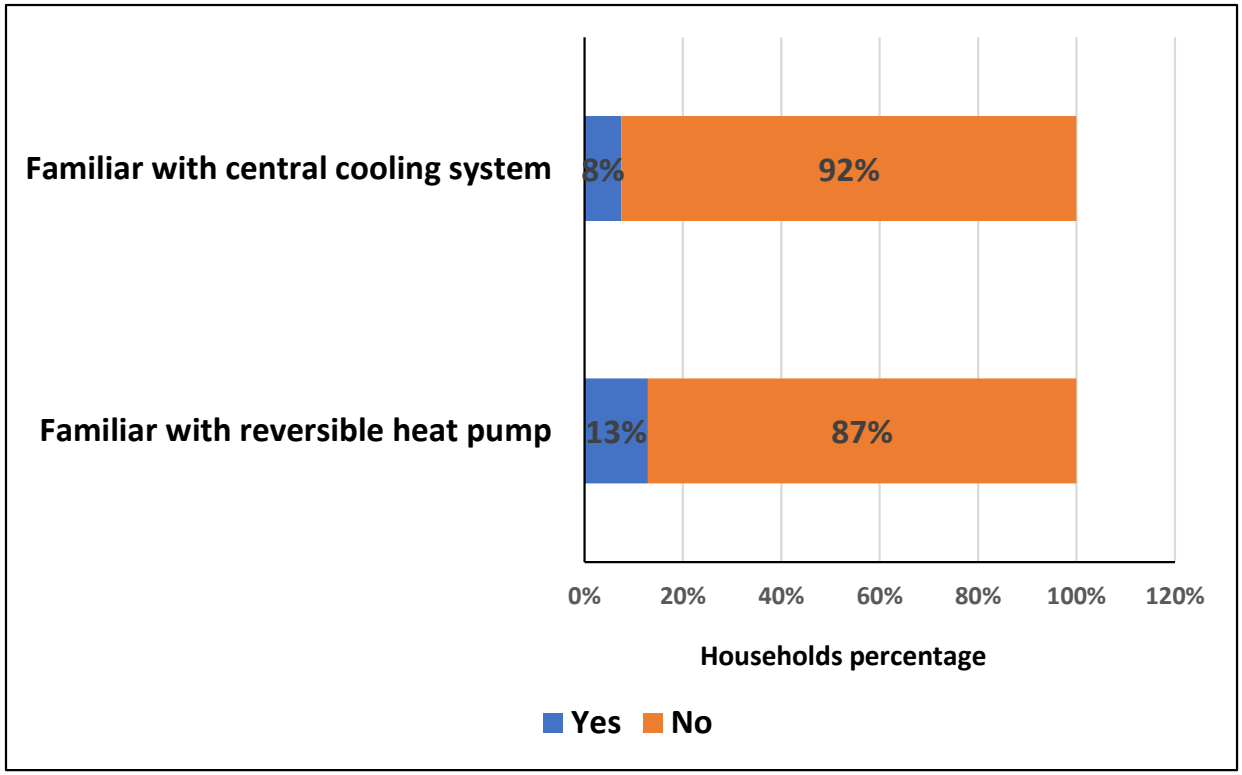
Who has energy efficient Air conditioners?



Factors that influence the purchase of a new AC by UK households

- When asked what factors would be the most important consideration when buying an AC unit, **price** was the topmost concern (48%).
- Energy label (24%) was the second factor to consider in choosing an AC unit.

Knowledge about how to cope with heat and source of information



Familiarity with efficient cooling technologies

Despite the important role of heat pumps in the heating and cooling decarbonisation, the UK household's familiarity with this technology is very low (13%).

