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The Fuel Poverty Data Linking Project

Emerging Findings Report

In Wales, a household is considered to be in fuel poverty if it needs to spend more than 10% of its net income on all household fuel use to maintain a satisfactory heating regime. Fuel poverty is particularly challenging in Wales due to the poor housing stock in many areas and the rural nature of much of Wales. Living in a cold or damp home increases the risk of adverse health events.

As part of its strategy to reduce fuel poverty in Wales, the Welsh Government implemented a demand-led fuel poverty scheme called Nest to improve the energy efficiency of homes.

This bulletin reports the emerging findings of a project that is using data linking techniques to explore the impact of the Warm Homes Nest scheme on health outcomes.

In order to inform potential future demand-led fuel poverty schemes in Wales, this study examines the impact of the current scheme on hospital admissions and general health for recipients of home energy efficiency measures.

Key Points

Administrative data for the Warm Homes Nest scheme was anonymously and securely linked to routine health records for analysis purposes.

Levels of health service use were compared for 36,467 recipients of home energy efficiency measures and a control group of 36,070 individuals who were eligible but who had not yet received measures.

From a **provisional, indicative** analysis of the Warm Homes Nest data, the following key points have emerged:

- A positive impact on cardiovascular and respiratory admissions was found, with the recipient group having fewer hospital admissions for both cardiovascular disease and respiratory conditions than the control group for the winter after measures were installed.
- Although an increase was found in the number of GP Events and prescriptions in both the recipient group and the control group for the winter after measures were installed, the increase was smaller for the recipient group than for the control group. The findings therefore suggest that without the measures, the recipient group would have experienced a greater increase in GP Events and prescriptions i.e. the measures had a 'protective effect'.
- Each of the individual home energy improvement measures e.g. insulation and heating upgrades, was found to have the same 'protective effect' on general health described above i.e. the group receiving each type of measure had a smaller increase in GP Events and prescriptions than the control group in the winter after measures were installed.
- The 'protective effect' on the health of recipients described above was observed for most age groups, from children aged less than 5 years to older people aged 75 years and over, with the exception of GP Events for 5 to 24 year olds i.e. recipients in most age groups had a smaller increase in GP Events and prescriptions than the control group in the winter after measures were installed.

Background

1. In Wales, a household is considered to be in fuel poverty if it needs to spend more than 10% of its net income on all household fuel use to maintain a satisfactory heating regime.
2. Fuel poverty is particularly challenging in Wales due to the poor housing stock in many areas and the rural nature of much of Wales. Estimated levels of Fuel Poverty in Wales were 29% in 2012 and are projected to be 23% in 2016. The predicted national levels of fuel poverty for Wales are higher than in England but lower than in Scotland or Northern Ireland (as a percentage of all households).¹
3. The World Health Organisation (2007)² recommends a minimum indoor temperature of 18 degrees and recognises that living in a cold and/or damp house may be harmful to health.
4. As part of its strategy to reduce fuel poverty in Wales, the Welsh Government developed a demand-led all-Wales fuel poverty scheme called Warm Homes Nest to improve the energy efficiency of homes. Nest has provided home efficiency improvements to those most likely to be in fuel poverty, including low income and vulnerable households since 2011.
5. The measures provided by Nest include insulation and heating upgrades, such as a more efficient boiler; some include newer technologies like air source heat pumps and external wall insulation.
6. The Project was carried out by a full-time researcher attached to the ESRC-³ funded Administrative Data Research Centre for Wales (ADRC-W), which is supported by the Welsh Government core-funded SAIL (Secure Anonymised Information Linkage) Databank at Swansea University. The researcher was jointly funded by the Welsh Government and the ESRC. The project was conducted within the information governance, information security and ethical framework of the ESRC-funded UK Administrative Data Research Network⁴.

Aims and Objectives

7. The overall aim of the programme of work within which this project falls is to use linked administrative data to examine the health and broader well-being impacts of Welsh Government- funded home energy efficiency improvement schemes for low income households. Within this aim, the objectives of this project were to:
 - Identify the health risks likely to be associated with living in fuel poverty.
 - Identify a robust control group⁵ for analysis purposes.
 - Investigate the impact of the scheme on the health of recipients.
 - Investigate the relative impact of the main types of home energy efficiency measure on the health of recipients.

Methods

8. This study conducted a Rapid Evidence Assessment of the literature on the health risks of living in fuel poverty or in an inadequately heated house in order to identify the most appropriate health outcomes for analysis.
9. The Warm Homes Nest scheme provided access to anonymised data relating to individual applications to the scheme and the measures installed.
10. The scheme data was anonymously linked to routine health records in order to examine the health service use of the recipients of home energy efficiency measures.

