Public Health England

Building Overheating and Health

New homes and our health, 25th Nov 2016
Good Homes Alliance 10th anniversary conference series

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Public Health England

Introduction to PHE

Public Health England

Public Health England's Mission

"To protect and improve the nation's health and to address inequalities, working with national and local government, the NHS, industry, academia, the public and the voluntary and community sector."

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PHE's role

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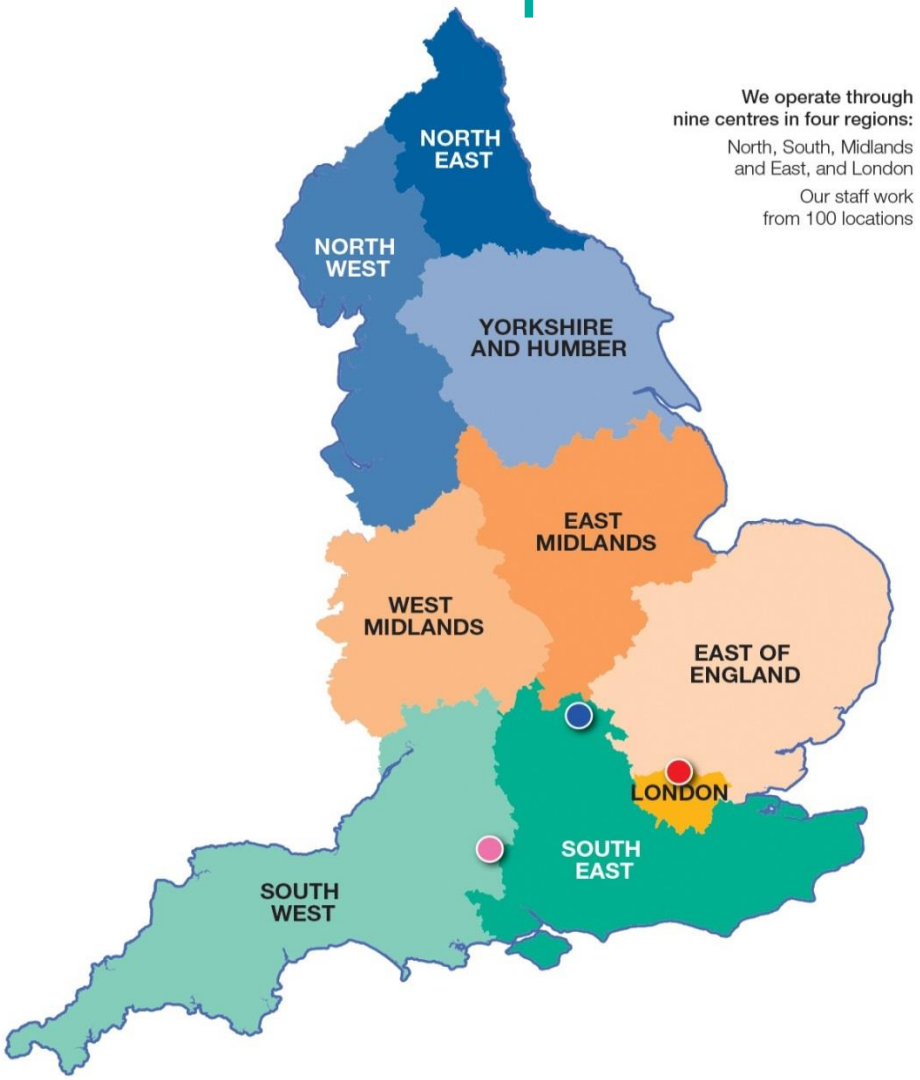
Our national and local presence

- PHE Colindale includes infectious disease surveillance and control, reference microbiology, other specialist services such as sequencing and high containment microbiology, plus food, water and environmental services
- PHE Chilton includes the Centre for Radiation, Chemical and Environmental Hazards (CRCE)
- PHE Porton includes departments for rare and imported pathogens, research, PHE Culture Collections and emergency response, plus food, water and environmental services



PHE has eight regional public health laboratories based in large NHS hospitals

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Extreme events and Health Protection

‘Any extreme weather event or other natural hazard with the potential to cause adverse impact on human health’

1. **Cold Weather**
2. **Heatwave**
3. **Floods**

Drought
Wildfires
Landslides
Windstorms

Earthquakes
Tsunamis
Volcanic ash
Space weather

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Heat health impacts

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Summer 2003

70,000 deaths in Europe

15,000 deaths in France

Particularly significant in Paris:

- temperature extremes: high minimum temperature
- poor meteorological forecast
- institutional failures: hospital and care home staff on holiday
- surveillance: small number of deaths reported
- no experience/knowledge: no public health measures
- “We didn’t know anything..” French Minister of Health