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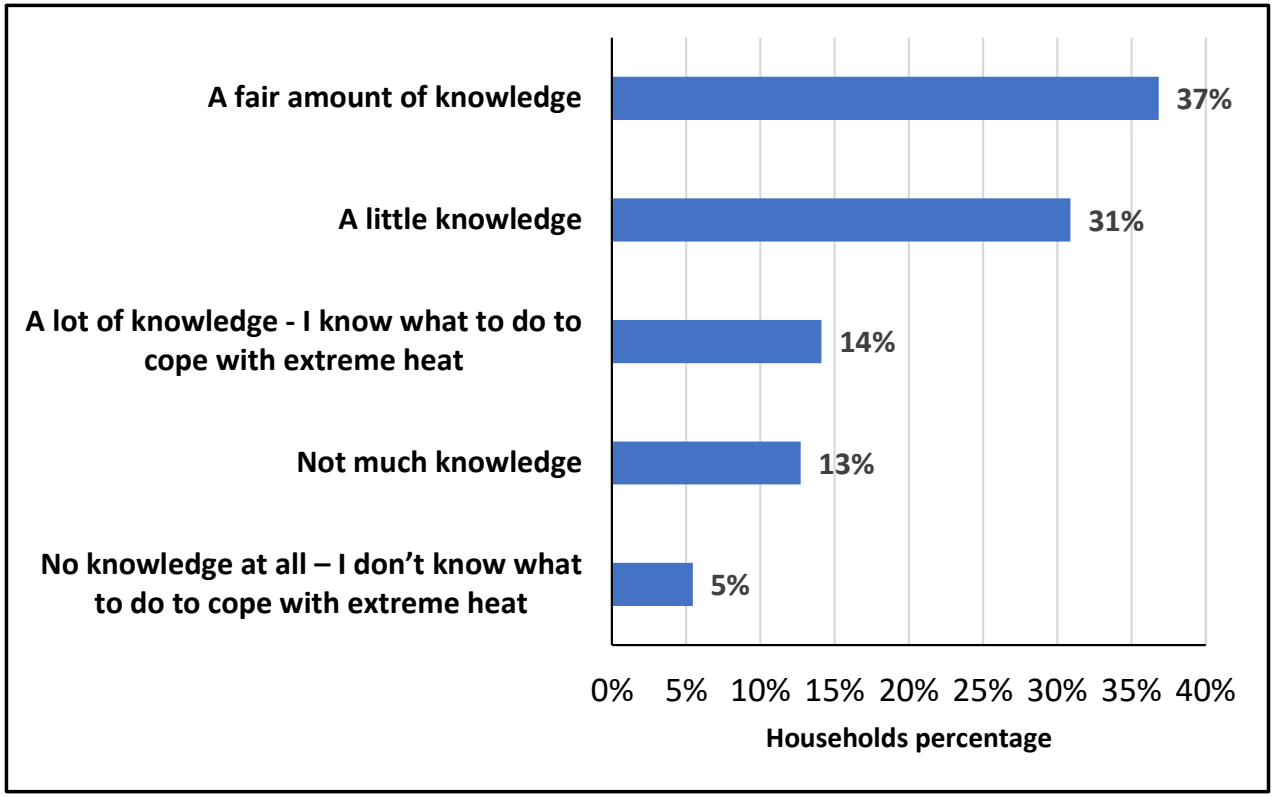
Knowledge about how to cope with heat and source of information



The extent of knowledge about how to cope with heat

Nearly half of the participants had little to no knowledge on coping with extreme heat,

lack of communication of heat risk with public

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Which factors influence experienced overheating in the UK?

