

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

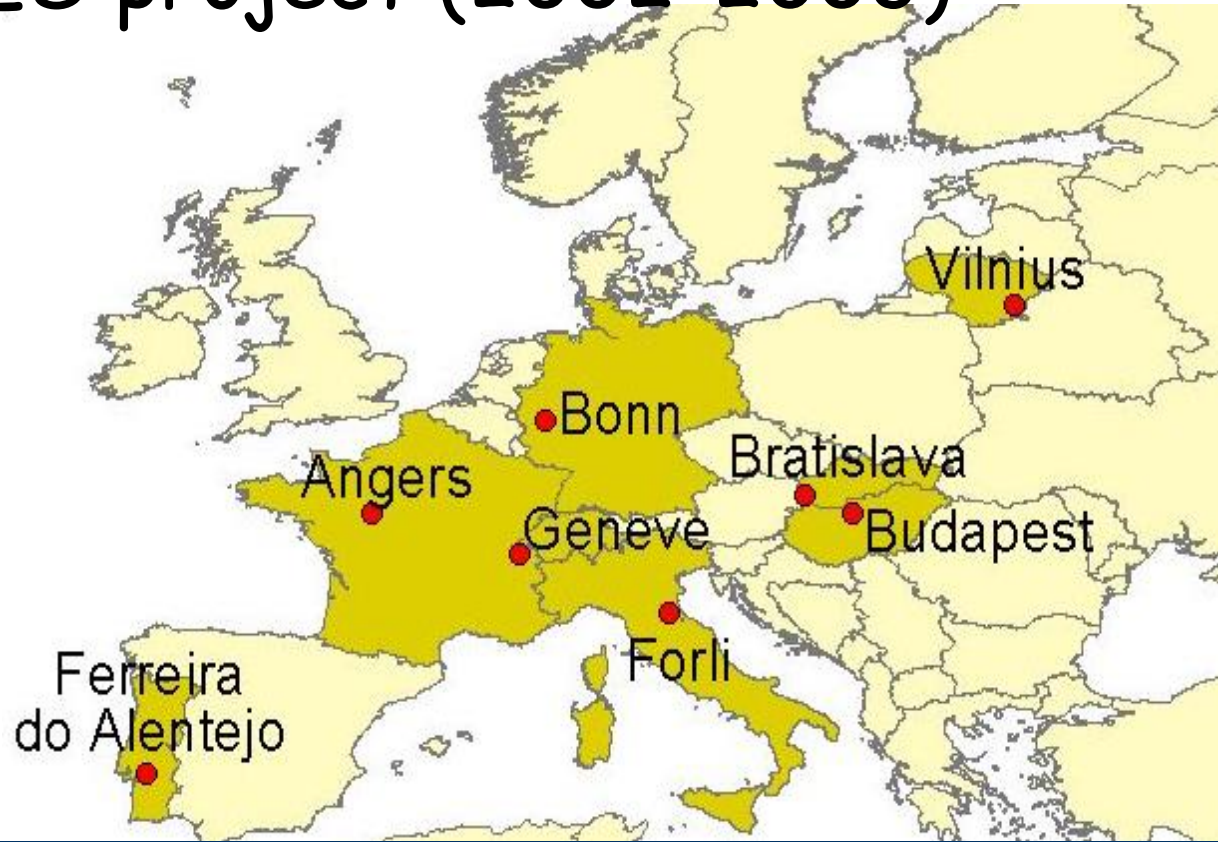
From Fuel Poverty to Thermal Discomfort

- 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 % ^{age} 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
Transient season Of these, % ^{age} feeling too cold	55% 90%	33% 69%	16% 63%	50% 20%
During winter Of these, % ^{age} feeling too cold	60% 92%	32% 76%	28% 85%	75% 98%

Some options for coping with Fuel Poverty

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

- heating
- cooking
- lighting, etc.



