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**Short-term health and social impacts of energy-efficiency investments in low-income communities: a controlled field study**

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Abstract

**Background** During 2012–15, £45 million was invested to improve the energy-efficiency of 4800 houses in low-income areas across Wales. Houses received measures such as external wall insulation, new windows and doors, upgrades to the heating system, and connection to the gas network. This study aimed to establish the short-term health and social impacts of these investments.

**Methods** A quasi-experimental field study with a controlled, before and after design was conducted (364 individuals in improved houses [intervention], 418 in houses with no improvements [control]). Any adult living in 24 selected intervention areas and matched control areas (n=23) was eligible for inclusion. Self-completed questionnaires, administered via a drop-off-and-collect method, were collected in the winter months (December to February) before and after installation of the energy efficiency measures. Health outcomes were mental health composite scale (MCS) and physical health composite scale (PCS) scores of the SF-12v2, SF-6D utility scores derived from the SF-12v2, self-reported respiratory symptoms, and subjective wellbeing. Social outcomes were financial difficulties and stress, food security, thermal comfort, housing conditions, and social isolation. The study used measures validated in previous research. Linear, ordered multinomial, and logistic multilevel models were constructed with measurement occasions nested within individuals.

**Findings** After controlling for sex, age, housing benefit, household income, and smoking status, we found that investments were not associated with improvements in MCS (B=0.00, 95%CI -1.60 to 1.60) or PCS (0.98, -0.34 to 2.28) scores, SF-6D utilities (-0.01, -0.04 to 0.02), or self-reported respiratory symptoms (-0.14, -0.54 to 0.26). However, people who received energy-efficiency measures reported improved subjective wellbeing compared with controls (B=0.38, 0.12 to 0.65), and fewer financial difficulties (-0.15, -0.25 to -0.05); they reported higher thermal comfort (odds

ratio 3·83, 95% CI 2·40 to 5·90), higher satisfaction with the improvement of their homes (3·87, 2·51 to 5·96), and less reluctance to invite friends or family to their homes (0·32, 0·13 to 0·77).

**Interpretation** Although there is no evidence that energy-efficiency investments provide physical health benefits in the short term, they improve social and economic conditions that are conducive to better health. Longer term studies are needed to establish the health impacts of energy-efficiency investments.

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**Contributors** WP, SER, and RAL conceived and designed the study. WP led the research. CG and SJ coordinated and conducted the fieldwork. RDJ contributed to data preparation and analysis. CG and WP conducted the statistical analyses. TGW and PA conducted the health economic analyses. All authors contributed to the interpretation of findings. All authors contributed to the drafts and read and approved the final draft.

#### **Declaration of interests**

We declare no competing interests.

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