

# Feeling the heat

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A British Red Cross briefing  
on heatwaves in the UK



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## Introduction

The UK is getting hotter. As a result of climate change, heatwaves are becoming longer and more extreme, and many people's health and wellbeing are suffering as a result – older people, urban populations and those with underlying health conditions are particularly at risk.

While a lot of us in the UK welcome spells of warm weather, we are too often unaware of the damage they can cause - over a third of UK adults think heatwaves will be a problem in the UK in the future, not now. Yet just last year, in the summer of 2020 we saw the shocking impact heatwaves can have, with a total of 2,556 excess deaths<sup>1</sup> in England alone.

**2,556**  
excess deaths  
from heat were  
recorded in  
England in  
Summer 2020



**1 in 3**  
UK adults think  
heatwaves will  
be a problem in  
the UK in future,  
not now



But the devastating impact of hot weather doesn't stop there. Heatwaves can cause heatstroke and exhaustion, and exacerbate underlying health conditions, such as kidney disease and heart disease. They place significant strain on the health and social care system and cause chaos for our infrastructure and businesses through cuts to water supplies, damaged rail networks and depleted workforces.

If we don't act now, the problem will only get worse. Projections show that hotter summers aren't going away – by 2050, heatwaves are projected to double in frequency and become more intense, resulting in three times more excess deaths caused by hot weather annually.

Through the British Red Cross's work responding to emergencies here in the UK and abroad, we are already seeing the devastating impact of climate change, including hot weather. But we also know that extreme weather emergencies don't need to be disasters. The most negative impacts of heatwaves are serious, but they are also preventable – and they don't need to be deadly. Simple early action saves lives during periods of extreme heat, from checking in on neighbours and providing first aid right through to implementing early warning and action systems.

## Simple early action saves lives during periods of extreme heat

### What's in this briefing paper?

This briefing paper summarises the trends, consequences and solutions relating to extreme heat in the UK, drawing on existing literature, new polling and expert interviews.

**Section 1** provides an overview of the existing evidence on heatwaves in the UK, the increasing risk, and what makes certain people more vulnerable.



**Section 2** brings together the results from a new survey of 2,000 UK adults, shining a spotlight on people's understanding of extreme heat in the UK, their own risk level and their ability to help themselves and others.



**Section 3** summarises simple steps people should take to protect themselves and others from extreme heat.



**Section 4** looks at how we currently respond to heatwaves in the UK.



**Section 5** sets out our recommendations for policymakers.



<sup>1</sup>A measure of excess deaths is the standard and most accurate way to calculate the number of deaths caused by periods of hot weather. The number of excess deaths is calculated by taking the average or expected rate of mortality in a given period and comparing it to the actual mortality rate.

# An overview of findings

## 1. Heatwaves and periods of hot weather have increased in the UK and will continue to do so, in terms of both intensity and length.

The average length of warm spells have more than doubled in length in the last few decades, and by 2050 the UK will be 50 per cent more likely to experience hot summers, while heat-related deaths could more than triple, to around 7,000 per year.

## 2. Even a seemingly small increase in temperature of 1°C seriously impacts people’s health and increases the number of deaths.

In the summer months it is estimated that 2 per cent more deaths occur for every 1°C above the daily average temperature, and in the last five years there were an average of 1,199 excess deaths a year caused by excess heat in England alone. We also know that lower levels of heat can still have serious impacts on physical and mental health, particularly for higher-risk groups, with deaths occurring below the higher-level heatwave alert thresholds in the UK.

## 3. Heatwaves in the UK are already having a devastating impact on our people, communities and public services.

The August 2020 heatwaves caused a record 2,556 excess deaths in England, as well as significant disruption across the UK. A severe water shortage led to more than 300 households in West Sussex having no water for five days<sup>1</sup>, and there were an estimated 5 million staff days lost, at a cost of approximately £770 million to the UK economy.

## 4. Certain groups are particularly vulnerable to heat risk.

<b>At-risk groups:</b>	 People aged 75+	 People with chronic and underlying health conditions	 People with a drug or alcohol addiction	
	 People with a mental health condition	 People who have a severe physical or learning disability or have limited mobility	 People living and working in urban settings	
	 Economically or socially marginalised groups	 People who are homeless	 People living alone or who are socially isolated	 People who work outdoors
	 People living in top-floor flats	 People living in care homes	 People who are pregnant	 Babies and young children

## 5. While the majority of adults see heatwaves in the UK as a potential risk to the health of others, some who are vulnerable underestimate the risk to themselves.

While most UK adults recognise that heatwaves can be life-threatening, the majority do not see themselves as vulnerable. Despite being a high-risk group, over half of those aged 75+ say they do not consider themselves as vulnerable to the impact of heatwaves..

## 6. The majority of the public have experienced adverse health effects from hot weather in the UK, and one in 12 have required medical attention as a result.

Three in five people say they have experienced adverse health effects as a result of hot weather in the UK and one in 12 have contacted their GP, called an ambulance or gone to hospital about this.

## 7. Yet, many people underestimate the seriousness of heatwaves in the UK.

Four in 10 UK adults think heatwaves are a normal part of summer, and over a third of UK adults believe heatwaves will be a problem in the UK in future, not now.

## 8. Although most UK adults say they know how to protect themselves during a heatwave, many have never seen information about this, including those who are most vulnerable to extreme heat.

Two in five UK adults say they have never seen information on how to protect themselves during a heatwave, and one in 10 say they have never had advanced warning that a UK heatwave is expected.

## 9. The window of opportunity to take effective action on heat is small, meaning that advanced planning, preparation and early action are all essential.

The negative impacts of heat can begin for people before a heatwave is triggered, and mortality rates can also increase one to two days after heatwaves begin. Responding to heatwaves should be a key part of national, regional and local emergency plans, but only England currently has a dedicated strategic framework for responding to heatwaves.



**1 in 4** believe the UK isn't hot enough to be at risk from heatwaves



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**10. Given the small window for action during a heatwave, local communities, including voluntary and community sector organisations, have a central role to play in responding.**

Local communities and the voluntary and community sector (VCS) are well placed to identify groups that are most at risk to heat, and work with emergency planners and communities to reach and support them through outreach and early targeted advice and support. By communicating alerts, sharing information about how to keep safe and checking in on high-risk groups, VCS community initiatives such as the London Community Advocates provide a strong example of how this can be done effectively.

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**11. Heatwave warnings and alerts are in place across the UK, but we could do more to target and reach the most at-risk groups early.**

Forecasts and warnings inform the UK public about imminent heatwaves, but despite this, we know that many people aren't prepared, including some of the most at-risk groups. Two in five UK adults have never seen information on how to protect themselves during a heatwave, rising to three in five of those who work outdoors for 30 hours a week or more, and those who have a heart condition.

**12. Cities and built-up urban areas are particularly susceptible to overheating, meaning that adapting buildings and outdoor spaces will be an important part of minimising the impacts of extreme heat.**

Cities and built-up urban areas can reach temperatures up to 10°C hotter than the surrounding rural areas, meaning city planning has a crucial role to play in reducing indoor and outdoor heat risks.



**Urban areas  
can reach  
temperatures  
up to 10°C  
hotter than  
surrounding  
rural areas**

## British Red Cross recommendations for policymakers

To prevent heatwave emergencies becoming disasters, our people, communities and public services need to be better prepared for and able to respond to periods of extreme heat.

As a first step, the British Red Cross recommends the following:

### 1. The UK and devolved governments should recognise the human impact of heatwaves, and prioritise the issue in key strategic and policy agendas.

- **The UK government** should prioritise heat risk planning, response, recovery and learning, and the needs of the most vulnerable in the upcoming National Resilience Strategy (first announced in the government's Integrated Review) and the upcoming Single Adverse Weather and Health Plan. This should champion a whole-of-society approach, be developed with local communities and emergency response stakeholders, including the voluntary and community sector (VCS), and should include an investment in community resilience for those most at risk.
- **Devolved governments** should develop a strategic plan to respond to heatwaves, to ensure effective coordination across government, agencies, communities and the VCS.
- **UK, devolved and local governments** need to work together to invest in short-, medium- and longer-term climate adaptation action that tackles indoor and outdoor heat, such as changes to buildings, urban planning and the promotion of green spaces.

### 2. People most vulnerable to extreme heat should be able to access targeted information and support, to allow them to act quickly and stay safe during a heatwave.

This should include ensuring the following needs are met:

- **Immediate practical needs:** Local authorities should ensure discretionary cash support is available for people most at risk and vulnerable to heat risk, to help them prepare and respond to a heatwave.

- **Mental health and emotional support:** Public health authorities should share mental health first aid guidance as well as emotional support and advice with higher-risk groups that are impacted by heatwaves.

- **Information and communication:** Public health authorities should develop and target early communication for the highest-risk groups, to help bridge the risk perception gap and tackle the health impacts that can affect high-risk groups before a heatwave. These should be shared via appropriate channels, given that certain high-risk groups, such as those aged 75+, are more likely to be digitally isolated.

Public health authorities, local authorities and emergency responders should ensure heatwave warnings and advice are communicated in a range of languages suited to the local population.

- **Advice, support and advocacy:** Local authorities and emergency responders should conduct outreach before and during a heatwave to reach the most vulnerable, providing information and practical and emotional support.

Local authorities and emergency responders should provide information on local green or cool spaces in advance of and during a heatwave to tackle indoor heating risk.

### 3. The VCS and local communities should be better utilised and equipped with the skills, resources and tools to promote early action in response to heat warnings:

- **Local resilience forums and local authorities** should embed the role of VCS organisations and local communities in heatwave outreach plans, working together to quickly identify the highest-risk groups, and provide them with tailored advice and support before and during periods of extreme heat.

- **UK and devolved governments** should enshrine a clearer role for the VCS in all heatwave and extreme weather and health strategic plans.



# Understanding UK heat risk

While periods of hot weather in the UK are enjoyed by many, we tend to hear less about how seriously heat can impact people's health and wellbeing, as well as infrastructure, businesses and services. Yet the impact is serious, and it is becoming increasingly more so.

This section summarises existing evidence on current and changing heat risks across the country; the groups most at risk; and how the impact of heat can vary depending on where you live.

## What is a heatwave?

In the UK, a heatwave is defined as a period of extreme heat lasting for three days or more. The heatwave threshold varies in different parts of the UK, between 25°C and 28°C (see Figure 1).<sup>2</sup>

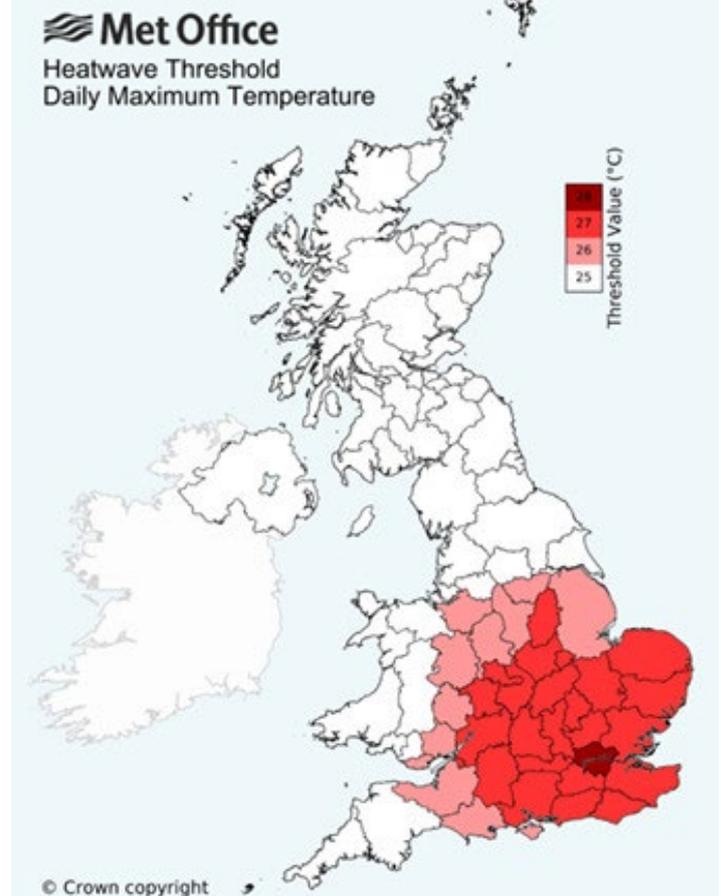


Figure 1. Heatwave threshold values for daily maximum temperature in the UK. Source: Met Office<sup>3</sup> (Contains public sector information licensed under the Open Government Licence v3.0).

## 1.1 Changing heat risks in the UK

Heat can affect anyone, but some people are at greater risk of serious harm than others, such as: older people, urban populations and those with underlying health conditions. For a full list of at-risk groups, see section 1.2.

