Resolution Foundation

It's getting hot in here

How ever-warmer UK summer temperatures will have an outsized impact on low-income households and low-paid workers

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Although the UK's summer of 2023 has been something of a washout so far, the country is getting hotter, with temperatures over 40°C – first experienced in the UK in 2022 – set to become the norm. Hotter weather will impact different people in different ways, so this Spotlight explores what it means for Brits at home and at work.

At current summer temperatures, a fifth of homes in England overheat, but the make-up of the housing stock means that one-third (36 per cent) have attributes that put them at high risk of overheating in the future. Additionally, more than half (54 per cent) of the poorest fifth of English families, three-times as many as among the richest fifth (18 per cent), live in homes liable of getting too hot, while two-thirds of socially-renting households, six-in-ten of those with young children, and more than half of ethnic-minority families have the highest risk of their homes getting too hot as the nation warms.

At work, one-in-four (23 per cent) of UK workers currently work in occupations at risk of heat stress, thereby facing the greatest health risks as the nation warms. Although this is fairly evenly distributed across the bulk of the income distribution, those in the top third have a notably lower-than-average risk. However, older workers are particularly exposed to heat at the workplace – 31 per cent of those in jobs liable to cause heat stress are aged over 50 – and office workers in less deprived areas are more likely to be able to be kept cool by air conditioning at work than those in more deprived places.

So, on top of forging a path to net zero that does not unfairly burden those on lower incomes, we also need to consider how to adapt to higher temperatures. For homes, this means considering heat – as well as cold – during retrofit. For workplaces, it means learning from countries that have long had higher temperatures, including legal rights for maximum workplace temperatures, and better adapted buildings.

Climate change means rising temperatures, and the UK isn't ready

This summer we've had a glimpse of what climate change will mean for global temperatures. July was the hottest month ever recorded, bringing extreme heatwaves across the northern

hemisphere, temperatures exceeding 50°C in the US and in China, and extensive wildfires in Mediterranean countries. And, although this summer has so far been something of a washout in the UK, the general trend of rising temperatures is clear: 2022 was the UK's hottest year on record, with temperatures topping 40°C for the first time – extremes expected to become the 'new normal' in years to come. These instances are made much more likely by the world's changing climate, especially as in the UK changes in temperature extremes are occurring much faster than changes in averages temperatures, bringing more frequent 'uncomfortably hot days' in summers to come.

So, as high temperatures are both with us and set to worsen, this Spotlight looks at how homes and jobs will be impacted by hotter weather.

More homes will be at risk of overheating as temperatures rise

Much attention has been paid to the health risks associated with the UK's old and inefficient building stock being too cold in the winter. But, with one-in-five homes already overheating during the summer months, a warmer world is set to present property owners with another need to adapt their homes.

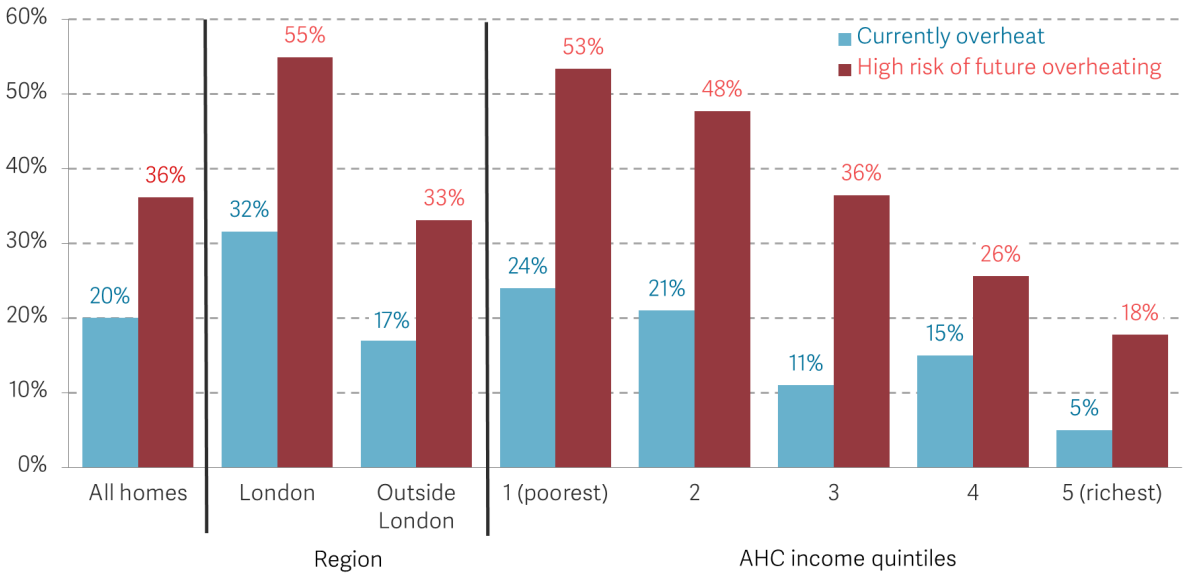
Overheating comes with big health risks. Heat exhaustion and heat stroke, cardiovascular and respiratory issues, and sleep disturbance and mental health problems are all linked to high temperatures in the home. Risks are highest when air temperatures exceed 25°C, and there is a clear association between heat-related deaths and temperatures, particularly for the elderly.

