

# Energy, Thermal Discomfort and Health



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# Energy, Thermal Discomfort and Health

1. From Fuel Poverty to Thermal Discomfort
2. From Thermal Discomfort to Health effects
3. Improving Energy Efficiency of dwellings: a cost effective challenge with multiple benefits
  - Energy saving
    - climate change
    - household expenses
  - Improved Comfort and Health
  - Improved Social attainments
    - Reduced cost to society

# From Fuel Poverty to Thermal Discomfort

- The UK 10% Fuel Poverty definition
  - ✓ Where a household needs to spend more than 10% of its available income on energy to maintain reasonable indoor temperatures
- Questions
  1. Although useful, can this definition **apply everywhere**?
  2. Does it identify **the most vulnerable** households?
  3. What are **'reasonable indoor temperatures'**?

# Does the 10% FP definition apply anywhere?

## WHO LARES project (2002-2003)

- 8 European cities
- 3,382 dwellings
- 8,519 individuals



Income % <sup>age</sup> spent on heating	Eastern Cities							
	Vilnius	Budapest	Bratislava	Genève	Bonn	Angers	Forli	Ferreira
>20 %	46%	26%	21%	1%	1%	4%	2%	1%

# Does the 10% FP definition identify the most vulnerable households? (1/2)



“Queen Elizabeth close to joining millions of her subjects in becoming a victim of ‘fuel poverty’”



# Does the 10% FP definition identify the most vulnerable households? (2/2)

- Low income + High energy costs + Thermally inefficient housing = Fuel Poverty and this has an impact on Health
- Based on the Hills review, Fuel Poverty has been redefined focusing on:
  - ✓ those on low income occupying energy inefficient dwellings (Low Income High Cost)
  - ✓ the extent (depth) of the fuel poverty

# What are 'reasonable' temperatures?



- WHO Guidance

- ✓ 'No demonstrable risk to health of healthy sedentary people living in air temperatures between 18°C and 24°C' (WHO-EURO, 1987)

- Thermal Comfort

- covered by WHO definition of Health: 'A state of complete physical, social and mental well-being'
- depends on: air temperature, radiant temperature, relative humidity, air velocity, clothing, level of activity
- its assessment is linked to surveys' methodology (eg, measurements and/or nature of questions)

# WHO LARES study



‘Is there a problem with temperature in your dwelling during winter, transient seasons or summer?  
If yes, do you feel too cold, too hot or both?’

Problem with temperature	Vilnius	Bratislava	Budapest	Ferreira
<b>Transient season</b> Of these, % <sup>age</sup> feeling too cold	<b>55%</b> <b>90%</b>	33% 69%	16% 63%	<b>50%</b> <b>20%</b>
<b>During winter</b> Of these, % <sup>age</sup> feeling too cold	<b>60%</b> <b>92%</b>	32% 76%	28% 85%	<b>75%</b> <b>98%</b>

# Some options for coping with Fuel Poverty

- Decrease energy consumption by using less energy than really needed for ~

- heating
- cooking
- lighting, etc.



