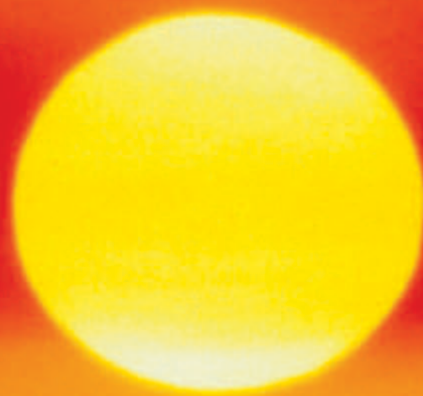


# heatwave

## PLAN FOR ENGLAND



PROTECTING HEALTH  
AND REDUCING HARM  
FROM EXTREME HEAT  
AND HEATWAVES



Large print

### DH INFORMATION READER BOX

<b>Policy</b>	<p>HR / Workforce Management Planning / Clinical</p> <p>Estates Commissioning IM &amp; T Finance Social Care / Partnership Working</p>
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<b>Description</b>	<p>The Heatwave Plan for England is to be re-issued in May 2011 as a part of raising both public and professional awareness. The Plan's purpose is to enhance resilience in the event of a heatwave. It is an important component of overall emergency planning.</p>
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<b>For Recipient's Use</b>	

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## Why this plan is needed

Heatwaves are forecast to increase in frequency in the coming years – this plan provides important guidance on how to reduce the impact they will have upon health and in doing so, will save lives. Climate change is increasingly acknowledged to be a serious threat to population health. These impacts are highlighted in the updated report *Health Effects of Climate Change in the UK 2008*

([www.dh.gov.uk/en/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/DH\\_080702](http://www.dh.gov.uk/en/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/DH_080702)).

The Climate Change Act 2008 now makes it a requirement for all statutory sectors, including the health sector, to have robust adaptation plans in place. The National Heatwave Plan is an important contribution to this work. Further information on climate change and health can be found in the Department of Health guidance document and summary, *The Health Impact of Climate Change: Promoting Sustainable Communities*, available at

[www.dh.gov.uk/en/publicationsandstatistics/DH\\_082690](http://www.dh.gov.uk/en/publicationsandstatistics/DH_082690).

Climate change means that heatwaves are likely to become more common in England. By the 2080s, it is predicted that an event similar to that experienced in England in 2003 will happen every year.

In Northern France in August 2003, unprecedentedly high day and night-time temperatures for a period of three weeks resulted in 15,000 excess deaths. The vast majority of these were among older people. An initial evaluation by the Health Protection Agency estimates that there were approximately 300 excess summer deaths following the heatwave in 2009 between 30 June and 2 July, and the majority of these



deaths occurred in the over 75 year olds. The Office for National Statistics (ONS) reported a 4 per cent increase over baseline mortality (680 excess deaths) in England and Wales between 16 July and 28 July 2006 when compared with the average for the same period from 2001 to 2005. This may be an underestimate. This compares to an excess mortality of approximately 2,000 people, representing 16 per cent of all deaths in the August 2003 heatwave.

Excess deaths are not just deaths of those who would have died anyway in the next few weeks or months due to illness or old age. There is strong evidence that these summer deaths are indeed 'extra' and are the result of heat-related conditions.

In the next few years, the risk of a heatwave in England as severe as that in France in 2003 is very low – less than 0.1 per cent. However, with the effects of climate change taking place, the frequency and temperatures of heatwaves are predicted to increase over time. During relatively mild heatwaves, excess death rates are significantly, but avoidably, higher in this country. Timely preventive measures can reduce these excess rates. In contrast to deaths associated with cold snaps in winter, the rise in mortality as a result of very warm weather follows very sharply – within one or two days of the temperature rising.

This means that:

- by the time a heatwave starts, the window of opportunity for effective action is very short indeed; and therefore
- proper preparedness is of the essence.

This plan draws on previous experience, and a seminar with experts, academics and professionals delivering the Heatwave Plan.

A handwritten signature in black ink, appearing to read 'Sally C Davies', with a stylized flourish at the end.

PROFESSOR DAME SALLY C DAVIES  
Chief Medical Officer

## Projections for future heatwaves

The sections below outline the projected range of temperature increases in England and the implications for different sectors.

### **Box 1: Projected range of temperature increases from 2010 to 2099**

Current and predicted summer temperatures for Central England; the analysis is based upon average temperatures, not extremes:

**Short (now):** 10th to 90th percentile of year-to-year variability approximately  $-1^{\circ}\text{C}$  to  $+1^{\circ}\text{C}$

**Medium (2010–2039):** Central estimate  $+1.4^{\circ}\text{C}$  (compared to 1961–1990 average); 10th to 90th percentile summer temperature rise from UKCP09 medium emissions scenario  $+0.5^{\circ}\text{C}$  to  $+2.6^{\circ}\text{C}$

### Box 1: Projected range of temperature increases from 2010 to 2099 (*continued*)

**Long (2040–2069):** Central estimate +2.6°C; 10th to 90th percentile range +1.2°C to +4.4°C

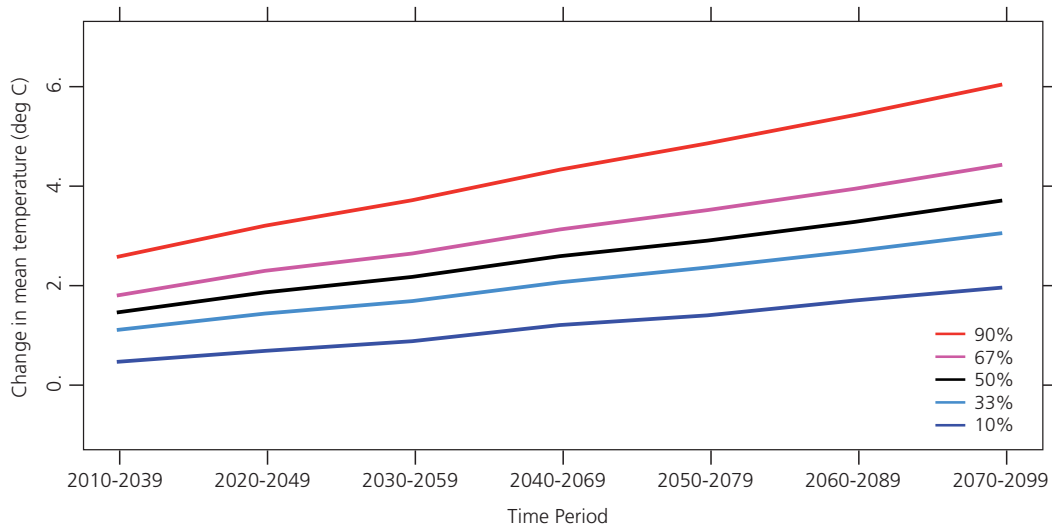
**Longer (2070–2099):** Central estimate +3.7°C; 10th to 90th percentile range +2.0°C to +6.1°C



#### Plot Details:

Data Source: Probabilistic Lan  
Future Climate Change: True  
Variables: temp\_dmean\_tmean\_abs  
Emissions Scenario: Medium  
Time Period: 2010-2039, ..., 2070-2099

Temporal Average: UA  
Spatial Average: Region  
Location: West Midlands  
Probability Data Type: cdf



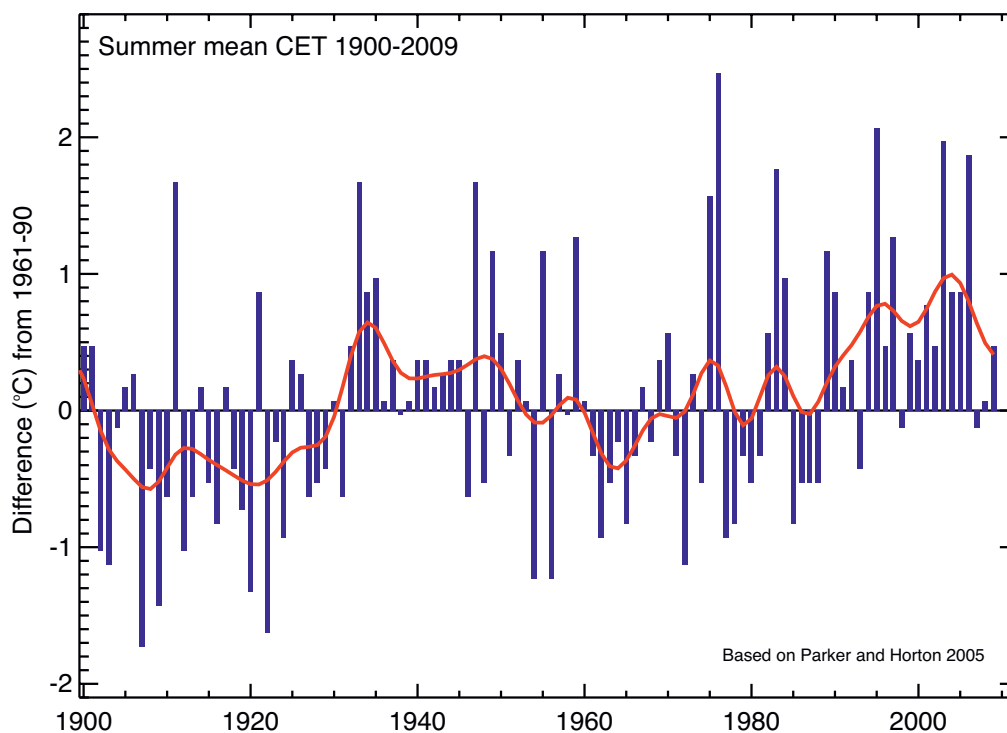
UK Climate Change Projections – <http://ukclimateprojections.defra.gov.uk/>

The average yearly temperature increases show the overall increasing temperature trends within England – the Southern and Central regions will be most affected. However, the extreme temperature variations are the ones that will be related to ‘heatwaves’.