But how can we identify homes at the most risk of overheating in the future? The most comprehensive source of data on this comes from a BEIS study in which temperature sensors were placed in hundreds of bedrooms and living rooms to record how, and to what extent, overheating occurred (where 'overheating' is defined as temperatures exceeding 26°C for more than 3 per cent of occupied hours[1]). This evidence identifies housing type as a key factor in heat exposure: flats and smaller homes have a higher risk, as they are less able to dissipate heat, as do properties with more residents – especially if over-occupied. In addition, properties in urban environments are more exposed to 'heat-island' effects – whereby built-up areas experience significantly warmer temperatures than rural locations – causing both hotter days and less cooling overnight.

We can extrapolate using these risk factors – small flats, small homes and overcrowded properties – to identify which properties are at the highest risk of overheating as the UK's temperature rises, with the latest projections of UK summers being 1.3 to 5.1°C warmer by 2070, depending on the extent to which global carbon emissions are reduced. Concerningly, this exercise shows that one third (36 per cent) of English homes can be deemed as high risk, an 80 per cent increase on the number of homes that recorded overheating in the Government's 2021 study, as Figure 1 shows.

Figure 1 **Warmer summers will see more homes, and especially those in which lower- income households live, overheat**

Proportion of homes that currently overheat and are at high risk of overheating in the future, by region and equivalised after housing costs income quintiles: England



Notes: Current overheating based on measured data for overheating in the bedroom between May and September. Properties deemed at high risk if they are flats with a footprint of less than 70 square metres, houses smaller than 50 square metres, or have 3 or more occupants in 5 or fewer rooms, in line with risk factors identified in the 2022 Climate Change Risk Assessment (CCRA).
Source: RF analysis of English Housing Survey 2020-21 data, English Housing Survey Energy Follow Up Survey.

Half of the poorest households live in homes that are the most likely to overheat, three times more than the richest households

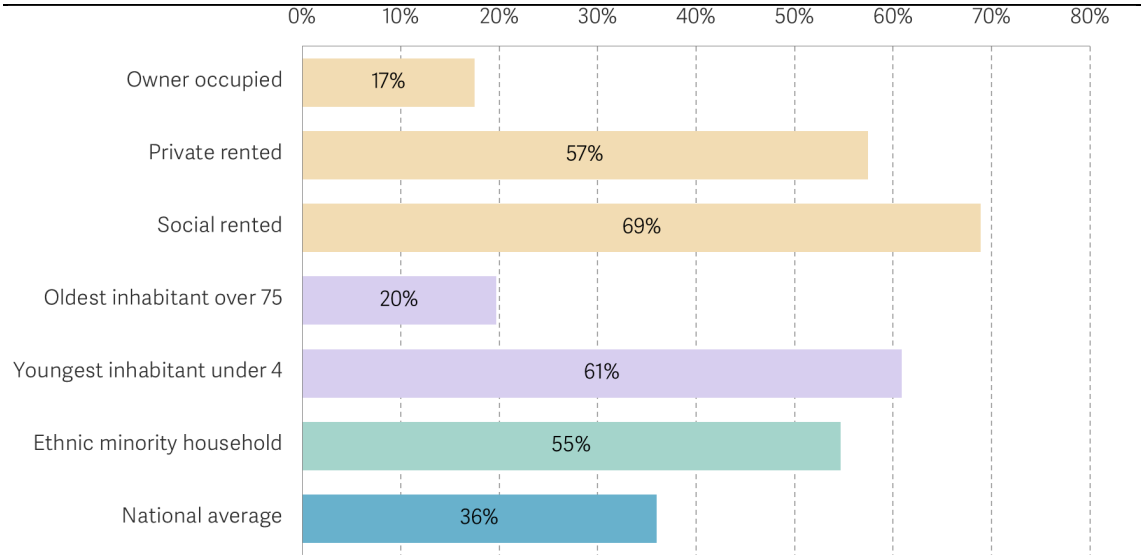
Figure 1 makes it clear that London faces a much larger problem than the rest of the country.[2] As mentioned above, this is likely to reflect the impact of being in a city. Our analysis, however, suggests that in the future the issue will be even worse in some parts of England than it already is in the capital, with the share of homes at high risk greatest in Yorkshire and the Humber (38 per cent) and the South East (39 per cent). Additionally, the income gradient observed today will steepen further – with the poorest fifth of English households three times more likely to live in a home at risk of overheating than the richest fifth (54 per cent compared with 18 per cent).