- Use other means for heating, cooking and lighting

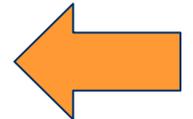
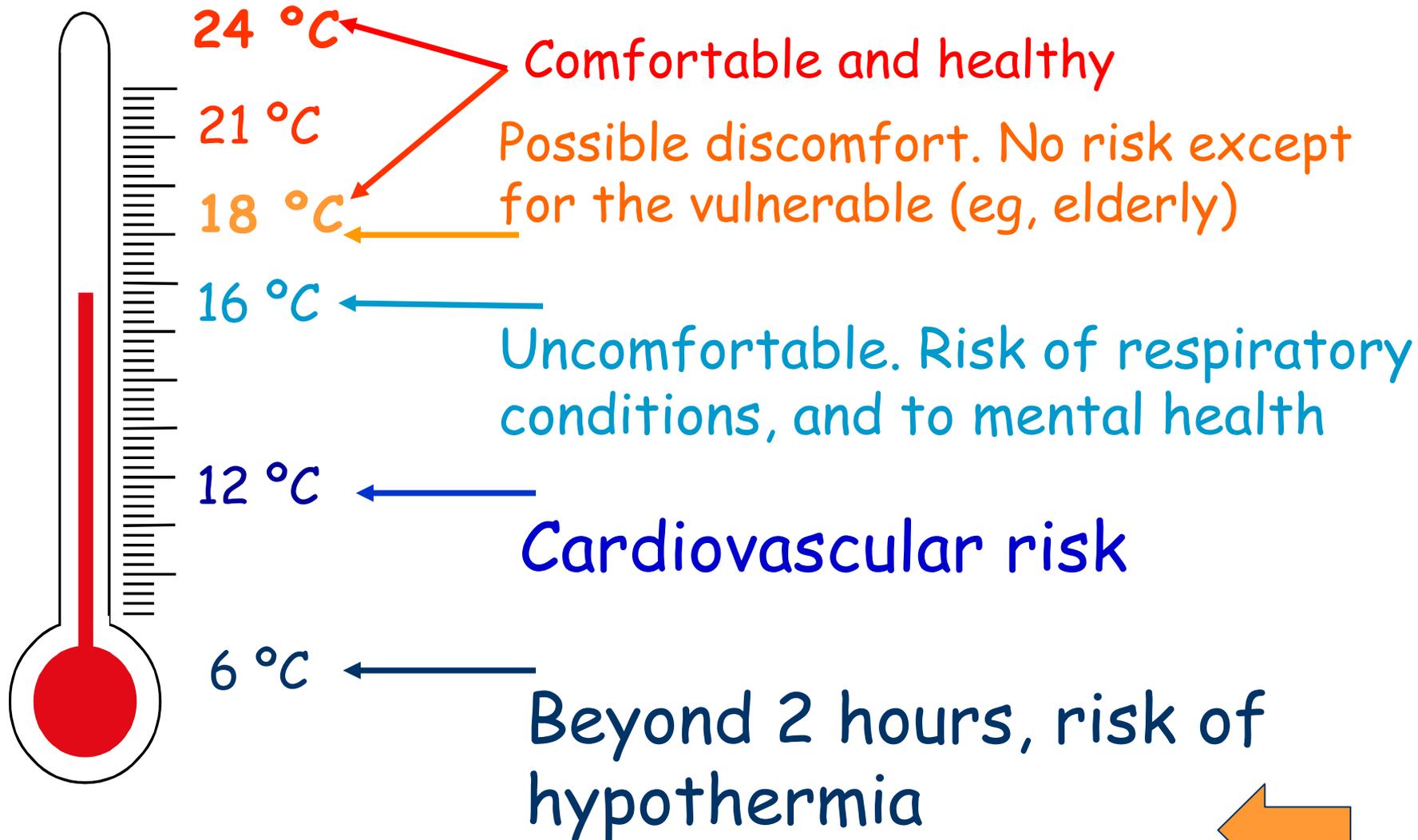
# ...with different consequences

- Direct
  - Insufficient appropriate energy for heating (air and water), lighting, food storage (refrigeration) and cooking
- Indirect
  - Inappropriate forms of ~
    - heating (eg. flueless gas or oil heaters)
    - lighting (candles, oil lamps)
  - Inadequate or no ventilation (blocking ventilators...)
  - Food spoilage and contamination
  - Low quality meals (avoiding cooking...)

# ...and effects on health and safety

- Low indoor temperature  Death; Cardiovasc. Resp. Mental health
- Poor indoor air quality
  - Dampness, mould growth  Asthma and allergies
  - CO poisoning (acute and chronic)
  - Biomass smoke: lung cancer; chronic bronchitis (COPD)
- Fire (and burn injuries)
- Accidental injury (falls, collisions)
- Poor personal and domestic hygiene
- Food poisoning
- Unbalanced diet (poor nutrition/obesity) 

