

Evidence on the links between domestic energy-efficiency improvements and health and well-being



1. Background....

The Scottish Government's **Home Energy Efficiency Programme for Scotland (HEEPS)** is the current mechanism for tackling **fuel poverty** and increasing the **energy efficiency** of domestic buildings. The programme provides local authorities with funding to improve homes in the most deprived areas, focussing on 'hard to treat' properties which require either **internal or external wall insulation**.

Fuel Poverty¹:



26.5% of Scottish households are spending more than 10% of their income on fuel

Poor health²:



Respiratory conditions
Cardiovascular conditions
Mental health
Excess winter deaths

Housing energy-efficiency

Cold homes³:

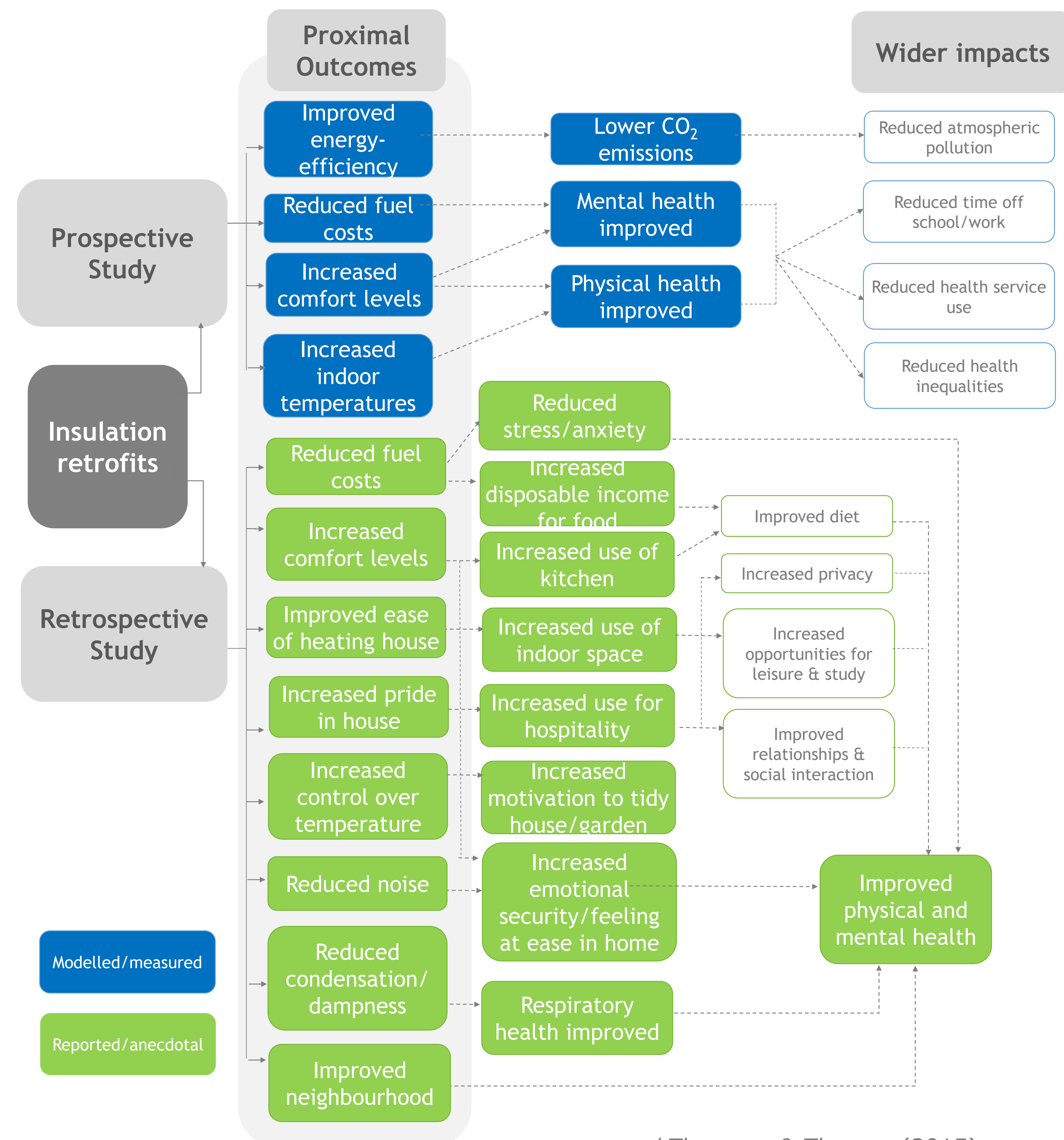


65% of households in the west of Scotland are classed as 'cold homes' with an EPC rating of between D and G

While the principle aim of these projects is to improve the **energy performance** of the existing building stock and reduce **CO₂ emissions**, investment in energy-efficiency also has potential public health benefits. There are known links between cold homes, poor health and fuel poverty however, as discussed in recent NICE guidelines², the impacts of energy-efficiency and warmth improvements on **health** and **quality of life** are still unclear. There is therefore a need for additional evidence on the efficacy of this type of intervention.

2. Methods....

A collaborative working group involving the **Energy Agency** and **NHS Ayrshire and Arran (Public Health)** was established with the aim of combining building performance data with a holistic evaluation of health and well-being. Both a **retrospective study** involving **semi-structured interviews** with those who had received insulation measures has been conducted alongside a controlled **prospective study** on ongoing insulation projects. Data has been collected through household energy questionnaires and health questionnaires (SF-36) as well as temperature monitoring, thermal comfort assessments and property surveys:



3. Our findings to date....

Before



Average saving on gas*:



30%



*interim results based on properties which have been monitored to date

58% with below average energy-efficiency

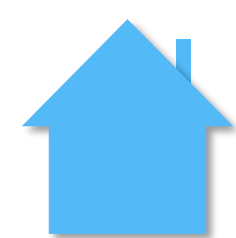
After



26% with below average energy-efficiency

Results from the environmental monitoring have shown that the majority of households are experiencing **improved thermal conditions** or have been able to **maintain** similar temperatures while **consuming less fuel**. A larger sample of households will be monitored as part of the 2016/17 and 2017/18 programmes in order to support these initial findings. **Results expected June 2018.**