Heatwaves in the UK can be deadly. In the summer months it is estimated that 2 per cent more deaths occur for every 1°C above the daily average temperature.<sup>4</sup> And with the frequency and intensity of hot weather expected to continue to rise in the years and decades ahead due to climate change, it is vital that we take action now.<sup>5 6 7</sup>



### UK today

Between 2000 and 2020 the UK experienced 84 heatwaves.<sup>8</sup>

The average annual temperature is around 1.2°C warmer than the pre-industrial period (the mid-1800s), and we've seen particularly intense heatwaves over the past two decades.<sup>9</sup>

The average length of warm spells has more than doubled in length, from just over 5 days in 1961-1990 to over 13 days in 2008-2017.<sup>10</sup>

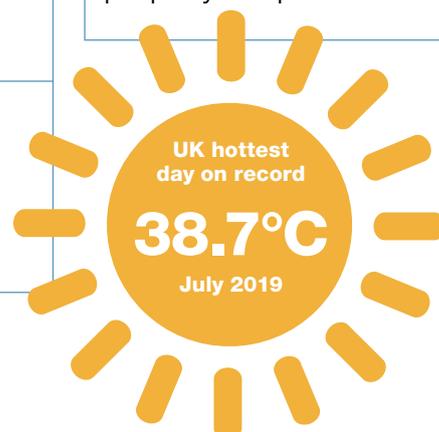
Between 2016 and 2020, there were an average of 1,199 excess deaths a year caused by excess heat in England.<sup>11 12</sup>

### UK in the future

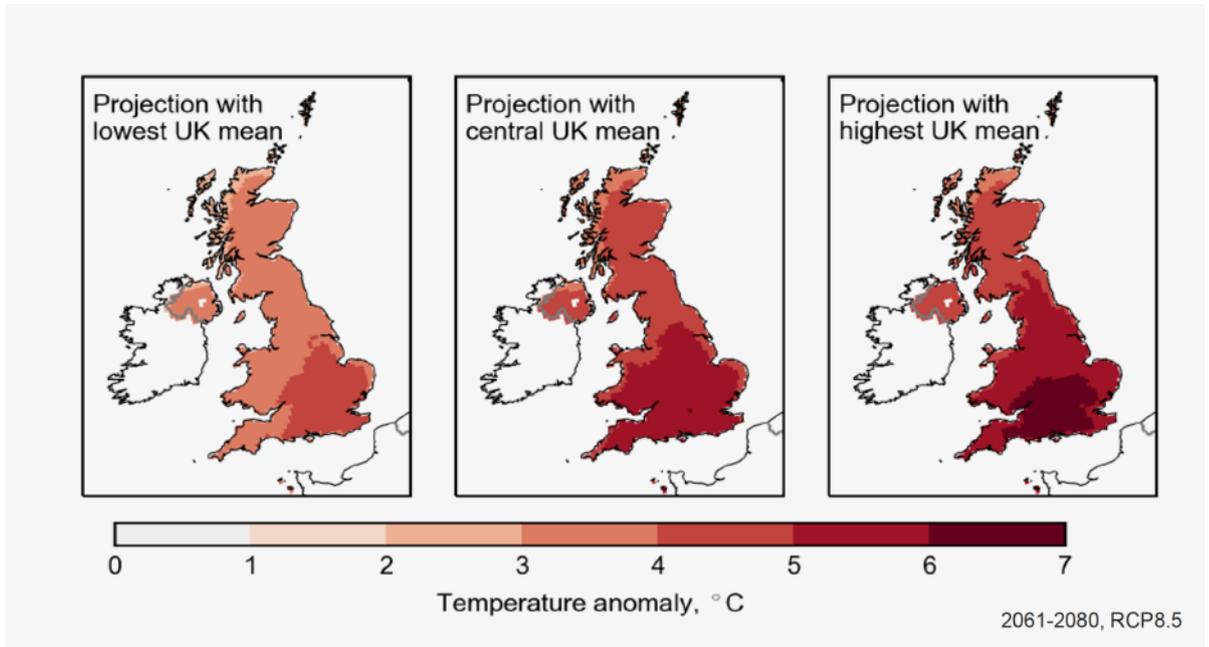
By 2050, the UK will be 50 per cent more likely to experience hot summers.<sup>13</sup>

Heat-related deaths in the UK could triple by the 2050s, reaching 7,000 per year.<sup>14</sup>

By the end of this century, total annual economic losses in London are estimated to reach £1.6 billion due to heatwaves, if we do not properly adapt.<sup>15</sup>



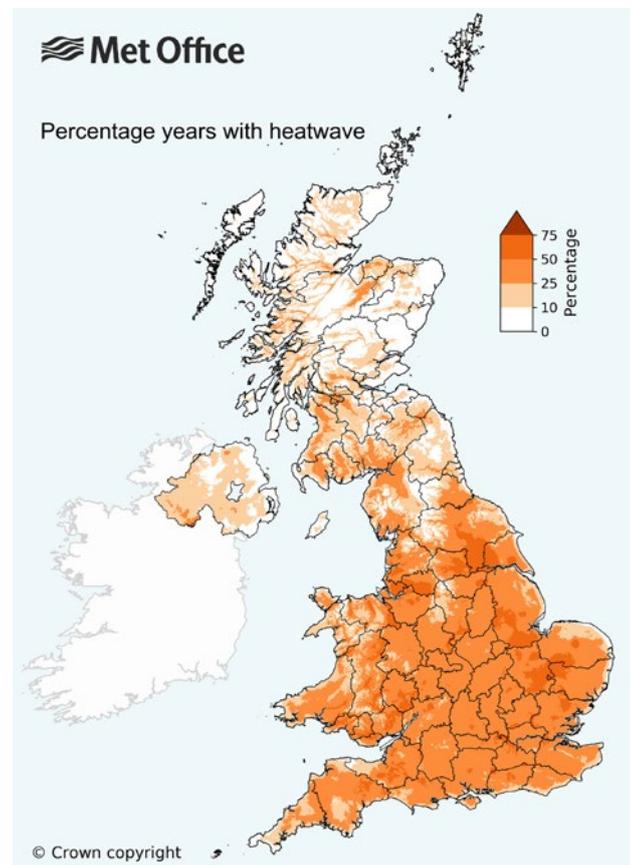
The MET Office maps (Figure 2) show the projected rise in mean temperatures in the UK by 2061-2080, against three predicted outcomes for lower, medium and higher temperature rises. Areas coloured in light red are forecast to increase by 0-4°C and areas in dark red are forecast to increase by 4-7°C. Southern England is expected to warm up the most.



**Figure 2. Regional projections for lowest, central and highest UK mean temperature rises for 2061-2080 in a high emissions scenario. Source: Met Office<sup>16</sup> (Contains public sector information licensed under the Open Government Licence v3.0).**

While all regions of the UK can be affected by heatwaves, London, the East of England, South East, West Midlands, inland areas of Wales, the East Midlands and the North West are most likely to experience higher temperatures (see figures 1 and 3).

The impact from heat in a given area can also change from year to year and over time. For example, one study found that between 2007 and 2015 Hampshire, the Isle of Wight and many areas of London were the most at risk of seeing excess deaths from heat in England, but by the end of this period, 2013-2015, the Surrey Heartlands area was at greatest risk, exceeding Hampshire, the Isle of Wight and London.<sup>17</sup>



**Figure 3. The percentage of years (1960–2018) for which at least one heatwave episode was observed, calculated from a 1km grid of daily maximum temperature. Source: Met Office<sup>18</sup> (Contains public sector information licensed under the Open Government Licence v3.0).**

**2,556**  
excess deaths  
from heat were  
recorded in  
England in  
Summer 2020



**People's health** – In some cases hot weather can be deadly.<sup>19</sup> In Summer 2020, the total excess deaths in England from heat was 2,556, accounting for the highest rate of mortality since the 2003 and 2006 heatwaves, which killed 2,234 (2003) and 2,323 (2006) people in England.<sup>20</sup>

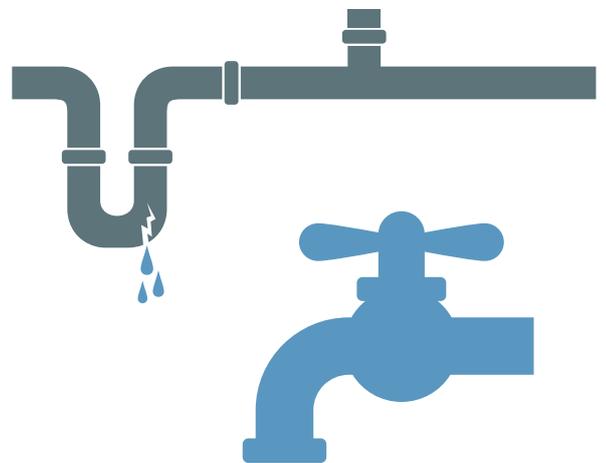
Hot weather makes it harder for our bodies to maintain a stable temperature, which can cause heatstroke (confusion, loss of consciousness, seizures), heat exhaustion (nausea, dizziness, headaches) and can affect the functioning of our lungs, heart and kidneys, particularly for those with an underlying health condition.<sup>21</sup> Hot weather also affects air quality because of the impact of heat on the ozone and other existing chemical compounds in the air. This can create a smog, such as that seen in London in 2020, making breathing more difficult for those with respiratory illness or heart conditions.<sup>22</sup>

Outside of an official heatwave, high temperatures can still be damaging for people's health and wellbeing.<sup>23</sup> In London, for example, even though temperatures need to reach 28°C over three days to classify as a heatwave, temperatures exceeding 24.7°C over two days have caused a greater incidence of illness, mortality and hospital admissions.<sup>24</sup> Further research in 2020 found that at least 90 per cent of heat-related deaths in London and the West Midlands occurred in weather below the Level 3 heatwave alert threshold.<sup>25</sup>

**90 per cent**  
of heat-related  
deaths in London  
and the West  
Midlands in 2020  
occurred below the  
highest heatwave  
alert level



**Infrastructure** – Transport, agriculture, energy supplies and IT networks are all affected by heatwaves.<sup>29</sup> Road surfaces can melt at air temperatures of 33°C, while train rails in direct sunlight can become up to 20°C hotter than the air temperature, and at 48-52°C they can buckle, prompting reductions in train speeds by 30-50 per cent.<sup>30,31</sup> These impacts can cause delays, longer journeys and costly repairs.<sup>32</sup> Prolonged hot weather and droughts can cause ground shrinkage, impacting electrical, gas and water pipes,<sup>33</sup> and can pose challenges for data storage centres which need to be kept cool in order to operate. Water supplies and sewerage systems can also be affected.<sup>34</sup> For example, in August 2020, more than 300 households in West Sussex went without water for five days.<sup>35</sup>



**Health services** – The impact of heat on people's health, even below the heatwave threshold, can lead to increased demands on GPs, hospitals and emergency services. It is estimated that the UK's 2003 heatwave cost the health sector £41 million<sup>26</sup>, while a study on the 7-10 July 2013 heatwave in England revealed that approximately 1,166 GP appointments for heat-related illness took place during this time.<sup>27</sup> Hospitals and care homes have also been found to be particularly susceptible to high indoor temperatures. In 2016 to 2017, there were 2,980 recorded instances of overheating above 26°C in hospital trusts.<sup>28</sup>

**5 million**  
staff days are  
estimated to have  
been lost in the  
UK as a result of  
heatwaves in 2020



**Economy** – Sectors such as financial services, manufacturing and construction can be impacted by heatwaves due to lower levels of productivity.<sup>36,37</sup> It was estimated that heatwaves in 2020 resulted in a loss of 5 million staff days in the UK, at a cost of £770 million.<sup>38</sup> In contrast, some sectors of the UK economy, such as tourism can benefit during heatwaves. The UK economy is estimated to have gained between £14.8 and £30.3 million from domestic tourism during the 2003 heatwave.<sup>39</sup>

## Spotlight: Summer 2020 Heatwave, 5th-15th August

- 1,734 people are estimated to have died in England in the August 2020 heatwave.<sup>40</sup>

- While maximum day-time temperatures were not record-breaking, the August heatwave lasted up to 10 days in some areas (see Figure 4).

- There were five “tropical nights” in some areas, where night-time temperatures remained above 20°C.<sup>41</sup>

- All regions of England, except for the North East and Yorkshire & Humber, saw significant increases in estimated excess mortality.<sup>42</sup>

There were a number of excess deaths across the country:

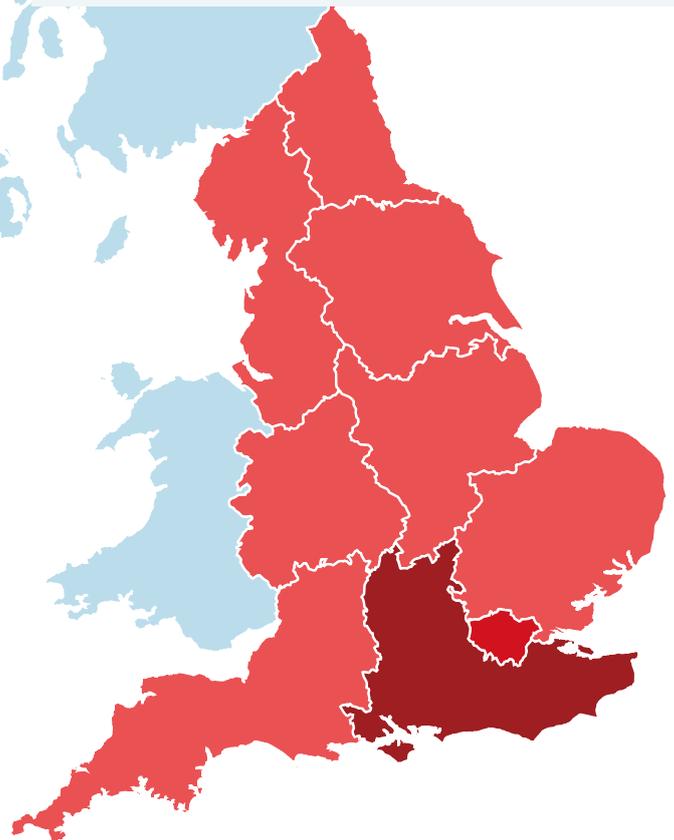
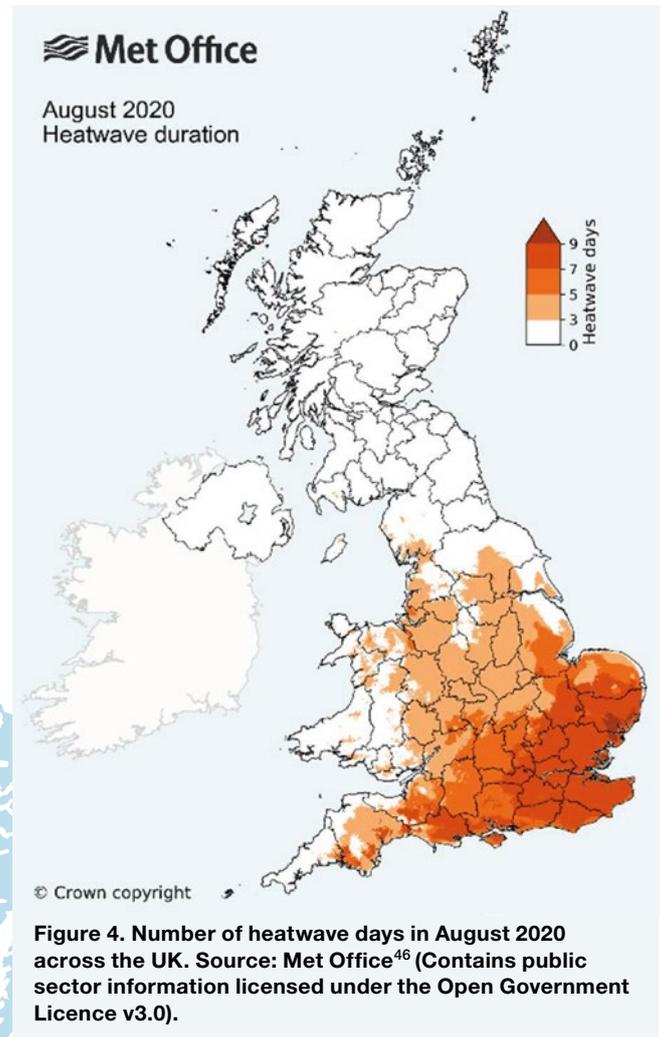
**500+ in the South East**