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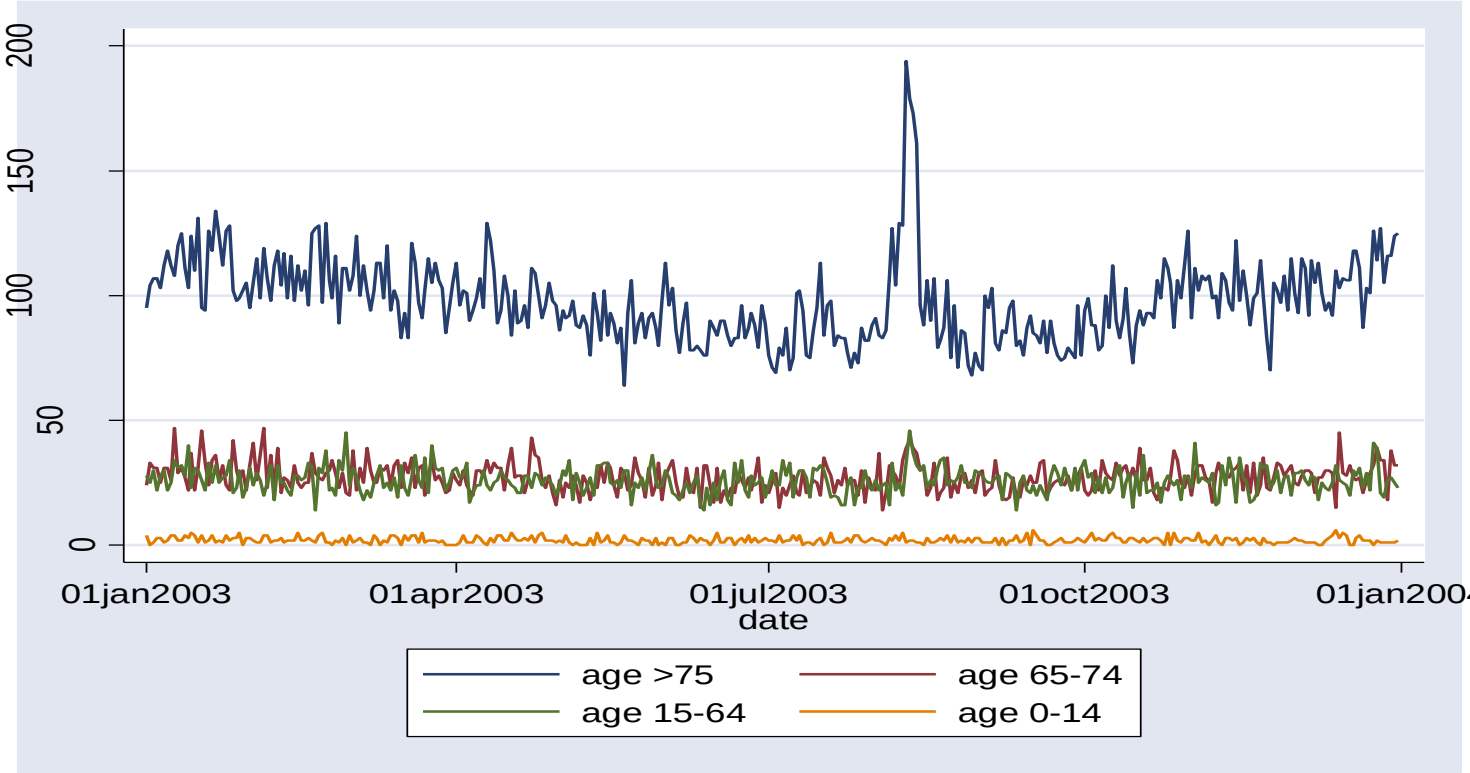
Daily mortality in London, 2003



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‘At-risk’ groups

- Elderly, esp >75 years old, those living on their own/socially isolated, or individuals in care homes
- Infants
- Individuals with chronic and severe illness: including heart conditions, diabetes, respiratory or renal insufficiency, Parkinson’s disease or severe mental illness.
- Those on medication that can affect renal function, the body’s ability to sweat, thermoregulation (e.g. psychiatric medications) or electrolyte balance (diuretics)
- Individuals unable to adapt their behaviour to keep cool such as having Alzheimer’s, a disability, being bed bound, drug and alcohol dependencies.

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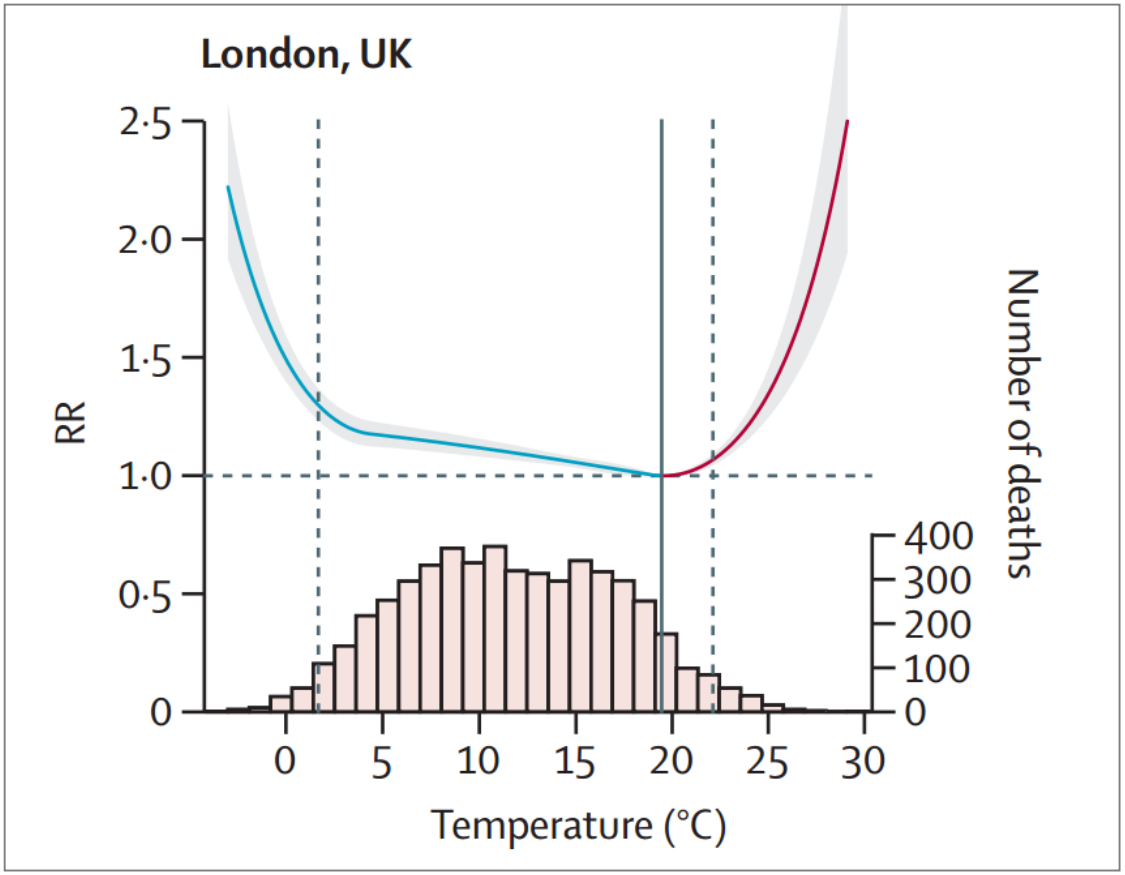
Threshold for increase in deaths