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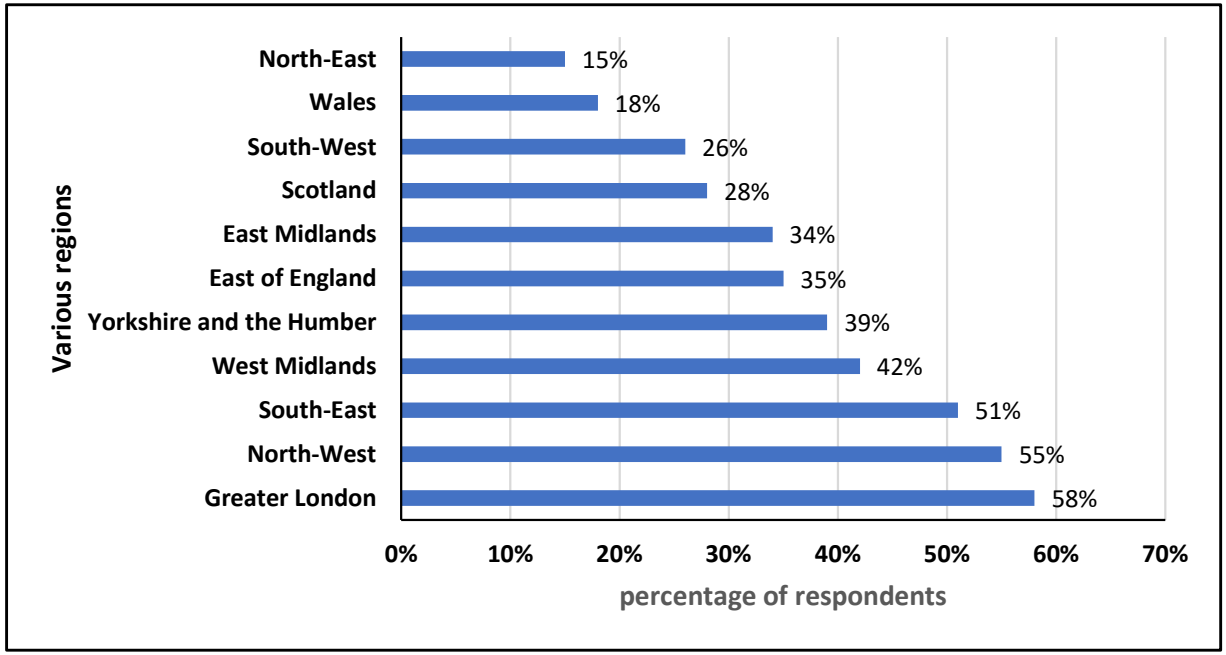
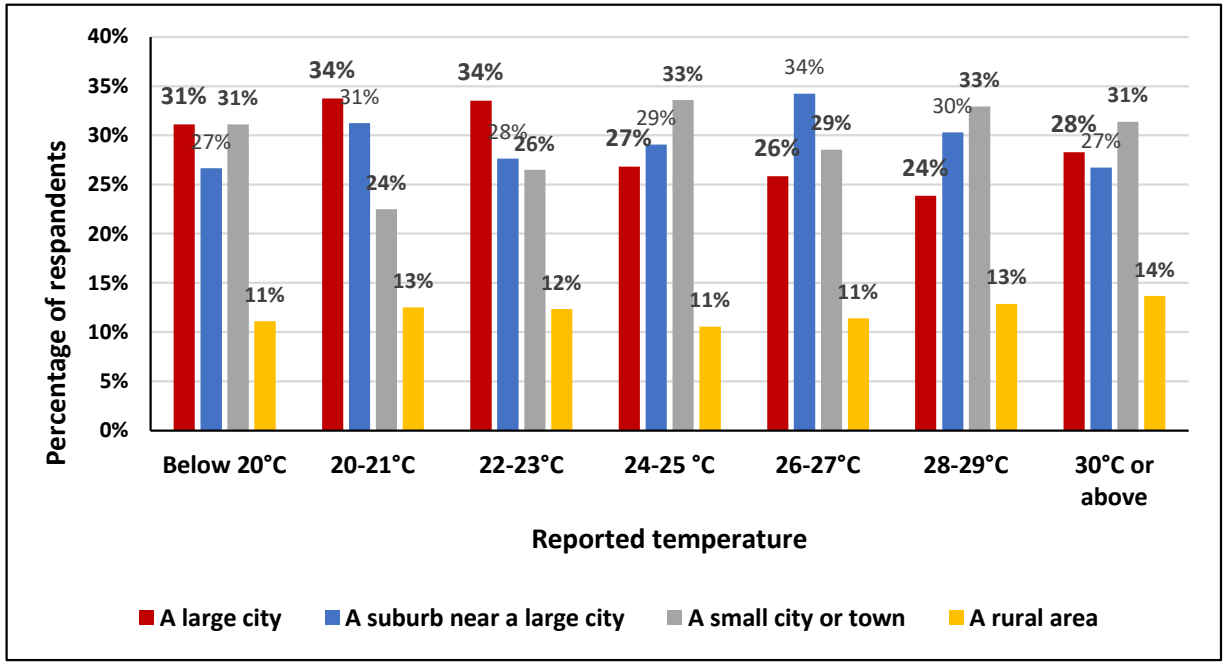
Geography is the first factor that influences reported overheating



Overheating experienced the most by dwellings located in Greater London, 3 times more than Wales.

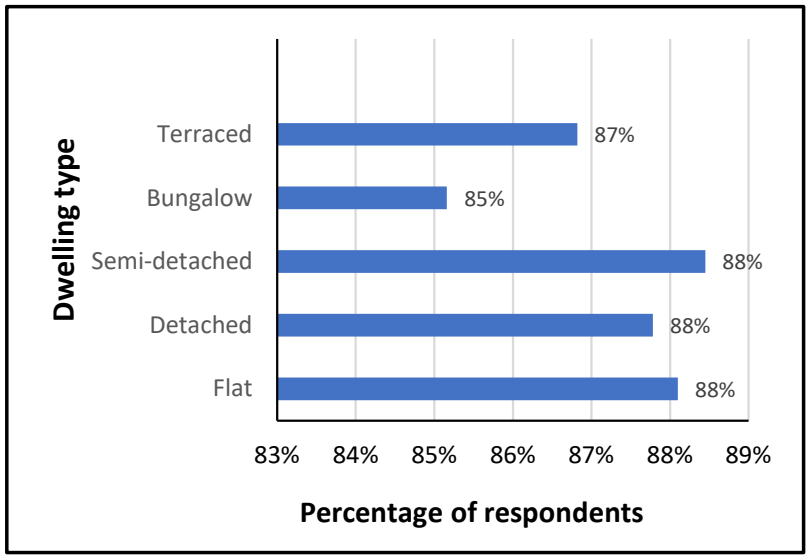
Overheating across various regions in UK