Feedback to date shows that the majority of households in both the **retrospective** and **prospective** study were satisfied with the improvements:



93% of respondents agreed that the **overall condition** of their home had been improved by the insulation



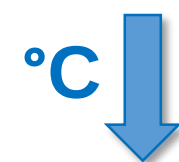
87% of respondents reported that their home now retained heat more effectively



51% of participants who reported having a problem with **condensation** or **dampness** said that this appears to have been improved



46% have decreased the number of heating hours required per day



21% have decreased the temperature of their main thermostat



The need for **additional clothing** and **hot water bottles** has been reduced

Fuels bills were reduced by **21%***
This equated to average annual fuel saving of:

£250

*based on modelled fuel costs from EPCs

Total no. of households engaged: **300+**
(across South Ayrshire, East Ayrshire and Dumfries & Galloway)

Health Impacts....

Our findings to date have shown evidence of the **proximal outcomes** (e.g. improved housing conditions, increased indoor warmth/comfort, increased pride in the home and reduced fuel bills) which have **potential links to longer term health outcomes**. This supports the theory that insulation retrofits can provide the initial steps in **health improvement pathways**. While our study was limited by the sample size and unable to measure some of the longer term outcomes at this stage, some observations regarding impacts on health are offered:

There were apparent improvements in the **General Health scores (SF-36)**:

- For those who also reported warmth improvements

There were further anecdotal reports of improvements to underlying health conditions including:



- Arthritis & other problems with bones, joints & muscles



- COPD & asthma



There were also reports of improved mood following the insulation works:

129 participants completed health questionnaires as part of the first phase of the study

79 of these were in households which received the insulation upgrades



"With the house being warmer its helped my arthritis a lot cause I'm not as sore now...It doesn't take me 3 hours in the morning now to get moving"

"I believe I feel better and more comfortable about the house, I really am....With the dampness...it helps my breathing a lot and I sleep better"

"You are a bit more content that you know you're coming into a warm house...it's quite nice to come in and shut the door and be quite cosy"

Neighbourhood Impacts....