# Health effects of low indoor temperatures



# Excess Winter Mortality (EWM)



- ✓ The number of deaths from December to March compared to the average number of deaths during the preceding August-November and following April-July (Northern Hemisphere)
- Fuel poverty has been associated with EWM but other factors have an impact
- The majority of fatalities are linked to respiratory and cardiovascular conditions (heart attacks and strokes)
- Paradoxically, countries with colder winter climates have lower EWM rates

# Fuel poverty and infectious diseases

## An increased level of colds and flu



### • NIH Scientists Offer Explanation for Winter Flu Season (2008)

'Stability of Virus' Membrane at **Cold Temperatures** May Ease Winter Spread

- When only one room is heated, **people crowd together** and it may lead to an increased rate of infectious diseases

D-11-03603R2 linked to 8829

50140-6736(11)61780-7

Embargo: February 20, 2012—00:01 (GMT)

Articles

ZN

### Increasing incidence of serious infectious diseases and inequalities in New Zealand: a national epidemiological study



Michael G Baker, Lucy Telfar Barnard, Amanda Kvalsvig, Ayesha Verrall, Jane Zhang, Michael Keall, Nick Wilson, Teresa Wall, Philippa Howden-Chapman

#### Summary

**Background** Although the burden of infectious diseases seems to be decreasing in developed countries, few national studies have measured the total incidence of these diseases. We aimed to develop and apply a robust systematic method for monitoring the epidemiology of serious infectious diseases.

Published Online  
Month date, 2012  
DOI:10.1016/S0140-6736(11)61780-7

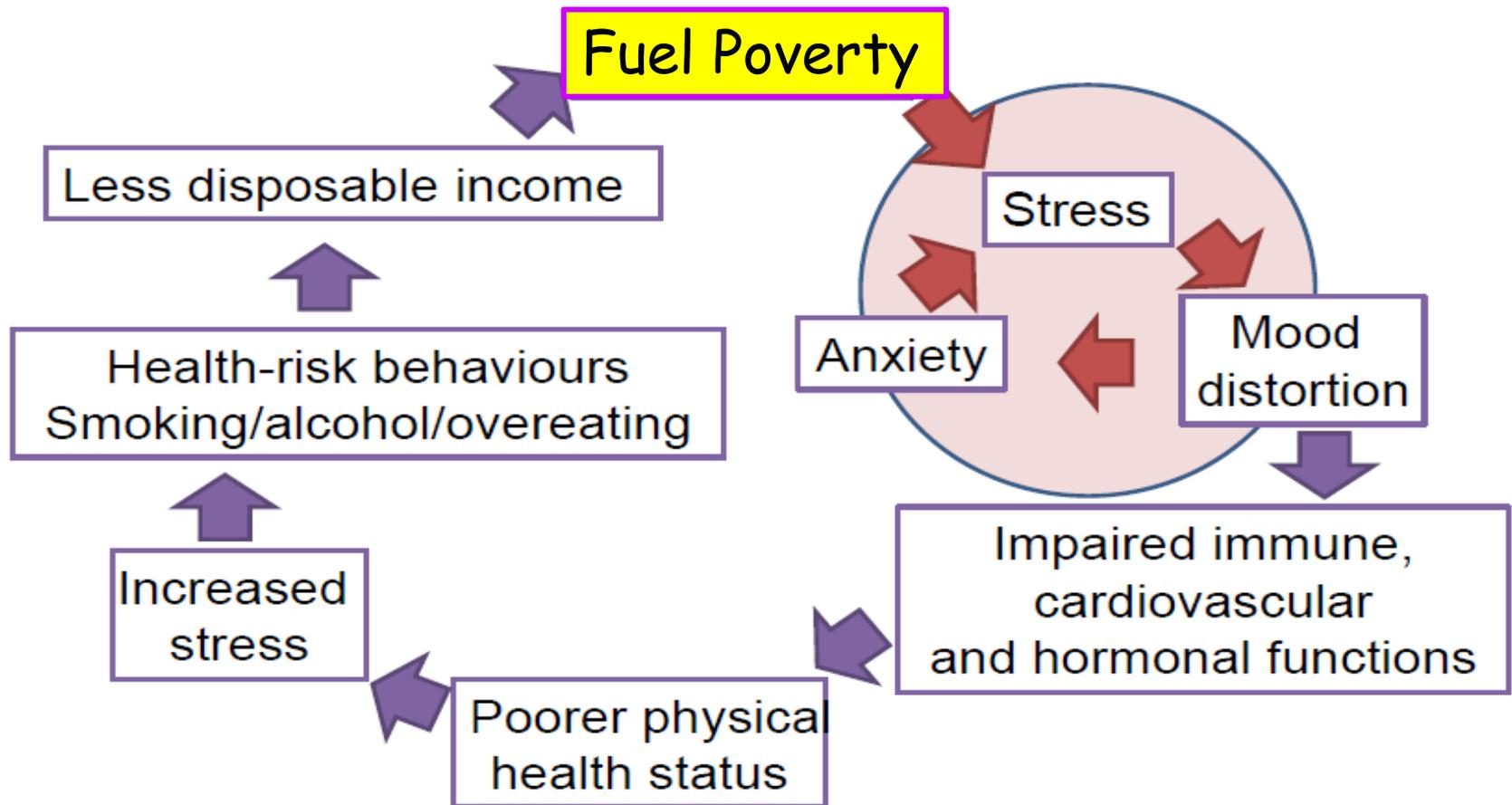
# Fuel poverty and mental health (1/3)