11. Data Linking is a technique for creating links between data sources so that anonymised information that is thought to relate to the same person, family, place or event can be connected for research purposes.
12. Health service use e.g. GP Events⁶, prescriptions and hospital admissions, were examined for the winter before and the winter after each measure was installed.
13. A control group was created using individuals who had applied for measures and later received them; they were therefore known to be both eligible and in need of measures but had not yet received measures.
14. It should be noted that, for this Emerging Findings Report, it has not been possible to complete the complex kinds of analysis necessary to show the margin of error for the results, nor to examine any effects in more detail. However, findings where a consistent effect or trend over time is observed are nevertheless worthy of note and suggest some association between the scheme and health outcomes. More complex statistical analysis will be published in the final report.
15. **All findings should therefore be considered both PROVISIONAL and INDICATIVE** and may be subject to revision following more detailed checking and analysis.
16. The key quality information relating to the study can be found on Page 6 of this Report.

Findings

Sample characteristics

17. The Warm Homes Nest scheme provided around 21,000 home energy efficiency measures to around 18,000 homes in Wales between April 2011 and March 2015.
18. The data from the Warm Homes Nest scheme was provided at the dwelling level. The dwelling-level data was linked to routine health records for all the individuals who were living in those homes during the study period, resulting in an 'intervention group' of 36,467 recipients of a home energy efficiency measure and a 'control group' of 36,070 individuals who were eligible but who had not yet received measures.
19. The intervention group contained individuals of all ages including 5.2% aged less than 5 years, 25.3% aged between 5 and 24 years, 43.4% aged between 25 and 59 years, 6.2% aged between 60 and 64 years, 10.3% aged between 65 and 74 and 9.5% aged 75 years or over.
20. The intervention group included 28,660 cases with heating upgrades, 495 cases with wall or loft insulation, 4,141 cases with both a heating upgrade and insulation and 2,426 installations with a complete new heating system.

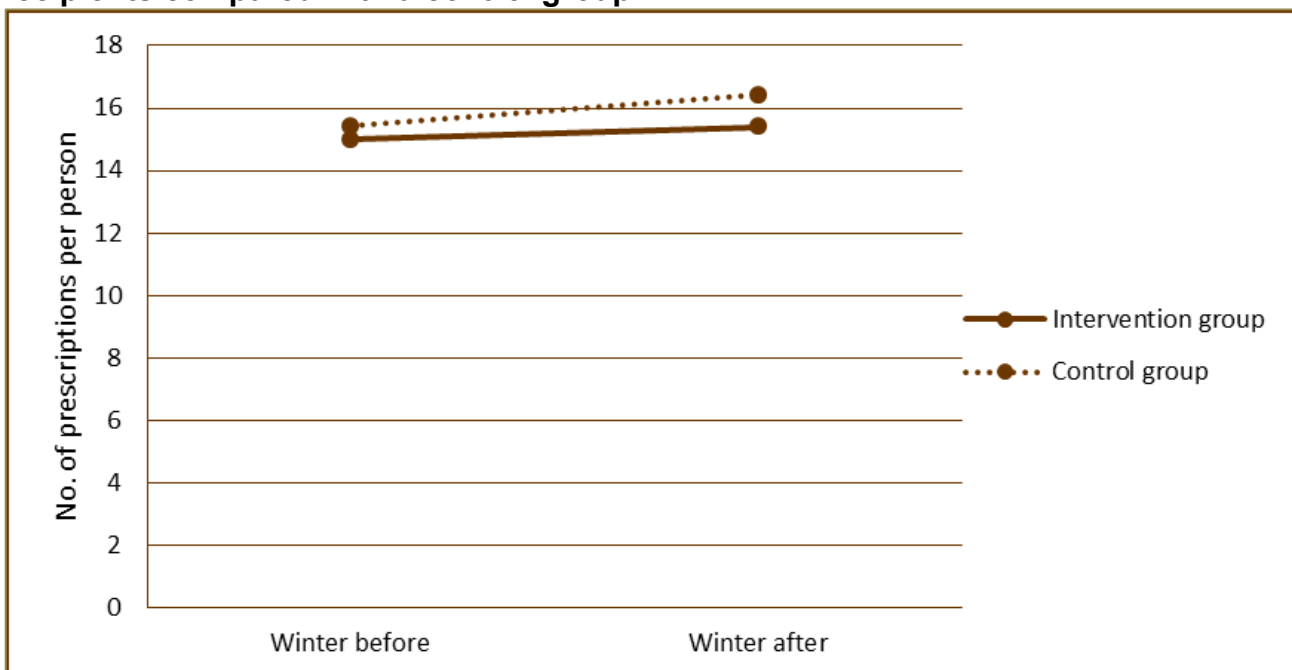
The health risks associated with living in fuel poverty

21. From a Rapid Evidence Assessment of the literature the following key health risks associated with living in fuel poverty were identified:
 - *General health*: A range of health impacts have been demonstrated to be associated with inadequate heating, e.g. gastric and duodenal ulcers⁷, colds and sore throats, frequent headaches and eczema⁸.
 - *Cardiovascular health*: The research literature identifies an association between coronary events⁹ and cold weather; those living in cold homes also have an increased risk of high blood pressure¹⁰.
 - *Respiratory health*: Studies show a 30-50% increase in a variety of respiratory symptoms¹¹ and an increase in hospitalisations due to respiratory causes¹² for people living in damp and/or cold homes.