**400+ in London**

**140-180 in total in the East, East Midlands, West Midlands, South West and North West.**<sup>43</sup>

- In England there were an estimated 219 deaths of people aged 45-64, 225 deaths of people aged 65-74, and 1,261 deaths of people aged 75+.<sup>44</sup>

- While concrete statistics are unavailable for Wales, Northern Ireland and Scotland, a significant increase in excess mortality was observed in Wales during the August 2020 heatwave.<sup>45</sup>



## 1.2 People who are particularly vulnerable to heat

While we can all be affected by high temperatures, there are a number of groups who are particularly vulnerable during heatwaves and hot weather.

### Age and gender



**Older age groups**, particularly 75+ year olds, are more likely to be affected due to the body's reduced ability to regulate temperature and an increased likelihood of having one or more health risks, such as chronic illness or the use of medication.<sup>47 48 49 50</sup> Older women are thought to be more vulnerable to the effects of heat than older men, which may be the result of having fewer sweat glands and being more likely to live alone.<sup>51</sup>

**Babies and young children**, particularly under four years old, are more sensitive to and at greater risk from the effects of extreme heat. For example, they sweat less than adults, which can make it more difficult to cool down. They also can't always tell someone they're too hot, and must rely on others to help them cool down.<sup>52 53 54</sup> Children who are overweight or taking medication may be more vulnerable.<sup>55</sup>



**People who are pregnant** can suffer from worsening swelling in their legs and feet, affecting their mobility and ability to cool down. They are also more likely to go into early labour in the week following a heatwave.<sup>56</sup>



### Health

**People with chronic and underlying health conditions**, including heart, lung or kidney conditions and diabetes, are more at risk because these conditions can flare up in hot weather.<sup>57 58 59</sup> Certain medications can also affect temperature regulation, skin sensitivity to sunlight, electrolyte balance and kidney function.



**Drinking too much alcohol or taking recreational drugs** can have significant health impacts, and can affect the body's ability to respond to increased temperatures.<sup>60 61</sup>



**People with mental health conditions** are more likely to experience severe distress during high temperatures as well as increased suicide risk.<sup>62 63 64</sup>



**People who have a severe physical or learning disability, have limited mobility or who have Alzheimer's or Parkinson's disease** can find it harder to adapt behaviour to keep cool during hot weather.<sup>65 66 67</sup>

### Housing



**People who live alone or who are socially isolated** are less able to access help quickly.<sup>68</sup>



**People who live in a top floor flat or south-facing property, in dense urban areas, or who live in poor-quality housing** can be more vulnerable to extreme hot weather.<sup>69</sup> One in five homes in England are prone to overheating.<sup>70</sup>



**People who live in care homes** are also at risk.<sup>71</sup> Around a quarter of all heat-related deaths during the 2003 heatwave occurred in care homes, with mortality in care homes in South England increasing by 42 per cent.<sup>72</sup> Significant increases in mortality in care homes were also observed in all three of the heatwaves in 2020.<sup>73</sup> Concerns have also been raised about indoor temperatures getting too high in care homes.<sup>74 75</sup>



**Homeless people** are more exposed to the impacts of outdoor extreme temperatures.<sup>76 77 78</sup>

### Socio-economic

**Outdoor workers**, those who work in hot places, and those whose job requires physical exertion or restrictive uniforms are more likely to suffer from heat-related illness. This includes those working in kitchens, security, construction, manufacturing, nursing and the armed forces.<sup>79 80 81</sup>



**Refugees and migrants** may not have access to current information about heat advice and health risks or may experience heat conditions that are different to their place of origin.<sup>84</sup>

**Economically or socially marginalised groups**, such as people on low incomes, can be more vulnerable to heatwaves as they may struggle to afford transport and utility bills, and may be less likely to access timely healthcare.<sup>82 83</sup>



## Spotlight: Covid-19 and heat risk

- Many people who are considered to be more vulnerable to Covid-19 are also more vulnerable to heat, exacerbating underlying health inequalities.
- Globally, we know that many of the same factors that contribute to making people vulnerable to Covid-19 also make them vulnerable to extreme heat. This includes living in high-density and poor-quality housing, and having fewer green spaces and outdoor cooling options or less ability to use them safely.<sup>85</sup>
- Self-isolating due to Covid-19 can increase indoor overheating risk and the likelihood of suffering from a heat-related illness. This highlights the importance of following up-to-date public health advice on both Covid-19 and heat risk.<sup>86</sup>
- Those who are recovering from Covid-19, particularly those who have been in hospital, are more vulnerable during hot weather due to complications associated with their condition.<sup>87</sup>
- People who are vulnerable to heat may be facing financial hardship due to Covid-19. The economic impacts of the pandemic may have resulted in significant wage losses of vulnerable individuals, their caregivers and social networks.<sup>88</sup>
- The number of deaths seen during the August 2020 heatwaves was particularly high, even taking into account how extreme the heat was and how long the heatwaves lasted.<sup>89</sup> The above factors are likely to have played a part in this, but more research is needed to understand how the symptoms of Covid-19 may have been exacerbated by extreme heat, and vice versa.

**“From the heatwaves in 2020, we’ve learnt that an episode of hot weather represents a concurrent risk to the ongoing Covid-19 pandemic, with many people needing to stay at home and potentially being exposed to higher indoor temperatures. [...] Further research needs to be done to see how the impacts of Covid-19 may have intersected to amplify the impacts of hot weather on population health.”**

**Environmental Public Health Scientist, Public Health England**

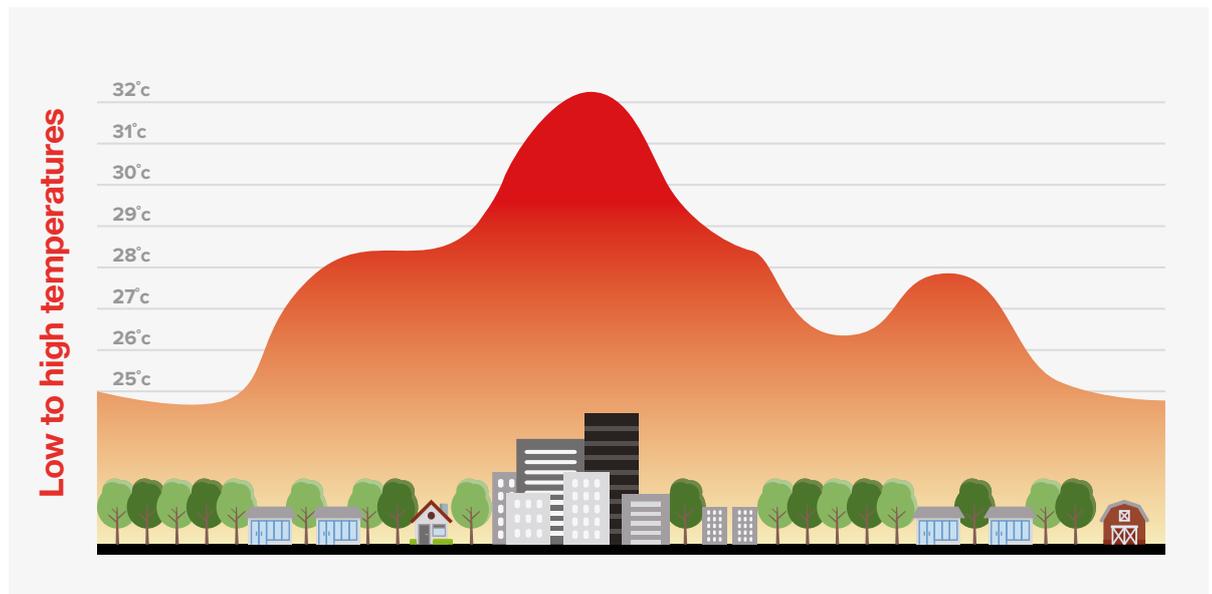


## 1.3 Heat in cities

Temperatures in towns and cities tend to be hotter than the surrounding rural areas as many surfaces – such as densely packed buildings, roads and pavements – absorb heat and release it slowly. This is called the “urban heat island effect”, which makes towns and cities hotter for longer, particularly at night. Major UK cities, such as London, Manchester and Birmingham, have seen temperatures reach up to 5-10°C above surrounding rural areas.<sup>90</sup> This can also create

“hotspots” where temperatures are even higher within the densest areas of a city.<sup>91 92 93</sup>

Urban heat risk is greater for those living in high-rise buildings with little access to green space. Urban areas also tend to have higher levels of air pollution, which can worsen respiratory symptoms and lead to higher death rates during periods of hot weather.<sup>94 95</sup>



**Figure 5. Temperature variation of a model city. Dense areas experience higher temperatures and less dense, more green areas experiences lower temperatures. Source: RCCC<sup>96</sup>**

### Spotlight: London & Glasgow

- In London, projections show a 3.0-7.7°C increase in summer air temperatures by 2080.<sup>97</sup>
- By 2050 it is expected that every other year Glasgow will experience summers that reach the June 2018 record of 32°C, when rail lines buckled and part of the Glasgow Science Centre roof melted.<sup>98 99</sup>

To build resilience to higher temperatures, tackling indoor heat risk has been identified as a priority, by modifying building designs and regulations to better withstand heat impacts and ensuring communities are prepared.<sup>100 101 102 103</sup> In addition to climate change, growing populations and urbanisation in cities like London mean that we need to protect new building developments from heat.<sup>104</sup>



**50 per cent** chance that every year Glasgow will experience summers as hot as the record reached in June 2018

**“We would expect some relationship between outdoor and indoor temperatures but of course all of the warning systems are based on outdoor temperatures...we just don’t really understand how outdoor temperatures relate to indoor temperatures in different types of buildings and I think that’s a pretty obvious area that needs more work.”**

**Research Fellow, Grantham Research Institute on Climate Change and the Environment at LSE**

# Public perceptions of heatwaves

## 2.1 Why public perceptions of heatwaves matter

The review of evidence provided in Section 1 has shown us that UK heatwaves can have a severe impact on people's health and wellbeing, and that they can be deadly. Yet many of us hold positive views about hot weather, and most people living in the UK do not consider themselves to be at risk from the impacts of heat.<sup>105 106 107</sup> Worryingly, this includes those from high-risk groups, such as those aged 75+ who are less likely than other age groups to take preventative measures during a heatwave.<sup>108</sup>

The more people understand the severe impact heatwaves can have, and the more they know about who is vulnerable and the steps that can be taken to protect themselves and those around them, the more prepared they will be to act when a heatwave comes along. Yet according to the UK Environmental Audit Committee, "the public is not sufficiently informed or aware of the risks from heat including of hot weather risks outside heatwave periods."<sup>109</sup>

This highlights the importance of educating the public, changing behaviours and building resilience to heat risk and heatwaves in the UK.