Figure 1 illustrates the wide ranges in temperature variation that have occurred in Central England during the last century, with 9 out of 10 summers during 2000 to 2009 being warmer than the 1961–1990 climatological average.



**Figure 1. Historic Mean Summer Temperatures for Central England.**



Parker, D E and Horton, E B, 2005. Uncertainties in the Central England Temperature series since 1878 and some changes to the maximum and minimum series. *International Journal of Climatology*, Vol 25, pp 1173–1188 ([www.hadobs.org](http://www.hadobs.org))

## Further information on Heatwave Projections

The UK Climate Impacts Programme – UKCIP publishes climate change scenarios on behalf of the Government. These show how the UK's climate might change in this century. The latest set of climate change information, UKCP09, can be found at [http://www.ukcip.org.uk/index.php?option=com\\_content&task=view&id=163&Itemid=287](http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=163&Itemid=287)

UKCIP works with businesses and organisations to help them assess how they might be affected by climate change, so they can prepare for its impact. We encourage organisations to use our tools and information to help them consider their climate risks and to plan to adapt.

See our website at <http://www.ukcip.org.uk/index.php>  
For tools to assess climate change impacts, see:  
[http://www.ukcip.org.uk/index.php?option=com\\_content&task=view&id=74&Itemid=187](http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=74&Itemid=187)

## Potential implications for the health sector

The following points were identified by stakeholders in recent evaluations Seminar 2010.

### Short term (0–5 years)

- Continue to work in partnership with local authorities and social care services to identify vulnerable populations and geographical areas to target long-term planning and interventions during a heatwave as per the Heatwave Plan.
- High temperatures during a heatwave may require affected wards to move patients; extra beds may need to be made available in hospitals due to increased demand.
- Laboratories, pharmaceutical storage and food storage areas in hospitals may be adversely affected by increasing temperatures during heatwaves. Most pharmaceutical products are heat sensitive and start to degrade if stored at higher than room temperature (usually 25°C).
- IT server overheating and disruption to email communication may occur in Primary Care Trusts and hospitals during heatwaves – incidents have already been reported.
- Encourage transport plans that maximise active and public transport for staff and patients to lower heat generated by motor vehicle use and car parks.

## Medium term (10–30 years)

- Focus on building design of hospitals and Primary Care Trusts to aid passive cooling where possible, and target vulnerable areas (patients, medications, IT) with air-conditioning.
- Review external hospital and health care land for ways to aid cooling – for example, consider constructing underground car parks and maximise green space and trees surrounding buildings.
- Transport planning – to encourage active transport and public transport and use of low-emission vehicles for NHS business.
- Partnership work with local authorities to identify and focus on vulnerable urban areas and populations – for example, certain urban areas may be affected more by high temperatures.

## Long term (30+ years)

- Planning of new hospitals – ensure maximum green space and water (e.g. lakes) surrounding buildings to aid passive cooling, and avoid building on flood plains.
- Building 'zero carbon' hospitals and minimising energy use in the NHS.
- Development of temperature-resistant drugs and laboratory materials.

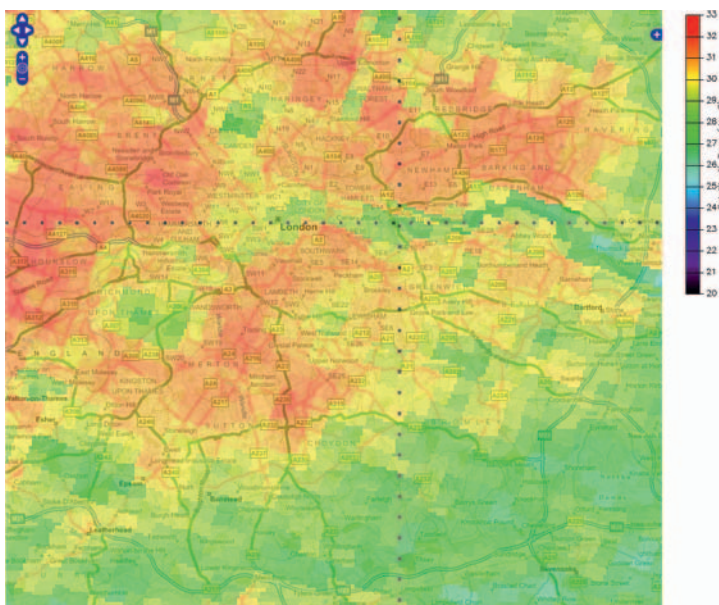


### Implications for other sectors:

A summary of implications for other sectors can be found under the section on Responsibilities at level 4: emergency heatwave.

Additionally, there are implications for long term housing and urban planning – for example, the design of the built environment can influence urban heat islands, see the satellite map of London below taken during the 2006 heatwave. This shows significantly cooler areas surrounding the reservoirs near Heathrow airport, along the River Thames, at Richmond Park and Hampstead Heath.

**Figure 2. Satellite map of London during the heatwave 2006.**

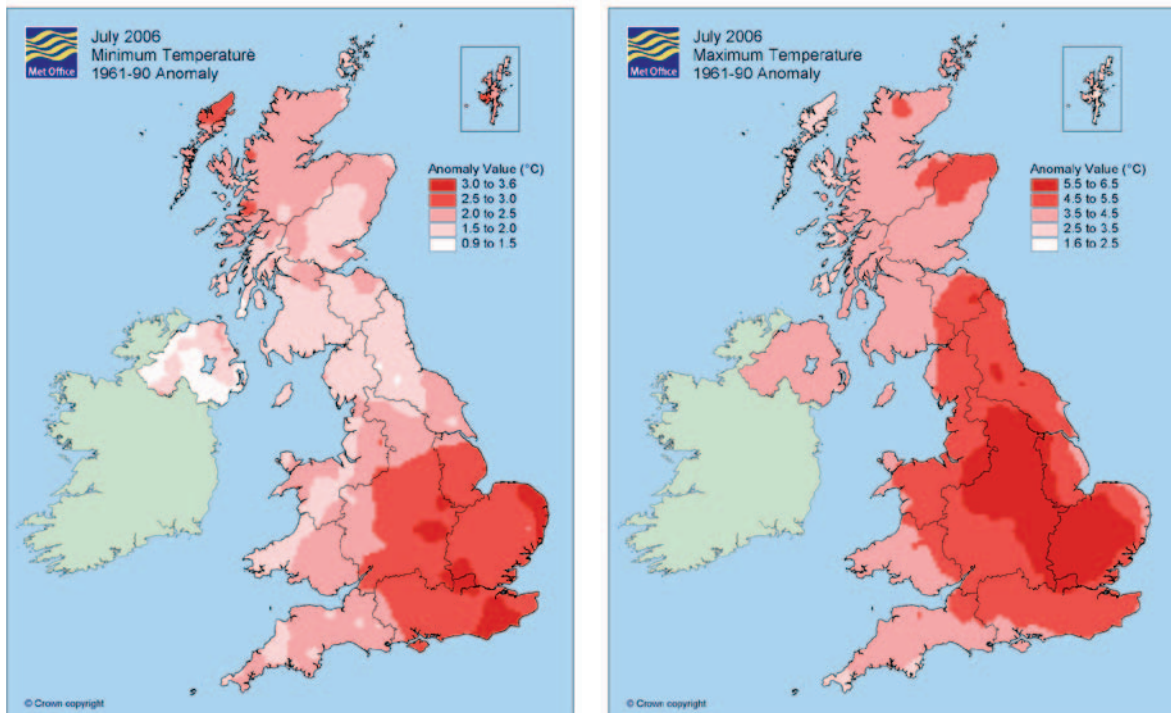


Crown Copyright Met Office, 2010.

## Patterns of heatwaves

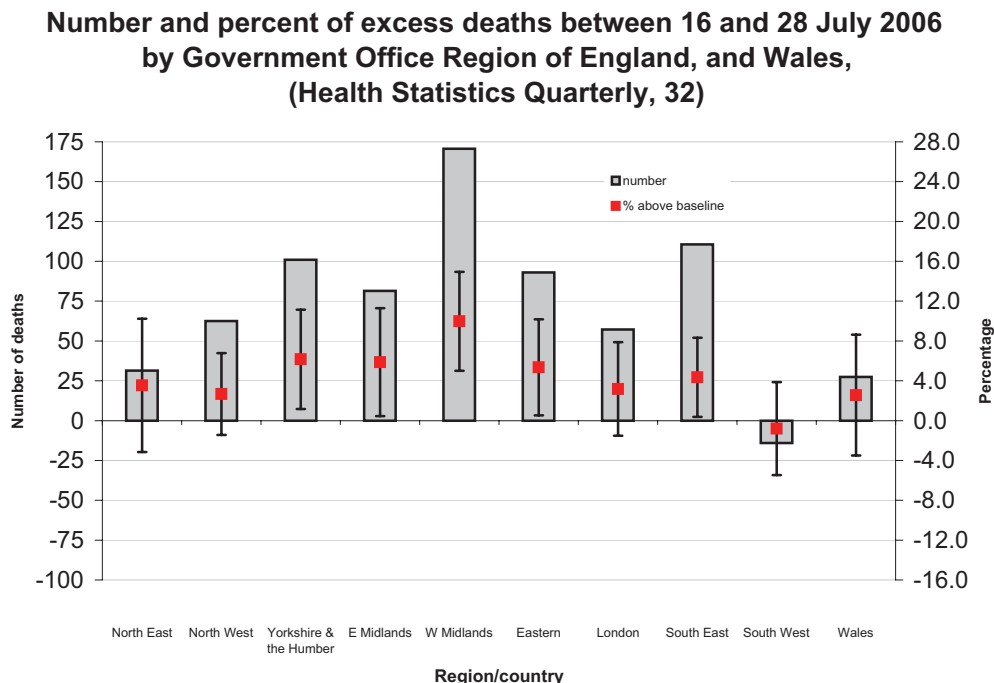
People gradually adapt to changing temperature patterns, and therefore heatwaves are a relative experience. We adapt to temperature during each summer and gradually over long periods of time; however, there is always a level to which we become accustomed. Therefore, thresholds vary for each region and risks to health appear to be greater earlier in the summer. In northern parts of England the temperature threshold is lower than for London and the South East. This explains the variation in regional heatwave temperature thresholds listed in Annex 1. The temperatures given are the highest temperatures for each region. Figure 3 shows the temperature patterns in the UK/England during the 2006 heatwave. Minimum temperatures relate to night-time temperatures. There are indications that night-time temperatures may be more important for impacts on health than maximum day-time temperatures.

