Care provision fit for a future climate: Overheating in care settings

Research study funded by Joseph Rowntree Foundation

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Structure of presentation

• Background
• About the research study
• Key findings and recommendations
Overheating and care sector

- Heat related mortality during heat waves has been highest amongst occupants of residential and nursing homes, despite the presence of care staff that could act to protect vulnerable residents.
- Although national Heatwave plan and specific guidance for the health and care sectors, it is unclear how effective that guidance has been in changing awareness, preparedness or practice during heatwaves, in the short or longer term.
- Heat-related mortality is expected to increase (7,000 excess heat-related deaths per year by 2050) – mainly among the elderly in poor health.
Research study details

- **Fifteen-month research study** (Feb Apr 2016) funded by Joseph Rowntree Foundation.
- Socio-technical case study based approach
- Led by Oxford Brookes University in collaboration with University of Manchester and Lancaster University
- **Scope of study:**
  - Examined how far existing care homes and other care provision in the UK are **fit for a warming climate**, and
  - Considered the **preparedness** of the care sector (both residential and extra care) with a focus on **overheating**.
Mixed-methods approach

- **Literature review** of existing evidence on impact of design, institutional contexts, management and staff practices on the risk of summertime overheating.
- **Building surveys** to identify design features that can enable or prevent occupants and their carers to control their thermal environment.
- **Climate modelling** using future weather data (2030s, 2050s and 2080s) in dynamic thermal simulation.
- **Monitoring of environmental conditions** in the four case studies (June 2015 – September 2015).
- **Qualitative Interviews** with Designers, Development director/asset manager, Scheme manager, Carers and Residents to assess how building design, management and occupant practices address overheating risks and vulnerabilities.
- **Options appraisal** to identify remedial measures.
- **Recommendations** for policy and practice.
Case study schemes

Care homes: Single bedrooms with access to on-site care services.
- Case Study A (42 beds / 2005)
- Case Study B (23 beds / mid-late 19th c.)

Extra-care homes: Rented or purchased flats or bungalows designed for people with mobility difficulties, with help and support available in an emergency.
- Case Study C (50 flats / 2006)
- Case Study D (60 flats / 2012)
## Indoor temperatures in case studies (Jun-Sep’15)

### Average mean temperatures across the monitoring period (June-Sep 2015):

- **Bedrooms:** 24.5°C
- **Private living rooms:** 25.5°C
- **Communal living areas:** 24.7°C
- **Office areas:** 25.7°C
Indoor temperatures in case study buildings

Indoor temperatures in Bedrooms in the Case Study buildings across monitoring period
(June - Sept 2015)

Temperature (degC)

- PHE Heatwave Plan ‘cool area’
Short term heat wave: Case Study D residential areas

- One short heat wave period (30th Jun – 1st Jul 2015).
- High temperatures in all rooms before, during and after heatwave.
- Indoor temperatures in these areas are above 26°C for 46%-94% of the total monitored period.
- Heating on during summer in bathrooms due to fault with heating system.

**CASE STUDY D: Indoor and outdoor temperatures in BEDROOMS over short-term heatwave period (30th June - 1st July 2015 ±3 days)**

- External temperature
- Flat 1 Bed (Southeast-facing)
- Flat 3 Bed (Southeast-facing)

**CASE STUDY D: Indoor and outdoor temperatures in PRIVATE LIVING ROOMS over short-term heatwave period (30th June - 1st July 2015 ±3 days)**

- External temperature
- Flat 1 Living (Southeast-facing)
- Flat 2 Living (Southeast-facing)
- Flat 3 Living (Southeast-facing)

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- PHE Heatwave Plan ‘cool area’ threshold indoor temperature (26°C)
## Current overheating in the case studies