As well as a heightened risk for poorer families, certain at-risk groups, or those without the agency to make modifications to the homes they live in, are over-represented in homes at risk of getting too hot in the summer, as Figure 2 shows. The most at-risk groups we identify are those who do not own their homes, ethnic minority households, and those with young residents – the last of these being of special importance as young children (particularly babies) can find it hard to keep cool, or risk health difficulties from poor sleep if bedrooms are too warm. Thankfully, older people tend to be less likely to live in a house that puts them at risk: just one-in-five (19 per cent) of households with a resident aged over 75 – an age above which it becomes much more difficult to regulate body temperatures – live in a home

designated as high risk, although the fact that one-fifth of the elderly population live in these sorts of homes still warrants concern.

Figure 2 **Renters and households with young children are over-represented in high-risk homes**

Proportion of homes at high risk of overheating, by selected occupant characteristics: England



Notes: Properties deemed at high risk if they are flats with a footprint of less than 70 square metres, houses smaller than 50 square metres, or have 3 or more occupants in 5 or fewer rooms, in line with risk factors identified in the 2022 Climate Change Risk Assessment (CCRA). Ethnic Minority Household refers to the Household Reference Person.
Source: RF analysis of English Housing Survey 2020-21 data.

Property owners will face big bills to ensure their homes remain habitable

Continued changes in the UK's climate will mean many homes need remedial work to remain safe and pleasant to live in, a cost landing at the same time as those associated with widespread energy efficiency upgrades to make them cheaper to heat during the winter months and more suitable for low-carbon heating. We shouldn't assume that net zero retrofit will be a silver bullet for high temperatures: studies have shown either no observable link between improving fabric efficiency and overheating risk (the presence of individual insulation measures did not impact measured overheating, and any trends based on EPC ratings are explained by property types), or that the links between insulation and overheating risk are variable and depend on numerous other factors, such as ventilation. Still, it makes sense to address both at the same time – especially as households are much less likely to resist change if workers only need to enter a property once.

A holistic approach to property upgrades should also consider the risks associated with measures to mitigate overheating. For example, reducing summertime temperatures through 'passive' measures such as shading to limit solar gain would curb natural heating on sunny winter days, thereby increasing winter energy demand and energy bills. And a surge in uptake of air conditioning – the most likely option for keeping houses cooler – comes with installation costs that will not be affordable for many, and will increase annual energy costs.

The Government has recently introduced standards to reduce overheating in new homes, but the much wider issue of the existing building stock remains unaddressed. Social tenants are protected by the Decent Homes Standard – a legally enforceable minimum standard on housing – outlining that homes should "provide a reasonable degree of thermal comfort", with an extension to the private sector expected imminently. This currently refers to insulation and heating efficiency but, should climate change remain unmitigated, it may be wise to expand this definition to include summer heat too.

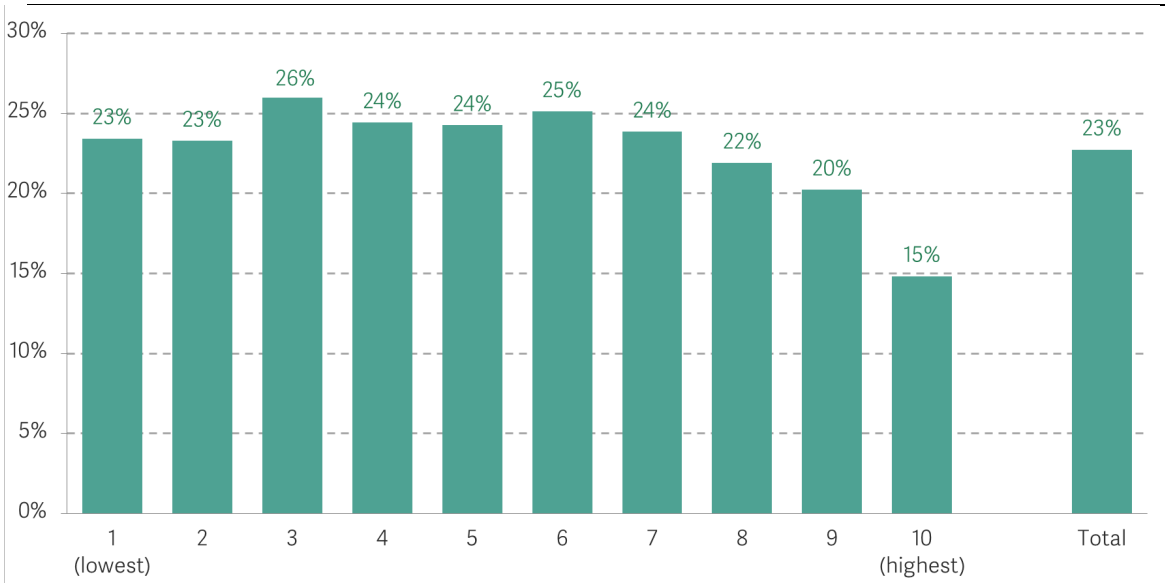
We will leave a full assessment of how policy should respond to the need to adapt to a warmer climate, but with the costs of mediation expected to be high, and differing significantly by property type, it is essential that lower-income households do not find themselves facing unaffordable bills, or unsafe exposure to high temperatures at home.