- Mental health is negatively affected by fuel poverty and cold housing for any age group
- More than 1 in 4 teenagers living in cold housing are at risk of multiple mental health problem
- Educational attainment and well-being of children are also negatively affected by cold housing



# Fuel poverty and mental health (2/3)

**A circle of risk which starts with FP**

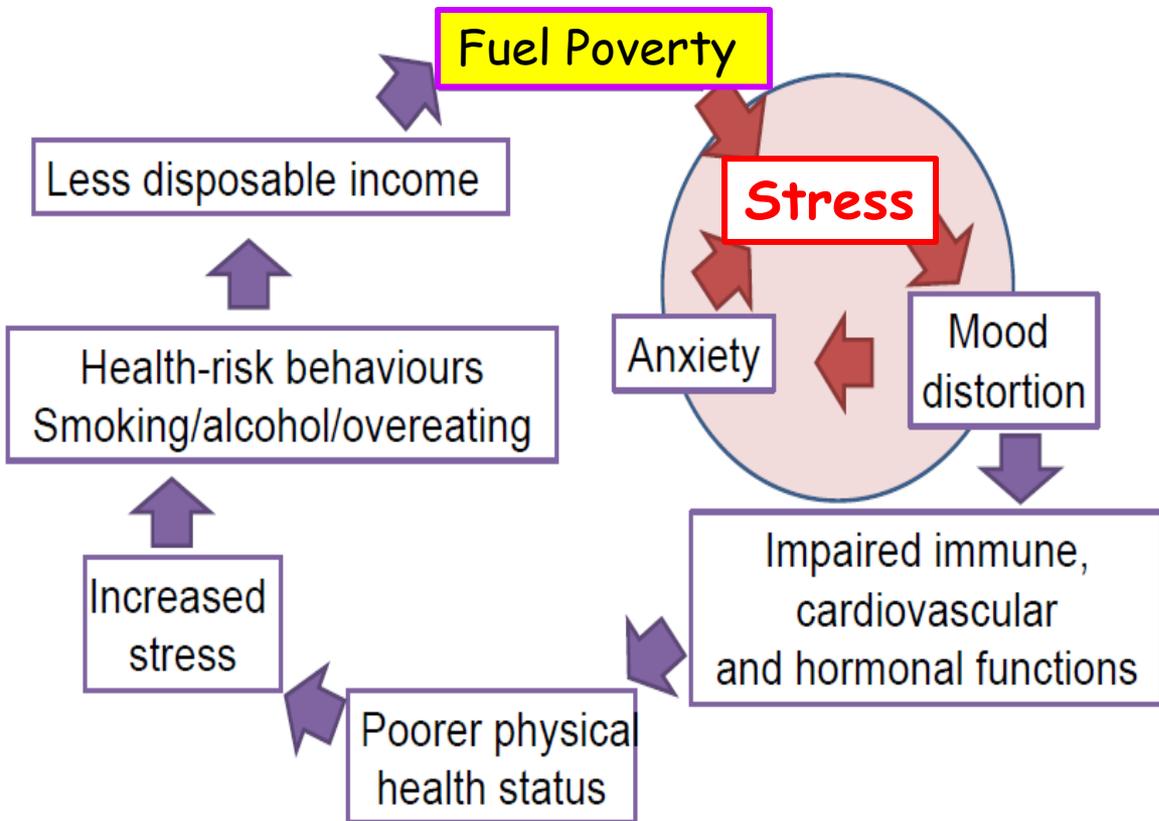


*Source: C. Liddell - IEA conference Copenhagen 2013*

# Fuel poverty and mental health (3/3)

Stress is the center of the circle of risk

A circle of risk which starts with FP

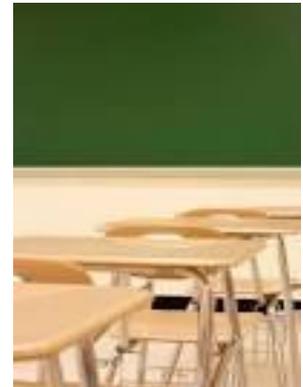


## Stress sources

- Income
- Cost of energy
- Cold home
- Mould & damp
- Stigma
- Damage to health
- No personal control
- Permanence

# These negative health effects mean

- Suffering for the individual and household
- Losses to the individual, and household ~
  - Working days lost
  - School days lost (under-achievement)
- Cost to society, including ~
  - Economic losses ~ 60%
  - Increased demand on the health sector ~ 40%



# Mechanisms to tackle the problem

## 1. Short term:

- ✓ **Subsidies/social tariffs** towards the cost of energy needed to maintain thermal comfort
- ✓ **Prohibiting disconnection during cold** weather
  - Should be **targeted to those more susceptible** to the health impacts: the elderly, infants, the disabled, and those with long-term sickness

## 2. Long term: improve the **energy efficiency** of dwellings

# Benefits of Energy Efficiency measures (1/2)

- Positive range of impacts on health and wellbeing
  1. Better self-reported **general health**
  2. Improved **respiratory health** (adults and children)
    - Decreased school absence due to asthma
  3. Improvement in **mental health** of adults **(30%-60%)**