Cumulative exposure–response association between temperature and mortality for London



From: Gasparrini et al., 2015

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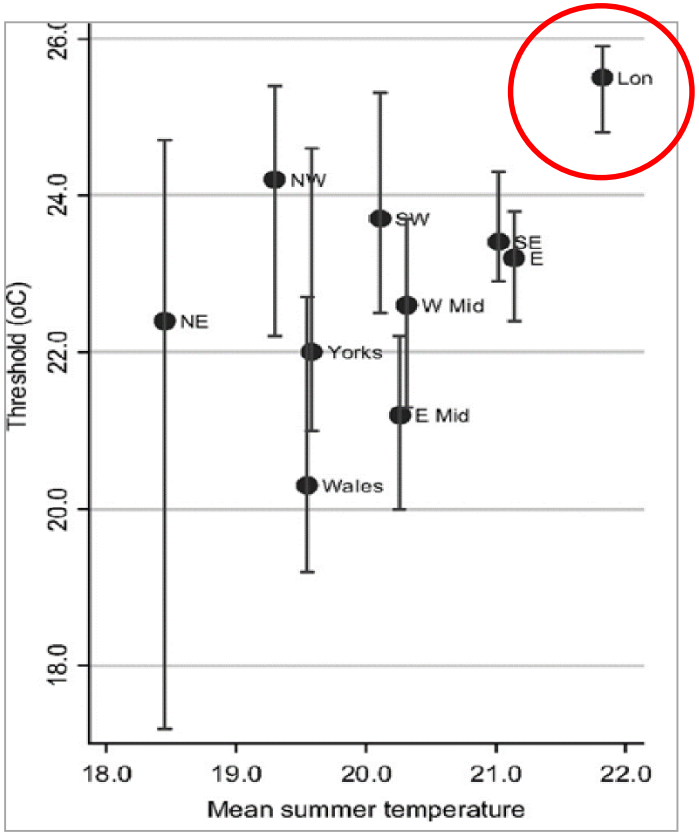
Threshold for harm to health

Estimated heat thresholds for each region, plotted against mean summer temperatures



From: B G Armstrong et al. (2011)

Health system impact

NEWS

Home | UK | World | Business | Politics | Tech | Science | Health | Education

Wales | Wales Politics | North West | North East | Mid | South West | South East

Heatwave sparks rise in accidents and A&E visits, say medics

17 July 2013 | Wales

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PHE Syndromic Surveillance Summary

Produced by the PHE Real-time Syndromic Surveillance team

05 August 2014 Year: 2014 Week: 31

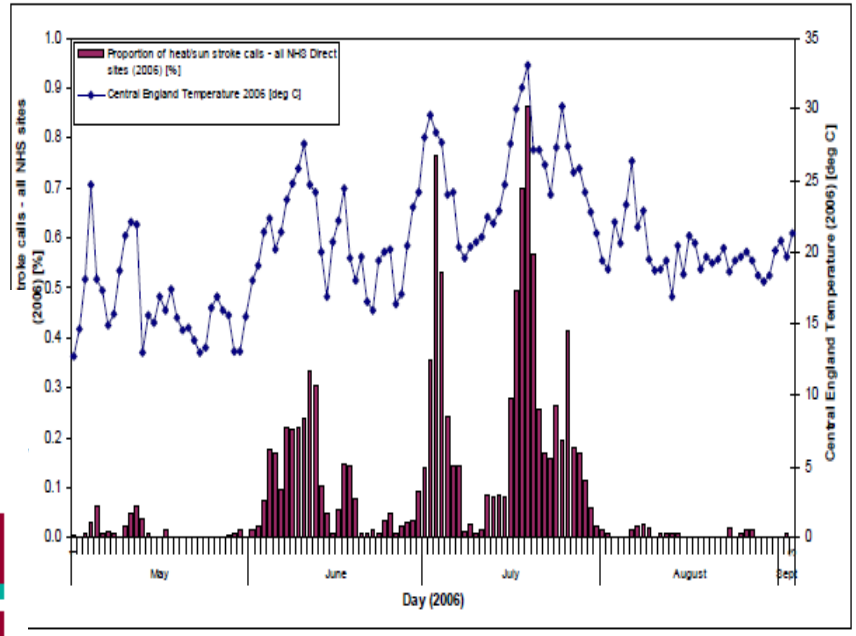
Syndromic surveillance national summary:

Reporting week: 28 July to 03 August 2014

Heatstroke consultations decreased during week 31.