**Figure 3. Temperature patterns in the UK/England during the 2006 heatwave.**



Excess summer deaths show regional variations, which relate largely to differences in temperature levels across the country (see figure 4). The excess deaths and illness related to heatwaves occur in part due to our inability to adapt and cool ourselves sufficiently. Therefore, relatively more deaths occur in the first days of a heatwave, as happened in 2006 during the first hot period in June (which did not officially reach heatwave status). This emphasises the importance of being well prepared for the first hot period of the season and at the very beginning of a heatwave.

**Figure 4. Regional variations in excess mortality.**



Cities and urban areas tend to be hotter than rural areas, creating urban heat island effects (see Box 2). This is due to increased absorption and reflection of the sun on concrete compared with green or brown spaces; reduced cooling from breezes due to buildings; and increased energy production from houses, industry, businesses and vehicles. These factors have important implications for long-term planning in order to reduce the impact of heatwaves by targeting high-risk geographical and urban areas.

High temperatures are also linked to poor air quality with high levels of ozone which are formed more rapidly in strong sunlight; small particles (PM10s) also increase in concentration during hot, still air conditions. Both are associated with respiratory and cardiovascular mortality. Additionally, there may be increases in sulphur dioxide emissions from power stations due to an increase in energy use for air-conditioning. Sulphur dioxide worsens symptoms of asthma.



Given the recent predictions of the impact of climate change, recommendations made in this plan aim to be energy neutral, except in very high-risk situations where lives may be saved.

### **Box 2: Urban Heat Islands**

During a heatwave it is likely to be hotter in cities than in surrounding rural areas, especially at night. Temperatures typically rise from the outer edges of the city and peak in the centre. This phenomenon is referred to as the 'Urban Heat Island' (UHI) and its impact can be significant. In London during the August 2003 heatwave, the maximum temperature difference between urban and rural locations reached 9°C on occasions. A range of factors vary between rural and urban areas and contribute to the UHI – for example:

- **Thermal properties** of building and road materials, the height and spacing of buildings and air pollution levels. These factors result in more of the sun's energy being captured, absorbed and stored in urban surfaces compared to rural surfaces during the day and a slower loss of this energy at night, thus resulting in comparatively higher air temperatures.
- **Less evaporation and shading**, with the consequent reduction in associated cooling, taking place in the typically drier urban areas as there is less vegetation.
- **Greater inputs of heat** as a result of the high density of energy use in cities. All this energy, for example from buildings and transport, ultimately ends up as heat.

## **Box 2: Urban Heat Islands (*continued*)**

Strategic planning is therefore required which takes account of the above factors, particularly in the context of climate change. At a local scale these include the modification of surface properties, for example 'cool roofs', 'green roofs' and 'cool pavements'. Planting trees and vegetation and the creation of green spaces to enhance evaporation and shading are other options, as temperatures in and around green spaces can be several degrees lower than their surroundings.

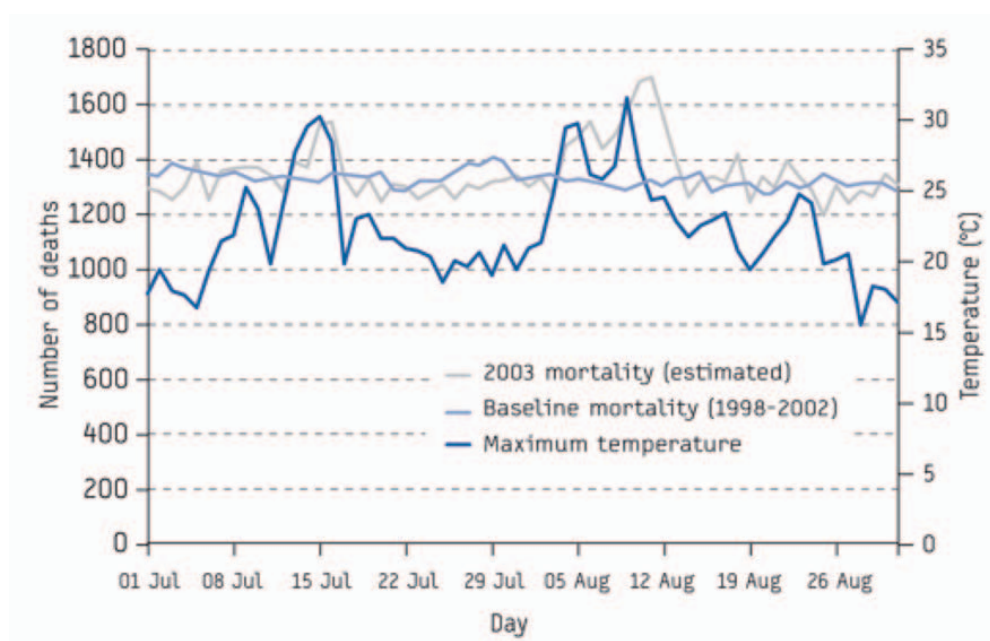
## The effects of heat on health

The body normally cools itself using four mechanisms:

- **radiation** in the form of infrared rays;
- **convection** via water or air crossing the skin;
- **conduction** by a cooler object being in contact with the skin; and
- **evaporation** of sweat.

Increasing temperatures in excess of approximately 25°C are associated with excess summer deaths, with higher temperatures being associated with greater numbers of excess deaths (see figure 5); at 27°C or over, those with impaired sweating mechanisms find it especially difficult to keep their bodies cool.

**Figure 5. Maximum Central England Temperature (CET) and daily mortality, England and Wales, July and August 2003.**



When the ambient temperature is higher than skin temperature, the only effective heat-loss mechanism is sweating. Therefore, any factor that reduces the effectiveness of sweating such as dehydration, lack of breeze, tight-fitting clothes or certain medications can cause the body to overheat. Additionally, thermoregulation, which is controlled by the hypothalamus, can be impaired in the elderly and the chronically ill, and potentially in those taking certain medications, rendering the body more vulnerable to overheating. Young children produce more metabolic heat, have a decreased ability to sweat and have core temperatures that rise faster during dehydration.

Older women appear to be more vulnerable to the effects of heat than older men, possibly due to having fewer sweat glands and being more likely to live on their own.

Box 3 describes the effects of overheating on the body, which in the form of heatstroke can be fatal.

However, the main causes of illness and death during a heatwave are respiratory and cardiovascular diseases. A linear relationship between temperature and weekly mortality was observed in England in summer 2006, with an estimated 75 extra deaths per week for each degree of increase in temperature. Part of this rise in mortality may be attributable to air pollution, which makes respiratory symptoms worse. The other main contributor is the effect of heat on the cardiovascular system. In order to keep cool, large quantities of extra blood are circulated to the skin. This causes strain on the heart, which for elderly people and those with chronic health problems can be enough to precipitate a cardiac event, for example heart failure. Additionally, death rates increase in particular for those with renal disease. A peak in



homicide and suicide rates during previous heatwaves in the UK has also been observed.

Sweating and dehydration affect electrolyte balance. For people on medications that control electrolyte balance or cardiac function, this can also be a risk. Medicines that affect the ability to sweat, thermoregulation or electrolyte imbalance can make a person more vulnerable to the effects of heat. Such medicines include anticholinergics, vasoconstrictors, antihistamines, drugs that reduce renal function, diuretics, psychoactive drugs and antihypertensives. Ozone and PM10s also increase the level of cardiovascular-related deaths.

### Box 3: Heat-related illnesses

The *main causes of illness and death* during a heatwave are *respiratory and cardiovascular diseases*. Additionally, there are specific heat-related illnesses including:

- **Heat cramps** – caused by dehydration and loss of electrolytes, often following exercise.
- **Heat rash** – small, red, itchy papules.
- **Heat oedema** – mainly in the ankles, due to vasodilation and retention of fluid.
- **Heat syncope** – dizziness and fainting, due to dehydration, vasodilation, cardiovascular disease and certain medications.

### Box 3: Heat-related illnesses (*continued*)

- **Heat exhaustion** – is more common. It occurs as a result of water or sodium depletion, with non-specific features of malaise, vomiting and circulatory collapse, and is present when the core temperature is between 37°C and 40°C. Left untreated, heat exhaustion may evolve into heatstroke.
- **Heatstroke** – can become a point of no return whereby the body's thermoregulation mechanism fails. This leads to a medical emergency, with symptoms of confusion; disorientation; convulsions; unconsciousness; hot dry skin; and core body temperature exceeding 40°C for between 45 minutes and eight hours. It can result in cell death, organ failure, brain damage or death. Heatstroke can be either classical or exertional (e.g. in athletes).