"I think it's improved the street, definitely...Not even just the street, the whole village"

78% of respondents felt that the street or neighbourhood had **'improved a lot'**

"I always liked it to be nice but now I take more pride in it. I even got my hedge cut shorter so everybody could see my house. I think it's lovely"



3. Examples....

Case Study A (Adult, female)

Mrs A felt that her home now heated up more quickly and retained the heat better following the insulation upgrades. She was also saving around **£20 per month** on fuel. This was confirmed in the monitoring analysis which showed a reduction in gas consumption of **19%** suggesting that property is now more energy-efficient. Although the measured data showed similar average temperatures, the occupant described feeling **more comfortable** and **less worried** about her home losing heat during the winter. She commented that she had has fewer colds since receiving the insulation and also felt that it was **easier to get about** and do things at home. Mrs A also reported a reduction in window condensation and traffic noise following the insulation improvements.



Case Study B (Retired couple)

Mr and Mrs B reported that their fuel bills had gone down since receiving the insulation and that they have been using their heating for **fewer hours per day**. This correlates with the measured data which shows that they have been able to maintain similar temperatures while also demonstrating a reduction in gas use of around **10%**. They commented that their comfort levels had improved and that they no longer required to use additional heaters or blankets. Mrs B reported feeling generally **more content** at home now that the place had been uplifted while Mr B had found that his **respiratory problems** had improved and that he had been in hospital less. They were pleased with the improvement the scheme had made to their local area and commented that they liked the place better now. They had also noticed a reduction in noise from passing traffic and described receiving positive comments from visitors.

Similar average temperatures:

Living room:
21°C (pre-install)
22°C (post-install)