**75+**  
year olds are less likely than other age groups to take preventative measures during a heatwave

**“Once people understand the level of impact that a severe heatwave can have, then it is a bit of an eye opener, because it is a silent killer.”**

**Head of Civil Contingencies Services,  
Met Office**



## 2.2 Understanding public perspectives on heatwaves

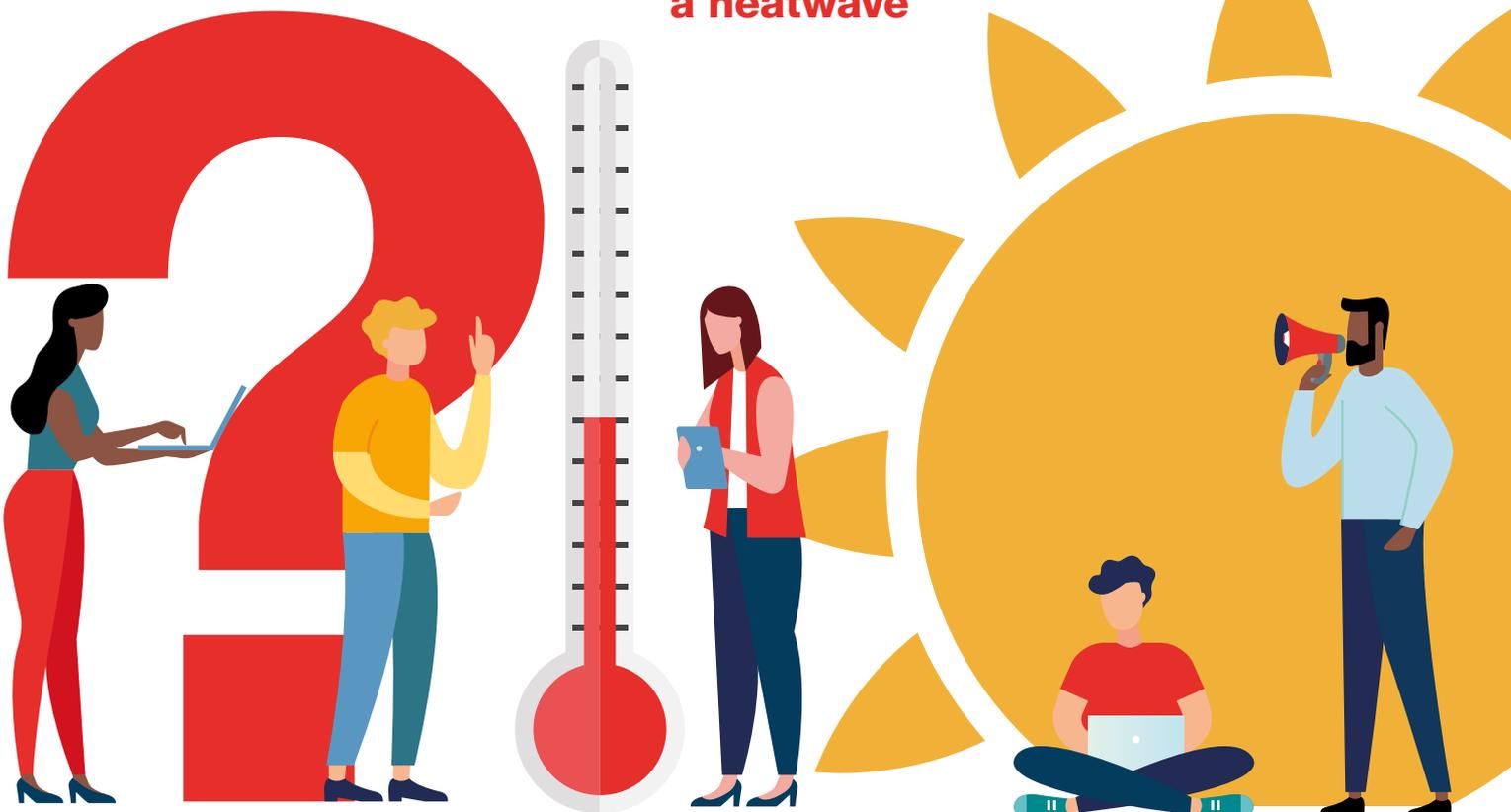
The British Red Cross conducted research among the general public to better understand perceptions of extreme heat and their own vulnerability to it; their experiences of extreme heat in the UK; their awareness of how to protect themselves from extreme heat; and perceptions of extreme heat as a climate issue. Our research shows that:

**More work is needed to inform people about the risk of extreme heat, and the ways in which they may be at risk:** while most people in the UK recognise that heatwaves can be life-threatening, most do not consider themselves to be vulnerable, including some more vulnerable groups, such as those aged 75+. Even though 17 per cent of people in the UK are considered to be at risk from the health impacts of heat, around half that proportion view themselves as very vulnerable to heatwaves (9 per cent).<sup>110</sup>

**Most people have experienced the negative effects of heat:** the impacts of extreme heat have been felt widely, with the majority of people saying they have experienced adverse health effects from hot weather in the UK, and as many as one in five saying they have experienced heat exhaustion or heatstroke. More at-risk groups are much more likely to have sought healthcare as a result of extreme heat, with one in four or more among those who work outside 30+ hours a week, those with severely limited mobility and those with a heart condition saying this is the case.

**Tailored, targeted messaging about minimising the impact of hot weather could help:** two in five adults say they've never seen information on how to protect themselves during a heatwave. This reinforces the importance of creating targeted messaging on heatwaves, to ensure it reaches those who are most at-risk.

**Two in five adults say they've never seen information on how to protect themselves during a heatwave**



**Methodology**

Opinium interviewed 2,000 UK adults online from 11th to 15th June 2021. Data was weighted to be nationally representative of UK adults by age, gender, region and social grade. Differences between groups highlighted below are significant to a 95 per cent confidence level. Opinium is a member of the British Polling Council and abides by its rules.

**“We know that many potentially vulnerable adults do not consider or recognise themselves as at risk from hot weather, and are unaware of the effectiveness of important protective behaviours.”**

Environmental Public Health Scientist,  
Public Health England



**People’s perceptions of extreme heat and their own vulnerability**

**Most people in the UK don’t think they are vulnerable to the impact of heatwaves**



**2 in 3 UK adults**

...see heatwaves in the UK as a potential risk to the health of others (64 per cent) and recognise they can be life-threatening (69 per cent)

**but only 9 per cent**

...of UK adults consider themselves to be very vulnerable to heatwaves...



**while 17 per cent**

...of people in the UK are considered to be vulnerable to the health impacts of heat.<sup>111</sup>

**Those who are more vulnerable to extreme heat don’t always see themselves as such**



**Over half of those aged 75+**

...do not consider themselves as vulnerable to the impact of heatwaves (57 per cent), despite being at significantly higher risk.

Among other at-risk groups a significant proportion again do not consider themselves to be vulnerable to the impact of heatwaves, including people:



with a heart condition  
**31 per cent**



with a lung condition  
**28 per cent**



living in a top-floor flat  
**30 per cent**



working outside 30+ hours a week  
**34 per cent**

**People are more likely to see themselves as vulnerable in parts of the country where the risk of heatwaves is higher**

**Do you consider yourself to be vulnerable to the impact of heatwaves**

(per cent who agree)

**29 per cent**  
Scotland

**29 per cent**  
Northern Ireland

**33 per cent**  
Wales

**33-45 per cent**  
Regions of England

**57 per cent**  
London



## People's experiences of extreme heat

The majority of the public have experienced adverse health effects from hot weather in the UK

### 60 per cent

...of UK adults have experienced at least one adverse effect of hot weather in the UK, most commonly:



**Headaches**  
33 per cent



**Dizziness or feeling faint**  
22 per cent



**Heat rash**  
21 per cent

### One in five

...UK adults say they have experienced heat exhaustion or heatstroke in the UK (18 per cent).



Those who have had to use health services as a result of the heat tend to be from groups that are known to be more vulnerable to heat

### 8 per cent

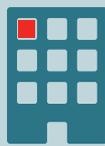
...of UK adults have needed to contact a GP, call an ambulance, go to hospital or go to A&E as a result of hot weather in the UK.

This compares to:



### 36 per cent

...of those who work outdoors for 30 hours a week or more



### 32 per cent

...of those who live in a top floor flat

### 26 per cent

...of those expecting a child or who have a child aged 0-3



### 24 per cent

...of those with a heart condition

### 23 per cent

...of those who have severely limited mobility



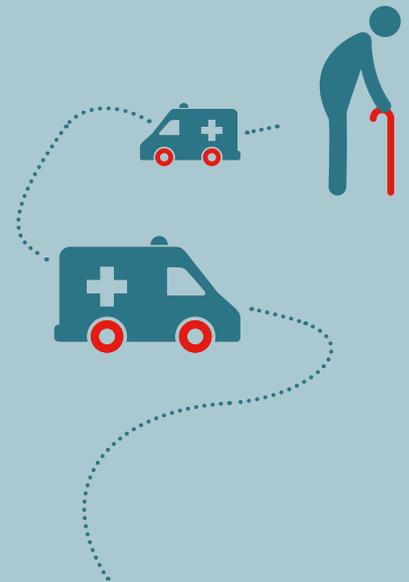
### 21 per cent

...of Londoners

By contrast, younger people are much more likely to have sought medical care as a result of extreme heat in the UK, compared to older people.

### 1 per cent

...of 75+ year olds have contacted their GP, called an ambulance or gone to hospital or A&E...



compared with

### 18 per cent

...of those aged 18 to 34



## Knowing how to protect oneself from extreme heat

Most UK adults say they know how to protect themselves during a heatwave, but a significant minority don't

### one in 10

...people in the UK say they don't know how to protect themselves during a heatwave.

Concerningly, among those who are expecting a child or who have a child under three...



**29 per cent**

...don't know how to protect themselves during a heatwave.

### 22 per cent

...of UK adults do not know where they can access information about how to protect themselves during a heatwave.



### 63 per cent

...of UK adults have found out that a UK heatwave is expected from the news or a weather report, the most common source of heatwave information.

Other sources of information include:

Met Office website or app **34 per cent**

Other weather-related apps e.g. BBC

Weather **43 per cent**

Word of mouth **19 per cent**

Social media **17 per cent**



Many UK adults have never seen information about how to protect themselves, including those who are most vulnerable to extreme heat

**40 per cent of UK adults have never seen information on how to protect themselves during a heatwave**



### one in 10

...say they have never had advanced warning that a UK heatwave is expected (9 per cent)

Those who are more vulnerable to heat are more likely to say they have never seen information on how to protect themselves during a heatwave:



People who work outdoors 30+ hours a week **62 per cent**



People with a heart condition **57 per cent**



People expecting a child or who have a child under three **53 per cent**

**“Many people trust the Met Office as an authoritative source and believe heat warnings, but don't have the confidence to act or know what actions they can take. We can help to bridge this confidence gap through education and building community understanding about the negative aspects of heat.”**

Head of Civil Contingencies Services, Met Office

# Perceptions of extreme heat as a climate issue

UK adults don't think heatwaves can affect people in the UK as seriously as other natural hazards, despite heatwaves claiming far more lives a year than floods

## What impact do you think each of the following has on people who live in the UK

(per cent selecting major impact)



**23 per cent**

...heatwaves



**42 per cent**

...flooding



**33 per cent**

...air pollution



**27 per cent**

...severe winter weather



**25 per cent**

...coastal erosion



– UK adults are significantly more likely to be concerned about the impact climate change (68 per cent) more broadly and air pollution (66 per cent) could have on them, than the specific impact of heatwaves (51 per cent).

While most UK adults think heatwaves in the UK are increasing due to climate change, a significant minority also think the UK isn't hot enough to be at risk from heatwaves



**6 in 10**

...UK adults say that we are seeing more extreme heatwaves in the UK as a result of climate change (61 per cent)



**4 in 10**

...think heatwaves are a normal part of summer in the UK (44 per cent)

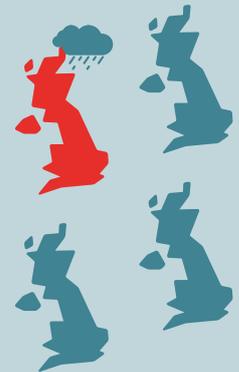


**1 in 3**

...think heatwaves will be a problem in the UK in the future, not now (37 per cent)

**One in four** say heatwaves in the UK are a positive thing (26 per cent)

**One in four** say the UK isn't hot enough to be at risk from heatwaves (25 per cent)



– 18-34 year olds are almost twice as likely to think the UK isn't hot enough to be at risk from heatwaves (35 per cent) compared to those aged 55+ (18 per cent)

– Some vulnerable groups are also more likely to agree that the UK isn't hot enough to be at risk from heatwaves, including people who:

Work outdoors 30+ hours a week **50 per cent**

Have a heart condition **44 per cent**

Are expecting a baby or with a child under three **43 per cent**

## Staying safe during a heatwave

The negative impacts of heat and warm weather, as well as mortality rates, increase within one or two days of the temperature rising, which means that the window of opportunity for effective action by communities, emergency services and health and social care is small, and advanced planning, preparation and early action are all essential.<sup>112</sup>

Below is some advice to help you, your family and those around you know how to stay safe in hot weather.



## 3.1 Heatwave checklist

### Before a heatwave

#### Keep informed, stay alert



Listen carefully for updates on the weather, and take heatwave warnings seriously.



Plan ahead to reduce the risk of ill health from the heat (e.g. stock up on high-protection sun creams).



Make sure you have plenty of bottled water somewhere handy in case of problems with the water supply.



Make sure people you know who may be particularly vulnerable in a heatwave (e.g. grandparents, older neighbours, etc.) are aware of the heatwave and know what to do to stay safe and look after themselves.



Be aware of what actions you can take to help yourself as well as others, e.g. by downloading the British Red Cross app and seeing how to help someone you suspect has heat exhaustion or heatstroke.



Ensure you have your medication. For example, if you have asthma, make sure you take your inhaler(s) wherever you go.

### During a heatwave

#### Stay cool, keep well



Drink plenty of fluids and avoid excess alcohol.



Slow down when it is hot, avoiding too much physical activity. If you can't avoid strenuous outdoor activity, such as sport, DIY or gardening, reduce it to cooler parts of the day – in the morning or evening.



If it's not possible to completely avoid being outside in direct sun, wear sun cream and ensure you take regular breaks indoors or in a shaded place to cool down.



If you do get hot, it is important to give your body a break from the heat, for example by having a cold bath or shower.



Wear light-coloured, loose-fitting clothes – preferably cotton or linen as they are natural fabrics that will allow your skin to breathe.

#### Keep your home cooler



Cover windows exposed to sunlight - external shutters or shades are particularly effective.



Open windows when the air feels cooler outside than inside, for example at night.



Check your central heating is off, as well as lights and electrical equipment that aren't in use.



Remember that it may be cooler outside in the shade or in a public building (such as places of worship, local libraries or supermarkets); consider a visit as a way of cooling down.



If you have concerns about an uncomfortably hot home that is affecting your health or someone else's health, seek medical advice.

