



Energy efficiency measures for housing may affect indoor air quality and in some cases lead to increases in exposure to radon

IN BRIEF

Researchers on the CUSSH project suggest that, while energy efficiency measures are likely to benefit energy savings and warmer homes, care should be taken not to cause reductions in air quality when designing and installing measures to increase the airtightness of homes.

The UK government has an ambitious goal of reducing carbon emissions by improving the energy efficiency of housing. This policy goal is a strong driver for change in the housing stock. A current Building Regulations Review aims to ensure that good indoor air quality is maintained by taking account of the latest evidence on outdoor and indoor air pollution.

Relevance

Worldwide, exposure to radon gas is second only to smoking as a cause of lung cancer. Changing the energy characteristics of a home can affect indoor air quality by influencing thermal and ventilation properties. This research aimed:

- To understand the relationships between energy efficiency measures such as double glazing, loft and wall insulation and indoor radon concentrations.
- To help housing policy stakeholders, designers and contractors to understand the wider impacts of housing design on radon exposure.
- To enhance the health benefits of energy efficiency measures and to highlight possible trade-offs.

We used a large-scale Public Health England dataset of radon measurements, linking it with information on dwellings in the Home Energy Efficiency Database (HEED).

The Process

- We linked radon measurements from 1980 to 2015, giving us information on 470,000 homes: the largest dataset of its kind.
- We matched radon measurements with dwellings and analysed their relationships.
- The process resulted in an understanding of the energy efficiency measures that could have the greatest association with indoor radon concentrations.
- Measures with the potential for the greatest adverse link with radon included double glazing, followed by loft insulation and wall insulation.



Researchers on the CUSSH project have highlighted evidence of an association between home energy efficiency and indoor radon levels

IMPLICATIONS

The analysis suggests that we need to revisit energy efficiency measures in homes, ensuring that they account for the potential for increased radon exposure as a result of air tightening, and especially in high radon areas.

Any increase in exposure to radon will lead to a rise in radon-related lung cancer rates and health risks. The CUSSH analysis has begun to improve our understanding of the relationship between energy efficiency, air change rates and indoor air quality, particularly for radon exposure. It offers suggestions for ensuring that the health benefits of energy efficiency measures are achieved and negative health consequences avoided.

Designers and contractors

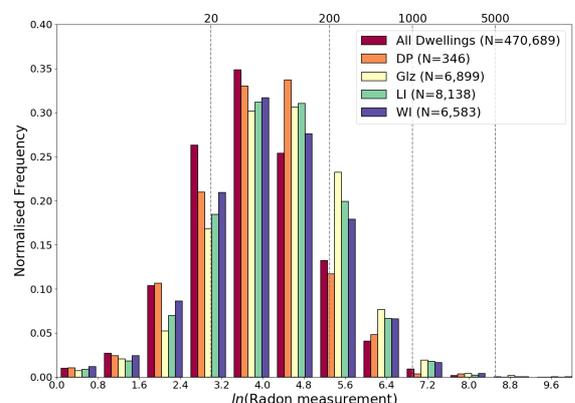
- Be aware that energy efficiency measures can increase indoor radon levels
- Carry out a radon risk assessment prior to designing and installing energy efficiency measures and be aware of the possible need to test for radon
- For energy efficiency measures in radon-affected areas, carry out a test after installation to check that radon levels are not high
- Aim to reduce high indoor radon concentrations to below the Public Health England target of 100 Bq/m³

Policymakers

- Currently reviewing legislation, strategies and advice to ensure they include all possible outdoor and indoor sources of air pollution.



Passive monitors used by Public Health England to measure indoor radon concentrations. Used with permission © Crown Copyright, 2013. Public Health England



Histogram showing the distribution of indoor radon in homes, by independent energy efficiency measure type

Reference: Symonds P, Rees D, Daraktchieva Z, et al. Home energy efficiency and radon: An observational study. *Indoor Air*. 2019;00:1–11. <https://doi.org/10.1111/ina.12575>