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Adaptive Method</th>
<th>Static Method</th>
<th>Case Study</th>
<th>Adaptive Method</th>
<th>Static Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case Study A</strong></td>
<td></td>
<td></td>
<td><strong>Case Study B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed 1 (GF, S)</td>
<td>-</td>
<td>6.3</td>
<td>Bed 1 (GF, NW)</td>
<td>-</td>
<td>7.9</td>
</tr>
<tr>
<td>Bed 2 (GF, W)</td>
<td>-</td>
<td>2.7</td>
<td>Bed 2 (FF, NE)</td>
<td>-</td>
<td>1.4</td>
</tr>
<tr>
<td>Bed 3 FF, SE)</td>
<td>-</td>
<td>2.2</td>
<td>Bed 3 (FF, SW)</td>
<td>1</td>
<td>16.7</td>
</tr>
<tr>
<td>Communal (FF, N/NW)</td>
<td>-</td>
<td>1.0</td>
<td>Communal 1 (GF, SW)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Office 1 (GF, NW/N)</td>
<td>1</td>
<td>1.6</td>
<td>Office 1 (B, NW)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Office 2 (GF, N)</td>
<td>-</td>
<td>-</td>
<td>Office 2 (B, SW)</td>
<td>1, 2</td>
<td>14.6</td>
</tr>
<tr>
<td><strong>Case Study C</strong></td>
<td></td>
<td></td>
<td><strong>Case Study D</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flat 1 (Bed) (GF, SW)</td>
<td>-</td>
<td>6.0</td>
<td>Flat 1 (Bed) (FF, SE)</td>
<td>1</td>
<td>49.9</td>
</tr>
<tr>
<td>Flat 1 (Living) (GF, SW)</td>
<td>1, 2, 3</td>
<td>1.4</td>
<td>Flat 1 (Living) (FF, SE)</td>
<td>1</td>
<td>9.3</td>
</tr>
<tr>
<td>Flat 2 (Bed) (FF, E)</td>
<td>1, 2, 3</td>
<td>24.1</td>
<td>Flat 2 (Living) (SF, SE)</td>
<td>1</td>
<td>3.2</td>
</tr>
<tr>
<td>Flat 2 (Living) (FF, E)</td>
<td>1, 2</td>
<td>1.0</td>
<td>Flat 3 (Bed) (TF, SE)</td>
<td>1</td>
<td>76.0</td>
</tr>
<tr>
<td>Flat 3 (Bed) (FF, W)</td>
<td>-</td>
<td>5.0</td>
<td>Flat 3 (Living) (TF, SE)</td>
<td>1</td>
<td>17.6</td>
</tr>
<tr>
<td>Flat 3 (Living) (FF, W)</td>
<td>-</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communal 1 (GF, S)</td>
<td>-</td>
<td>-</td>
<td>Communal 1 (UGF, SE/SW)</td>
<td>1, 3</td>
<td>1.1</td>
</tr>
<tr>
<td>Communal 2 (GF, SE)</td>
<td>1</td>
<td>1.1</td>
<td>Communal 2 (SF, NE)</td>
<td>1, 3</td>
<td>1.4</td>
</tr>
<tr>
<td>Office (GF, NE)</td>
<td>-</td>
<td>0.4</td>
<td>Communal 3 (LGF, NE)</td>
<td>1, 3</td>
<td>4.4</td>
</tr>
<tr>
<td>Office (GF, SE)</td>
<td>1</td>
<td>10.6</td>
<td>Office 1 (SF, SW)</td>
<td>-</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Note: B=Basement; LGF=Lower Ground Floor; UGF=Upper Ground Floor; GF=Ground Floor; FF=First Floor; SF=Second Floor; TF=Third Floor; S=South; SE=South-east; SW=South-west; N=North; NE=North-east; NW=North-west; E=East; W=West.
Current and future overheating risks in the case studies

Static method:

<table>
<thead>
<tr>
<th>% of occupied hours over threshold temperature</th>
<th>Case Study A</th>
<th>Case Study B</th>
<th>Case Study C</th>
<th>Case Study D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current climate</td>
<td>Bed 3 (FF, SE)</td>
<td>Bed 3 (FF, SW)</td>
<td>Bed 3 (FF, NE)</td>
<td>Bed 3 (FF, NW/N)</td>
</tr>
<tr>
<td>2030</td>
<td>Lounge (FF, NW/N)</td>
<td>Lounge 2 (GF, NE)</td>
<td>Staff office (B, NW)</td>
<td>Lounge 1 (GF, S)</td>
</tr>
<tr>
<td>2050</td>
<td>Manager’s office (GF, N)</td>
<td>Flat 2 Bed (FF, NE)</td>
<td>Flat 2 Living (FF, NE)</td>
<td>Manager’s office (GF, SE)</td>
</tr>
<tr>
<td>2080</td>
<td>Flat 1 Bed (FF, SE)</td>
<td>Flat 1 Living (FF, NE)</td>
<td>Lounge 1 (uGF, SE/SW)</td>
<td>Flat 1 Living (FF, SE)</td>
</tr>
<tr>
<td>Measured (2015)</td>
<td>Staff office (SF, SW)</td>
<td>Lounge 1 (GF, S)</td>
<td>Flat 1 Bed (FF, SE)</td>
<td>Lounge 1 (GF, S)</td>
</tr>
</tbody>
</table>