The impact on general health

22. Routine GP Event data consists of all entries made by primary care services regarding the individual patient; this may include consultations, test results, referrals or prescribing.
23. A count of GP Events is a simple proxy indicator of general health, with a higher count representing a greater level of interaction with primary care. However, for this Emerging Findings Report, all GP Events were counted, including those that were unlikely to be affected by living in a cold or damp home. Further work will be completed at the next stage of the project to exclude events related to e.g. pregnancy and childbirth, accidents outside the home etc.
24. The following GP data was examined:
- The number of prescriptions issued for the winter period before and the winter period after the household received a home energy improvement measure.
 - The overall number of GP Events¹³ recorded for the winter before and the winter after the household received a home energy improvement measure.
25. For Warm Homes Nest recipients, a 'protective effect' was found on general health. Although an increase was found in the number of prescriptions issued to both the recipient group and the control group for the winter after measures were installed, the increase was smaller for the recipient group than for the control group. The findings therefore suggest that without the measures, the recipient group would have experienced a greater increase in prescriptions i.e. the measures had a 'protective effect'. Chart 1, below, shows an example of the observed pattern, showing the pattern for the age group 65 to 74 years; however, the protective effect was observed for all age groups.
26. The same 'protective effect' was observed for the number of GP Events.
27. These results suggest a positive impact of the Warm Homes Nest scheme on the general health of recipients. However, as noted above, further work will be required in order to select only those GP Events and prescriptions likely to be affected by living in a cold or damp home.

Chart 1 The number of GP Prescriptions per person aged between 65 and 74 years in the winter months before and winter months after installation: 'intervention group' of recipients compared with a control group



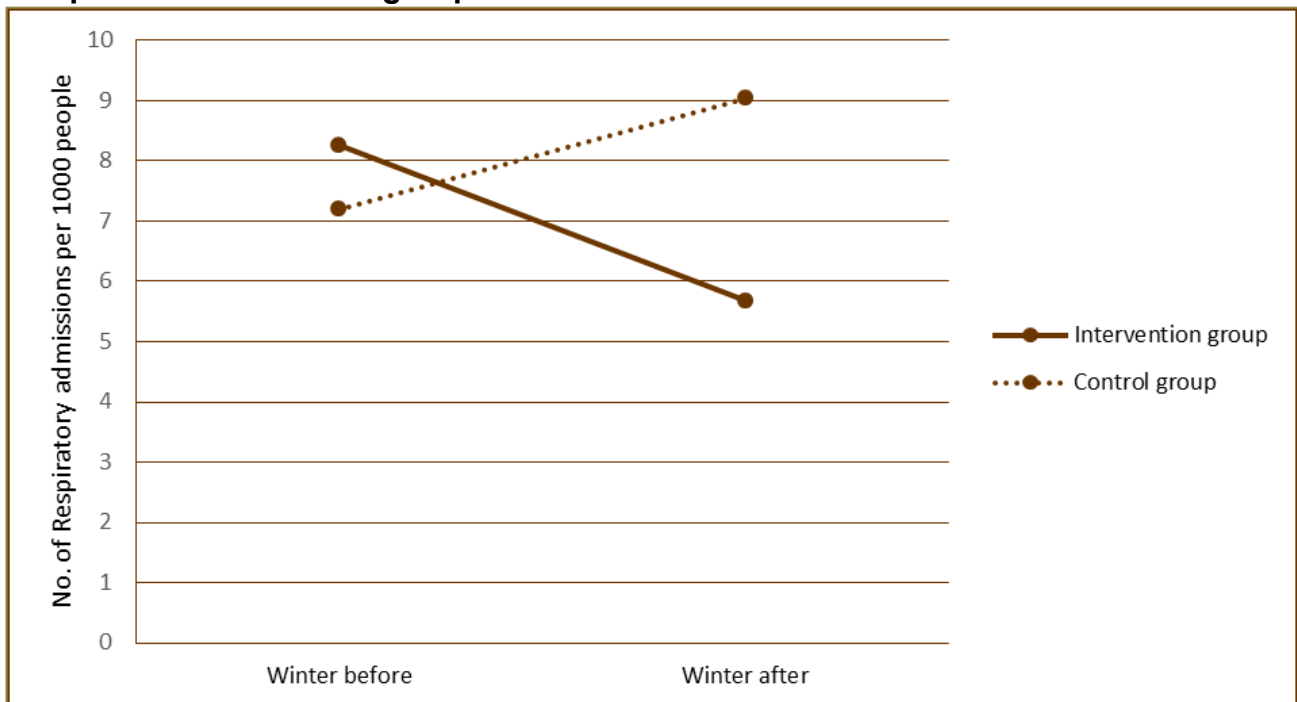
The Impact on general health by age group

