Short report

Housing standards and excess winter mortality

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The winter peak in mortality has been shown to be related to cold stress in a number of countries.[1] There are 30 000–60 000 excess winter deaths in the United Kingdom annually. In Ireland, the equivalent figure is 1500–2000 deaths. This winter surplus accounts for a rate of seasonal variation in mortality of 15%, among the highest in Europe.[2] Paradoxically, Ireland has a relatively mild winter (mean temperature of 5°C) whereas countries with more severe winter conditions exhibit significantly lower variations in seasonal mortality (for example, Denmark and Norway have mean winter temperatures below freezing but 5% seasonal mortality variation).[2] This paper hypothesises a link between poor housing standards (in terms of thermal efficiency and heating systems) and high rates of excess winter mortality in Ireland.

Methods

Norway was chosen for comparison with Ireland. A comparative analysis of risk factors for cardiovascular[3] and respiratory diseases[4] and of housing standards was undertaken. Registered monthly mortality data from 1986–1995 were obtained from the Irish Central Statistics Office and Statistics Norway. Data on mortality from cardiovascular disease (ICD-code 390–459), respiratory disease excluding influenza (ICD-code 460–486; 490–519) and "all causes" (ICD-code 000–999) were examined. Proportionate and crude mortality rates per 1000 population for cardiovascular and respiratory disease were calculated. Excess winter mortality was calculated by comparing the number of deaths per day during the winter period, December to March, with that of the non-winter period, April to November, for each year. Relative excess winter mortality was calculated by dividing daily excess winter deaths by daily non-winter deaths.[5]

Results

Minimum residential insulation standards in Ireland and Norway differ substantially. Using averages for 1986–1995, roof insulation was 100 mm in Ireland and 200 mm in Norway; wall insulation was 40 mm and 125 mm in Ireland and Norway respectively; floor insulation was 150 mm in Norway and 25 mm in Ireland. Average internal temperatures of 15°C and 21°C are reported for Irish and Norwegian homes respectively.

Winter environmental temperatures are colder in Norway than Ireland (mean (1986–1995) January temperatures of −1.1°C and 5°C respectively). Some 33% of Norwegians and 32% of Irish people smoke daily. Obesity rates are 9% in Norway and 10% in Ireland (obese defined as a body mass index≥30). Detailed, reliable data on diet are difficult to obtain, although it would seem that both countries have relatively high cholesterol diets. Emissions of harmful particulate matter are broadly comparable. Demographically, the two countries are similar. The proportions of the Norwegian and Irish populations ≥65 years are 14.5% and 11.5% respectively. Some 6.9% of the population in both countries are young children (<4 years). The bulk of the Norwegian and Irish populations are 20–55 (49.9% and 47.5% respectively).

The mean (1986–1995) proportionate mortality rate of 46.2% for cardiovascular disease was identical in both countries (table 1). Respiratory disease accounted for a smaller share of total mortality in Norway than in Ireland (9.9% and 13.8%). Crude mortality rates show that cardiovascular disease accounted for 4.1 deaths and 4.9 deaths per 1000 population and respiratory disease accounted for 1.3 deaths and 1.1 deaths per 1000 population in Ireland and Norway respectively. However, mean daily excess winter deaths from cardiovascular disease was 39.6 for Ireland and 6.3 for Norway. The corresponding

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Table 1 Mean (1986–1995) rates of proportionate, crude, excess winter, and relative excess winter mortality from cardiovascular disease and respiratory disease, Ireland and Norway

Mean mortality rates	*Ireland*	*95% CI*	*Norway*	*95% CI*
Proportionate mortality from cardiovascular disease (%)	46.2	45.34, 47.06	46.2	45.26, 47.14
Proportionate mortality from respiratory disease (%)	13.8	13.36, 14.24	9.9	9.36, 10.44
Crude mortality from cardiovascular disease per 1000 population	4.1	3.94, 4.26	4.9	4.76, 5.14
Crude mortality from respiratory disease per 1000 population	1.3	1.25, 1.35	1.1	1.03, 1.17
Excess winter deaths per day from cardiovascular disease	39.6	32.59, 46.61	6.3	5.39, 7.21
Excess winter deaths per day from respiratory disease	24.3	20.08, 28.52	4.3	3.32, 5.28
Relative excess winter mortality from cardiovascular disease	0.25	0.21, 0.29	0.12	0.10, 0.14
Relative excess winter mortality from respiratory disease	0.57	0.46, 0.68	0.4	0.32, 0.48

figures for respiratory disease were 24.3 and 4.3. Relative excess winter mortality from cardiovascular disease was 0.25 in Ireland and 0.12 in Norway; the corresponding figures for respiratory disease were 0.57 and 0.4.

Discussion

This study shows that, while Norway and Ireland exhibit similar (crude and proportionate) rates of mortality from cardiovascular and respiratory disease, relative excess winter mortality from cardiovascular disease in Ireland is 2.1 times that in Norway and for respiratory disease it is 1.4 times the Norwegian figure. A possible significant explanation for this strong seasonality in Ireland is that Irish housing standards are considerably poorer than those in Norway, allowing falls in outdoor temperature to have a much greater impact on internal temperatures. While Norwegian data control surprisingly well for the major risk factors for cardiovascular and respiratory diseases apart from housing standards, there are some factors that have not been controlled for, for example, environmental temperature is lower in Norway than in Ireland and clothing standards and health services may differ. Further research to test the hypothesis that there is a link between housing standards and excess winter mortality would be beneficial. Such research would help to establish whether improved energy efficiency in housing might be an effective preventative intervention to reduce excess winter mortality.

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Conflicts of interest: none.

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Correction

A printer's error occurred in this letter by Professors Porta and Alvarez-Dardet (2000;**54**:559–60). The correct title of the letter should have read "Authors' reply: How is causal inference [not interference] practised in the biological sciences?"