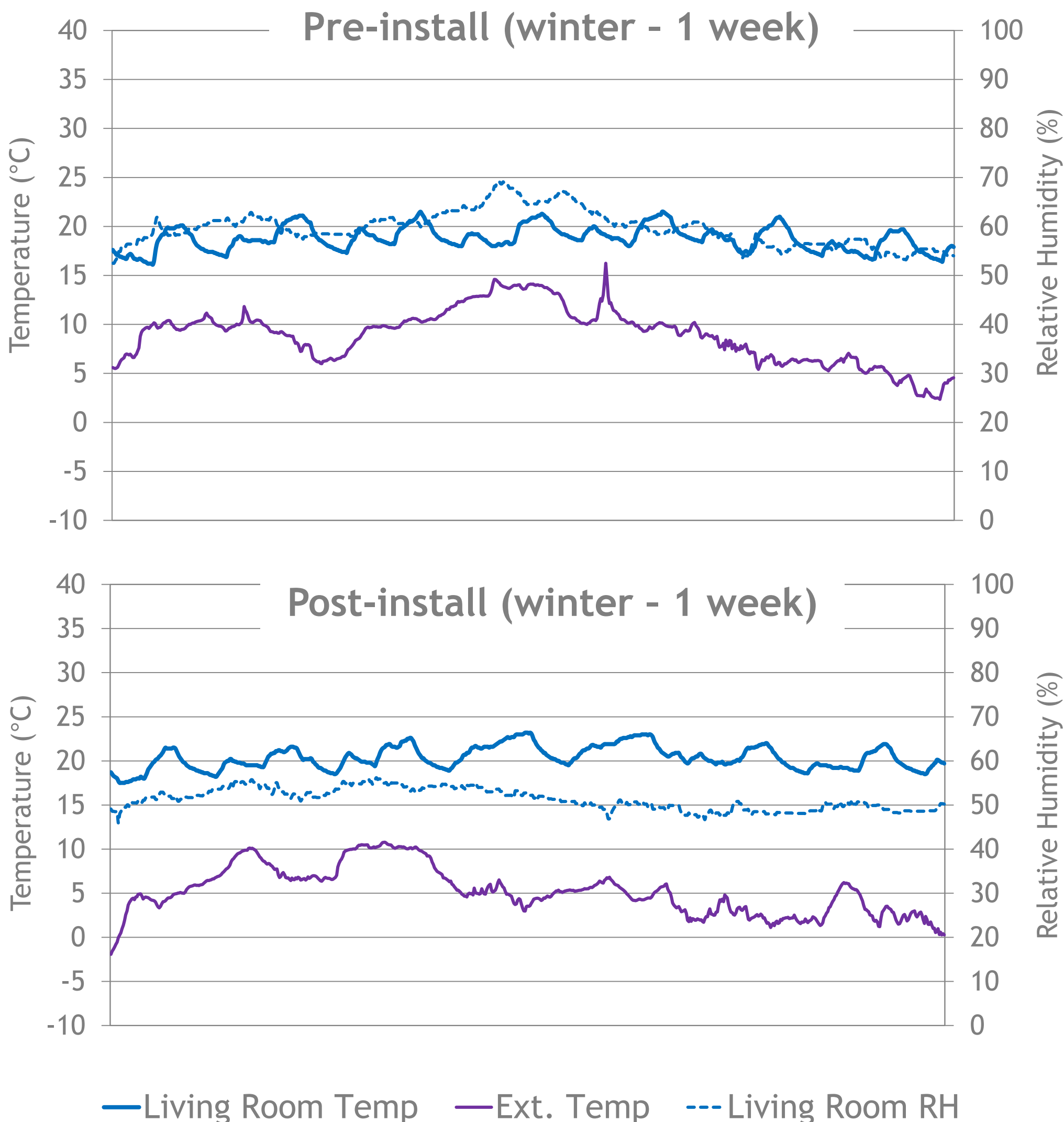
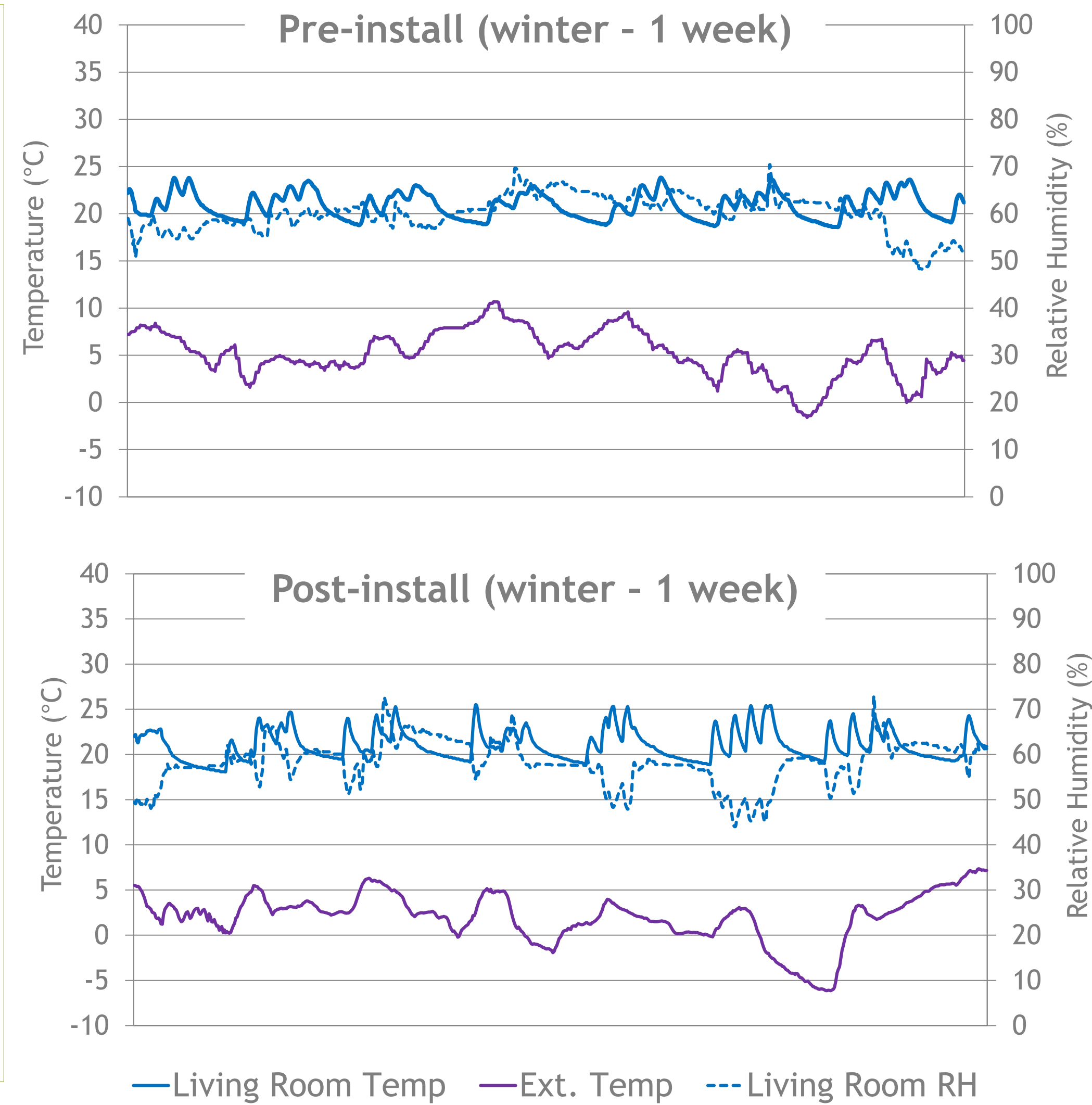
Similar average relative humidity:

61% (pre-install)
57% (post-install)

Gas consumption decreased by
19%

Reported behaviour changes:

• Decreased use of the heating system



Similar average temperatures:

Living room:
19°C (pre-install)
20°C (post-install)

Reduction in average relative humidity:

56% (pre-install) to
49% (pre-install)

Gas consumption decreased by
10%

Reported behaviour changes:

• Decreased use of the main heating system
• Reduced need for blankets and additional heaters

3. Examples....

Case Study C (Adult, male)

Mr C reported that his home was **much warmer** following the insulation upgrades and this was evident in the temperature data which showed an improvement in all rooms. While the temperatures were **still below the recommended standards**, the occupant found these conditions to be comfortable and felt **more relaxed** about using the heating. He was even able to **use more rooms** in the property including using the spare room for guests. This did lead to an apparent *increase* in energy consumption however the gas usage was still well below average compared to similar properties. Mr C also reported improvements to previous issues with damp and mould and the measured data also showed a slight reduction in the average relative humidity levels. He also report feeling **more at ease** at home and also that his **asthma symptoms had improved** meaning that he did not need to use his inhaler as much.



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Increase in average temperatures:

10°C to 12°C in living room

11°C to 14°C in kitchen

12°C to 15°C in bedroom.

Reduction in average relative humidity:

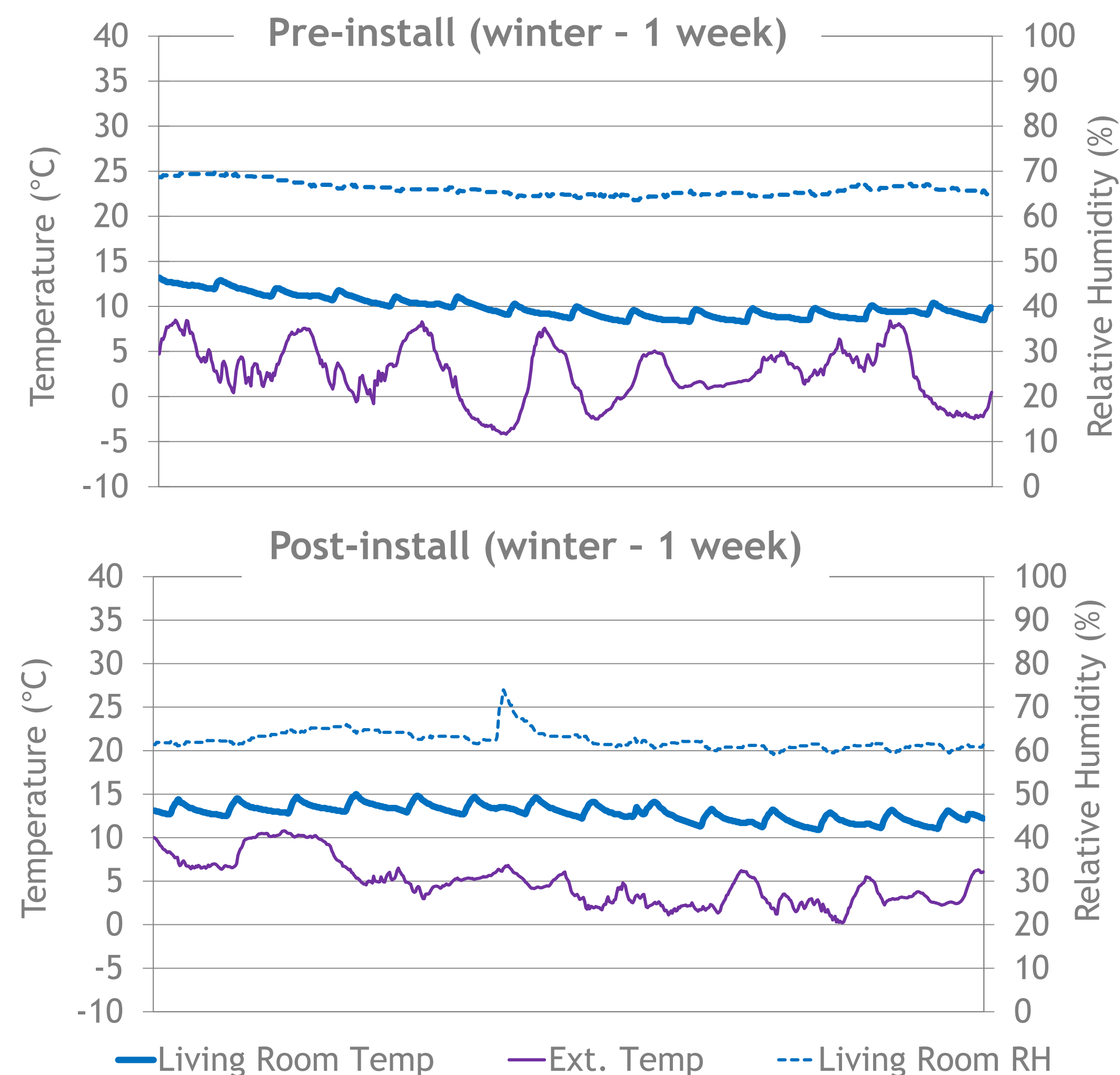
67% to 57% in living room

Gas consumption increased by

40%

Reported behaviour changes:

- Increased use of the heating system
- Increased usable space within the home
- Improved ventilation



4. Conclusions....

The project has highlighted the benefits of including a **public health perspective** in the evaluation of energy-efficiency improvements by looking beyond the theoretical energy savings and capturing the **actual experiences of the occupants**. For insulation retrofits, there are apparent direct impacts on physical health as well as indirect impacts on well-being through reduced fuel bills and increased pride in the home. Health data is most valuable when correlated with the property conditions and the extent to which performance has been improved.

References:

- 1 - Scottish Government. (2017). *Scottish House Condition Survey: 2016 Key Findings* (No. PPDAS83659). Edinburgh: Scottish Government.
- 2 - NICE. (2015). *Excess winter deaths and illness and the health risks associated with cold homes* (NICE Guideline No. NG6).
- 3 - EHAS. (2016). *Existing Homes Alliance Scotland Factsheet: Cold Homes across Scotland: regional information*.
- 4 - Thomson & Thomas (2015). *Developing empirically supported theories of change for housing investment and health*. *Social Science & Medicine*, 124, 205–214.