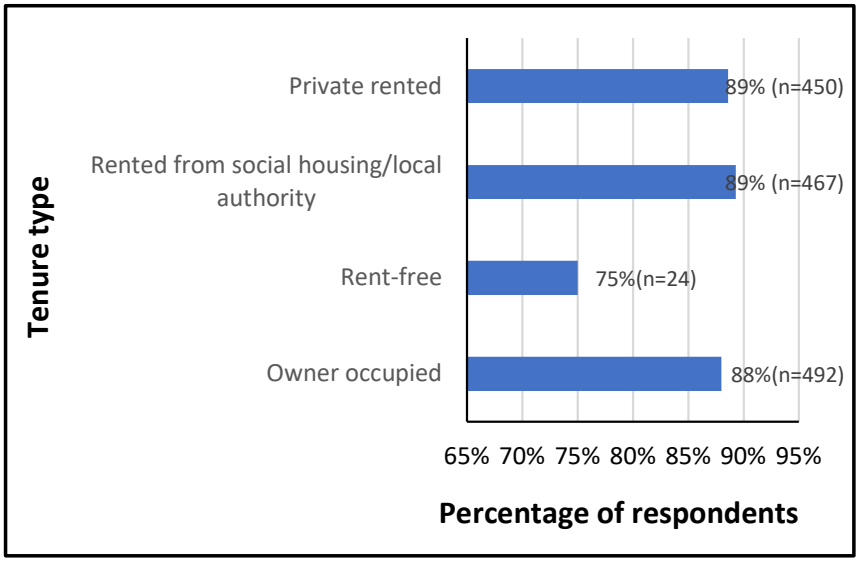
People in urban areas experienced 30 degrees or above, **twice** more than people in rural areas.

Temperature distribution of overheating reported by urban or rural locations

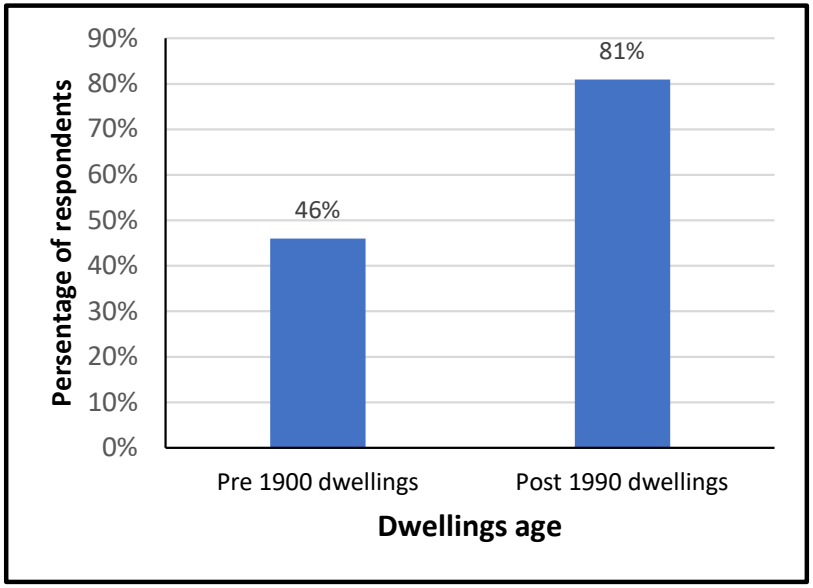
Influence of dwelling characteristics on reported overheating



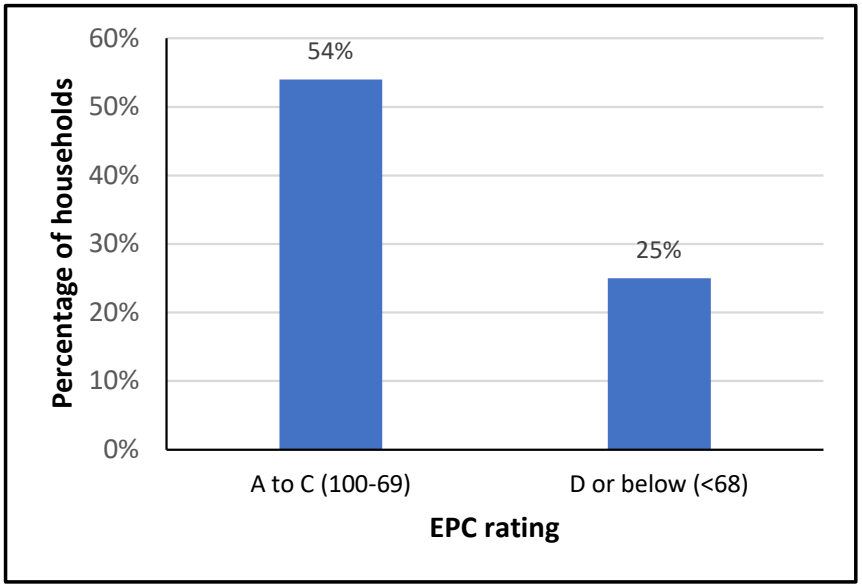
Percentage of households reporting overheating by dwelling type



