Data Linking Demonstration Project - Examining Fuel Poverty using Home Energy Efficiency Data (HEED) and Routinely Collected Health Data

Llywodraeth Cymru
Welsh Government

1. The Fuel Poverty data linking demonstration project has been delivered as part of the Welsh Government Programme to Maximise the Use of Existing Data. It was one of three projects aiming to demonstrate the unique contribution data linking can make to the evidence base. The three projects have examined the Secure Anonymised Information Linkage (SAIL) process developed at Swansea University, from acquiring additional data to carrying out analysis on new data sets created by linking existing administrative data.

2. 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.

3. The projects were delivered by a Knowledge Transfer Research Fellow jointly funded by the Welsh Government (WG) and the Economic and Social Research Council (ESRC) working on a one-year fellowship which ran on a part time basis over the period of October 2011 to March 2013.

Aims

4. To describe in detail the data linking process from the acquisition of a new data set to completing analysis on multiple linked anonymised datasets.

5. To investigate the contribution we can make to the Fuel Poverty evidence base through the analysis of various health data sets linked to Home Energy Efficiency Database (HEED) data, which contains information about home energy efficiency interventions completed under a number of schemes and initiatives in Wales.

6. To determine whether home energy efficiency interventions have a measurable effect on the health of residents, focussing on the kinds of improvements in health outcomes that might be expected to be associated with home energy efficiency interventions e.g. respiratory conditions.

7. To identify the potential further contribution that might be made to the Fuel Poverty evidence base if, in future, additional data sets were acquired and linked to allow additional analysis.

Methodology

8. Data on home energy efficiency improvements completed in Wales over the period 2000 to 2012 and collated by the Energy Saving Trust was anonymised into the Secure Anonymised Information Linkage (SAIL) databank at Swansea University.

9. The Project analysed the health of people who lived at the same address in Wales from 2000 to 2012 and for whom insulation or central heating improvements were recorded in HEED. Two Project Groups were defined such that approximately the same numbers of interventions had been completed for each: the 'First Group' had interventions between 2000 and 2007 and the 'Second Group' had interventions between 2008 and 2012.

10. The health of the First and Second Groups were compared over time for a series of health measures using anonymised linked health records from ONS mortality data, hospitalisation records and GP practice event data.

111. Two analytical methods were used. We began by simply comparing the rates of various health measures in the two Groups on a year-on-year basis. However, we also wished to find a better method that allowed us to compare outcomes after the exact intervention date. To do this, we aligned the health records according to exact intervention dates, comparing rates before and after the interventions, and summarised this for both First and Second groups; since this method was considerably more time-consuming, it was not possible to calculate this for all outcomes within the limited scope of a demonstration project but the method has been documented so that it can be used in future projects.

Key Findings

12. The Project was experimental and, as a demonstration project, had a relatively limited scope. Many lessons were learned about data quality, the challenges associated with the use of newly-linked data sets and the methods required to analyse linked, longitudinal data.

Nevertheless, the Project has demonstrated that data linking can make a substantial contribution to the evidence base; in particular, that linked data can be used to:

- establish retrospective Project populations;
- create 'control' Groups for comparison purposes; and
- anonymously flag individuals who received interventions, taking advantage of 'natural experiment' scenarios to identify the long term effects of policy interventions.

13. Dividing the non-migratory population receiving HEED-recorded energy efficiency interventions into two groups according to when they received their interventions created two distinctly different population groups. When compared over a number of health indicators the First Group consistently displayed poorer health outcomes than the Second; we suggest this is due to the First Group being more deprived.