Diagnostic indicators at a glance:

Indicator	Current trend
Myocardial Ischaemia	decreasing
Meningitis	no trend
Heat/sunstroke	no trend



NHS Direct calls heat/sun stroke (2006)

Emergency admissions (1994-2000)

- No impact on total admissions
- BUT renal/respiratory (<5 yrs) and respiratory (75+ yrs)
- → Most deaths occur in <u>community but hospitals part of a system</u>

(Johnson and Bickler 2007), (Kovats, Hajat et al. 2004)

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Heatwave Plan

Making the case: the impact of heat on health – now and in the future

Ref: PHE publications gateway number: 2015049
PDF, 462KB, 21 pages

Beat the heat: staying safe in hot weather (leaflet)

Ref: PHE publications gateway number: 2016071
PDF, 417KB, 8 pages

This file may not be suitable for users of assistive technology. Request an accessible format.

Beat the heat (poster)

Ref: PHE publications gateway number: 2016071
PDF, 298KB, 1 page

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Beat the heat: keep cool at home (checklist)

Ref: PHE publications gateway number: 2016071
PDF, 193KB, 2 pages

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Heatwave Alert Levels

Figure 2.1: Heatwave Alert levels

Level 0	**Long-term planning** *All year*
Level 1	**Heatwave and Summer preparedness programme** *1 June – 15 September*
Level 2	**Heatwave is forecast – Alert and readiness** *60% risk of heatwave in the next 2–3 days*
Level 3	**Heatwave Action** *Temperature reached in one or more Met Office National Severe Weather Warning Service regions*
Level 4	**Major incident – Emergency response** *Central Government will declare a Level 4 alert in the event of severe or prolonged heatwave affecting sectors other than health*

LOCAL Threshold temperatures

Threshold maximum day and night temperatures defined by the Met Office National Severe Weather Warning Service (NSWWS) region are set out below.

Maximum temperatures (°C)

NSWWS 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

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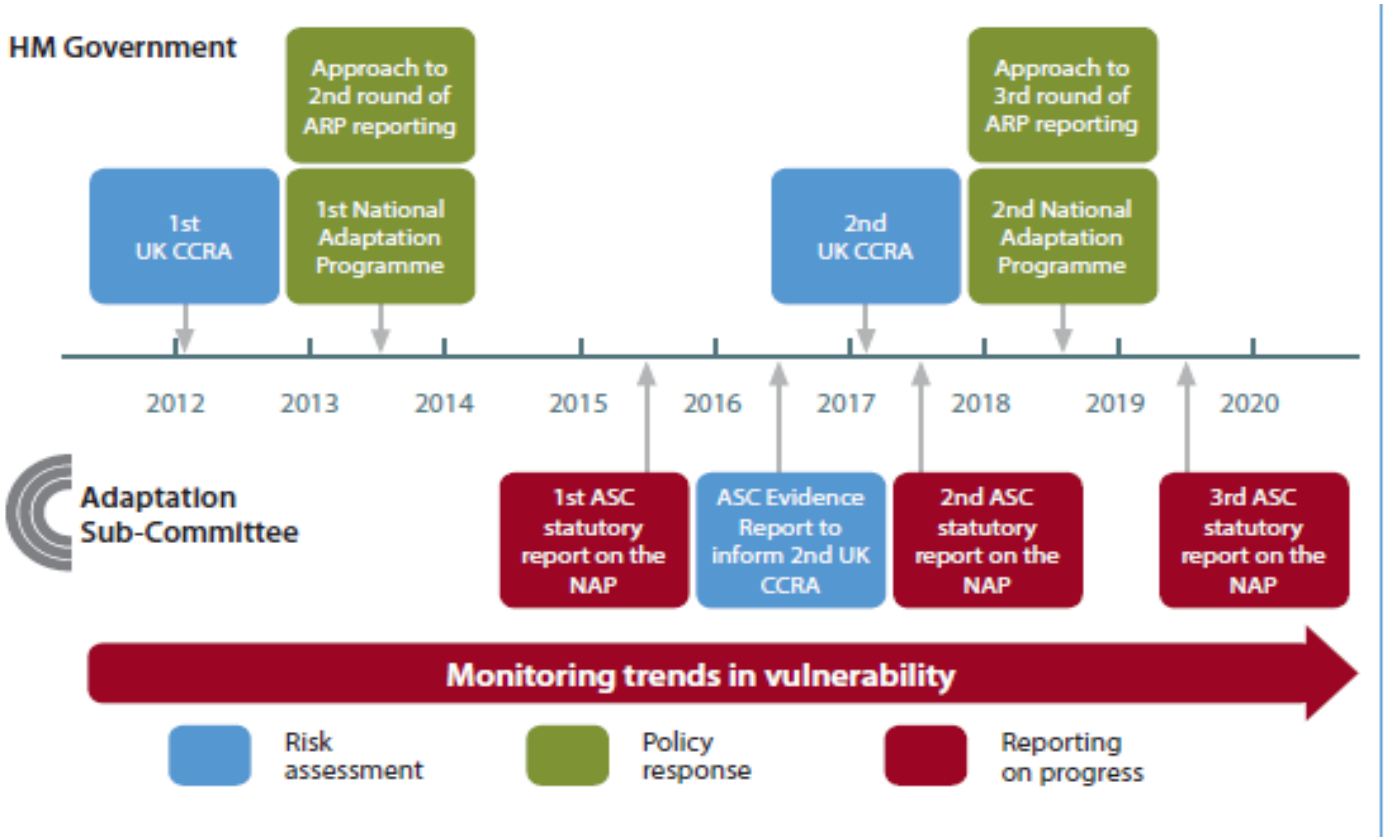
UK adaptation policy cycle