Percentage of households reporting Overheating across tenure



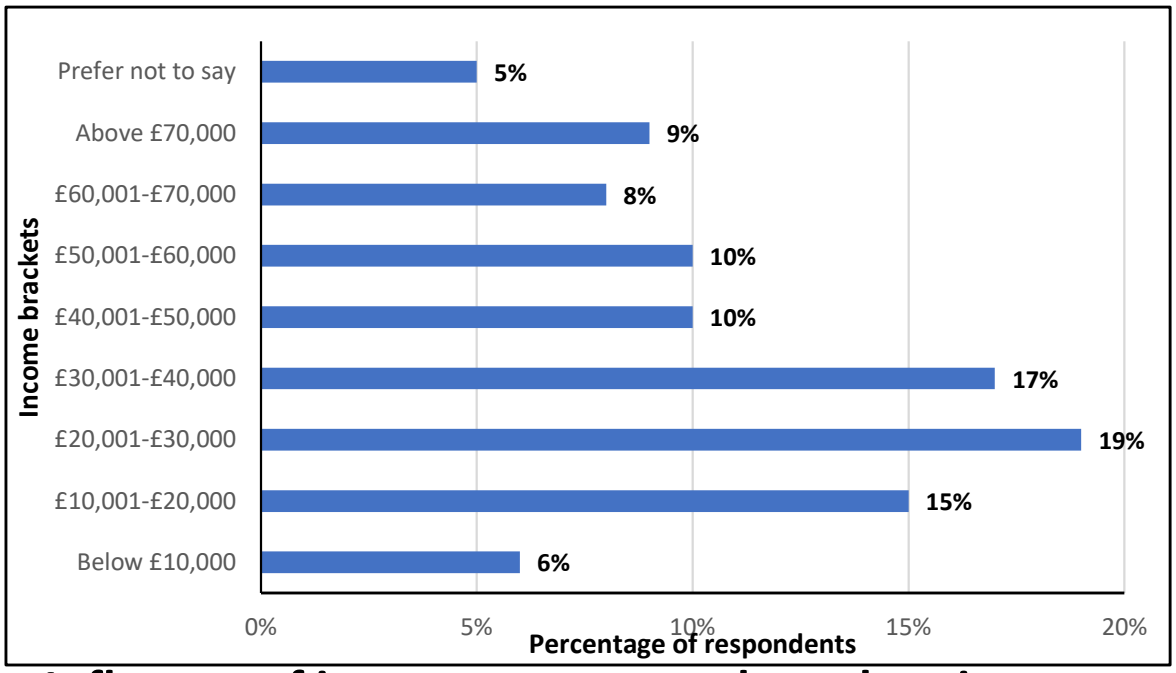
Percentage of households reporting Overheating across dwelling age



Percentage of households reporting Overheating across EPC rating

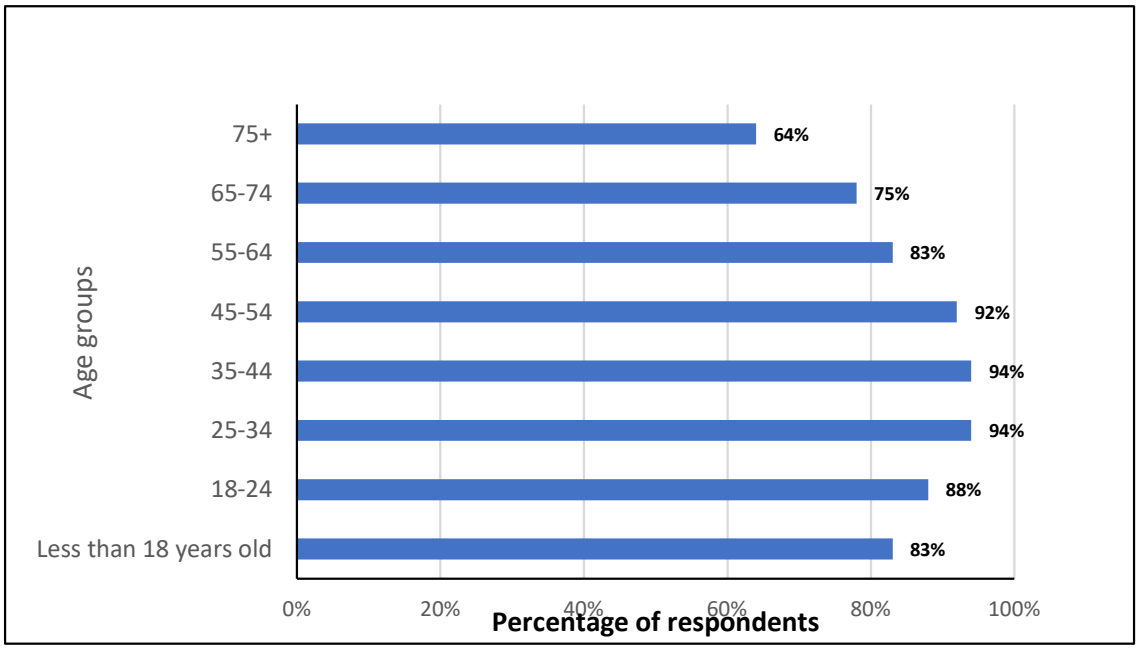
Our study shows overheating reported by the households is influenced by dwelling age and, EPC rating not dwelling type or tenure!

