Occasional Paper

No.7

Published on 30 April 2002

The Raised Incidence of Winter Deaths

Neil Bowie, BA (Open), MSc
Graham Jackson, BSc, MA

This short paper presents information, mainly in graphical form, which illustrates seasonal variations in Scottish mortality levels. In particular it focuses on what has become known as 'excess winter mortality'.

Contact: Statistics Customer Services using our Contact Form

Contents

Summary

This short paper presents selected information, mainly in graphical form, that illustrates seasonal variations in Scottish mortality levels. In particular it focuses on measures of what has become known as 'excess winter mortality'. As well as covering information on selected broad cause of death categories, it gives specific consideration to deaths involving hypothermia and influenza.

Key points to emerge include the following:

- Mortality rates are markedly higher in winter months than summer months.
- There are indications that measures of this 'excess winter mortality' have been relatively high in Scotland (and the rest of the UK) when compared with many countries with more extreme winter climates, although further research on this is needed.
- The term 'excess winter deaths' is potentially misleading as it may wrongly be interpreted as a precise number of avoidable deaths.
- 'Excess winter mortality' is particularly pronounced for the elderly.
- Deaths from hypothermia are relatively rare; they do not represent a significant part of 'excess winter mortality'.
- Deaths where influenza has been mentioned on the death certificate are also relatively infrequent ...
- ... however there is a very strong relationship between the numbers of deaths from all causes and measures of influenza activity.
- Additional winter deaths are particularly associated with respiratory and circulatory diseases.

Introduction

It has long been recognised by epidemiologists that mortality rates in Scotland exhibit a seasonal pattern with relatively low levels in the summer and peaks in the winter. Chart 1, which displays the average daily deaths by month in Scotland over the period 1989 to 2001, shows this clearly. Not surprisingly this pattern reflects the seasonal variations in temperature. This is illustrated by Chart 2 which presents average monthly minimum temperatures based on selected weather stations in Scotland.