14. Within the limited scope of the demonstration Project, it was difficult to demonstrate that the changes over time we observed were due to home energy efficiency interventions rather than being explained by other factors or having occurred purely by chance. Further research is recommended to examine the extent to which other factors or interventions e.g. Communities First, may have influenced the outcomes. In terms of demonstrating whether the changes could have occurred by chance, it was not possible to use the kinds of statistical testing that would usually be applied[1]; however, findings where a consistent effect over time was observed are nevertheless worthy of note and suggest some association between the HEED interventions and the health outcomes so are reported using the phrase 'the data suggests'. It should be noted, then, that the Project is experimental and **individual findings should be viewed with caution and as indicative rather than conclusive**. However, because a number of the findings suggest the same general pattern, taken together they represent a somewhat more conclusive picture.

15. In terms of identifying impacts on health outcomes, the number of home energy efficiency interventions completed increased progressively over time. This means that any improvements in health were expected to become apparent on a gradual basis a number of years after the start of the intervention programme (i.e. the year 2000).

16. Calculation of an Excess Winter Mortality Index suggested an

immediate positive impact of HEED-recorded interventions in reducing excess winter deaths.

17. The European Age-Standardised Hospitalisation Rates (EASHR) for 'all Circulatory diseases' suggest a positive effect associated with HEED-recorded interventions. For elective admissions, the effect became observable after 2 to 3 years of interventions; for emergency admissions, the effect became observable after 3 to 4 years. More specific EASHRs for Ischaemic Heart Disease suggest a positive effect 5 to 6 years after interventions started to be made and for Stroke after 4 to 5 years.

18. The EASHRs for 'all Respiratory diseases' suggest some limited indication of a positive effect 4 to 5 years after interventions began. Looking more specifically at hospitalisation for Asthma, the positive effect became measurable slightly longer after interventions began (5 to 6 years).

19. The EASHRs for admissions for 'mood disorders' suggest a positive effect after 3 to 4 years.

20. The EASHRs for Injuries and poisonings showed a positive effect after 3 to 4 years.

21. Based on the sample of data available on GP practice events (i.e. about 47% of the Wales population), the analysis suggests a positive effect on prescribing (i.e. fewer prescribing events). This effect was measurable 4 to 5 years after interventions began for 'all prescribing' and after 7 to 8 years for prescribing for respiratory conditions. The findings for prescribing rates were reinforced by the additional, more sophisticated analysis undertaken using the specific intervention dates.

22. No noticeable effect of home energy efficiency intervention was found on the European Age Standardised Mortality rate for all causes, on the broader category of 'All Mental Health' admissions (as opposed to the 'mood disorders' reported above) and prescribing for infections.

Discussion

23. The analysis methods used for this Project represent a first step in attempting to identify whether home energy efficiency interventions have a positive impact on health. Without further refinement of the methods developed for this Project, the results presented remain speculative and 'question raising' rather than substantive. The analysis, while not allowing statistical significance to be ascribed, has identified some noteworthy improvements in health

that may relate to the home energy efficiency interventions.

24. To allow ourselves to have greater confidence in the findings of this study and the extent to which improvements in health can be considered to have been caused by home energy efficiency interventions, we would need to examine and account for all the elements of underlying population change in much more detail, from the individual causes of hospitalisation and death to the severity of each winter and the detailed effects of economic change.

25. Despite recommending further work to examine other factors that might be contributing to the observed changes, the Project has demonstrated the considerable contribution data linking can make to the evidence base.

Next steps

26. There is a lot of scope for additional analysis of the relationship between home energy efficiency interventions and health outcomes. The more complex method developed to analyse changes in prescribing could be used to examine additional health outcomes. As time goes on, health data for additional years will become available, allowing longer term comparison of the Groups over time. As noted above, further work would also be required to examine and account for all the elements of underlying population change in much more detail. Further work would also be required to explore whether the elapsed times between when the interventions began and the point where changes reach a level where they become observable are plausible, possibly through observation of relative changes after Second Group interventions.

27. WG and other organisations have plans to anonymise datasets for additional topics into SAIL in the coming years, which will provide the ability to monitor a wider range of outcomes.

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

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[1] Please see main report for further discussion.