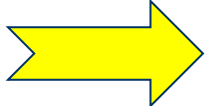


- Use other means for heating, cooking and lighting

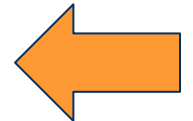
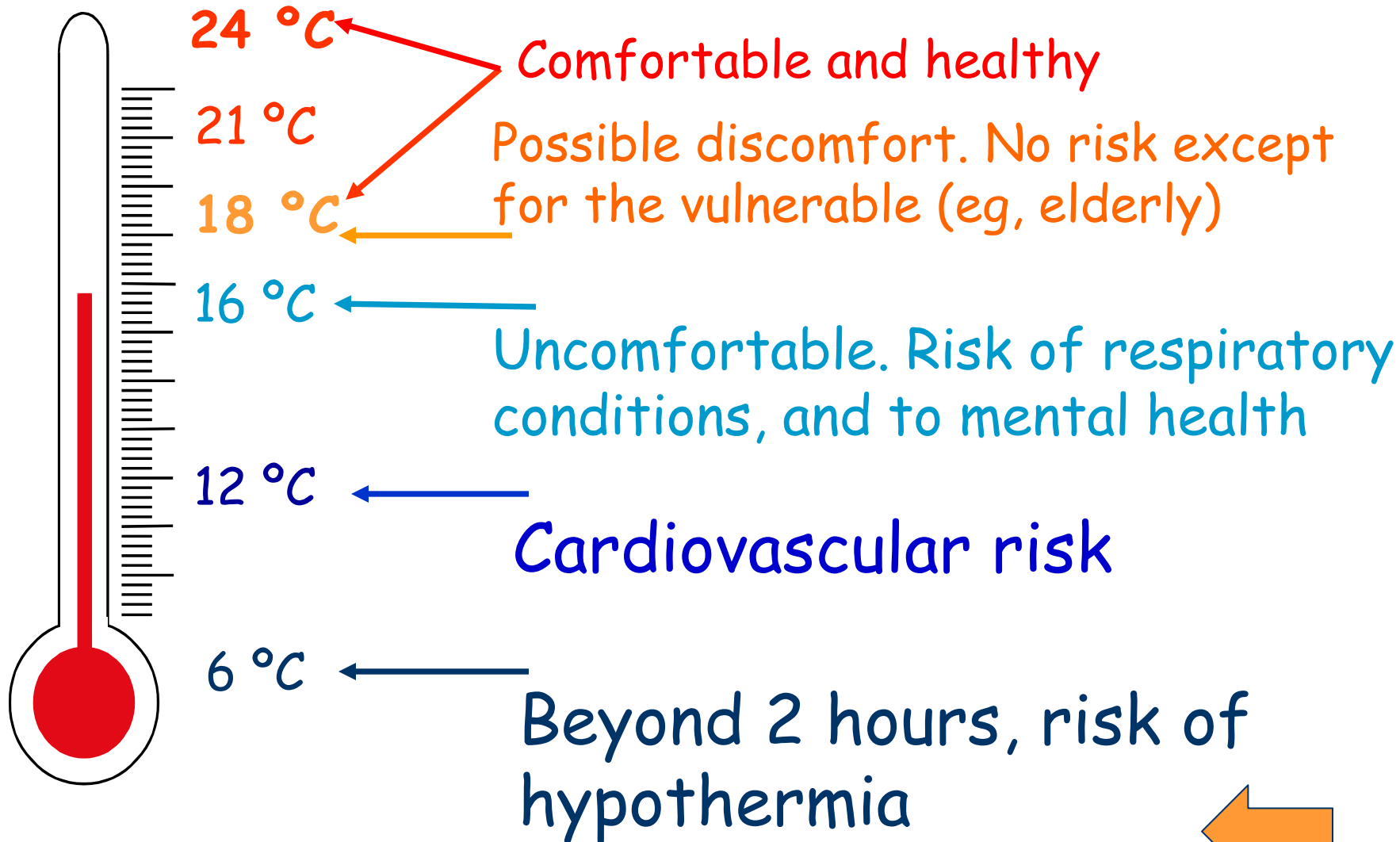
...with different consequences

- 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

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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