Climate Change Act 2008

CHAPTER 27



Source: Committee on Climate Change (2015b)

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UK health-related climate priorities

Adaptation priorities	Is there a plan?	Are actions taking place?	Is progress being made in managing vulnerability?
1. Public understanding of climate change risks	Red	Green	Amber
2. Heat-related health impacts	Amber	Green	Red
3. Cold-related health impacts	Green	Green	Amber
4. Pathogens, air pollution and UV radiation	Amber	Green	Grey
5. Capability of the health and social care system	Amber	Green	Grey
6. Capability of the emergency planning system	Green	Green	Grey
7. Capacity of people and communities to recover from flooding	Amber	Green	Grey

Source: Committee on Climate Change (2015b)

Main issues

- Heat
  - Indoor overheating
  - Urban greenspace
- Cold
- Flooding
- Air quality
- Health and social care assets (& staff)
- Capability to respond to emergencies
- Public understanding of CC risk

The indoor environment relevant for all!

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Overheating in buildings

MORE ACTION NEEDED: Risks to health, wellbeing and productivity from high temperatures

Current magnitude:	HIGH	Future magnitude:	HIGH	In the 2050s, under a medium emissions scenario, assuming a continuation of current policies and plans.
Confidence:	HIGH	Confidence:	MEDIUM	

'At present, there are **no comprehensive policies in place to adapt existing homes and other buildings** to high temperatures, manage urban heat islands, nor safeguard new homes. The level of **risk from overheating across the UK is unknown** for hospitals, care homes, schools, prisons, and places of work.'

'There is evidence that **people lack a basic understanding of the risk**s to health from indoor high temperatures, and are therefore less likely to take measures to safeguard their and their dependents' wellbeing. Insulating homes to improve thermal efficiency needs to be undertaken carefully to avoid increasing the risk of overheating.'

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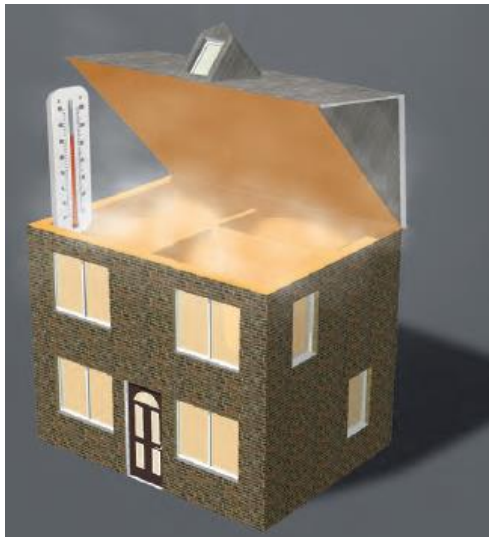
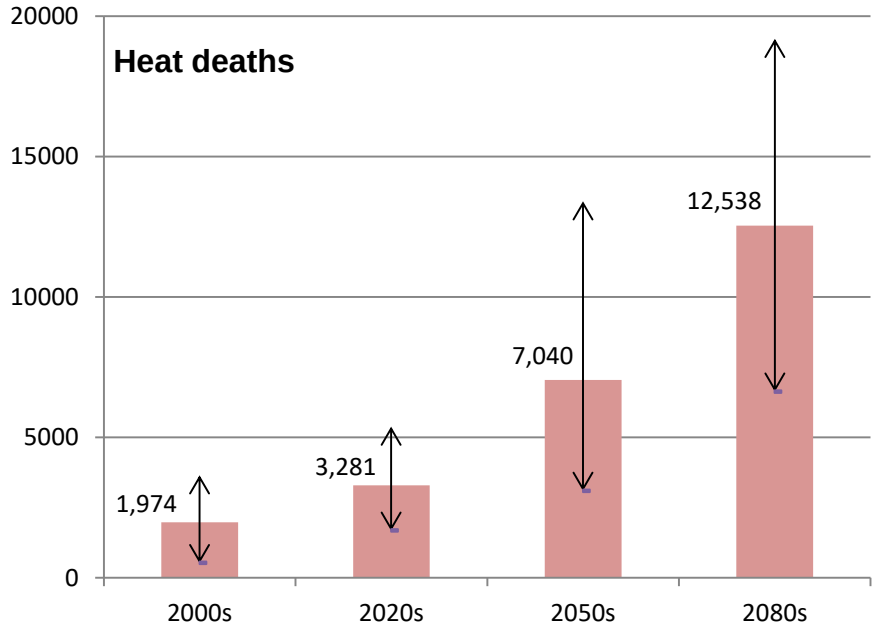
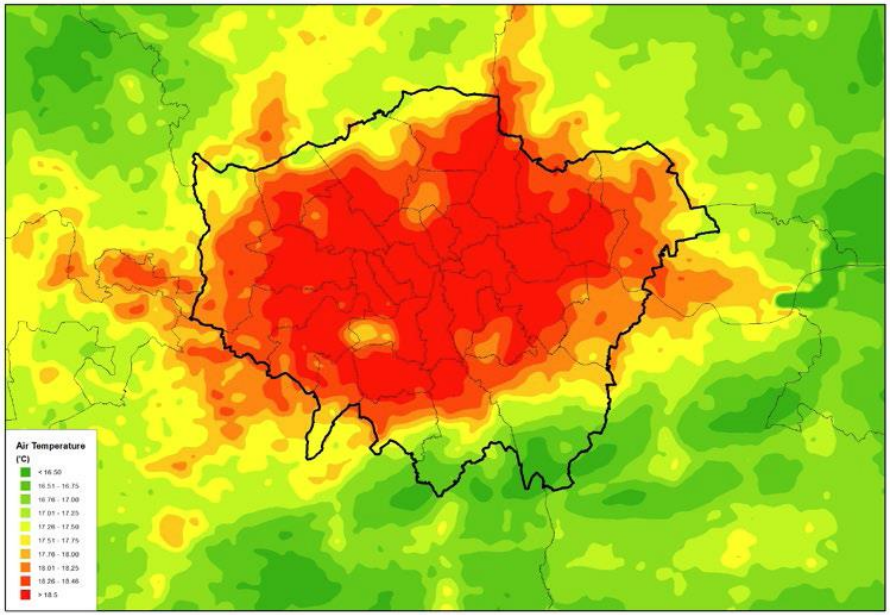
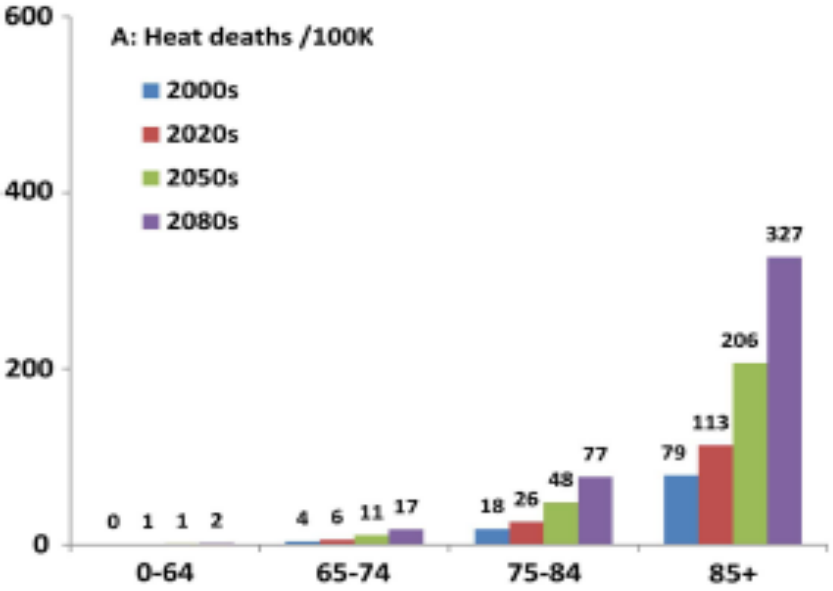