**1 in 5 homes in England are likely to overheat so it's important you know how to keep your home cool in hot weather.<sup>113</sup>**

#### Watch out and take action



Look out for neighbours, family or friends who may be at risk of harm from heat, isolated or unable to care for themselves during a heatwave. Check if they are coping with the heat, know how to adapt their home and make sure they have everything they need.



If you have a chronic illness, for example a heart, lung or kidney problem, be aware that it may get worse in hot weather.

Get Help. Call NHS 111 or in an emergency 999.



To sign up to heat alerts, visit: [metoffice.gov.uk](https://www.metoffice.gov.uk)

Visit the British Red Cross's [educational resources on heatwaves](#)

Download the British Red Cross's [First Aid app](#)

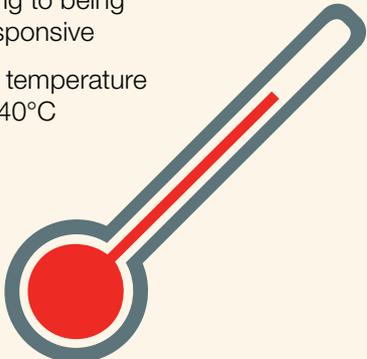
For latest public health advice in England visit: [www.gov.uk](https://www.gov.uk)

**“Before the hot weather arrives, it's a really good time to think about what people can do to protect themselves, their friends and family, from heat.”**

Environmental Public Health Scientist, Public Health England

You can use the following resource to find out if your home is at risk of overheating and what further action you can take: [Beat the heat: keep cool at home checklist](#) ([publishing.service.gov.uk](https://publishing.service.gov.uk))

## 3.2 First aid advice during heatwaves

Health risk	Symptoms	How to help
<p><b>Dehydration:</b> when your body loses more water than it takes in, often as a result of sweating in hot weather</p>	<ul style="list-style-type: none"> <li>- dry mouth</li> <li>- dizziness and confusion</li> <li>- headache</li> <li>- reduction in or dark urine</li> </ul> 	<p>Drink plenty of water and avoid alcohol or caffeine as they can make dehydration worse.</p> 
<p><b>Heat exhaustion:</b> caused by excessive sweating resulting in a loss of body fluids and salts</p> 	<ul style="list-style-type: none"> <li>- dizziness and confusion</li> <li>- headache</li> <li>- sweating and having pale, clammy or cool skin</li> <li>- feeling nauseous</li> <li>- stomach, leg or arm cramps</li> <li>- rapid pulse and breathing</li> </ul>	<p>Help the person to a cool place and get them to rest lying down with their legs raised.</p> <p>Give them plenty of water to drink, which will replace lost fluids. If you have them, isotonic sports drinks will help replace salts lost through sweating.</p> <p>Even if the person appears to recover fully, you should seek medical advice. If their condition gets worse, call 999 for emergency help.</p>
<p><b>Heatstroke:</b> when the body temperature becomes dangerously high and the body is unable to cool itself, due to prolonged exposure to heat</p> 	<ul style="list-style-type: none"> <li>- hot, flushed and dry skin</li> <li>- headaches, dizziness or feeling confused and/or restless</li> <li>- rapidly worsening condition leading to being unresponsive</li> <li>- body temperature over 40°C</li> </ul> 	<p>Call 999 immediately or ask someone else to do it.</p> <p>Quickly move them into a cool environment and remove outer clothing. Loosely wrap the person in cold damp clothes or a sheet. Continuously pour cold water over the sheet or clothes. If there is no sheet available, you can also fan them or sponge them with cold water. Keep cooling them while waiting for help to arrive.</p> <p>If their temperature returns to normal and they no longer feel hot to touch, you can stop cooling them. Replace the wet sheet with a dry one and help them to rest.</p>
<p><b>Sunburn:</b> skin damage caused by too much sun exposure</p>	<ul style="list-style-type: none"> <li>- red and painful skin (these symptoms can take up to five hours to appear)</li> </ul>	<p>Move the person out of the sun and encourage them to drink sips of cold water. Cool the affected skin with cold water or encourage them to soak in a cold bath for up to 20 minutes. Calamine or aftersun lotion may also soothe the skin.</p>
<p><b>Hay fever:</b> allergic reaction caused by high pollen levels. Warm, sunny weather can increase pollen levels in the air, so it is important to watch out for updates on this in the weather forecast</p>	<ul style="list-style-type: none"> <li>- sneezing</li> <li>- itchy eyes</li> <li>- runny nose</li> </ul> 	<p>Most symptoms can be treated with medicines called antihistamines which help relieve the symptoms of allergies.</p> <p>Other measures include: wearing wraparound sunglasses to stop pollen getting in the eyes; showering and changing clothes after being outside to wash pollen off; and remaining indoors when pollen levels are high.</p>

### 3.3 The role of communities in protecting those who are most vulnerable during heatwaves

#### Previous **British Red Cross and International Red Cross and Red Crescent** movement

research has shown that crisis response should be as local as possible. When local communities are empowered to prepare for, respond to and recover from an emergency, they tend to cope and recover much better.<sup>114</sup>

Our experience is that local community volunteers and organisations in emergencies – whether in the UK or internationally – have a critical role to play. They are always first on the scene and have local knowledge of what support is needed and where the gaps are. They are well positioned to reach out to people at risk and help them get the most appropriate support they need quickly. As extreme hot weather events become more frequent in the UK, emergency services, local responders and communities need to work together to better prepare for extreme hot weather events and future worst-case scenarios before they hit.<sup>115</sup>

**“If there is a heatwave predicted in the next three or four days, we will liaise with voluntary and community sector organisations, such as the British Red Cross. They will be going out to knock on doors, make sure our most vulnerable are well looked after and hand out the Beat the Heat leaflet.”**

**Deputy Civil Protection Manager,  
London Borough of Barking and Dagenham**

VCS and local communities should be fully integrated into early warnings and early action plans for heatwaves, so that more people receive early warnings, advice and information, and so that they receive this as quickly as possible.

**“The weather warning service has two customer groups, the public and Category 1 and 2 responders. Actually, that’s missing a trick - we’re missing out the voluntary and community sector, which is key to community resilience. We could easily address that gap a bit more without having to create entirely new services. It might just be about adapting some of the language used or opening up access to community resilience in the voluntary and community sector”**

**Head of Civil Contingencies Services, Met Office**



## Spotlight on Community Responses: Lai Ogunsola, London Community Advocate



Lai is an active member of London's Community Resilience Advocate programme, which is run by the British Red Cross and brings together volunteers across the community to plan, prepare for and respond to emergencies. A key part of Lai's role is to work closely with the community to develop community crisis plans that work alongside emergency plans led by Local resilience forums, and to ensure threats that might impact the community are communicated effectively. These risks include heatwaves, flooding, fire and cold weather risks, among others.

As part of his work Lai sets up meetings to bring members of his local community together to discuss how they can build better responses to these risks. He also attends community forums and other local meetings to give as many people as possible a say in how the community can build its resilience. As well as working with communities to build solutions, Lai shares information about new research, communicates warnings and alerts, and provides advice about practical actions people can take to protect themselves, including wearing appropriate clothing and drinking water regularly.

Lai has found that knowledge about heatwave risks in his local area is mixed. He says that most people do not think about how the risk from heatwaves builds gradually as the temperature rises, and thinks many people would only take action if they experienced a sudden change in their health or started feeling very unwell.

**“Most people would probably keep the problem to themselves unless there was a threshold clinical issue. So, for example, if someone is well but they start feeling nauseous or having high anxiety, or their concentration dips to the extent where they're not able to do things... then that's the stage where people would probably go and try and speak to a general practitioner... I think if it happened slowly people probably wouldn't make a big deal.”**

The support someone is likely to receive from their community very much depends on their social network, according to Lai, and in particular how often people drop by to visit them, and how much they go out. This means that those who are isolated or have limited contact can be particularly vulnerable.

Lai believes that communities could better support each other during heatwaves by remaining alert for hot weather warnings, looking out for friends, family, neighbours and colleagues, and actively sharing important information on heat. This includes looking out for signs from others that the heat may be affecting them, and responding appropriately.

# How we currently respond to heatwaves in the UK



This section summarises what people need in a heatwave as well as existing policy, practice and frameworks focussed on preparing for, responding to and recovering from heatwaves in the UK.



## 4.1 People's needs before, during and after a crisis

We know that many people aren't prepared for heatwaves so whatever their situation, it's important to understand what their immediate needs are. This will ensure responders are more effective and people and communities are better able to support themselves when a crisis hits.



### 1

**Before a heatwave** people need support to be prepared, including:

- Early weather warnings – access to trusted alerts and information
- Advice to stay safe and well – tailored for different at-risk groups
- Early action – knowledge, confidence and support to take action

### 2

#### In responding to heatwaves

people need help with:

##### Immediate practical needs

- Shelter – access to shelter and the ability to stay cool at home
- Medication – particularly for people with underlying health conditions
- Cash support – for people struggling financially to protect themselves from hot weather

##### Mental health and psychosocial support

- Extreme heat can increase underlying mental health, anxiety and stress



##### Information and communication

- First aid & practical advice – to stay safe and well
- Translation – of advice and information which reaches people and communities



##### Advocacy, advice and support

- Advice, help, support – with information on cool outdoor spaces available locally and further community support

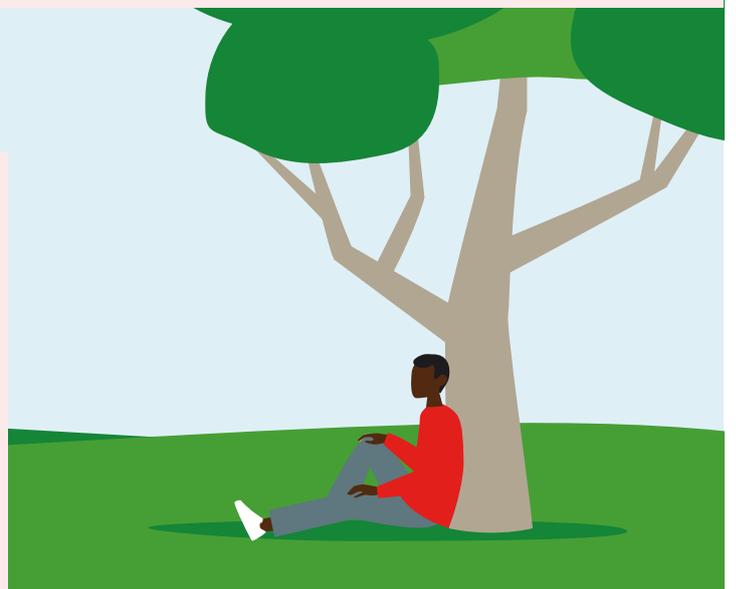


### 3

#### Planning for future heat risk

People need support to prepare for next time, and action needs to be taken to reduce future heat risk through:

- Adapting buildings and outdoor spaces to minimise heat risks
- Reducing indoor heating risk for buildings, workplaces, and increasing access to cool outdoor spaces



## 4.2 Before a heatwave: Alerts and warnings

Early warning and early action are essential for keeping people safe and well in hot weather. Heat-related illness and deaths from heat can increase within one or two days of the temperature rising, meaning that by the time hot weather arrives, the window for action is short.<sup>116</sup> As experts we spoke to told us, alerts and warnings are also particularly important for heat because it can be more difficult for the public to know when the temperature pushes over from warm weather into extreme heat that poses a high level of risk to people's health.

**“For ice and snow, people take action on the basis of what they can see out the window or in the weather forecast. For heat, the trigger seems to be much higher. So unless there is a red warning, people might not take action. This suggests that you need to be very strong with the messaging to overcome this hurdle. We’ve used some fairly strong language in the new National Severe Weather Warning to provoke a response, by making it less passive and less neutral.”**

**Head of Civil Contingencies Services, Met Office**

Forecasts and warnings need to reach those who are most at risk, as well as the wider population, quickly so that people feel confident to take early action and keep themselves and their family, friends and neighbours safe and well. Increasing awareness among the public of available support and advice is important for the same reason.

### Heat-focused alerts for health and social care workers

**“Every morning, if it is looking likely that a heat event is coming, then the Met Office will give [Public Health England] a call and a dynamic risk assessment will be undertaken [...] to decide whether an alert will be issued.”**

**Environmental Public Health Scientist,  
Public Health England**

Public Health England, in association with the Met Office, runs a ‘Heat-Health Alert’ service each year between 1st June and 15th September. Aligned to the Heatwave Plan for England’s heat threshold levels and action plans, this acts as an early warning system that flags when high temperatures may affect the public. The service issues alerts and public health advice to health and social care professionals on actions that should be taken to minimise the impact of heat on people’s health.