Whatever the underlying cause of heat-related symptoms, the treatment is always the same – move the person to somewhere cooler and cool them down.

## High-risk factors

There are certain factors that increase an individual's risk during a heatwave. These include:

- **Older age:** especially women over 75 years old, or those living on their own who are socially isolated, or in a care home.
- **Chronic and severe illness:** including heart conditions, diabetes, respiratory or renal insufficiency, Parkinson's disease or severe mental illness. Medications that potentially affect renal function, the body's ability to sweat, thermoregulation or electrolyte balance can make this group more vulnerable to the effects of heat.
- **Inability to adapt behaviour to keep cool:** having Alzheimer's, a disability, being bed bound, too much alcohol, babies and the very young.
- **Environmental factors and overexposure:** living in urban areas and south-facing top-floor flats, being homeless, activities or jobs that are in hot places or outdoors and include high levels of physical exertion.

In a moderate heatwave, it is mainly the high-risk groups mentioned above who are affected. However, during an extreme heatwave such as the one affecting France in 2003, normally fit and healthy people can also be affected.

## Protective factors

The key message for preventing heat-related illness and death is to **keep cool!**

The best ways to do this include the following.

### Stay out of the heat:

- Keep out of the sun between 11.00am and 3.00pm.
- If you have to go out in the heat, walk in the shade, apply sunscreen and wear a hat and light scarf.
- Avoid extreme physical exertion.
- Wear light, loose-fitting cotton clothes.

### Cool yourself down:

- Have plenty of cold drinks, and avoid excess alcohol, caffeine and hot drinks.
- Eat cold foods, particularly salads and fruit with a high water content.
- Take a cool shower, bath or body wash.
- Sprinkle water over the skin or clothing, or keep a damp cloth on the back of your neck.

### Keep your environment cool:

- Place a thermometer in your main living room and bedroom to keep a check on the temperature.
- Keep windows that are exposed to the sun closed during the day, and open windows at night when the temperature has dropped.

- Care should be taken with metal blinds and dark curtains, as these can absorb heat – consider replacing or putting reflective material in-between them and the window space.
- Consider putting up external shading outside windows.
- Have your loft and cavity walls insulated – this keeps the heat in when it is cold and out when it is hot.
- Use pale, reflective external paints.
- Turn off non-essential lights and electrical equipment – they generate heat.
- Grow trees and leafy plants near windows to act as natural air-conditioners (see Box 4).
- Keep indoor plants and bowls of water in the house as evaporation helps cool the air.
- If possible, move into a cooler room, especially for sleeping.

### **Look out for others:**

- Keep an eye on isolated, elderly, ill or very young people and make sure they are able to keep cool.
- Ensure that babies, children or elderly people are not left alone in stationary cars.
- Check on elderly or sick neighbours, family or friends every day during a heatwave.
- Be alert and call a doctor or social services if someone is unwell or further help is needed.

## **Box 4: Creating cool environments with green spaces**

Trees change urban micro-climates for the better. How does it work? Firstly, trees create shade in summer, allowing cooler air to accumulate and circulate at ground level.

Secondly, trees help to reduce the air temperature by the cooling effect of evaporation. Trees 'transpire' water, releasing large amounts of moisture into the air. One large tree can put out 200 to 300 gallons of water on a summer day. Studies suggest that air-conditioning demand can be reduced by up to 30 per cent through the effects of well-placed trees. Water features such as lakes, ponds and fountains help to cool the environment by the cooling effect of evaporation.

Thirdly, trees and all other vegetation potentially have a positive effect on pollution as they steadily extract from the air a wide range of pollutants generated by traffic, including carbon and sulphur dioxides, ozone, heavy metals and diesel particulates. Air quality tends to deteriorate in heat and causes additional health problems.

Trees also help to reduce the impact of climate change – over one year a mature tree will remove about 22kg of carbon dioxide. Trees with white or paler leaves can potentially help to reflect heat upwards increasing their cooling effect. Additionally, creating more green spaces and planting trees speeds up drainage and reduces the risk of flooding.

**Box 4: Creating cool environments with green spaces  
(continued)**

In summary, urban green space and trees can have the following beneficial effects:

***Reduces urban heat islands*** – predictions for urban temperatures over the next 70 years show that if there is less than 10 per cent urban green cover, urban temperatures will increase by about 8.2°C, whilst if green cover exceeds 10 per cent it will keep temperatures to only 1°C above current temperatures.

***Reduces pollution*** – each year 1.3 million trees remove 2,535 tonnes of pollutants from the air.

***Reduces flooding*** – each year 1.3 million trees would catch 7 billion tonnes of rainwater, thereby reducing the impact of flooding.

***Reduces noise*** – a belt of trees can reduce noise levels by as much as 6–8 decibels for every 30 metres width of woodland.



## Plan summary

The arrangements outlined here spell out what needs to be done by health and social care services and other bodies to raise awareness of the risks relating to severe hot weather and what preparations both individuals and organisations should make to reduce those risks.

The plan also explains the responsibilities at national and local level for alerting people once a heatwave has been forecast, and for advising them how to respond and what to do during a heatwave.

The core elements of the plan are:

- A Heat-Health Watch system operating from 1 June to 15 September, based on Met Office forecasts, which will trigger levels of response from the Department of Health and other bodies.
- Advice and information issued by the Department of Health directly to the public and to health and social care professionals, particularly those working with at-risk groups, both before a heatwave is forecast and when one is imminent.
- The Strategic Health Authority (SHA) role in a heatwave is to ensure that local services have the capacity and capability to deliver their functions as laid out in this plan. The SHA will hold the local NHS to account for implementation. Specific guidance for SHAs will be outlined under each alert level.

- Hospitals and care, residential and nursing homes to provide cool areas and monitor indoor temperatures to reduce the risk of heat-related illness and death in the most vulnerable populations.
- Extra help, where available, from health and social care services, the voluntary sector, families and others to care for those most at risk, mainly isolated older people and those with a serious illness or disability. This will be determined locally as part of individual care plans, and will be based on existing relationships between statutory and voluntary bodies.
- Using the media to get advice to people quickly, both before and during a heatwave.
- Long-term multi-agency planning to adapt to and reduce the impact of climate change, including 'greening the built environment', increasing shading around and insulation of buildings, increasing energy efficiency and reducing carbon emissions.

This plan sets out what needs to happen before and during a severe heatwave in England. It includes specific measures to protect at-risk groups.

## The Heatwave Plan

A Heat-Health Watch system will operate in England from 1 June to 15 September each year. During this period, the Met Office may forecast heatwaves, as defined by forecasts of day and night-time temperatures and their duration. See figure 6 for a summary of the heatwave levels.

While Heat-Health Watch is in operation, the Health Protection Agency will monitor the number of calls people make to NHS Direct and the number of visits made to a sample of GP practices. Daily NHS Direct call rates and weekly GP consultation rates will be reported to the Department of Health, to assess how people's health is affected by the weather and to give some insights into how well services are responding.

The Heat-Health Watch system comprises four main levels outlined in figure 6 and described in further detail below – 1, 2, 3 and 4. It is based on threshold day and night-time temperatures as defined by the Met Office. These vary from region to region, but the average threshold temperature is 30°C during the day and 15°C overnight. Details of individual regional thresholds are given in Annex 1.

**Figure 6. Summary of Heatwave Plan levels and actions.**

## LEVEL 1

### Long-term planning

– All year

### Summer preparedness

– 1 June – 15 Sept

#### Long-term planning

- Increase trees and green spaces
- External shading
- Reflective paint
- Loft and wall insulation
- Water features
- Reduce internal energy and heat

#### Summer preparedness

- Identify high-risk individuals
- Include risk in Common Assessment Framework and Care Programme Approach
- Install thermometers
- Identify cool areas
- Increase awareness in staff



## LEVEL 2

60 per cent risk of heatwave in 2-3 days\*

#### Alert and readiness in community

- Public media messages
- Increase advice to health and social care workers
- Check high-risk people have visitor/phone call arrangements in place

#### Alert and readiness in care homes and hospitals

- Monitor indoor temperatures four times a day
- Prepare cool areas
- Ensure sufficient staffing
- Identify high-risk people
- Sufficient cold water and ice



## LEVEL 3

Heatwave temperature reached in one or more regions

#### Heatwave Action in community

- Media alerts about keeping cool
- Visit/phone high-risk people
- Look out for neighbours
- Reduce unnecessary travel
- Review safety of public events

#### Heatwave Action in care homes and hospitals

- Monitor indoor temperatures four times a day
- Maximise external shading and night-time ventilation
- Ensure cool areas do not exceed 26°C
- Provide regular cool drinks

## LEVEL 4

Heatwave for four or more days in two or more regions

#### EMERGENCY

**If severe or prolonged heatwave affecting sectors other than health**

#### High-risk Groups

**Community:** Over 75, female, living on own and isolated, severe physical or mental illness; urban areas, south-facing top flat; alcohol and over-exertion  
**Care home or hospital:** over 75, female, frail, severe physical or mental illness; multiple medications; babies and young children.

\*Because Level 2 is based on a prediction, there may be jumps between levels. Following Level 3, wait until temperatures cool to Level 1 before stopping Level 3 actions.