Source: Zero Carbon Hub (n.d.)





Source: ARUP (2014b)



Source: Hajat et al. (2014)

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Impact of home *indoor* temperatures?

Limited evidence:

- 50% of French deaths in homes during 2003 heatwave
- 80% of heat strokes in New York City due to exposure at home
- Indoor health thresholds challenging to establish!
- Impact of interventions on health, productivity, inequalities…?

Subject of ongoing research eg:

- NERC AWESOME project
- NIHR Health Protection Research Unit in Environmental Change

Fouillet, Rey et al. 2006, New York City Community Health Survey Public Use Data, 2007 in Quinn, Tamerius et al. 2014

Health Protection Research Unit in Environmental Change and Health

Search

NHS
National Institute for Health Research

Project 1 – Modelling overheating in dwellings.

A simulation model is being developed, based on a validated building physics models (e.g. Energy Plus) and applied to housing survey and building stock and occupancy data for England. Data gathered from an indoor temperature measurement campaign for over 800 dwellings representative of the English stock will enable detailed analysis of overheating risk factors along with the further development of the modelling tools.

Researchers

Prof Michael Davies, Mr Ian Hamilton, Dr Anna Mavrogianni, Mr Clive Shrubsole, Dr Jonathon Taylor, Dr Sotiris Vardoulakis

Project 2 – Evaluating housing interventions to reduce the impact of heatwaves

Overheating in houses is a significant problem in England and likely to increase with climate change. This research will use epidemiological methods to examine modification of the temperature-related risks (heat and cold) by housing type. The results will then be used to develop models for quantification of current and future heat-related burdens under alternative strategies of adaptation in the housing sector and the built environment.

Researchers

Prof Paul Wilkinson, Mr Clive Shrubsole, Dr Anna Mavrogianni, Dr Jonathon Taylor, Dr Roberto Picetti

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Risk profiles: flats

Tenancy: elderly, impaired mobility, respiratory condition, mostly home
Building: south facing, poorly insulated, no shading, UHI, main road

Tenancy: Young family, child with asthma, home during the day
Building: top floor conversion, west facing, dual aspect, poorly insulated walls/roof, UHI

Tenancy: Young couple, no children, work away from home
Building: mid level, well insulated outside UHI, west facing window with shading and balcony

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This slide pack is part of a series