28. The numbers of both GP Events and prescriptions were compared for the winter before the intervention and the winter after separately for each of the following age groups: children aged less than 5 years, young people aged between 5 and 24 years, people aged between 25 and 59 years, people aged between 60 and 64 years, people aged between 65 and 74 years and people aged 75 years or over.
29. The 'protective effect' on the health of recipients observed in Chart 1, above, was found for most age groups, with a smaller increase in the number of GP Events and prescriptions observed in the recipient group than in the control group for the winter after measures were installed. The only exception was GP Events for the 5 to 25 year age group, where no protective effect was observed.

The impact on cardiovascular and respiratory health

30. The number of hospital admissions for both cardiovascular and respiratory conditions were compared for the winter before and the winter after the household received a home energy efficiency improvement.
31. For Warm Homes Nest recipients, there was a decrease in the total number of respiratory admissions between the winter before and the winter after the intervention (see Chart 2, below). This compares with an increase in respiratory admissions for the control group over the same period.
32. The same pattern was observed for admissions due to a cardiovascular condition.
33. These results suggest a positive impact of the Warm Homes Nest scheme on both the cardiovascular and respiratory health of recipients. However, further work will be done at the next stage of the project to conduct a more complex analysis to explore the effect on more specific conditions within respiratory and cardiovascular health.

Chart 2 The number of Respiratory Hospital Admissions per 1,000 people in the winter months before and winter months after installation: 'intervention group' of recipients compared with a control group



The effect of different types of home energy efficiency measure

34. The main types of home energy efficiency measure were: an upgraded heating system, wall and/or loft insulation, both heating and insulation, or a full heating system.
35. The numbers of GP Events and prescriptions were compared for the winter before and the winter after the intervention for each of the main types of home energy efficiency measure.
36. Each of the individual home energy improvement measures was found to have the same 'protective effect' on general health described above. In other words, although an increase was found in the number of GP Events and prescriptions in both the recipient group and the control group for the winter after measures were installed, the group receiving each type of measure had a smaller increase in GP Events and prescriptions than the control group. No noteworthy difference was observed in the pattern by type of measure.

Next Steps

37. This bulletin presents emerging findings from the analysis of linked administrative data for the Warm Homes Nest scheme. The next report in the series, planned for publication in early 2017, will report the findings of more complex analysis.
38. Future publications will:
 - report on the statistical significance of the analysis to date;
 - report analysis relating to additional health conditions;
 - comment more fully on the magnitude of any differences between type of measure and age groups; and
 - report analysis relating to the impact of the Warm Homes Nest scheme on educational attainment.

Key Quality Information

39. The data linking technique used resulted in 74% of the Nest Warm Homes data being linked to health datasets. Work is underway to improve the data linking rate by including anonymised address information. Based on the limited information available about recipients, there was no evidence of bias in terms of the characteristics of the individuals for whom record linkage was possible compared with those for whom record linkage failed i.e. no particular group is relatively less well-represented in the analysis presented in this report.
40. The cohorts include a small number of households that contained unexpectedly large numbers of members, possibly indicating the inclusion in the dataset of some multiple occupancy residences (e.g. converted houses or hostels) where it is probable that not all residents will have received the relevant measure. A method for addressing this issue is under development. For the purpose of this emerging findings report, a sensitivity analysis was undertaken and demonstrated that the overall findings were not affected by excluding these households from the analysis.

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- 2 WHO Housing, Energy and Thermal Comfort *World Health Organization* 2007.
- 3 The UK Economic and Social Research Council.
- 4 <http://adn.ac.uk/>
- 5 Multiple GP Events will occur on a single day e.g. each drug prescribed or physical measurement e.g. blood pressure, is recorded as a separate event.
- 6 A control group is a group of individuals who have not received an intervention who are similar enough to be compared with the group who have received the intervention. This is to determine whether it is the intervention that has caused any observed change.
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- 13 Multiple GP Events will occur on a single day e.g. each drug prescribed or physical measurement e.g. blood pressure, is recorded as a separate event.

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Views expressed in this report are those of the researchers and not necessarily those of the Welsh Government

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