### Level 1: Summer preparedness and long-term planning

During the summer months, social and healthcare services need to ensure that awareness and background preparedness are maintained by the measures set out in the Heatwave Plan. Long-term planning includes year-round joint working to reduce the impact of climate change and ensure maximum adaptation to reduce harm from heatwaves. This involves influencing urban planning to keep housing, workplaces, transport systems and the built environment cool and energy efficient.

### Level 2: Alert and readiness

This is triggered as soon as the Met Office forecasts that there is a 60 per cent chance of temperatures being high enough on at least two consecutive days to have significant effects on health. This will normally occur 2–3 days before the event is expected. As death rates rise soon after temperature increases, with many deaths occurring in the first two days, this is an important stage to ensure readiness and swift action to reduce harm from a potential heatwave.

### Level 3: Heatwave action

This is triggered as soon as the Met Office confirms that threshold temperatures have been reached in any one region or more. This stage requires specific actions targeted at high-risk groups.

### Level 4: Emergency

This is reached when a heatwave is so severe and/or prolonged that its effects extend outside health and social care, such as power or water shortages, and/or where the integrity of health and social care systems is threatened. At this level, illness and death may occur among the fit and healthy, and not just in high-risk groups and will require a multi-sector response at national and regional levels.

## Responsibilities at Level 1:

### Summer preparedness and long-term planning

During the summer months, social and healthcare services need to ensure that awareness and background preparedness are maintained by the measures set out in the Heatwave Plan. Long-term planning includes year-round joint working to reduce the impact of climate change and ensure maximum adaptation to reduce harm from heatwaves. This involves influencing urban planning to keep housing, workplaces, transport systems and the built environment cool and energy efficient.

### **National level – Summer preparedness**

Preparations at this level will be the overall responsibility of the Department of Health, in collaboration with the Met Office, the Health Protection Agency and NHS bodies, including NHS Direct.

The **Met Office** will develop and publicise the regional threshold temperatures in preparation for Level 2 and will ensure that forecasts are disseminated when there is a 60 per cent chance that thresholds will be exceeded, as appropriate to the Department of Health and via national, regional and local weather forecasts.

The **Health Protection Agency**, in collaboration with **NHS Direct**, will refine mechanisms for the surveillance of increased heat-related illness with the aim of being able to provide daily real-time reports to the Department of Health. These will provide a source of intelligence on how severe the effects are and how well services are responding.



The **Department of Health** will issue general advice to the public and healthcare professionals, including details of what to do at Levels 2 and 3.

- A public information leaflet will be available to be downloaded from the Department of Health web address: ([http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_126666](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_126666)). The same advice will also be posted on NHS Direct Online ([www.nhsdirect.nhs.uk](http://www.nhsdirect.nhs.uk)), NHS Choices ([www.nhs.uk](http://www.nhs.uk)), with links to the Health Protection Agency ([www.hpa.org.uk](http://www.hpa.org.uk)), and Department of Health websites ([www.dh.gov.uk](http://www.dh.gov.uk)). Printed leaflets will be available upon request to professionals and the public and we will seek to ensure that Heatwave Plan is widely communicated using a variety of channels to ensure maximum publicity.
- A factsheet will be available for health and social care professionals, particularly those who visit people in their homes. This offers advice on practical measures to reduce health risks during a heatwave and encourages identification of at-risk individuals **in advance** and assessment of their additional care needs.
- A second factsheet will be specifically aimed at the managers and staff of residential and nursing care homes, where people are particularly at risk during hot weather.

Implementing the practical advice in the leaflet and both factsheets complements the plan.

## **Regional level – Summer preparedness**

Preparations at this level include Strategic Health Authorities.

**Strategic Health Authorities** will ensure that healthcare providers are aware of all the guidance on minimising and coping with heat-related health risks.

In particular, SHAs role is to ensure that:

- national guidance is cascaded to local services;
- all organisations engage in preparing for a heatwave;
- all NHS trusts include heatwave planning on their risk register; and
- local Primary Care Trusts identify which local healthcare organisations are most vulnerable to the effects of heatwaves

**DH** will work in partnership with the health and social care sectors at regional and local levels, and other government departments, to ensure awareness and preparedness for heatwave planning and enhance long-term planning, including working with and influencing:

### **Social Care to:**

- ensure care, nursing and residential homes are aware of the Heatwave Plan; are engaged in preparing for heatwaves; and include heatwave planning on their risk registers.

### **Department of Health to:**

- inform and ensure awareness of the Heatwave Plan with DCLG Resilience and Emergencies Division (which will share information with local responders and represent

Government at local or multi-area strategic co-ordination groups in the event of a significant emergency) and regional HPA director;

- identify which geographical areas and populations in the region are most at risk from heatwaves;
- encourage the uptake of insulating homes for populations vulnerable to the effect of heatwaves;
- encourage public health system to increase urban green spaces to reduce the impact of heat islands;
- encourage housing agencies to promote the provision of external shading on south/west facing windows, especially for vulnerable households and the use of reflective paint;
- ensure consistency of heatwave planning messages and actions with the children's sector; and
- establish links of heatwave planning with other adaptation and mitigation measures for climate change, for example, promote carbon emission reduction from housing insulation and flood management with by increasing green space.

### **Local level – Summer preparedness**

Preparations at this level include NHS Trusts; Social Services; public health and local authorities, and care, residential and nursing homes.

**Primary Care Trusts** and **local Social Services** will support community and primary care staff in:

- Identifying individuals who are at particular risk from extreme heat (see the section on **High-risk factors** on page 23). These people are likely to be already receiving care.

- Identifying any changes to individual care plans for those in high-risk groups, including those with chronic illness or severe mental illness, which might be necessary in the event of a heatwave, including initiating daily visits by formal or informal carers to check on people living on their own.
- Working with the families and informal carers of at-risk individuals to ensure awareness of the dangers of heat and how to keep cool and to put simple protective measures in place, such as installing proper ventilation and ensuring that fans and fridges are available and in working order.
- Reviewing surge capacity and the need for, and availability of, staff support in the event of a heatwave, especially if it lasts for more than a few days.
- Where individual households are identified as being at particular risk from hot weather, making a request to Environmental Health to do an assessment using the Housing Health and Safety Rating System (HHSRS). In summer months especially, cycling and walking should be encouraged as a means of transport as this will help to reduce overall heat levels and poor air quality in urban areas due to car use.

Primary Care Trusts can work actively with the local authority lead on the HHSRS to identify and assess those considered most vulnerable during heatwaves.

If residents find their home uncomfortably hot and there are concerns about the heat negatively affecting their health, seek advice from the Environmental Health Department within the local authority, who can undertake a Housing Health and Safety Rating System assessment (see Box 5).

### Box 5: Housing Health and Safety Rating System (HHSRS)

This is the way in which local housing authorities assess homes under the Housing Act 2004. It is the basis for regulation of housing conditions. Anyone, including health professionals, can request that an assessment be made if they have concerns about how housing conditions could potentially affect someone's health.

The assessment is usually made by an Environmental Health practitioner in the local housing authority. Judgement as to the risk is made by reference to the vulnerable age group for the hazard arising from deficiencies identified on inspection regardless of who is actually living there (for excess heat this is people aged 65 years or over).

There are 29 potential hazards in the system: these include excess cold, **excess heat**, damp and mould, lead, carbon monoxide, noise, entry by intruders, falls associated with baths, falling on stairs, falling on the level, fire, electrical hazards, and crowding and space.

Depending on the severity of the hazards found, the housing authority can require that the landlord takes action to reduce the hazard; alternatively, the assessment can be used as a basis for housing renewal assistance, e.g. grants or loans. For the most serious of hazards (Category 1) there is a duty on the authority to take action. For further information on the HHSRS please visit:

[www.communities.gov.uk/documents/housing/pdf/150940.pdf](http://www.communities.gov.uk/documents/housing/pdf/150940.pdf)

**Local authorities** will raise awareness among care home managers and staff about the very significant heat-related health risks, and will encourage additional staff training in line with the Department of Health factsheet. They will encourage the organisation of large, outdoor events taking account of the dangers of heat by ensuring the provision of shade, cold water and information for individual protection.

**NHS Trusts and care, nursing and residential homes** will raise awareness among staff about the very significant heat-related health risks. Additionally, the following preparations should be made:

- Indoor thermometers should be installed in each room that vulnerable individuals spend substantial time in (bedrooms, living areas and eating areas) and, during a heatwave, indoor temperatures should be monitored at least four times a day.
- Cool rooms or cool areas should be created. High-risk groups who are vulnerable to the effects of heat are physiologically unable to cool themselves efficiently once temperatures rise above 26°C. Therefore, every care, nursing and residential home should be able to provide a room or area that maintains a temperature of 26°C or below. Hospitals should aim to ensure that cool areas are created that do not exceed 26°C, especially in areas with high-risk patients.
- If temperatures exceed 26°C, high-risk individuals should be moved to a cool area that is 26°C or below.
- Cool areas can be developed with appropriate indoor and outdoor shading, ventilation, the use of indoor and outdoor plants and, if necessary, air-conditioning.

- During the summer months, sufficient staff must be available so that appropriate action can be taken in the event of a heatwave.
- Due to the additional risk of psychiatric medications affecting thermoregulation and sweating, mental health trusts and teams need to ensure that hospital environments have a cool room (26°C or below) and that heatwave considerations (see the section on **Protective factors** on page 24) are included within an individual's Care Programme Approach.
- All care, residential and nursing homes should provide an email address to local authority/NHS emergency planning officers, to facilitate the transfer of emergency information.