All are available for download at **www.zerocarbonhub.org**

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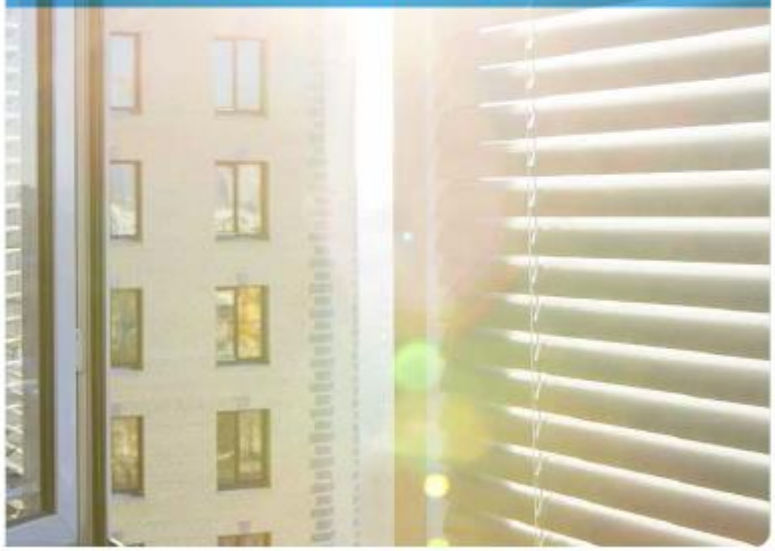
Assessment Protocol

Overheating in dwellings

Andy Dengel (BRE), Mich Swainson (BRE),
David Ormandy (Warwick Medical School, University of Warwick – BRE Trust Research Fellow),
Véronique Ezratty (Service des Etudes Médicales, EDF, Levallois-Perret, France)



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Guidance Document

Overheating in dwellings

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Hospitals and care homes

Risk factors

- Building type. 90% of existing wards prone to O/H.
- Concentration of vulnerable groups highest in hospitals and care homes

Drivers

- Energy efficiency (NHS: 30% public sector; 3% of total UK emissions)
- Health and safety: limited opening of windows.
- Climate change, ageing, urbanisation.
- Heat drives hospital admissions and vulnerability profile changing

Table I **Increases in mortality during August 2003 heat wave in southern England,* compared to to expected summer mortality, by place of death and age group**

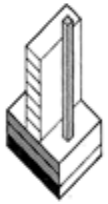
	Age under 75 years		Age 75 years and over	
	Percentage increase (95 per cent confidence interval)	Estimated number of excess deaths	Percentage increase (95 per cent confidence interval)	Estimated number of excess deaths
Own home	13.2 (4.3, 22.0)	73	33.2 (23.8, 42.7)	191
General Hospital	11.3 (5.3, 17.4)	134	36.5 (31.5, 41.5)	767
Hospice	8.6 (-6.4, 24.1)	16	0.2 (-17.1, 17.1)	0
Nursing Home	49.6 (15.5, 82.5)	25	42.2 (31.8, 52.4)	214
Residential Home	71.6 (17.0, 133.0)	15	28.8 (18.6, 39.0)	138
Other places	19.6 (-0.5, 40.2)	22	3.8 (0.7, 19.8)	5
Total	13.5 (9.0,18.2)	284	33.4 (29.8, 37.0)	1,315

* Deaths to residents of Government Office Regions for the South East, South West, East of England and London.

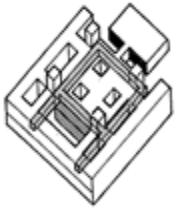
Health Statistics Quarterly 29 Spring 2006, Kovats

DeDeRHECC and two subsequent studies

- 5-6 basic types of hospital ward
- Risk of overheating and use of energy varies according to type, but also location and orientation
- Solar gain is a key driver
- Poor maintenance and uncontrolled internal gains exacerbate the problem.
- Mechanical ventilation without heat recovery is very energy intensive.
- Ceiling fans are safe and can improve comfort in warm weather.



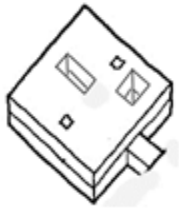
'Matchbox on a muffin'
Classic 1960s NHS hospital building form
Early examples include Princess Margaret, Swindon, 1958. c. 50 in England. Idea that facilities likely to change located in muffin, wards in the slab (sometimes offices).
DeDeRHECC case studies: Maternity building, Bradford Royal Infirmary; Ward tower, Addenbrooke's, Cambridge.



'Best Buy' /closed court
Developed late 1960s: minimum space without compromising clinical effectiveness
DeDeRHECC case study: Rosie Maternity as variant

'Nucleus' /open court
Developed late 1970s from 'Harness', a standardised set of templates. More than 100 Nucleus units built
DeDeRHECC case study: Glenfield, Leicester (1984)

'Nightingale pavilions'
Predominant model from 1860s to 1930s
Design for daylight, natural ventilation.
DeDeRHECC case study: Bradford Royal Infirmary (1927-)



Deep plan
Facilitated from 1960s by mechanical ventilation systems and acceptable solutions for artificial lighting. Many recent PFI examples
DeDeRHECC case study: St Albans City Hospital, Gloucester Wing (1988)

Source, DeDe RHECC, Prof Alan Short (Cambridge University) and Prof Kevin Lomas (Loughborough University)