Influence of households income and age on reported overheating



Influence of income on reported overheating

Reported overheating decreased where income increased.

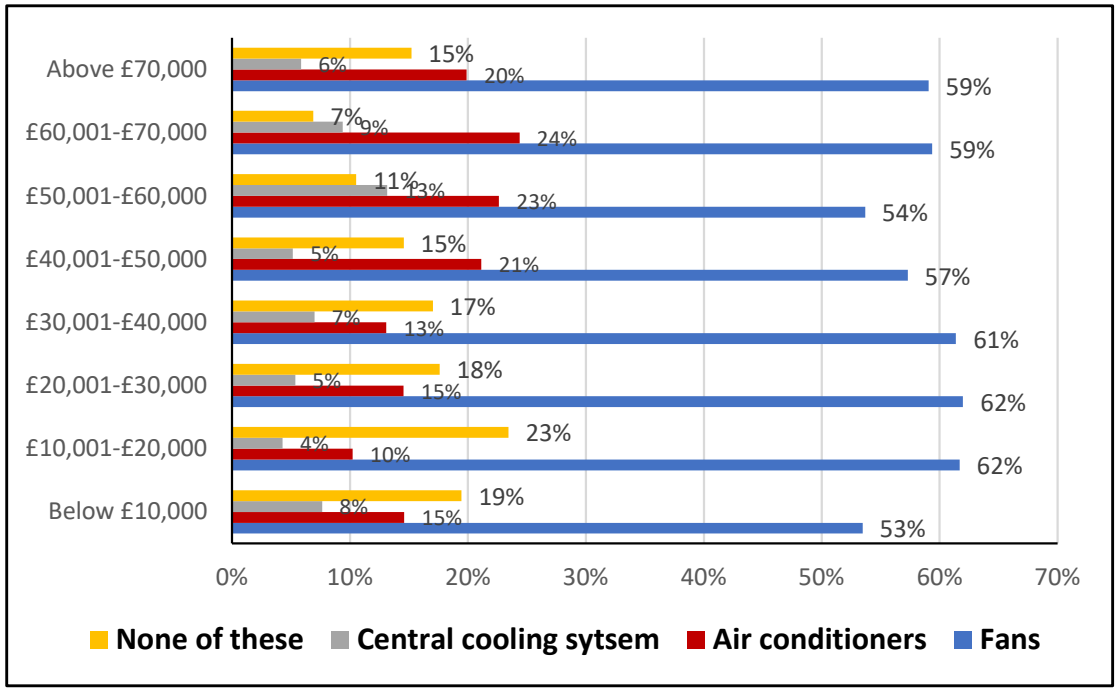


Influence of age on reported overheating

75+ had the least percentage scores for reported overheating due to:

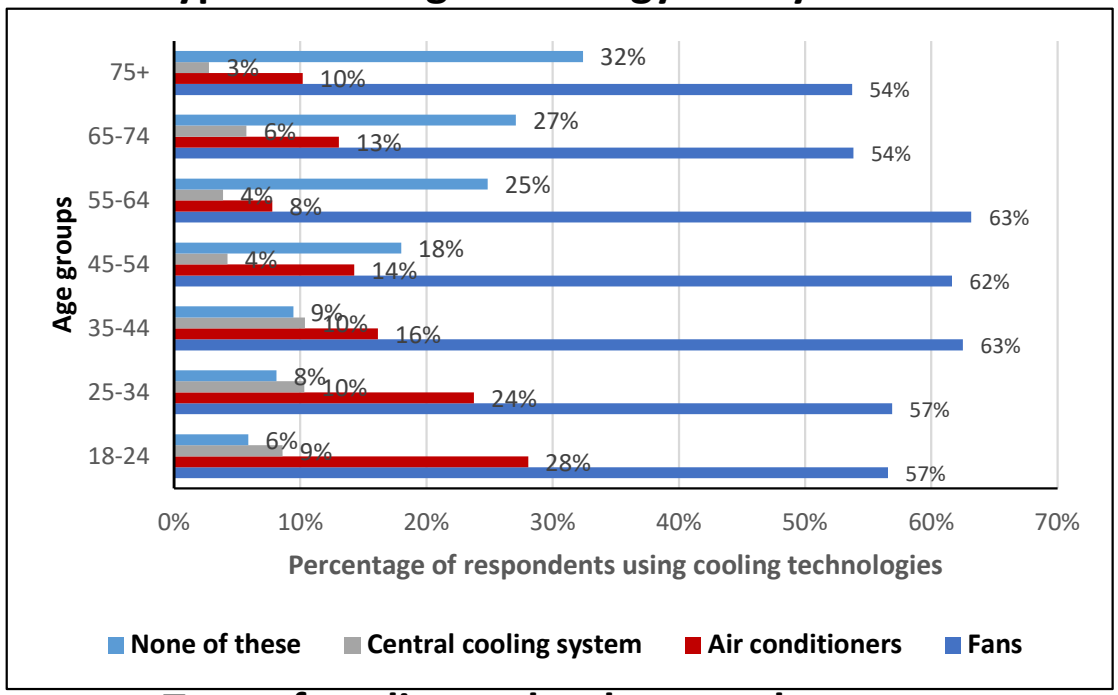
- Impaired ability of the elderly in detecting heat
- A likely preference for higher temperatures compared to younger people
- 75+ years do not perceive themselves as vulnerable and at risk from heatwaves

Households' characteristics and using AC (coping strategy)



Type of cooling technology use by income

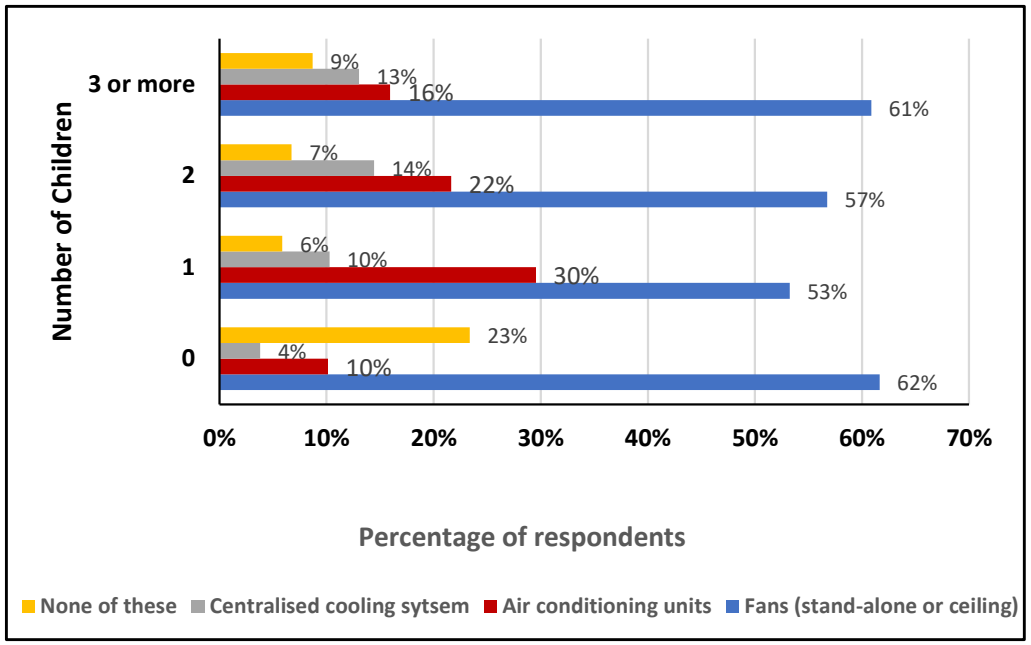
AC use is two times higher for people with higher incomes.