### Long-term planning

The **Department of Health, other government departments, local authorities, the NHS and public health authorities** should work in partnership at national, regional and local levels to ensure long-term adaptation for heatwaves and to reduce the impact of climate change by promoting the following measures:

- **Greening the built environment:** Trees, plants and green spaces act as natural air-conditioners, provide shade and absorb carbon dioxide. They also help to reduce the impact of flooding. Urban planners, schools and health and social care organisations should aim to maximise opportunities to 'green the environment' along streets and around buildings.



- **Shading and insulating housing and buildings:** Council and housing associations should increase the use of reflective paint and external shading around south-facing windows, around top-floor flats or where indoor temperatures exceed 26°C to protect high-risk residents who are vulnerable to the effects of heat. It may be appropriate to move high-risk individuals into cooler properties. Cavity wall and loft insulation keeps the heat in during winter and also helps to keep homes cooler in the summer. Local communities should work in partnership to increase uptake of the many grants available to insulate homes. Additionally, hospitals and institutions should ensure that they are well insulated and increase external shading.
- **Increase energy efficiency and reduce carbon emissions:** Insulation increases energy efficiency and reduces carbon emissions. Additional measures include undertaking a carbon audit, promoting the use of public transport, switching to energy-efficient vehicles and appliances, recycling and local procurement. Energy use tends to go up during a heatwave due to increased use of fans and air-conditioning. However, these measures generate heat and make air quality worse. Therefore long-term planning should aim to maximise energy-neutral cooling mechanisms.

See Box 6 for a summary of the measures that hospital estates and care homes can take to assist in cooling without the use of air-conditioning.

See Box 7 for a summary of the wider benefits of increasing green spaces.

See Box 8 for a summary of the benefits in relation to protection against heatwaves of insulating homes.

**Box 6: Cooling hospital estates and care homes**

- Create cooling green spaces in the surrounding environment, with trees, shrubs, trellises, arbours, climbers (avoid ivy as it can damage buildings), green roofs and water features.
- Do not extend car parks at the expense of green spaces – this adds to surrounding heat. Introduce an active transport plan. Plant trees around existing car parks and on top of multi-storey car parks.
- Ensure that buildings are well insulated – both loft and cavity insulation helps to reduce heat build-up (and also reduces carbon emissions and increases energy efficiency).
- Increase opportunities for night-time ventilation either through vents or windows.
- For south-facing windows, consider external shading or reflective glass. Reflective paint may help on south-facing walls.

## **Box 7: Wider health benefits of green space**

- Children with attention deficit hyperactivity disorder have reported significant improvements in symptoms when in contact with natural environments and green spaces.
- The presence of green spaces in otherwise identical urban areas is associated with reduced indicators of stress and family aggression
- Living in closer proximity to green spaces is associated with improved wellbeing, reduced mental health problems, and reduced health inequalities
- Exposure to natural environments or scenes of nature have shown reduction in physiological stress indicators such as reduced blood pressure and muscle tension and changes to EEG alpha wave activity.
- Access to green spaces and natural environments can increase the likelihood of physical activity and active travel in adults and children.

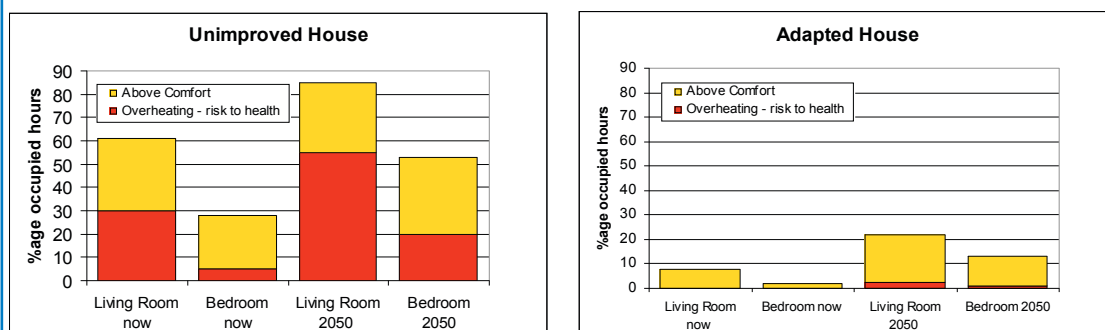
### Box 8: How insulating homes can protect against heat

Insulating homes has multiple health benefits, improving physical and mental health, and additionally acts on both mitigation and adaptation regarding climate change:

- **Mitigation** – installing insulation will improve the energy efficiency of the home and will reduce CO<sub>2</sub> by an estimated average of 1.2 tonnes/year.
- **Adaptation** – helping future-proof existing homes to reduce the health impact of excessive thermal gain in the forecast warmer summers.

### Insulated homes protect against the heat

The two graphs below identify conditions within an average (1930s semi-detached) house in the month of July, both for now and in 2050, looking at the percentage of the month in which internal temperatures would exceed specific thresholds (living room being above comfort at 25°C and overheating at 28°C, bedroom 23°C and 26°C respectively), comparing where the measures recommended above had, or had not, been installed.



## Box 8: How insulating homes can protect against heat (continued)

A range of measures are recommended to retrofit homes to ensure that excessive solar gain in the summer is avoided. Some of these measures, including cavity wall and loft insulation, are also of direct benefit now and in 2050 to retain warmth in the home during the cold winter months. Note that adequate ventilation is needed to ensure that heat does not become trapped within the building.

For information, estimated costs of each measure are summarised below.

### Cost of measures for adapting houses for climate change

<b>Measures which aid the reduction of overheating only</b>	
Natural ventilation through windows	£0
Awnings on all south/west windows	£1,700
Ceiling fans (DIY)	£545
Wood or tiles, not carpets, on ground floor	£2,100
Paint façade to increase reflectivity	£3,750
<b>Measures which also benefit winter warmth</b>	
Improve roof insulation	£199
Cavity wall insulation where cavities are present	£199
Replace single-glazing with double-glazing, low-e coatings	£5,000

**Box 8: How insulating homes can protect against heat (continued)**

Costs based on figures from *Your home in a changing climate* (available at [www.london.gov.uk/trccg/docs/pub1.pdf](http://www.london.gov.uk/trccg/docs/pub1.pdf)), except roof and cavity wall insulation which are based on current averages for costs through able-to-pay insulation schemes.

**For further information on grants available to insulate homes visit:**

[www.direct.gov.uk/en/Environmentandgreenerliving/  
Energyandwatersaving/  
Energyandwaterefficiencyinyourhome/DG\\_064374](http://www.direct.gov.uk/en/Environmentandgreenerliving/Energyandwatersaving/Energyandwaterefficiencyinyourhome/DG_064374)

## Responsibilities at Level 2: Alert and readiness

This is triggered as soon as the Met Office forecasts threshold temperatures for at least two to three days ahead in any one region, or forecasts that there is a 60 per cent chance of temperatures being high enough on at least two consecutive days to have significant effects on health. As most deaths occur in the first two days, this is an important stage at which to ensure readiness and swift action to reduce harm from a potential heatwave.

### National and regional level

The **Met Office** will notify the Department of Health and other organisations with 'Heat-Health Watch' responsibility (Strategic Health Authorities, Local Authorities, Primary Care Trusts, NHS Trusts and Social Services departments) immediately when it is forecast that there is a 60 per cent chance that threshold temperatures will be exceeded for any one region. A warning will also be broadcast to the public via television and radio weather reports. This warning will resemble the examples given at Annex 3.

The **Department of Health** will make advice available to the public and health and social care professionals in affected regions, in preparation for an imminent heatwave, via NHS Direct Online and the Met Office, Health Protection Agency and Department of Health websites.

The **Health Protection Agency** will continue to monitor any increases in heat-related illness reported in calls to NHS Direct and GP consultations. It will provide daily real-time reports about NHS Direct calls and weekly reports about GP consultations to the Department of Health. These will provide a source of intelligence on both how severe the reported effects are and how well services are responding.



In collaboration with the **Met Office** and **Strategic Health Authority communications leads**, the **Department of Health** will target the media in affected regions with publicity about Met Office warnings and Department of Health advice to the public.

### **Strategic Health Authorities will:**

- ensure that local services are notified of a Met Office alert and change of heatwave level;
- liaise with DH and Met Office to ensure, if a priority region, that the media are targeted to provide health advice to the public;
- hold local health services to account for taking actions as laid out in Level 2 preparedness;
- link with their regional HPA service to receive monitoring information;
- brief upwards to DH, as appropriate; and
- ensure DCLG Resilience and Emergencies Division are aware of the change in heatwave alert levels

### **Local level**

**Primary Care Trusts** and **local Social Services** will ensure:

- that health and social care workers have identified those in their community who are at particularly high risk from a heatwave. They should arrange, where appropriate, for a daily visit/phone call by a formal or informal carer (family, neighbour, friend, voluntary and community sector workers) during the heatwave period (see the section on **High-risk factors** on page 23). Visits should be considered especially for those living on their own and without the contact of a daily carer;

- distribution of Department of Health advice to community health and social care workers who are in contact with all those defined as at risk living at home; and
- distribution of Department of Health advice to the managers of local authority-funded and private care, residential and nursing care homes.

### **Hospitals and care, residential and nursing homes must:**

- ensure that cool rooms are ready and consistently at 26°C or below;
- check that indoor thermometers are in place and recording sheets printed to measure temperature four times a day;
- identify naturally cooler rooms that vulnerable patients can be moved to if necessary;
- identify particularly vulnerable individuals (those with chronic/severe illness, on multiple medications, or who are bed bound) who may be prioritised for time in a cool room;
- obtain supplies of ice/cool water;
- ensure that staffing levels will be sufficient to cover the anticipated heatwave period;
- repeat messages on risk and protective measures to staff; and
- in the context of mental health trusts and community teams, ensure that visits or phone calls are made to advise high-risk individuals (those with severe mental illness, living on their own, or without regular contact with a carer).