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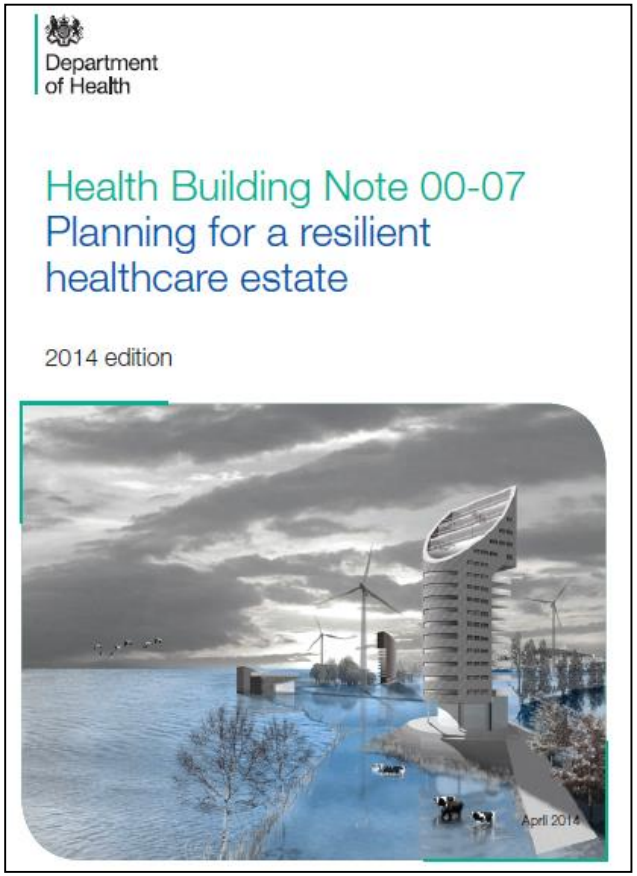
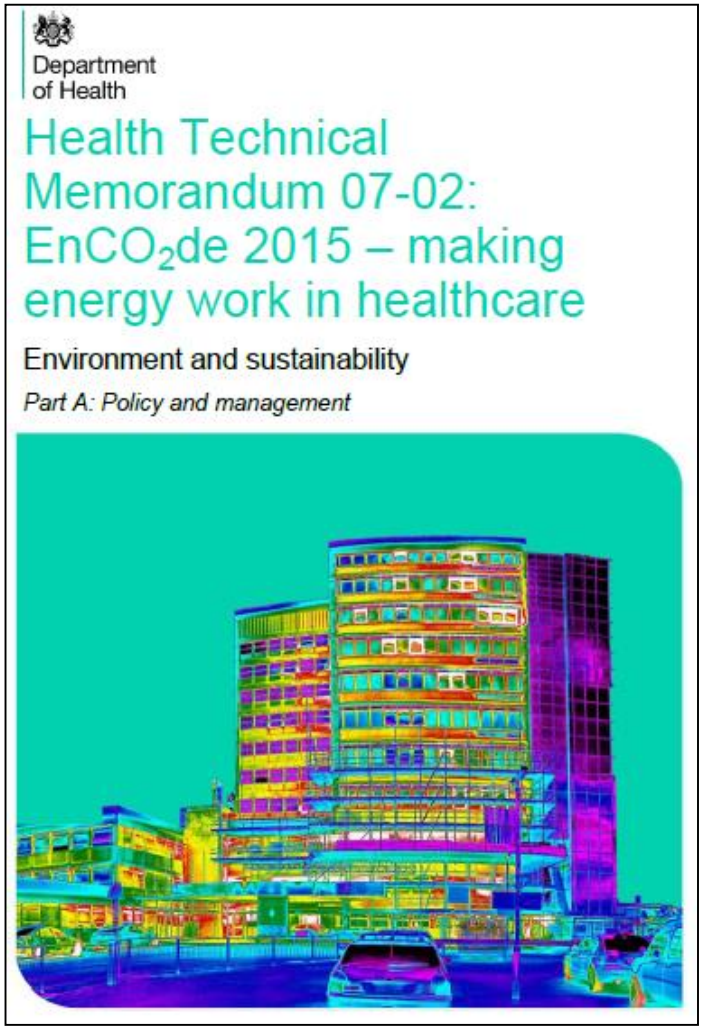
Health & Social care estates





1.4 Patients' and staff wellbeing: thermal comfort and health

- environmental factors affect staff satisfaction and patient health
- all influenced by attempts to improve energy efficiency in hospitals
- natural tendency to adapt to changing environmental conditions
- building designers can estimate internal temperatures at which occupants are likely to feel comfortable in free-running buildings
- but patients in hospital may be more vulnerable and less able to adapt:
  - Older age groups, unwell
  - Disordered thermoperception
  - Immobile, difficulty adjusting bedding, windows, accessing fluids

Recommendation

1.4.15 Adaptive thermal comfort guidance is recommended for non-clinical areas

1.4.16 For each clinical area, decisions about setting environmental conditions should only be made after **careful judgements as to the vulnerability and duration of stay of the intended patients**.

In all clinical areas, **year round internal temperature monitoring** is recommended.

At any time of the year **where temperatures are found to exceed 26˚C**, a **risk assessment** should be carried out and **appropriate action** taken to ensure the safety of vulnerable patients.

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- Overheating is current risk; but little awareness
- Perceptions that ‘old means cold’
- Overheating and climate change rarely considered in design or briefs
- Mismatch between modelled and monitored temperatures
- Lack of effective heat management
- Collaboration need to standardise overheating thresholds,

Care provision fit for a future climate

by Rajat Gupta, Gordon Walker, Alan Lewis, Laura Barnfield, Matt Gregg and Louis Neven

This report assess the risks of summertime overheating, and investigates the preparedness of care settings, both now and in the future. Hotter, drier summers with heatwaves of greater frequency and intensity have serious implications for the UK's ageing population.

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INSPIRING SOCIAL CHANGE

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In summary

- Heat has significant health impacts; some population groups are more susceptible than others
- Exposure to indoor heat is thought to be an important mediator, but there are research and policy/practice gaps that need to be filled
- The Heatwave Plan for England offers a framework to reduce risks to health, encompassing year-round, upstream interventions as well as emergency responses

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Acknowledgements

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Get in touch! ExtremeEvents@phe.gov.uk