While this alert system is primarily targeted at health and social care professionals in England, the public can also sign up for heat alerts here: [metoffice.gov.uk](https://www.metoffice.gov.uk)

<b>Level 0</b>	<b>Long-term planning</b> All year
<b>Level 1</b>	<b>Heatwave and summer preparedness programme</b> 1 June – 15 Sept
<b>Level 2</b>	<b>Heatwave is forecast – alert and readiness</b> 60 per cent risk of heatwave in the next 2 to 3 days
<b>Level 3</b>	<b>Heatwave action – temperature reached in one or more Met Office National Service Weather Warning Service Regions</b>
<b>Level 4</b>	<b>Major incident – emergency response</b> - central government will declare a Level 4 alert in the event of severe or prolonged heatwave affecting sectors other than health

Figure 6. Heatwave Alert levels in England. Source: Public Health England<sup>117</sup>

**“We’ve learnt from experience that the more regularly you send the lower level warnings, the less regard stakeholders have for them. They have more impact when you send fewer that have a requirement for action. So, if you send Level 3 and Level 4 alerts out then those are the ones that have the most impact. If you go to Level 4 it’s declared a major incident. The Level 3 heatwaves are the ones where it’s important to make sure that you’ve got advanced notice, to make sure people are aware of the potential for something to happen, and that they are taking the appropriate action.”**

**London Lead for Emergency Preparedness, Resilience and Response,  
NHS England & NHS Improvement**



### **Extreme weather alerts for the general public**

While the public can access the Heat-Health Alert, the Met Office also launched a new National Severe Weather Warning in June 2021. It covers the whole of the UK, is aimed at the general public, and combines information on all types of severe weather, from extreme heat, thunderstorms, lightning and wind to rain, snow, ice and fog. Amber and red warnings can be issued to inform the public of potential widespread disruption and adverse health effects.<sup>118</sup>

### **Action at lower heat risk thresholds**

Before a heatwave is declared and at lower heat risk thresholds we know people’s health and wellbeing is already being impacted and that lower levels of heat can still be deadly for higher-risk groups.<sup>119</sup> In addition to forecasts and warnings to inform the public about imminent heatwaves, there is also an opportunity to increase broader preparedness and awareness around extreme heat as an increasing risk to population health. Targeted action for higher-risk groups at lower thresholds of heat is important to keep people safe and well, and to prevent deaths.

**“Something we should be thinking about more is whether more targeted actions and messaging are needed, that could focus perhaps on the most vulnerable at lower levels of heat. Essentially it’s a trade-off between capturing more of the increase in risk versus basically always being on some kind of alert. I think there’s got to be some reflection on how much of that risk reduction happens in an ongoing way versus it being linked to an early warning system.”**

**Research Fellow, Grantham Research Institute on  
Climate Change and the Environment at LSE**

## 4.3 Responding to heatwaves

### National emergency planning

At the national level, The Civil Contingencies Act (2004) provides a duty on Category 1 responders to warn and inform the public before, during and after an emergency<sup>11,120</sup>. When a severe heatwave is projected and is expected to affect transport, food and water, energy supplies and businesses as well as health and social care services, the decision to issue the highest heatwave alert level - Level 4 - is made at the national level. This is co-ordinated by the Civil Contingencies Secretariat (Cabinet Office) and taken in light of a cross-government assessment. Otherwise, the Level 3 Heatwave Alerts and actions remain in place for England as set out in the Heatwave Plan for England.



### Regional Heatwave Plans

England has a strategic framework for heatwaves called the **Heatwave Plan for England**. This is led by Public Health England and advises professionals, organisations and individuals on how best to plan for and respond to hot weather, setting out and coordinating the actions to be taken by organisations at varying heat-alert levels. It is expected that the Heatwave Plan will merge into a Single Adverse Weather and Health Plan, as advised by the UK National Adaptation Programme (NAP).<sup>121</sup>

While the devolved nations do not currently have dedicated strategic plans linked to early warning systems in place for heatwaves<sup>122</sup>, public health advice is provided in each nation, along with guidance for social care providers that is issued in Wales and Scotland in periods of hot weather.<sup>123 124</sup>

**“The Heatwave Plan for England aims to raise awareness of the health consequences of hot weather and it outlines actions that professionals, organisations and individuals can take to plan for and respond to hot weather in order to minimise the negative effects on population health.”**

**Environmental Public Health Scientist,  
Public Health England**

**“If it looks like the heat might spread to Wales, Scotland and Northern Ireland, we’ve set up the communications behind the scenes so that they can opt into the early warning service.”**

**Head of Civil Contingencies Services,  
Met Office**

<sup>11</sup> The UK government defines an emergency as either an event or situation which threatens serious damage to human welfare in a place or the environment of a place in the United Kingdom. Or as war, or terrorism, which threatens serious damage to the security of the United Kingdom (see <https://www.legislation.gov.uk/ukpga/2004/36/section/1>)

## Local emergency planning

**“One of the other roles of local authorities under the Civil Contingencies Act is to make sure our residents and staff are warned and informed in advance of a heatwave. We ask our health and social care providers to visit our most vulnerable residents, to ask them how they are coping, to remind them to stay safe and stick to cool spaces, and to make sure they have got plenty of water to drink.”**

**Deputy Civil Protection Manager,  
London Borough of Barking and Dagenham**

At a local level, heatwave planning along with other emergency planning arrangements run by local government and the NHS are brought together by the Local resilience forum (LRF). Local health resilience partnerships (LHRPs) also bring together local health sector organisations to support strategic planning. While local authorities have obligations to plan for emergencies such as heatwaves, as well as to adapt to and mitigate the long-term impacts of climate change, they face varying levels of risk from heatwaves depending on the local context around climate, the urban heat island effect and vulnerable groups.<sup>125 126</sup>

In London, the London Resilience Partnership also brings together more than 170 organisations to assess and plan against emergency risks, and to respond, recover and learn from emergencies including heatwaves.<sup>127</sup>

The London Risk Register is designed to provide a summary of the main risks and actions affecting Greater London, which aligns with the UK National Risk Register.<sup>128</sup> The Mayor of London and Greater London Authority also have frameworks, such as the **London City Resilience Strategy**, **Climate Action Strategy** and **London Environment Strategy**, which include actions on heat risk in London. In addition, the **London Climate Change Partnership** is the centre for expertise on climate change adaptation and resilience to extreme weather in London, and has a webpage dedicated to the topic of heatwaves.

**“Haringey is committed to ensuring that anyone rough sleeping can access additional services during the hot weather, so when a heatwave is coming Haringey will trigger the Hot Weather Protocol. Under the protocol we provide cool spaces for homeless people to go and shelter from the sun and to access water and sun cream. During periods of hot weather we also provide people with support and advice on how to stay safe.”**

**Strategy and Monitoring Coordinator  
– Rough Sleeping, Haringey Council**

Local authorities can play a key role in helping local communities to prepare for and respond to heatwaves, through access to information and support. They are central in supporting, warning and informing the public, which can include signposting, publishing heatwave guidance and advice on their website and social channels, raising awareness through outreach, and ensuring emergency water supplies are provided if there is a water outage. Some also provide discretionary assistance, which can be an important preventative measure for people who would otherwise not be able to afford to keep protected in extreme heat, to pay for items such as hats or sun cream.



## 4.4 Planning for heat risk: Adapting buildings and outdoor spaces

After a heatwave it is important to review and update emergency response plans, in order to gather lessons learnt, gain insight and continuously improve heatwave preparedness and response. Beyond emergency planning and response, we also need to reduce heat risk impacts for people by building longer-term resilience and preparedness through climate adaptation plans that tackle indoor and outdoor heat risks.

**“Climate change is a reality now, so we’ve got to be watchful, careful and plan ahead. To do that we’ve got to keep reviewing our plans, make sure they are fit for purpose, and keep looking out for our most vulnerable people.”**

Deputy Civil Protection Manager,  
London Borough of Barking and Dagenham

### Buildings and indoor heat risks

Every five years, the UK National Adaptation Programme (NAP) sets the actions that government and others will take to adapt to the challenges of climate change in the UK.<sup>129</sup> On heat risk the NAP states that, “Safe upper temperature thresholds for health are difficult to establish and there is currently no standard method to quantify the risk and health impact of overheating in buildings.”<sup>130</sup> Changing construction practices, building the resilience of communities, planting urban trees and creating green spaces are among other solutions outlined in the plan to reduce the impacts of heat, particularly indoor heat risks. According to the [UK Climate Change Committee’s Third UK Climate Change Risk Assessment \(2021\)](#) we are some way off. The assessment identifies heat health risk from increased exposure to heat in homes and other buildings as one of the highest priority areas for action in the next two years, ahead of the next [UK National Climate Adaptation Programme \(2018-2023\)](#).<sup>131</sup>

**“The efforts in gearing up towards NetZero are extremely disconnected from the adaptation agenda - and in my view that’s a big mistake because we risk maladaptation in a number of areas and heat is an obvious one. We spend a lot of money insulating our homes, we build new builds that don’t require loads of heating expenses because they are so well insulated, but then if you can’t also open the windows and they are very poorly ventilated then that’s a risk.”**

Research Fellow, Grantham Research Institute on  
Climate Change and the Environment at LSE

### Health and care settings

The NHS, for example, is looking at how it can protect patients and staff from the impact of heat. New hospitals can be more at risk of overheating than older hospital buildings<sup>132</sup>, so it is important to employ cooling mechanisms on estates, as well as address heat risk in future planning. Other solutions include making sure staff are trained and prepared in advance of heatwaves, linking up with the VCS when people are discharged, and promoting good practice for people to stay safe and well during hot weather. Heat risk also applies in social care settings.

**“We’ve got a variety of NHS estates in London ranging from Victorian up to modern builds, and the teams there are very supportive of our emergency planners getting involved in future planning cycles for the hospitals, to make sure that things like heatwaves are taken into consideration.”**

London Lead for Emergency Preparedness, Resilience  
and Response, NHS England & NHS Improvement

### Urban heat risks

Cities and built-up urban areas tend to be hotter than the surrounding rural areas as many surfaces – such as densely packed buildings, roads and pavements – absorb heat and release it slowly. City planning can play a crucial role in reducing indoor and outdoor heat risks. For example, the London Environment Strategy states that people, infrastructure and public services must be better prepared for extreme heat events and increased temperatures.<sup>133</sup> It recommends:

- Cooling buildings without increasing energy demand by avoiding air conditioning.
- Using reflective paints on the top of buses to keep them cool.
- Designing buildings and infrastructure to reduce the impact from heatwaves.
- Planting more trees and creating green spaces to provide shade and cool down the local area.

To tackle overheating, the Greater London Authority is also leading a cool spaces initiative, publicising the indoor and outdoor sites available for Londoners to get respite from the heat<sup>134</sup>, and has installed over 100 drinking fountains across London in partnership with Thames Water.<sup>135</sup>

## Conclusion & recommendations for policymakers

We all have a role to play to keep ourselves and others safe and well during a heatwave. This briefing shows that periods of extreme heat in the UK are getting worse and are here to stay. If we don't take proper measures to prepare for, respond to and recover from them, their consequences will only grow.

There is work to be done at an individual, community and national level to avoid extreme heat emergencies becoming disasters. Our polling shows that the public must be better informed about the risks that can come from extreme heat, and about the life-saving role they can play in reducing the impact on themselves as well as those around them. At the same time, our policy analysis shows our institutions and our communities must be better prepared to respond to heatwaves: to understand who is most at risk in their communities; to know what works in terms of messaging and alerts; to have established systems and networks for providing support when a heatwave hits; and to plan for future heatwaves.

The VCS has a vital role to play in this journey. Throughout the response to Covid-19, and through its role working closely with Local resilience forums, the VCS has not only mobilised quickly and flexibly, but also used its insight into community assets and vulnerabilities to inform and improve local approaches. More initiatives such as the London Community Advocates, seen on page 25, will no doubt be hugely important in making communities more aware of and better prepared for periods of extreme heat.

The British Red Cross is not the only one calling for a more effective response to the growing threat of extreme heat in the UK. The Climate Change Committee's Third UK Climate Change Risk Assessment has also identified heat health risk as one of the highest priority areas for action in the next two years, ahead of the next UK National Climate Adaptation Programme (NAP) 2023. We need to harness expertise and action across sectors, working alongside policymakers and communities to build resilience and preparedness.

The following recommendations are designed to support governments and emergency partners - including local authorities, Local resilience forums, public health bodies, and community organisations – to deliver a truly human-centred approach to working with and supporting communities and those who are most vulnerable to heat.



## 1. The UK and devolved governments should recognise the human impact of heatwaves, and prioritise the issue in key strategic and policy agendas.

- **The UK government** should prioritise heat risk planning, response, recovery and learning, and the needs of the most vulnerable in the upcoming National Resilience Strategy (first announced in the government's Integrated Review) and the upcoming Single Adverse Weather and Health Plan. This should champion a whole-of-society approach, be developed with local communities and emergency response stakeholders, including the voluntary and community sector (VCS), and should include an investment in community resilience for those most at risk.
- **Devolved governments** should develop a strategic plan to respond to heatwaves, to ensure effective coordination across government, agencies, communities and the VCS.
- **UK, devolved and local governments** need to work together to invest in short-, medium- and longer-term climate adaptation action that tackles indoor and outdoor heat, such as changes to buildings, urban planning and the promotion of green spaces.

## 2. People most vulnerable to extreme heat should be able to access targeted information and support, to allow them to act quickly and stay safe during a heatwave.

This should include ensuring the following needs are met:

- **Immediate practical needs:**  
Local authorities should ensure discretionary cash support is available for people most at risk and vulnerable to heat risk, to help them prepare and respond during a heatwave.
- **Mental health and emotional support:**  
Public health authorities should share mental health first aid guidance and emotional support and advice with higher-risk groups that are impacted by heatwaves.

### - Information and communication:

Public health authorities should develop and target early communication for the highest-risk groups, to help bridge the risk perception gap and tackle the health impacts that can affect high-risk groups before a heatwave. These should be shared via appropriate channels, given that certain high-risk groups, such as those aged 75+, are more likely to be digitally isolated.

Public health authorities, local authorities and emergency responders should ensure heatwave warnings and advice are communicated in a range of languages suited to the local population.

### - Advice, support and advocacy:

Local authorities and emergency responders should conduct outreach before and during a heatwave to reach the most vulnerable, providing information and practical and emotional support.

Local authorities and emergency responders should provide information on local green or cool spaces in advance of and during a heatwave, to tackle indoor heating risk.

## 3. The VCS and local communities should be better utilised and equipped with the skills, resources and tools to promote early action in response to heat warnings:

- **Local resilience forums and local authorities** should embed the role of VCS organisations and local communities in heatwave outreach plans, working together to quickly identify the highest-risk groups, and provide them with tailored advice and support before and during periods of extreme heat.
- **UK and devolved governments** should enshrine a clearer role for the VCS in all heatwave and extreme weather and health strategic plans.

