



## Housing can influence exposure to carbon monoxide (CO) from outdoor and indoor sources

# IN BRIEF

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Using a model representing 11.5 million homes in England and Wales, researchers on the CUSSH project show that we need to ensure sufficient ventilation in retrofit properties to reduce potential carbon monoxide (CO) exposure.

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.

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### Relevance

- Exposure to even low concentrations of carbon monoxide (CO), has been linked with self-reported neurological symptoms in building occupants
- There is a need to understand the relationships between energy efficiency measures such as double glazing, loft and wall insulation and indoor CO concentrations from both outdoor and indoor sources.
- A greater understanding of the wider impacts of housing design on CO exposure is necessary for housing policy stakeholders, designers and contractors.
- It is critical to enhance the health benefits of energy efficiency measures and to highlight possible trade-offs.

We used a large-scale building physics model, estimating indoor CO levels for 11.5 million English and Welsh dwellings in the Energy Performance Certificate (EPC) database.

### The Process and Key Results

- CO concentrations from both indoor and outdoor sources were modelled for England and Wales: for the existing housing stock and for a scenario in which energy efficient measures are added.
- The process resulted in an understanding of the energy efficiency measures that could have the greatest association with indoor CO concentrations.
- Clusters of elevated indoor CO concentration are found in urban areas due to higher outdoor concentrations and smaller dwellings with reduced ventilation.

## Researchers on the CUSSH project have estimated the impact of housing type and energy efficiency on indoor carbon monoxide (CO) concentrations

# IMPLICATIONS

**The study suggests that we need to revisit energy efficiency measures in homes, ensuring that they account for the potential for increased CO exposure as a result of air tightening, especially in areas of higher outdoor CO concentrations.**

An increase in exposure to CO will lead to a rise in 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 CO exposure. It offers suggestions for ensuring that the health benefits of energy efficiency measures are achieved and negative health consequences avoided.

### Designers and contractors

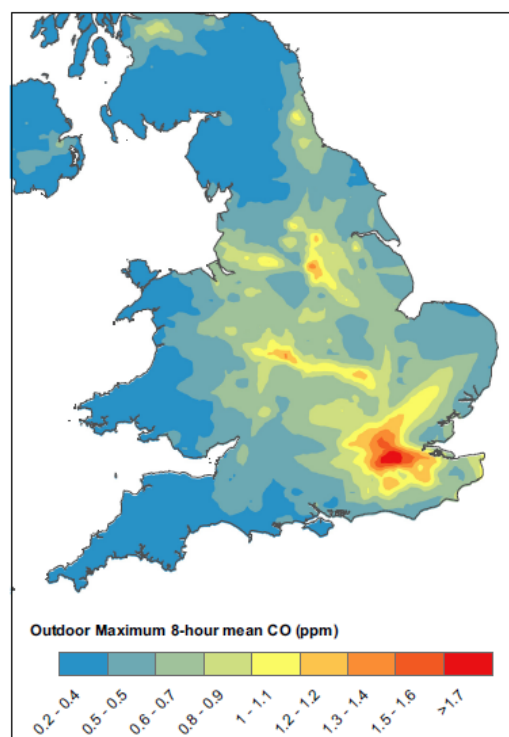
- Be aware that energy efficiency measures can lead to increased indoor CO levels
- For energy efficiency measures in smaller properties in urban areas, ensure that additional ventilation is provided near CO sources

### Landlords and homeowners

- Ensure that all heating and cooking appliances are regularly and routinely serviced, CO monitors are installed and working, and extractor fans are working

### Policymakers

- Review legislation, strategies and advice to ensure they include all possible outdoor and indoor sources of air pollution.
- Support the installation of electrical heating and cooking systems for housing over gas.



*Outdoor annual maximum 8-hour mean CO concentration (ppm)*