A fifth of workers are in occupations that have an overheating risk, and poorer office workers are less likely to have access to air conditioning

As well as at home, we also face overheating at work. Guidance from the Health and Safety Executive states that overheating is a bigger risk for workers in physical occupations, those who work outside or in environments where heat is created (such as manufacturing facilities), and those who work in confined spaces. As shown in Figure 3, such roles cover around a quarter (23 per cent) of UK workers. These roles are spread fairly evenly across the bulk of the income spectrum, but are less likely to be undertaken by people in the richest third.

Figure 3 **Workers in better off households are less likely to work in roles at risk of overheating**

Share of workers in roles exposed to overheating risks, by equivalised after housing costs income deciles: UK, 2019-20



Notes: Occupations at risk are those based outside, that involve physical exertion, in environments where processes create heat, or in restricted spaces, in line with HSE guidance.
Source: RF analysis of Family Resources Survey and Households Below Average Income data.

Further analysis shows that these workers are evenly spread around the country, ranging from 20 per cent of the workforce in London to 25 per cent in the West Midlands. They are, however, not spread evenly by age: the dominance of manufacturing and construction roles in those deemed at risk (comprising half of the total) means that the median age of workers in roles at risk of overheating is 42, compared to 28 for those deemed not at risk – with one-in-three (31 per cent) at-risk workers aged over 50, compared with one-in-five (18 per cent) of those not at risk. This is particularly worrying because age is a major exacerbatory factor for heat-related illness (along with being overweight, and having health conditions such as heart disease and high blood pressure).

Additionally, many of the roles highlighted in Figure 3 cannot be done from home and have less temporal flexibility than other occupations, giving workers little means of escaping the heat.

And despite media reports of desk occupancy rates 'soaring' as office workers make the most of air conditioning at work, not all office workers have this option. Office workers in more deprived areas and those outside of London, as Figure 4 shows, are more likely to work in buildings without air conditioning.

Air conditioning is also more prevalent in areas that currently experience the hottest summers – London, the South East and East of England – suggesting that more places of work in other parts of the country may soon be investing in means to keep their workers cool. However, as with increasing air conditioning use in residential buildings, such investment would bring wider infrastructure issues and increase the costs associated with the net zero transition (51 per cent of UK energy demand for cooling currently comes from office buildings).

With ever growing evidence of hotter and more frequent future summer temperatures, employment policy will likely face pressure to respond. For example, there is currently no maximum working temperature law to protect workers from high temperatures, and many workers lack the flexibility to change working patterns to avoid the warmest parts of the day.

Figure 4 **Workers in London and in less deprived areas are more likely to work in air-conditioned offices**

Proportion of leased office buildings with air conditioning installed, by region and Index of Multiple Deprivation income quintiles of LSOA in which the building is located: England, 2022

Notes: Chart shows proportion of office buildings, not proportion of workers. Data not available for office properties that are not leased, i.e. those owned by the company that occupies them.
Source: RF analysis of DLUHC non-domestic EPC register, ONS Index of Multiple Deprivation datasets.

Hotter summer temperatures are one of the main ways that climate change will impact the UK. However, as we have shown, the risks that these higher temperatures bring will not decarbonising the UK without unfairly burdening lower-income households, policy makers need to ensure that Brits are protected from the ill effects of warmer weather that climate change is already delivering.

[1] For vulnerable residents this temperature threshold is reduced to 25°C.
[2] Unfortunately, the data for regional overheating is only made available on a 'London' and 'Other Regions' basis.