*Source: H.Thomson et al., Cochrane database of Systematic Reviews 2013*

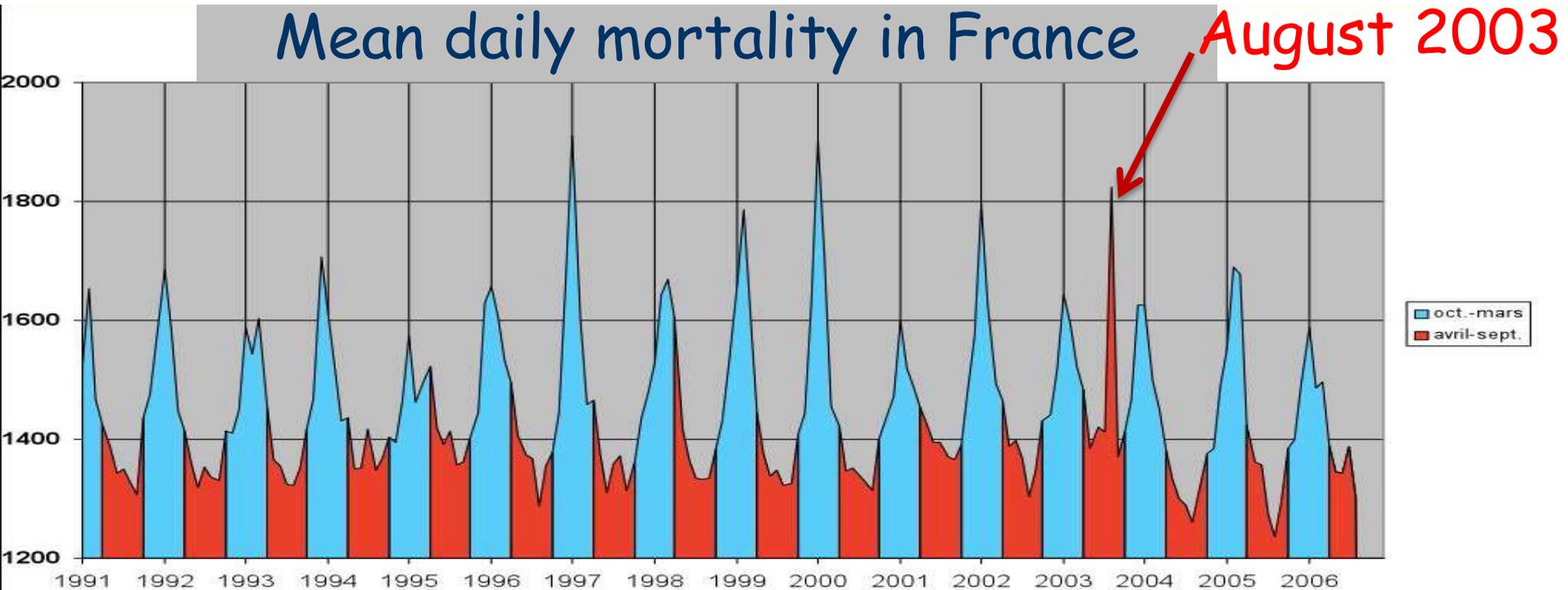
*C. Liddell Energy Policy (2011); P. Howden-Chapman et al., Energy Policy (2012)*

# Benefits of Energy Efficiency measures (2/2)

- Harmful effects are rare and usually avoided (through better communication with residents and ventilation assessment) and outweighed by health benefits
- There are greater improvements in health in recipients on low incomes
  - This supports the inclusion of energy efficiency measures in strategies to tackle social issues like fuel poverty and health inequity

*Source: C. Maidment et al. Meta-analysis in Energy Policy (2014)*

# Insulation improves Energy Efficiency and can protect against Excess Heat



D. Rousseau, 2006  
Climatologie

- Energy inefficiency = risk factor for death (2003, France)

*Source: Vandentorren et al., Eur J Public Health 2006*

# bre Case study: the cost-benefit of energy improvements (1/2)



## Before:

- solid, un-insulated stone walls
  - off peak storage radiators
  - electric immersion heater
  - little roof insulation
  - partial double glazing
- Occupied by pensioner

## After:

- condensing gas boiler for hot water and radiators for space heating
  - top-up loft insulation
  - full double glazing
- Same occupant

# bre Case study: the cost-benefit of energy improvements (2/2)



- ✓ Upgrading this 100+ year old house
- 1. Cost of energy upgrade - £3,528
- 2. Estimated annual energy cost saving - £504
- 3. Estimated annual cost saving to health sector - £528
- 4. Period for savings to health sector to cover cost of upgrade (ie. 1 divided by 3) - 6.7 years

*Source: BRE, 2011*

# Cost Benefits of energy efficiency measures in England

•To improve all the cold homes in England to what is now considered to be a reasonable level of energy efficiency would give a **cost saving to the health sector** of

✓ **£750 million per year**



*Source:* "Quantifying the Cost of Poor Housing", Nicol et al, BRE 2010

# Conclusions

- "Too often **health** is equated only with **health care**
- ...there is **enough cost benefit evidence** to show that many interventions are efficient, equitable, and effective when designed and delivered in the right way
- ...**public health and the medical workforce have critical roles** to play in social and political advocacy at all levels, helping lead more equitable health, and social and economic, systems"

*Source: M. Marmot and J. Allen. Editorial "Social Determinants of Health Equity" American Journal of Public Health (2014)*



Thank you

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" Charlie and the chocolate factory ". Roald Dahl  
Illustration: Michel Siméon