## Methodology

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The British Red Cross commissioned Savanta ComRes to develop a briefing on heatwaves that would bring together the latest evidence on heatwaves in the UK; the general public's perceptions of heatwaves, their vulnerability and the steps they take to protect themselves; and expert advice and policy recommendations on how we can respond to heatwaves most effectively.

Savanta ComRes conducted a literature review to establish a solid knowledge basis of heatwaves in the UK. The policy and research documents referenced in this report are outlined at the end of the report.

Savanta ComRes and British Red Cross also conducted telephone interviews lasting 45 minutes with five experts in the field (from the Met Office, Public Health England, NHS England, Grantham Institute and a London Borough) along with a 30 minute telephone interview with a community advocate volunteer. Key quotes from the interviews and one case study are included throughout the report.

The British Red Cross also commissioned Opinium to conduct a 10-minute online survey among 2,000 UK adults from 11th to 15th June 2021. Data were weighted to be nationally representative of UK adults by age, gender, region and social grade. Opinium is a member of the British Polling Council and abides by its rules.

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## About the British Red Cross

For over 150 years, the British Red Cross has helped people in crisis, whoever and wherever they are. We are part of a global voluntary network, responding to conflicts, natural disasters and individual emergencies. We enable people in the UK and abroad to prepare for and withstand emergencies in their own communities. And when the crisis is over, we help them recover and move on with their lives.

## References

- <sup>1</sup> BBC. (2020). More Sussex homes without water as heatwave continues. Accessed: [bbc.co.uk/news/uk-england-sussex-53748040](https://bbc.co.uk/news/uk-england-sussex-53748040)
- <sup>2</sup> Met Office. (2019). A new heatwave definition for the UK.
- <sup>3</sup> Met Office. (2019). A new heatwave definition for the UK.
- <sup>4</sup> Arbutnott, K. G. & Hajat, S. (2017). The health effects of hotter summers and heat waves in the population of the United Kingdom: a review of the evidence. *Environ Health* 16, 119.
- <sup>5</sup> Lowe, J.A., Bernie, D., Bett, P., Bricheno, L., Brown, S., Calvert, D., Clark, R., Eagle, K., Edwards, T., Fosser, G., Fung, F., Gohar, L., Good, P., Gregory, J., Harris, G., Howard, T., Kaye, N., Kendon, E., Krijnen, J., Maisey, P., McDonald, R., McInnes, R., McSweeney, C., Mitchell, J.F., Murphy, J., Palmer, M., Roberts, C., Rostron, J., Sexton, D., Thornton, H., Tinker, J., Tucker, S., Yamazaki, K., Belcher, S., (2018). UKCP18 Science Overview Report.
- <sup>6</sup> Kovats, R. S., Valentini, R., Bouwer, L. M., Georgopoulou, E., Jacob, D., Martin, E., Rounsevell, M., & Soussana, J.-F. (2014). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1267-1326.
- <sup>7</sup> Brimacombe, C. (2020). Heatwaves are an invisible killer – and the UK is woefully unprepared. Article: [research.reading.ac.uk/research-blog/heatwaves-are-an-invisible-killer-and-the-uk-is-woefully-unprepared/](https://research.reading.ac.uk/research-blog/heatwaves-are-an-invisible-killer-and-the-uk-is-woefully-unprepared/)
- <sup>8</sup> Brimacombe, C. (2020). Heatwaves are an invisible killer – and the UK is woefully unprepared. Article: [research.reading.ac.uk/research-blog/heatwaves-are-an-invisible-killer-and-the-uk-is-woefully-unprepared/](https://research.reading.ac.uk/research-blog/heatwaves-are-an-invisible-killer-and-the-uk-is-woefully-unprepared/)
- <sup>9</sup> UK Climate Risk. (2021). High Temperatures Briefing: Findings from the UK Climate Change Risk Assessment Evidence Report 2021. [ukclimaterisk.org/wp-content/uploads/2021/06/CCRA3-Briefing-High-Temperatures.pdf](https://ukclimaterisk.org/wp-content/uploads/2021/06/CCRA3-Briefing-High-Temperatures.pdf)
- <sup>10</sup> Met Office. (2019). State of the UK Climate. Cited on the Met Office blog: [metoffice.gov.uk/research/climate/understanding-climate/extreme-events---heatwaves](https://metoffice.gov.uk/research/climate/understanding-climate/extreme-events---heatwaves)
- <sup>11</sup> Public Health England. (2019 and 2020). Heatwave mortality monitoring. Accessed: [gov.uk/government/publications/phe-heatwave-mortality-monitoring](https://gov.uk/government/publications/phe-heatwave-mortality-monitoring)
- <sup>12</sup> The Climate Change Committee. (2018). Heat and Preventable Deaths in the Health and Social care System. Accessed: [theccc.org.uk/wp-content/uploads/2019/07/Outcomes-Heat-preventable-deaths-case-study.pdf](https://theccc.org.uk/wp-content/uploads/2019/07/Outcomes-Heat-preventable-deaths-case-study.pdf)
- <sup>13</sup> Met Office. (2019). UK Climate Projections.
- <sup>14</sup> UK Climate Change Committee. (2021). Independent Assessment of UK Climate Risk 2021. Accessed: [theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf](https://theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf)
- <sup>15</sup> Costa, H., Floater, G., Hooyberghs, H., Verbeke, S., & De Ridder, K. (2016). Climate Change, Heat Stress and Labour Productivity: A Cost Methodology for City Economies. Accessed: Centre For Climate Change Economics And Policy.
- <sup>16</sup> Met Office. (2018). UKCP18 National Climate Projections. Accessed: [metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-overview-slidepack-notes.ff.pdf](https://metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-overview-slidepack-notes.ff.pdf)
- <sup>17</sup> Williams, L., Erens, B., Ettelt, S., Hajat, S., Manacorda, T., & Mays, N. (2019). Evaluation of the Heatwave Plan for England: Final Report. Accessed: Policy Innovation and Evaluation Research Unit.
- <sup>18</sup> Met Office. (2019). A new heatwave definition for the UK.
- <sup>19</sup> Office for National Statistics. (2019). Do Summer Heatwaves lead to an increase in deaths? Accessed: [ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/articles/dosummerheatwavesleadtoanincreaseindeaths/2019-10-07](https://ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/articles/dosummerheatwavesleadtoanincreaseindeaths/2019-10-07)
- <sup>20</sup> Kovats, R. S., Johnson, H., & Griffith, C. (2006). Mortality in southern England during the 2003 heat wave by place of death. *Health Stat Q*, 29:6–8.

- <sup>21</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021. Accessed: [gov.uk/government/publications/heatwave-plan-for-england/heat-health-risks-and-covid-19-actions-to-prevent-harm](https://gov.uk/government/publications/heatwave-plan-for-england/heat-health-risks-and-covid-19-actions-to-prevent-harm)
- <sup>22</sup> Future Climate Info. Heatwaves and Pollution: The need to adapt. Last accessed 8th July 2021. [futureclimateinfo.com/heatwaves-and-pollution-the-need-to-adapt/](https://futureclimateinfo.com/heatwaves-and-pollution-the-need-to-adapt/)
- <sup>23</sup> Abeling, T. (2015). According to plan? disaster risk knowledge and organizational responses to heat wave risk in London, UK. *Ecosyst. Health Sustain.* 1, 1–8.
- <sup>24</sup> Greater London Authority. (2018). London Environment Strategy. Accessed: [london.gov.uk/sites/default/files/london\\_environment\\_strategy\\_0.pdf](https://london.gov.uk/sites/default/files/london_environment_strategy_0.pdf)
- <sup>25</sup> Williams, L., Erens, B., Ettelt, S., Hajat, S., Manacorda, T., & Mays, N. (2019). Evaluation of the Heatwave Plan for England: Final Report. Accessed: Policy Innovation and Evaluation Research Unit.
- <sup>26</sup> Hunt, A. (2007). Study on the economic effects of the 2003 heat wave on transport. Paper presented at Institute of Asphalt Technology National Conference, Telford, UK United Kingdom.
- <sup>27</sup> Elliot, A. J., Bone, A., Morbey, R., Hughes, H. E., Harcourt, S., Smith, S., Loveridge, P., Green, H. K., Pebody, R., Andrews, N., Murray, V., Catchpole, M., Bickler, G., McCloskey, B., & Smith, G. (2014). Using real-time syndromic surveillance to assess the health impact of the 2013 heatwave in England. *Environmental research*, 135, 31–36. [doi.org/10.1016/j.envres.2014.08.031](https://doi.org/10.1016/j.envres.2014.08.031)
- <sup>28</sup> House of Commons Environmental Audit Committee. (2018). Oral evidence: Heatwaves: Adapting to Climate Change. Accessed: [data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environmental-audit-committee/heatwaves-adapting-to-climate-change/oral/83417.html](https://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environmental-audit-committee/heatwaves-adapting-to-climate-change/oral/83417.html)
- <sup>29</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>30</sup> Network Rail. Buckled rail and summer heat. Accessed: [networkrail.co.uk/running-the-railway/looking-after-the-railway/delays-explained/buckled-rail-and-summer-heat/](https://networkrail.co.uk/running-the-railway/looking-after-the-railway/delays-explained/buckled-rail-and-summer-heat/)
- <sup>31</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>32</sup> House of Commons Environmental Audit Committee. (2018). Heatwaves: Adapting to Climate Change. Accessed: [publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/826/826.pdf](https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/826/826.pdf)
- <sup>33</sup> Fu, G., Horrocks, L. & Winne, S. (2016). Exploring impacts of climate change on UK's ICT infrastructure. *Proceedings of the ICE Infrastructure Asset Management*, 3, 1, 42-52.
- <sup>34</sup> Dawson, R.J., Thompson, D., Johns, D., Gosling, S., Chapman, L., Darch, G., Watson, G., Powrie, W., Bell, S., Paulson, K., Hughes, P., & Wood, R. (2016). UK Climate Change Risk Assessment Evidence Report: Chapter 4, Infrastructure. Report prepared for the Adaptation Sub-Committee of the Committee on Climate Change, London.
- <sup>35</sup> BBC. (2020). More Sussex homes without water as heatwave continues. Article: [bbc.co.uk/news/uk-england-sussex-53748040](https://bbc.co.uk/news/uk-england-sussex-53748040)
- <sup>36</sup> Costa, H., Floater, G., Hooyberghs, H., Verbeke, S., & De Ridder, K. (2016). Climate Change, Heat Stress and Labour Productivity: A Cost Methodology for City Economies. Accessed: Centre For Climate Change Economics And Policy.
- <sup>37</sup> Committee on Climate Change. (2017). UK Climate Change Risk Assessment 2017: Evidence Report. Chapter 6: Business and Industry. Accessed: [theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Chapter-6-Business-and-industry.pdf](https://theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Chapter-6-Business-and-industry.pdf)
- <sup>38</sup> Committee on Climate Change. (2017). UK Climate Change Risk Assessment 2017: Evidence Report. Chapter 6: Business and Industry. Accessed: [theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Chapter-6-Business-and-industry.pdf](https://theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Chapter-6-Business-and-industry.pdf)
- <sup>39</sup> Taylor, T. & Ortiz, R.A. (2009). Impacts of climate change on domestic tourism in the UK: a panel data estimation. *Tourism Economics* 15(4): 803–812.
- <sup>40</sup> Public Health England. (2020). Heatwave mortality monitoring report. Accessed: [gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020](https://gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020)
- <sup>41</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>42</sup> Public Health England. (2020). Heatwave mortality monitoring report. Accessed: [gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020](https://gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020)

- <sup>43</sup> Public Health England. (2020). Heatwave mortality monitoring report. Accessed: [gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020](https://gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020)
- <sup>44</sup> Public Health England. (2020). Heatwave mortality monitoring report. Accessed: [gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020](https://gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020)
- <sup>45</sup> Office for National Statistics. (2020). Deaths registered weekly in England and Wales, provisional: week ending 14 August 2020. Accessed: [ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsregisteredweeklyinenglandandwalesprovisional/weekending14august2020](https://ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsregisteredweeklyinenglandandwalesprovisional/weekending14august2020)
- <sup>46</sup> Met Office. (2020). August Heatwave. Accessed: [metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2020/2020\\_06\\_august\\_heatwave.pdf](https://metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2020/2020_06_august_heatwave.pdf)
- <sup>47</sup> Williams, L., Erens, B., Ettelt, S., Hajat, S., Manacorda, T., & Mays, N. (2019). Evaluation of the Heatwave Plan for England: Final Report. Accessed: Policy Innovation and Evaluation Research Unit.
- <sup>48</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>49</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>50</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>51</sup> The Department of Health. (2009). Supporting vulnerable people before and during a heatwave: Advice for care home managers and staff. Accessed: [nhs.uk/Livewell/Summerhealth/Documents/Heatwave per cent20for per cent20care per cent20home per cent20staff.pdf](https://nhs.uk/Livewell/Summerhealth/Documents/Heatwave%20for%20care%20home%20staff.pdf)
- <sup>52</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>53</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>54</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>55</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>56</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>57</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>58</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>59</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>60</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>61</sup> Public Health England. (2020). Heatwave mortality monitoring report.
- <sup>62</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>63</sup> Lawrence, E., Thompson, R., Fontana, G., & Jennings, N. (2021). The impact of climate change on mental health and emotional wellbeing: current evidence and implications for policy and practice. Accessed: Grantham Institute.
- <sup>64</sup> Thompson, R., Hornigold, R., Page, L. & Waite, T. (2018). Associations between high ambient temperatures and heat waves with mental health outcomes: a systematic review. *Public Health*, 161, 171-191.
- <sup>65</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>66</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>67</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>68</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>69</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>70</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>71</sup> Public Health England. (2020). Heatwave Plan for England.