### Responsibilities at Level 3: Heatwave action

This is triggered as soon as the Met Office confirms that threshold temperatures have been reached in any one region or more. This stage requires specific actions targeted at high-risk groups.

#### National and regional levels

The **Met Office** will confirm that the high temperature threshold has been reached for any one region or more. The forecast will include the likely duration of the heatwave, the likely temperatures to be expected and the probability of other regions exceeding their threshold. The Met Office will continue to monitor and forecast temperatures in each region.

The **Department of Health** will continue to make available advice to the public and health and social care professionals in affected regions (as at Level 2).

The **Health Protection Agency** will continue to monitor any increases in heat-related illness reported in calls to NHS Direct and GP consultations and provide daily real-time reports about NHS Direct calls and weekly reports about GP consultations to the Department of Health. These will provide a source of intelligence on both how severe the reported effects are and how well services are responding.

In collaboration with the **Met Office** and **Strategic Health Authority communications leads**, the **Department of Health** will target the media in affected regions with publicity about Met Office warnings and Department of Health advice to the public.

## **Strategic Health Authorities to:**

- continue action as for Level 2;
- muster mutual aid where requested by the local services;
- ensure that updated guidance and monitoring information reaches local services; and
- brief DCLG Resilience and Emergencies Division and central DH emergency preparedness with updates and risks.

## **Local level**

### **Primary Care Trusts and local Social Services will:**

- continue to distribute advice to people at risk, and managers and staff of care homes;
- ensure that health and social care staff are aware of risk and protective factors, and consider, where appropriate, daily visits/phone calls for high-risk individuals living on their own who have no regular daily contacts;
- advise social care or informal carers to contact the GP if there are concerns about an individual's health; and
- ensure that Department of Health advice reaches private and local authority-funded care, residential and nursing care home managers as soon as a heatwave starts.

### **It is recommended that hospitals and care, residential and nursing homes:**

- implement appropriate protective factors, including regular supplies and assistance with cold drinks;
- ensure that cool rooms are consistently below 26°C as this is the temperature threshold at which many vulnerable patients find it difficult to cool themselves naturally if sweating is impaired due to old age, sickness or medication;

- check that indoor temperatures are recorded four times a day for all areas with patients in;
- identify particularly vulnerable individuals (those with chronic/severe illness, on multiple medications, or who are bed bound) for prioritisation in cool rooms;
- monitor and minimise temperatures in all patient areas and take action if the temperature is a significant risk to patient safety, as high risk patients may suffer undue health effects including worsening cardiovascular or respiratory symptoms at temperatures exceeding 26°C;
- reduce internal temperatures by turning off unnecessary lights and electrical equipment;
- consider moving visiting hours to mornings and evenings to reduce afternoon heat from increased numbers of people;
- make the most of cooling the building at night with cross ventilation. Additionally, high night-time temperatures in particular have been found to be associated with higher mortality rates. Due to the potential increased risk of cross infection that may be induced by cross ventilation, they should ensure increased vigilance of other routine infection control measures;
- in the context of mental health trusts and community teams, ensure that visits or phone calls are made to check on high-risk individuals (those with severe mental illness, living on their own, or without regular contact with a carer);
- seek early medical help if an individual starts to become unwell; and

- ensure that discharge planning takes into account the temperature of accommodation and level of daily care during the heatwave period.

**Primary Care Trusts, Local Authorities, Strategic Health Authorities** and the **Care Quality Commission** have a potential role in monitoring whether the above measures are implemented.

### Responsibilities at Level 4: Emergency

This is reached when a heatwave is so severe and/or prolonged that its effects extend outside health and social care, such as power or water shortages, and/or where the integrity of health and social care systems is threatened. At this level, illness and death may occur among the fit and healthy and not just in high-risk groups.

Level 4 may be declared locally, regionally or nationally, according to established operating doctrines.

In the event of a major incident being declared, all existing emergency policies and procedures will apply.

All Level 3 responsibilities will also continue.

### Heatwave – cross-government response

- In the event of a Level 4 emergency being declared, the Cabinet Office will ensure that a lead government department is nominated to coordinate the central government response machinery as necessary.
- In practice, while the Department of Health is most likely to be the lead government department responsible for a Level 4 heatwave emergency, as a prolonged heatwave would primarily be a public health issue, this would need to be confirmed at the time in light of prevailing circumstances.
- While other issues are likely to arise as part of any heatwave emergency, such as power failures and transport disruption, these would be dealt with by the departments concerned as part of a coordinated response unless they became the overriding concern, in which case the overall central government department lead may transfer responsibility.

- Response arrangements therefore need to be flexible, in order to adapt to the nature of the challenge and other circumstances at the time while applying good practice, including lessons from previous emergencies.

### **The health sector – at national level**

- Level 4 emergency may be considered under the following conditions: prolonged or severe heatwave, concerns over numbers of deaths, problems arising with schools, transport, water and food supplies and interference with critical national infra-structure and media concerns.
- The decision to call a Level 4 heatwave emergency at national level will follow a cross-government assessment of the heatwave. The Civil Contingencies Secretariat (Cabinet Office) will lead on arranging this assessment with all interested departments/agencies and in taking the final decision regarding appropriate emergency level.
- Consultation will take place with a range of interested departments/agencies, for example the Met Office, HPA, EPRR, Policy Lead for CMOs office, Water Companies, Transport, Education, DCLG, Comms lead, Devolved Administrations, and the Defence Forces.

### **The health sector – at regional level**

- DCLG Resilience and Emergencies Division will support the co-ordination of a cross-sector response to the heatwave.
- Strategic Health Authorities will provide regular briefings and advice to DCLG Resilience and Emergencies Division and central DH emergency preparedness team.
- Strategic Health Authorities will continue to ensure Level 3 actions are continued at regional and local levels.
- Strategic Health Authorities will ensure Primary Care Trusts



have identified local healthcare providers most vulnerable to heatwaves and that safety measures are taken, for example, the closure of wards that are too hot for vulnerable patients with transfer to safer locations.

- During extreme conditions, non-high risk groups are also affected. Therefore, further risk appraisals should be made regarding continuation of public or sporting events, the potential closure of schools, provision of local cool centres, reducing urban heat and deteriorating air quality by minimising unnecessary transport and energy use.

## Anticipated impacts for other sectors during a heatwave Level 4

Anticipated risks and responses during a heatwave Level 4, according to different sectors, are summarised below.

The previous pages have highlighted the risks to public health from a heatwave. The risks to other important areas of life from four or more days where temperatures have reached threshold values during the day and overnight are equally important. These wider risks, which have the potential to generate disruption at a national, regional and local level, include the following:

### **Transport infrastructure**

- Road surfaces are susceptible to melting under extreme or prolonged temperatures; however, as the surface temperature may not be dependent on the air temperature, melting is more likely to be as a result of direct sunlight.
- Traffic congestion leading to delays on motorways or trunk roads has potentially serious consequences for those stranded in vehicles, particularly vulnerable people such as the elderly or young children.
- The rail network will be susceptible to rails warping or buckling under extreme or prolonged temperatures and this will vary according to specific local factors including local geography and the maintenance status of the track. As a very approximate guide, staged preventative measures begin to be applied when air temperatures reach 22°C. The most extreme precautions would only cut in at air temperatures of 36°C (which is likely to give a railhead temperature of over 50°C).

- Extreme temperatures on the London Underground network could lead to a range of health and safety challenges. London Underground network operations monitor Met Office weather forecasts, and if temperatures are forecast not to fall below 24°C for three days running they will get ready to implement plans to deploy hot weather notices and bottled water supply, as well as measures to prevent track buckling.

## **Power supplies**

- Rising temperatures increase demand for supply due to use of air-conditioning units and reduce the power-carrying capacity of the system as it is harder to cool conductors – this will restrict the ‘maintenance window’ available and could ultimately require greater redundancy on the system to permit maintenance.
- Rising temperatures cause cooling problems for power stations as they are unable to cool components. This effect has been experienced in France, but not yet to a serious extent in the UK.
- High air temperatures are more of a problem and nuclear reactors can trip out at above 40°C, although this has never yet been reached at any sites (38°C being the record).
- Rising temperatures lower power station efficiency. This effect is of lower concern than the two effects above.

## **Environmental pollution**

- Air quality – traffic concentrations can generate pollutants such as oxides of nitrogen and lead and greatly increase ozone levels.
- Water quality – prolonged sunshine can accelerate the growth of blue-green algae, which can cause problems for aquatic life, including fish.

- A prolonged heatwave may cause increased health and environmental problems including odour, dust and vermin infestation, increasing public nuisance and complaint. Additional measures would be necessary to mitigate these problems, including more frequent collections and enhanced pollution control measures at landfills and other waste treatment facilities.

### **The potential for wildfires**

A wildfire is any uncontrolled fire that occurs in the countryside or a wilderness area. Wildfires occur when the necessary elements for a fire are in place: an ignition source, a combustible material such as vegetation, sufficient heat and an adequate supply of oxygen. Many wildfires are attributed to human sources such as arson, discarded cigarettes, sparks from equipment, and power line arcs. The risks during a heatwave can be greater because the vegetation will be that much drier than usual. The smoke and other risks from wildfire can cause the closure of motorways.