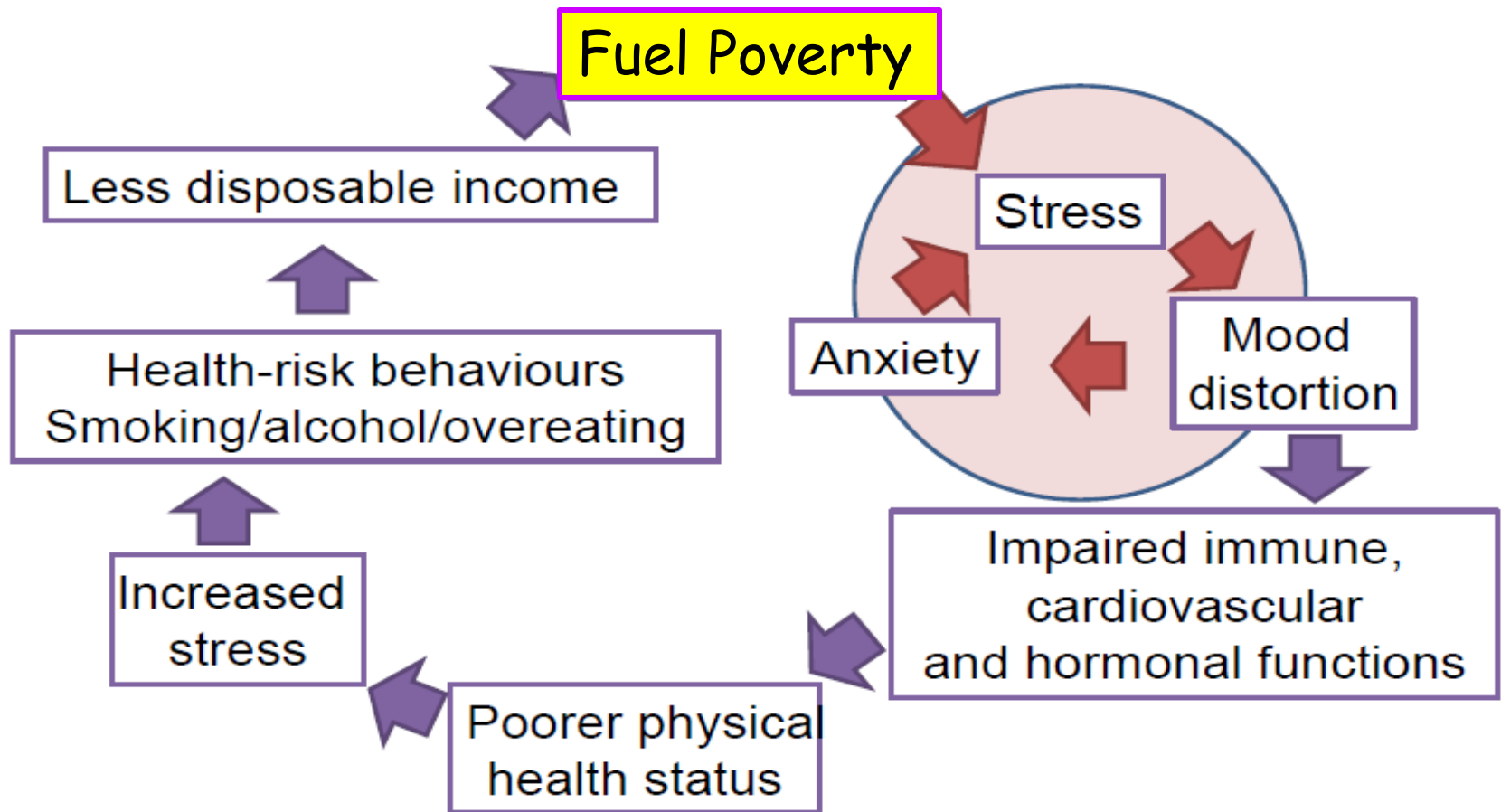
Fuel poverty and mental health (1/3)