- <sup>72</sup> Kovats, R. S., Johnson, H., & Griffith, C. (2006). Mortality in southern England during the 2003 heatwave by place of death. *Health Statistics Quarterly* 29, 6–8.
- <sup>73</sup> Public Health England. (2020). Heatwave mortality monitoring report. Accessed: [gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020](https://gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020)
- <sup>74</sup> House of Commons Environmental Audit Committee. (2018). Oral evidence: Heatwaves: Adapting to Climate Change. Accessed: [data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environmental-audit-committee/heatwaves-adapting-to-climate-change/oral/83417.html](https://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environmental-audit-committee/heatwaves-adapting-to-climate-change/oral/83417.html)
- <sup>75</sup> Gupta, R., Walker, G., Lewis, A., Barnfield, L., Gregg, M., & Neven, L. (2016). Care provision fit for a future climate. Joseph Rowntree Foundation: [jrf.org.uk/report/care-provision-fit-future-climate](https://jrf.org.uk/report/care-provision-fit-future-climate)
- <sup>76</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>77</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>78</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>79</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>80</sup> Public Health England. (2021). Heat-health risks and Covid-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>81</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>82</sup> Khare, S., Hajat, S., Kovats, S., Lefevre, C. E., Bruine de Bruin, W., Dessai, S., & Bone, A. (2015). Heat protection behaviour in the UK: results of an online survey after the 2013 heatwave. *BMC Public Health* 15:878.
- <sup>83</sup> Global Heat Health Information Network. (2020). Protecting health from hot weather during the Covid-19 pandemic.
- <sup>84</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>85</sup> Global Heat Health Information Network. (2020). Protecting health from hot weather during the COVID-19 pandemic.
- <sup>86</sup> Global Heat Health Information Network. (2020). Protecting health from hot weather during the COVID-19 pandemic. [ghhin.org/wp-content/uploads/technical-brief-COVID-and-Heat-finalv2-1.pdf](https://ghhin.org/wp-content/uploads/technical-brief-COVID-and-Heat-finalv2-1.pdf)
- <sup>87</sup> Public Health England. (2021). Beat the Heat: Coping with heat and COVID-19.
- <sup>88</sup> Global Heat Health Information Network. (2020). Protecting health from hot weather during the COVID-19 pandemic.
- <sup>89</sup> Public Health England. Heatwave mortality monitoring report: 2020. (November 2020). [gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020](https://gov.uk/government/publications/phe-heatwave-mortality-monitoring/heatwave-mortality-monitoring-report-2020)
- <sup>90</sup> Smith, C. L., Webb, A., Levermore, G. J. Lindley, S. J. & Beswick, K. (2011). Fine-scale spatial temperature patterns across a UK conurbation. *Climatic Change* 109, 269–286.
- <sup>91</sup> Oke, T.R. (1973). City size and the urban heat island. *Atmospheric Environment* 7, 769–779.
- <sup>92</sup> Red Cross Red Crescent Climate Centre. (2019). Heatwave Guide for Cities.
- <sup>93</sup> Souch, C. & Grimmond, S. (2006). Applied climatology: urban climate. *Progress in Physical Geography*. 30, 270–279.
- <sup>94</sup> Analitis, A., Michelozzi, P., D'Ippoliti, D., De'Donato, F., Menne, B., Matthies, F., Atkinson, R., Iñiguez, C., Basagaña, X., Schneider, A., Lefranc, A., Paldy, A., Bisanti, L., & Katsouyanni, K. (2014). Effects of Heat Waves on Mortality: Effect Modification and Confounding by Air Pollutants. *Epidemiology* 25(1), 15-22.
- <sup>95</sup> Wolf, T. & McGregor, G. (2013). The development of a heat wave vulnerability index for London, United Kingdom. *Weather and Climate Extremes*, Volume 1, pp. 59-68.
- <sup>96</sup> Singh, R., Arrighi, J., Jjemba, E., Strachan, K., Spires, M., Kadihasanoglu, A. Heatwave Guide for Cities. (2019). Red Cross Red Crescent Climate Centre. Accessed: [climatecentre.org/downloads/files/IFRCGeneva/RCCC%20Heatwave%20Guide%202019%20A4%20RR%20ONLINE%20copy.pdf](https://climatecentre.org/downloads/files/IFRCGeneva/RCCC%20Heatwave%20Guide%202019%20A4%20RR%20ONLINE%20copy.pdf)
- <sup>97</sup> Met Office. (2020). City of London Climate Change UKCP Results. Accessed: [metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/spf/london-city-factsheets-3-of-3-the-results-v0.2.pdf](https://metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/spf/london-city-factsheets-3-of-3-the-results-v0.2.pdf)

- <sup>98</sup> O'Neill, S. & Tett, S. (2019). Mapping Future Scottish Heatwave Extremes: Report for Climate Ready Clyde. [climatereadyclyde.org.uk/wp-content/uploads/2019/10/GlasgowCityRegion\\_Heatwave-Report-CRC\\_web.pdf](https://climatereadyclyde.org.uk/wp-content/uploads/2019/10/GlasgowCityRegion_Heatwave-Report-CRC_web.pdf)
- <sup>99</sup> Climate Ready Clyde. (2021). Glasgow City Region Climate Adaptation Strategy and Action Plan: Choosing to flourish in our future climate. [climatereadyclyde.org.uk/gcr-adaptation-strategy-and-action-plan/](https://climatereadyclyde.org.uk/gcr-adaptation-strategy-and-action-plan/)
- <sup>100</sup> ARCC. (2015). So what: maintaining thermal comfort in hospitals with ventilation and good design. ARCC Network. [arcc.ouce.ox.ac.uk/wp-content/so-what/DeDeRHECC-so-what-final.pdf](https://arcc.ouce.ox.ac.uk/wp-content/so-what/DeDeRHECC-so-what-final.pdf).
- <sup>101</sup> Committee on Climate Change. (2014). Committee on Climate Change – Managing climate risk to well-being and the economy: adaptation committee progress report 2014. London: Committee on Climate Change.
- <sup>102</sup> Short, C. A., Lomas, K. J., Giridharan, R. & Fair, A. J. (2012). Building resilience to overheating into 1960's UK hospital buildings within the constraint of the national carbon reduction target: Adaptive strategies. *Building and Environment*, 55, 73-95.
- <sup>103</sup> The Lancet. (2018). Heatwaves and health. *The Lancet*, 392, 359.
- <sup>104</sup> Greater London Authority. (2012). The London Plan 2021. Accessed: [london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021](https://london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021)
- <sup>105</sup> Abrahamson, V., Wolf, J., Lorenzoni, I., Fenn, B., Kovats, S., Wilkinson, P., Adger, W. N., & Raine, R. (2008). Perceptions of heatwave risks to health: interview-based study of older people in London and Norwich, UK. *Journal of Public Health* Vol. 31, No. 1, pp. 119–126.
- <sup>106</sup> Khare, S., Hajat, S., Kovats, S., Lefevre, C. E., Bruine de Bruin, W., Dessai, S., & Bone, A. (2015). Heat protection behaviour in the UK: results of an online survey after the 2013 heatwave. *BMC Public Health* 15:878.
- <sup>107</sup> Williams, L., Erens, B., Ettelt, S., Hajat, S., Manacorda, T., & Mays, N. (2019). Evaluation of the Heatwave Plan for England: Final Report. Accessed: Policy Innovation and Evaluation Research Unit.
- <sup>108</sup> Abrahamson, V., Wolf, J., Lorenzoni, I., Fenn, B., Kovats, S., Wilkinson, P., Adger, W. N., & Raine, R. (2008). Perceptions of heatwave risks to health: interview-based study of older people in London and Norwich, UK. *Journal of Public Health* Vol. 31, No. 1, pp. 119–126.
- <sup>109</sup> House of Commons Environmental Audit Committee. (2018). Heatwaves: Adapting to Climate Change. House of Commons Environmental Audit Committee Ninth Report of Session 2017-19.
- <sup>110</sup> The Climate Coalition, Priestley International Centre for Climate and The UK Health Alliance on Climate Change. (2020). "This report comes with a health warning." Accessed: [static1.squarespace.com/static/58b40fe1be65940cc4889d33/t/60216eb1006e531e01308ced/1612803831486/The+Climate+Coalition+Health+Report+2021+Download](https://static1.squarespace.com/static/58b40fe1be65940cc4889d33/t/60216eb1006e531e01308ced/1612803831486/The+Climate+Coalition+Health+Report+2021+Download)
- <sup>111</sup> The Lancet. (2020). The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises. Accessed: [thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32290-X/fulltext](https://thelancet.com/journals/lancet/article/PIIS0140-6736(20)32290-X/fulltext)
- <sup>112</sup> Public Health England. (2019). Heatwave Plan for England.
- <sup>113</sup> Public Health England. (2021). Heat-health risks and COVID-19: Actions to Prevent Harm. Heatwave and Summer Preparedness 2021.
- <sup>114</sup> British Red Cross. (2019). People Power in Emergencies. [redcross.org.uk/about-us/what-we-do/we-speak-up-for-change/people-power-in-emergencies](https://redcross.org.uk/about-us/what-we-do/we-speak-up-for-change/people-power-in-emergencies)
- <sup>115</sup> Department for Environment Food & Rural Affairs. (2018). The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting. Accessed: [assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/727252/national-adaptation-programme-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf)
- <sup>116</sup> Public Health England. (2019). Heatwave Plan for England.
- <sup>117</sup> Public Health England. (2020). Heatwave Plan for England.
- <sup>118</sup> Met Office. (2021). Why the Met Office is launching a new extreme heat warning. Accessed: [blog.metoffice.gov.uk/2021/06/18/why-the-met-office-is-launching-a-new-extreme-heat-warning/](https://blog.metoffice.gov.uk/2021/06/18/why-the-met-office-is-launching-a-new-extreme-heat-warning/)
- <sup>119</sup> Williams, L., Erens, B., Ettelt, S., Hajat, S., Manacorda, T., & Mays, N. (2019). Evaluation of the Heatwave Plan for England: Final Report. Accessed: Policy Innovation and Evaluation Research Unit.

- <sup>120</sup> UK Government. (2004). Civil Contingencies Act. [legislation.gov.uk/ukpga/2004/36/contents](https://legislation.gov.uk/ukpga/2004/36/contents)
- <sup>121</sup> Department for Environment Food & Rural Affairs. (2018). The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting. Accessed: [assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/727252/national-adaptation-programme-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf)
- <sup>122</sup> Brimicombe, C., Porter, J. J., Di Napoli, C., Pappenberger, F., Cornforth, R., Petty, C., & Cloke, H. L. (2021). Heatwaves: An invisible risk in UK policy and research. *Environmental Science and Policy* 116 1–7.
- <sup>123</sup> NHS Wales. (2021). Extreme Hot Weather Advice For The Public. Accessed: [phw.nhs.wales/services-and-teams/environmental-public-health/extreme-hot-weather/hot-weather-advice-for-the-public-2/](https://phw.nhs.wales/services-and-teams/environmental-public-health/extreme-hot-weather/hot-weather-advice-for-the-public-2/)
- <sup>124</sup> Scottish Government. (2021). Hot Weather. Ready Scotland: Preparing for and dealing with emergencies. Accessed: [ready.scot/respond/severe-weather/hot-weather](https://ready.scot/respond/severe-weather/hot-weather)
- <sup>125</sup> Department for Environment Food & Rural Affairs. (2018). The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting. Accessed: [assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/727252/national-adaptation-programme-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf)
- <sup>126</sup> Wolf, T. & McGregor, G. (2013). The development of a heat wave vulnerability index for London, United Kingdom. *Weather and Climate Extremes*, Volume 1, pp. 59-68.
- <sup>127</sup> London Resilience Partnership. (2017). London Risk Register. Accessed: [london.gov.uk/sites/default/files/london\\_risk\\_register\\_6.0.pdf](https://london.gov.uk/sites/default/files/london_risk_register_6.0.pdf)
- <sup>128</sup> London Resilience Partnership. (2017). London Risk Register. Accessed: [london.gov.uk/sites/default/files/london\\_risk\\_register\\_6.0.pdf](https://london.gov.uk/sites/default/files/london_risk_register_6.0.pdf)
- <sup>129</sup> Department for Environment Food & Rural Affairs. (2018). The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting. Accessed: [assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/727252/national-adaptation-programme-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf)
- <sup>130</sup> Department for Environment Food & Rural Affairs. (2018). The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting, pp. 52. Accessed: [assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/727252/national-adaptation-programme-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf)
- <sup>131</sup> UK Climate Change Committee. (2021). Independent Assessment of UK Climate Risk. Accessed: [Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf](https://theccc.org.uk/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf) (theccc.org.uk)
- <sup>132</sup> Department for Environment Food & Rural Affairs. (2018). The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting. Accessed: [assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/727252/national-adaptation-programme-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/727252/national-adaptation-programme-2018.pdf)
- <sup>133</sup> Greater London Authority. (2018). London Environment Strategy. Accessed: [london.gov.uk/what-we-do/environment/london-environment-strategy](https://london.gov.uk/what-we-do/environment/london-environment-strategy)
- <sup>134</sup> Greater London Authority. (2021). The London Plan 2021. Accessed: [london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021](https://london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021)
- <sup>135</sup> Greater London Authority. (2020). London City Resilience Strategy 2020. Accessed: [london.gov.uk/sites/default/files/london\\_city\\_resilience\\_strategy\\_2020\\_digital\\_0.pdf](https://london.gov.uk/sites/default/files/london_city_resilience_strategy_2020_digital_0.pdf)

<sup>111</sup> BBC. (2020). More Sussex homes without water as heatwave continues. Article: [www.bbc.co.uk/news/uk-england-sussex-53748040](https://www.bbc.co.uk/news/uk-england-sussex-53748040)



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