### **Animal welfare**

- Rising temperatures would require the increase of ventilation requirements for animals temporarily housed at farms, markets and slaughterhouses.
- Rising temperatures lead to changes in transport, markets and temporarily housed animal stocking densities.
- Delays on transport have the potential to lead to increased distress and suffering of animals and increase the number of deaths of animals in transit.
- Slaughterhouses' killing throughput may be affected due to reduced working hours at slaughterhouses and the transport of a lower number of animals.

- There is the potential for an increase in the number of pet fatalities due to irresponsible owners leaving them in restricted enclosures with poor ventilation (e.g. dogs in cars).

### **Water shortages**

- Water companies have plans in place to deal with any disruption to the water supply or sewerage services. These plans are regularly reviewed and tested by the water companies and are independently certified every year.
- In the event of an unavoidable failure of the piped water supply, water companies must supply water by alternative means such as in static tanks in the street or bottled water. There is a requirement to provide not less than 10 litres per person per day, with special attention given to the needs of vulnerable people, hospitals and schools.
- Where an interruption to the piped water supply exceeds five days, the minimum requirement rises to 20 litres per person per day.
- Strong demand has the potential to jeopardise the availability of water supplies, particularly in southern and some other parts of the UK, and could lead to local hose-pipe restrictions if high temperatures persist.

### **Children's sector**

Some schools have had to close classrooms where conditions are too hot.

**Looking after schoolchildren and those in early years settings during heatwaves: Guidance for teachers and other professionals**

[www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb\\_C/1210577610802?p=1204031509010](http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1210577610802?p=1204031509010)

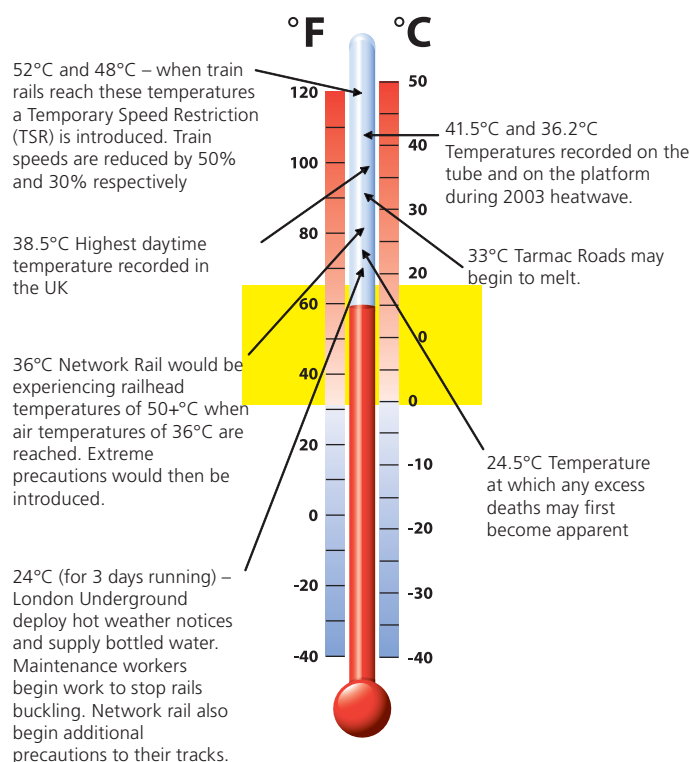
## Crops

- Rising temperatures mean crops start to experience stress due to heat and water shortage, if prolonged they will die. Horticulture is very sensitive.
- Crops may not be harvested at appropriate times and may be lost or quality and nutritional value may be reduced.
- High temperatures may mean crops cannot be sown at appropriate times or need more water.
- Flowering and pollination may be affected, reducing fruit and grains.
- It may become difficult to store crops such as potatoes at the appropriate temperature as machinery has to work harder.

## Key trigger temperatures

Figure 7 summarises the key trigger temperatures during a heatwave. Although excess seasonal deaths start to occur at approximately 25°C, for practical reasons the health heatwave alert system is based upon temperature thresholds where the odds ratio is above 1.15– 1.2 (a 15–20% increased risk). The different trigger temperatures are summarised in Annex 1, with regional variations due to the relative adaptation to heat. However, a significant proportion of excess summer deaths occur before the health heatwave alert is triggered, which emphasises the importance of long-term planning actions by local authorities and the health sector.

**Figure 7. Trigger temperatures**



## Monitoring and surveillance

The Health Protection Agency will further explore improving surveillance of heat-related deaths, for example, monitoring a sample of mortuaries, coroners and funeral homes during a heatwave period.

### Evaluation

An annual review of the Heatwave Plan will take place each autumn/winter.

### Information on alert levels

The heatwave alert levels will be triggered by temperature thresholds (see Annex 1) set according to regional variations. Therefore the Met Office website ([www.metoffice.gov.uk](http://www.metoffice.gov.uk)) will be the first place where the alert levels will be available. The alert levels will also be subsequently displayed on the Department of Health, Health Protection Agency and NHS Direct websites.

### Information on air quality

Regular updates on levels of particulate matter (PM10), sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide are available on <http://uk-air.defra.gov.uk/> which offers health advice to those who may be particularly sensitive to air pollution.

Advice to those with respiratory problems is consistent with the advice to all others during a heatwave – to keep windows shaded and closed when outside temperatures are hotter during the daytime to reduce heat (and ozone) entering the home; and opening windows at night or when it is cooler outside, to aid cooling of their home.



Ozone is the main air pollutant that affects respiratory symptoms and has diurnal variation, peaking during the hottest period of the day and dropping to very low levels at night. Other air pollutants tend to be at lower levels indoors, and therefore the other main advice to those with respiratory problems is to restrict going outside, especially during the hottest period of the day. Additional information on air quality can be found from:

- the freephone Air Pollution Information Service telephone number [0800 55 66 77](tel:0800 55 66 77)
- Sky News Air Pollution bulletin (which normally airs in the evening around 18.45).

## Annex 1: Threshold temperatures

Threshold day and night temperatures defined by the Met Office by region are set out below.

Temperatures are in degrees centigrade.

Region	Day	Night
London	32	18
South East	31	16
South West	30	15
Eastern	30	15
West Midlands	30	15
East Midlands	30	15
North West	30	15
Yorkshire and Humber	29	15
North East	28	15

## Annex 2: For further information

### Information for care homes, health and social care professionals and the public

Copies of the public information leaflet and factsheets for health and social care professionals and care, residential and nursing care home managers can be downloaded from: [www.dh.gov.uk/publications](http://www.dh.gov.uk/publications).

### EuroHEAT Project and Heat-Health Action Plan Guidance

The EuroHEAT project, co-funded by the World Health Organization (WHO) and the European Commission, brought together experts from across Europe to share learning in developing national heatwave plans.

Results of this work are summarised in WHO guidance called *Heat-Health Action Plans*. It explains the importance of the development of heat-health action plans, their characteristics and core elements, with examples from several European countries that have begun their implementation and evaluation. Below are the eight core components of heat action plans that the guidance identifies.

#### **Eight core elements of Heat-Health action plans**

- **Agree a lead body** to coordinate multi-agency collaboration and to direct the response.
- **Accurate and timely alerting systems** – Heat-Health Warning Systems – to trigger warnings, determine action thresholds and communicate risks.
- **Reduce indoor heat exposure (medium and short term).**

- **Particular care for vulnerable population groups.**
- **Preparedness of the health and social care system** – staff training and planning, appropriate healthcare and the physical environment.
- **Heat-related health information plan** – what is communicated, to whom and when.
- **Long-term urban planning** – building design, energy and transport policies.
- **Real-time surveillance and evaluation.**

For more information please visit the WHO Euro weblink at:  
[http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0009/95913/E92473.pdf](http://www.euro.who.int/__data/assets/pdf_file/0009/95913/E92473.pdf)

## Annex 3: Core messages

These are the core messages to be broadcast as official Department of Health warnings alongside national and regional weather forecasts. They may be expanded or otherwise refined in discussion with broadcasters and weather presenters.

### Level 1: Summer preparedness and long-term planning

No warning required unless there is a 60 per cent probability of the situation reaching Level 2 somewhere in the UK within the next three days, then something along the lines of:

**"If this does turn out to be a heatwave, we'll try to give you as much warning as possible. But in the meantime, if you are worried about what to do, either for yourself or somebody you know who you think might be at risk, for advice go to NHS Direct Online at [www.nhsdirect.nhs.uk](http://www.nhsdirect.nhs.uk). Alternatively ring NHS Direct on 0845 4647."**

### Level 2: Alert and readiness

The Met Office, in conjunction with the Department of Health, is issuing the following heatwave warning for [regions identified]:

**"Heatwaves can be dangerous, especially for the very young or very old or those with chronic disease. Advice on how to reduce the risk either for yourself or somebody you know can be obtained from NHS Direct Online at [www.nhsdirect.nhs.uk](http://www.nhsdirect.nhs.uk) or on 0845 4647, or from your local chemist."**

## Level 3 and 4: Heatwave action/Emergency

The Met Office, in conjunction with the Department of Health, is issuing the following heatwave advice for [regions identified]:

**“Stay out of the sun. Keep your home as cool as possible – shading windows and shutting them during the day may help. Open them when it is cooler at night. Keep drinking fluids. If there’s anybody you know, for example an older person living on their own, who might be at special risk, make sure they know what to do.”**

**Extreme heat is dangerous to everyone. During a heatwave, when temperatures remain abnormally high over more than a couple of days, it can prove fatal, particularly among certain at-risk groups. In one hot spell in London in August 2003, deaths among people aged over 75 rose by 60 per cent.**



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