- 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

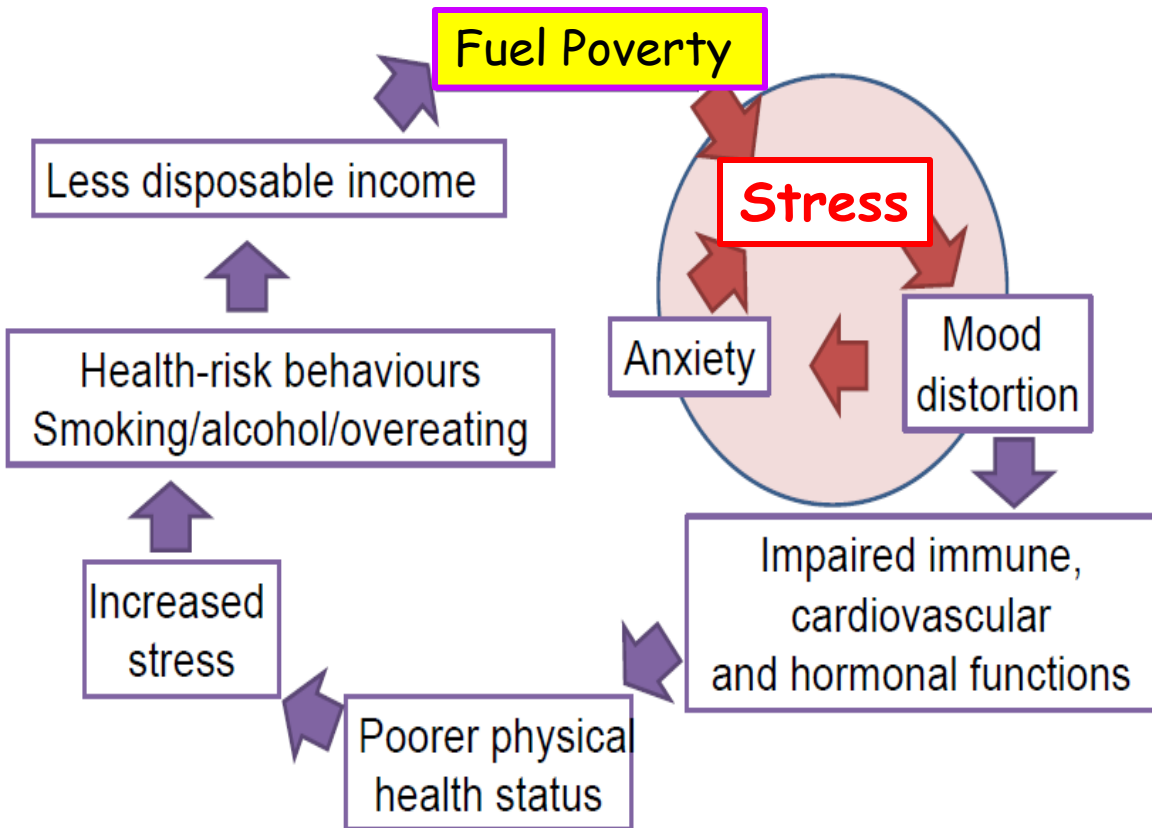


Source: C. Liddell - IEA conference Copenhagen 2013

Fuel poverty and mental health (3/3)

Stress is the center of the circle of risk

A circle of risk which starts with FP

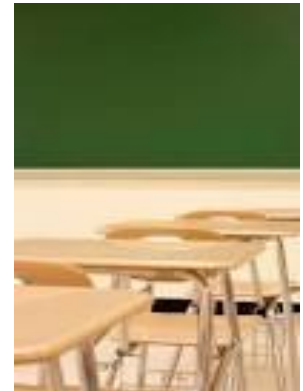


Stress sources

- 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%)**

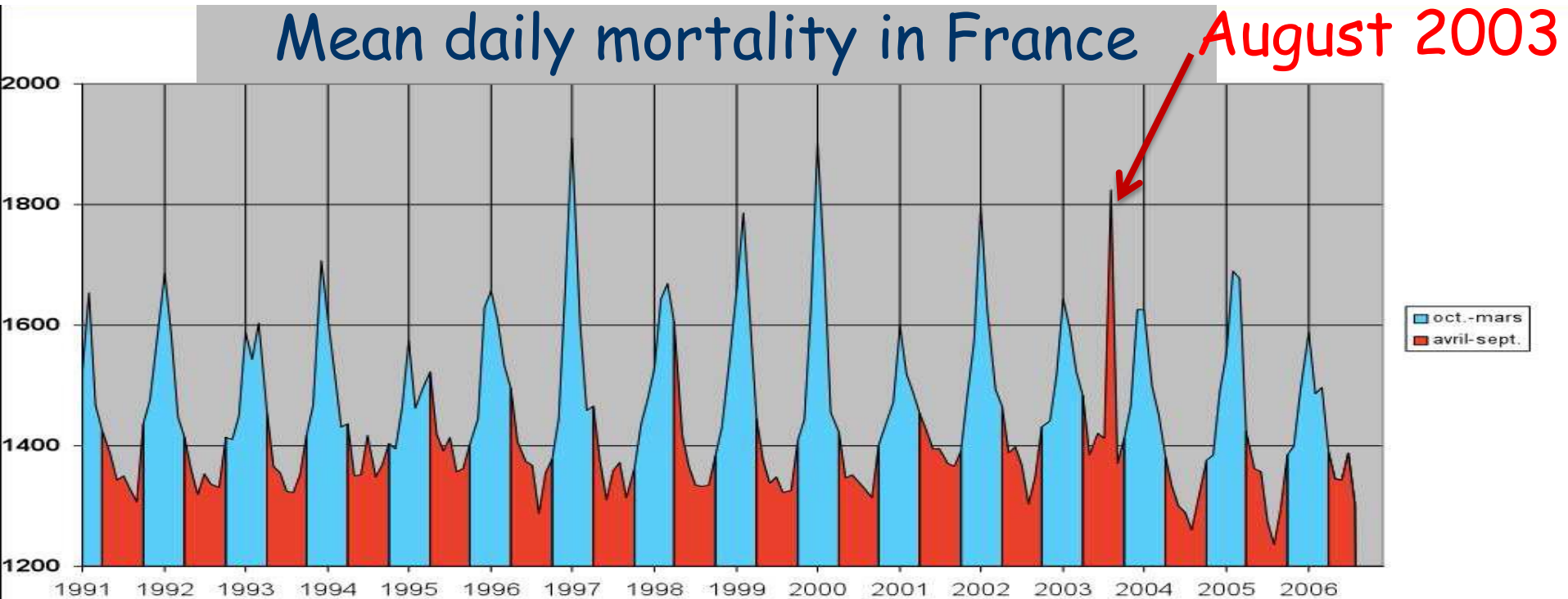
*Source: H.Thomson et al., Cochrane database of Systematic Reviews 2013
C. Liddell Energy Policy (2011); P. Howden-Chapman et al., Energy Policy (2012)*

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