Type of cooling technology use by age

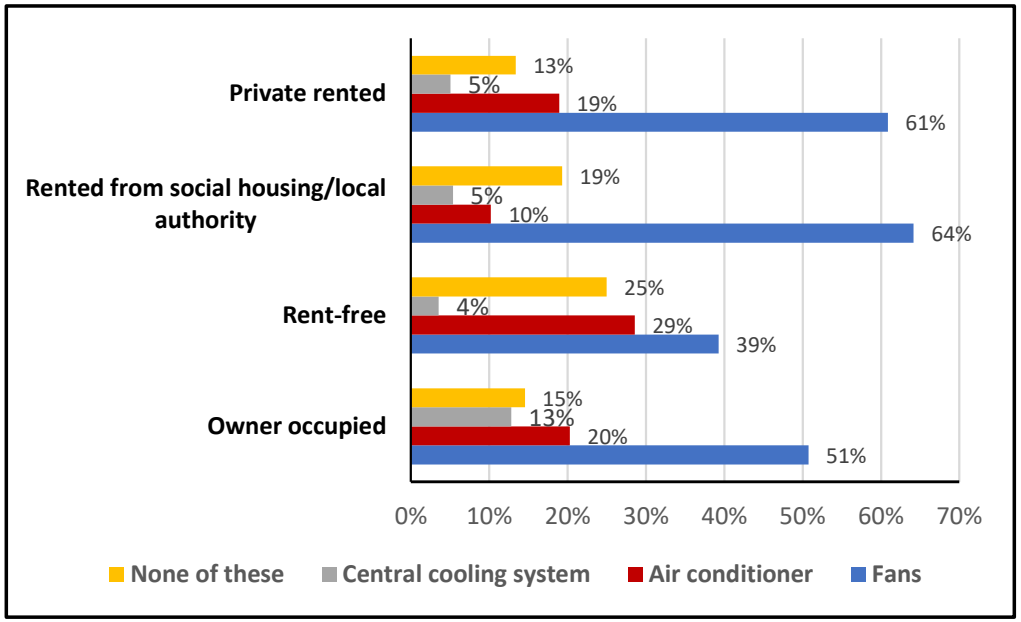
Younger people are 3 times more likely to use ACs.

Correlation of households' characteristics and using AC



Using cooling technology use by household composition

Households with at least one child are 6 times more likely to use AC



Using Cooling technology use by type of tenure

Owner/occupied tenures use AC twice as much as households living in rented social housing/local authority tenure

Main takeaways:

- The rate of overheating reporting in UK dwellings has increased 4 times over 11 years.
- Prevalence of overheating felt in Greater London dwellings was at least two times greater than other regions.
- Households in cities, experienced 30^{o}C or above twice more than households living in rural areas,
- Changing behaviours is dominant coping heat strategies within UK households,
- Uptake of ACs as a coping behaviour has increased 6 times over last 11 years.
- Overheating reported by the households in our study is more influenced by dwelling age and, EPC rating not dwelling type or tenure.

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Main takeaways:

- Overheating experience is not entirely reliant on the building construction, other households' characteristics and behaviours can also affect overheating.
- Occupant characteristics is a key element of using coping strategies.
- More than a third of the sample still don't consider heatwaves as an immediate risk.
- Half of the samples had no knowledge on how to cope with heat.
- More than half of the samples had no knowledge of energy labelling.
- Over 90% of the samples were not familiar with low-carbon cooling technologies, such as reversible heat pumps.
- Finally, 60% of households were not aware of their EPC rating.

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Policy Recommendations to reduce overheating impacts

Hence, two types of recommendations need to be considered to reduce overheating impacts:

- To adapt households cooling behaviours,
- To adapt building design.

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UK main policy for responding to heat

Adverse Weather and Health Plan (AWHP):

- *It is a reactive plan rather than proactive one,*
- *Heat-Health Alert is produced by* **UK Health Security Agency** *in partnership with the* **Met Office,**
- *It is a short-term response to heat (through early warning system),*
- *Lacks long-term response to heat (through behaviour adaptation and* resilience-building),
- Public communication is the weakest part of the plan.

Policy Recommendations to shape (low-carbon) cooling behaviours

To reduce health impacts, **UK Health Security Agency (UKHSA),** must conduct **a national adaptation awareness campaign** on developing:

- Risk of heatwaves and increasing risk perceptions,
- The effect of overheating on health and,
- Knowledge of effective heat coping strategies.

Government needs to launch **awareness of energy efficiency programmes**, as a key to the initial purchase decision.

Incentivizing purchase of more efficient appliances can also be effective.

UK energy label needs to make energy labels easier for people to interpret. E.g., replacing kWh information with estimated running costs (making it easier for comparisons).

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Policy Recommendations to consider overheating in building design

The government revised Part O of the building regulations in 2021 to consider passive cooling strategies in new builds.

- ✓ Future research needs to be done on post-occupancy evaluation (POE) of new build homes to see whether passive cooling is enough to reduce overheating impact.
- ✓ The Government needs to establish a comprehensive national retrofit plan to adapt existing homes to reduce overheating impact.
- ✓ Overheating must be managed alongside heating and energy efficiency programmes, otherwise, it can lead to increasing overheating impacts.
- ✓ Overheating risk needs to be considered as a factor in **EPC rating calculations** alongside heating factors such as heating system, level of insulation, and fuel source.

MK0

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Slide 28

MK0 For example, energy efficiency measures programmes can negatively affect overheating if the specific characteristics of individual buildings and their heat performance are not considered

Mehri Khosravi, 2024-06-18T12:36:06.161

THANK YOU!

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