Care provision fit for a future climate
Influence of building design, management and use

Adaptation of environment to enable further heat management

Health & Safety requirements conflicts (window restrictors); low level TRVs restrict access; trickle-vents in windows present but painted over
Key findings and recommendations
1. A culture of ‘keeping warm’: the perception that older people are vulnerable to cold, not heat

- Prevalent perception, from designers to front-line staff, that older people ‘feel the cold’.
- While cold seen to represent a bigger threat to older occupants’ health, there is less recognition that heat can also present a significant health risk.
- Low prioritisation of overheating and future climate change (briefing & design)
- Provision of warmth is associated with good care.

“... we haven't thought about air conditioning or the environment getting too warm... we’re probably more concerned about things being cold in winter rather than warm in summer...”
2. Mismatch between climate modelling and monitoring results underplays present day risks from high temperatures

- Modelling indicates some risk of future overheating but little current overheating risk.

- However empirical monitoring indicates prevalent and current risk of overheating, particularly during short-term heat waves.

- Modelling weather files appear to be too conservative for simulating overheating results that match; the monitored data most closely matched the 2050s-2080s climate period weather files.

- Sensing system to detect overheating.
3. Lack of standardised overheating criteria and thresholds

**Heating-related guidance**
Mainly based on research focusing on external ambient temperatures and related mortality/morbidity.

**Static criteria:**
- CIBSE Guide A 2006
- SAP Appendix P 2012
- PHPP (PassivHaus) 2007

**Adaptive:**
- CIBSE TM52
- BS EN 15251:2007
- ANSI/ASHRAE Standard 55-2013

**WHO guidance:**
Health effects minimised in temperatures <24degC

**HHSRS guidance:**
Adverse health effects increased in external temperatures >25degC

**Heatwave plan for England guidance:**
Cool room/area temperatures <26degC

**CIBSE Guide A 2006**
- Living areas: 1% of occupied hours over 28degC
- Bedrooms: 1% of occupied hours over 26degC

**PHPP 2007**
- Building: 10% occupied hours over 25degC

**SAP Appendix P 2012**
- Building: Significant risk if monthly mean internal temperatures over 23.5degC

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No statutory maximum internal temperature for care schemes.
4. Lack of effective heat management in care settings due to design and management issues

- Heating system was in operation 24/7 including during the summer months in all of the case study buildings.
- Disconnect between, and lack of communication from design intent to handover
- Separation of roles within care organisation creating confusion in terms of responsibilities
- Lack of investment in long-term physical strategies to tackle overheating
- Conflicts between existing passive cooling strategies and occupant requirements
- Centralised heating and hot water systems can lead to unwanted heat gains due to pipework.
5. Lack of awareness and prioritisation of current and future summer overheating risks and heat wave plan

- Lack of preparedness at all levels (briefing, design, management, care living)
- Design briefs prioritise other issues-safety, security. Eg. Window restrictors
- Managers aware of Public Health England Heatwave Plan – other staff unaware
- Aspects of the plan implemented on ‘ad-hoc’ basis: Checking occupants’ clothing, “pushing fluids,” providing electric fans. No consultation with occupants’ GPs about health risks.
- Feasibility of providing cool rooms: lack of suitable rooms and impractical to move all occupants in one room.
- Ingrained practices of residents a barrier during heat waves: meals, clothes, washing
Conclusions

• Monitoring revealed that overheating is a current and prevalent risk in care settings.

• Lack of awareness and preparedness at all levels (design, management, use)

• Most responses to hot weather involve short-term ‘ad hoc’ solutions. Lack of investment in long-term strategies (external shading, effective ventilation, thermal mass)

Recommendations

• Encourage monitoring of environmental conditions in care settings through development and implementation of an overheating detection and monitoring protocol using smart sensors and surveys during summer months.

• Share insights from case studies where overheating has been experienced and tackled.

• Ensure new-build schemes are designed to avoid overheating, and that design intent is seen through to construction and operation.

• Harmonise and standardise health-related and building thermal comfort related overheating thresholds with particular consideration of care settings.
Care provision fit for a future climate

This report assesses 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.

Case study reports

[Detailed Case Study Reports]

http://architecture.brookes.ac.uk/research/lowcarbonbuilding/
Thank you for listening!

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