Chart 1: Average daily deaths by month, 1989-2000

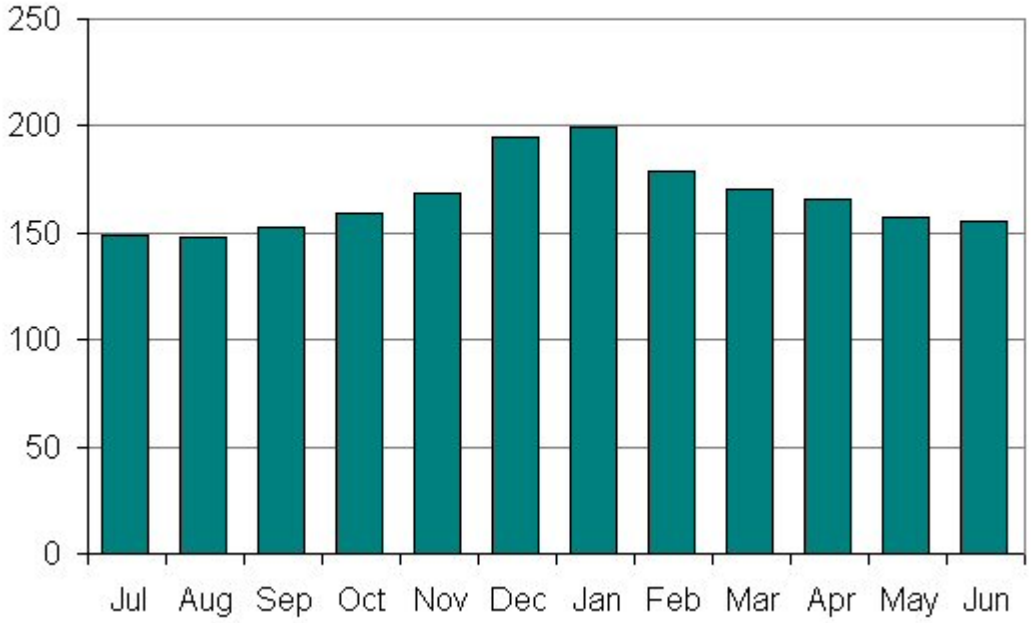


Chart 2: Mean minimum monthly temperatures, 1989 - 2000

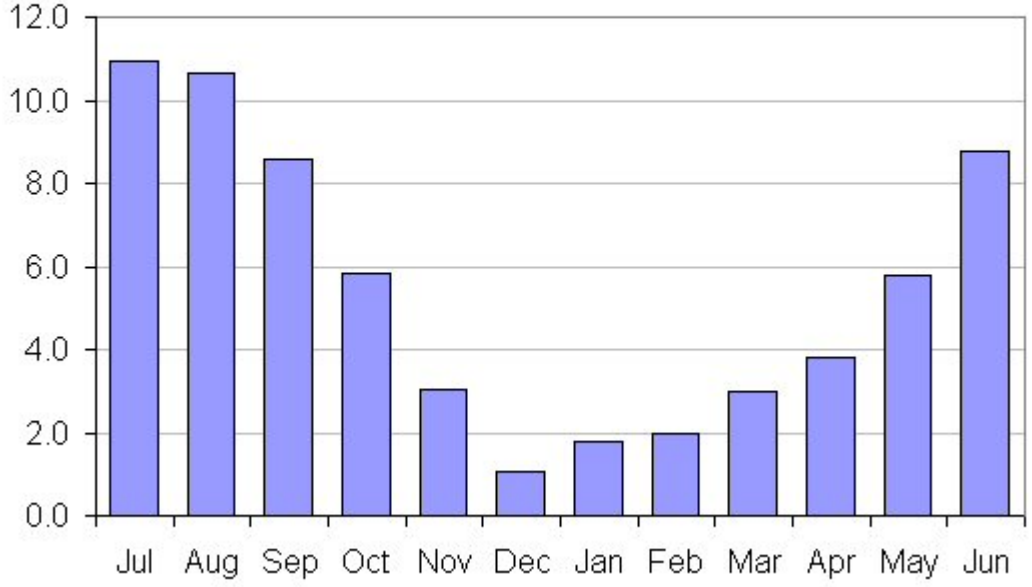
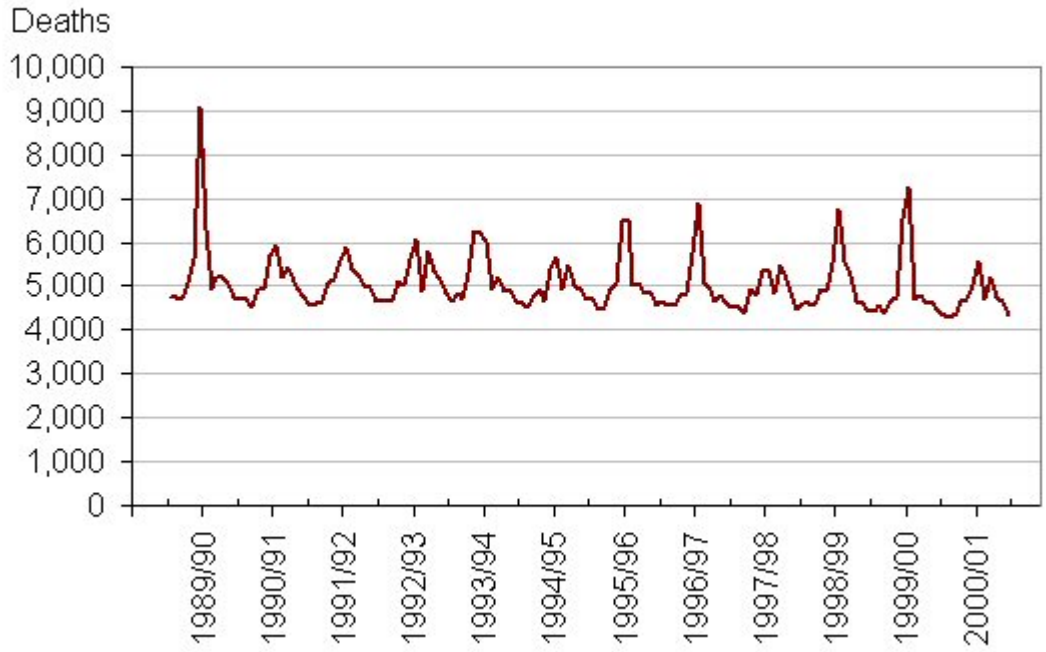


Chart 3, which plots monthly deaths for 1989/90 to 2000/01, shows that within the general pattern there are significant variations in the size and timing of the winter peaks. In particular there is a very high peak in December 1989 that coincides with the last major influenza epidemic in Scotland.

Chart 3: Deaths by month, 1989/90 to 2000/01



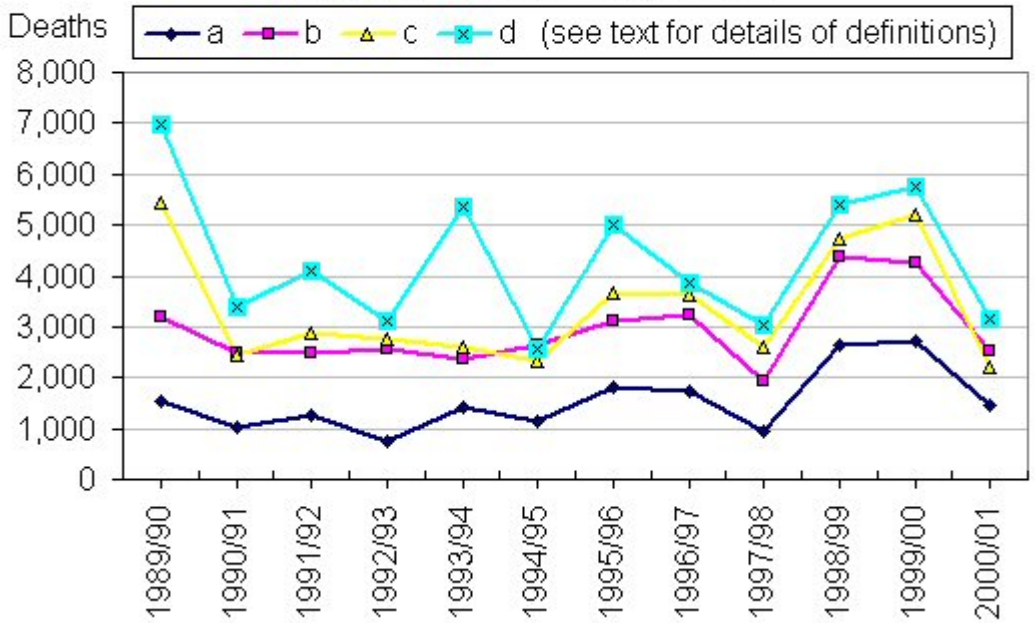
Summary measures of 'excess winter mortality'

Various summary measures have been used to assess trends in 'excess winter mortality' and the relative size of the winter peaks. A selection of these are defined below:

a. deaths in quarter 1 (January - March) minus the quarterly average;
b. deaths in quarter 1 (January - March) minus deaths in quarter 3 (July - September);
c. deaths in December - March minus the average of deaths in the preceding August - November and the following April - July;
d. deaths in October - March minus deaths in the preceding July - September and the following April - June.

All of these definitions attempt to compare a 'winter' period with either a 'summer' period or the rest of a twelve month period. Chart 4 presents these four measures for the period 1989/90 to 2000/01. As can be seen, the resulting totals, often called 'excess winter deaths', vary significantly.

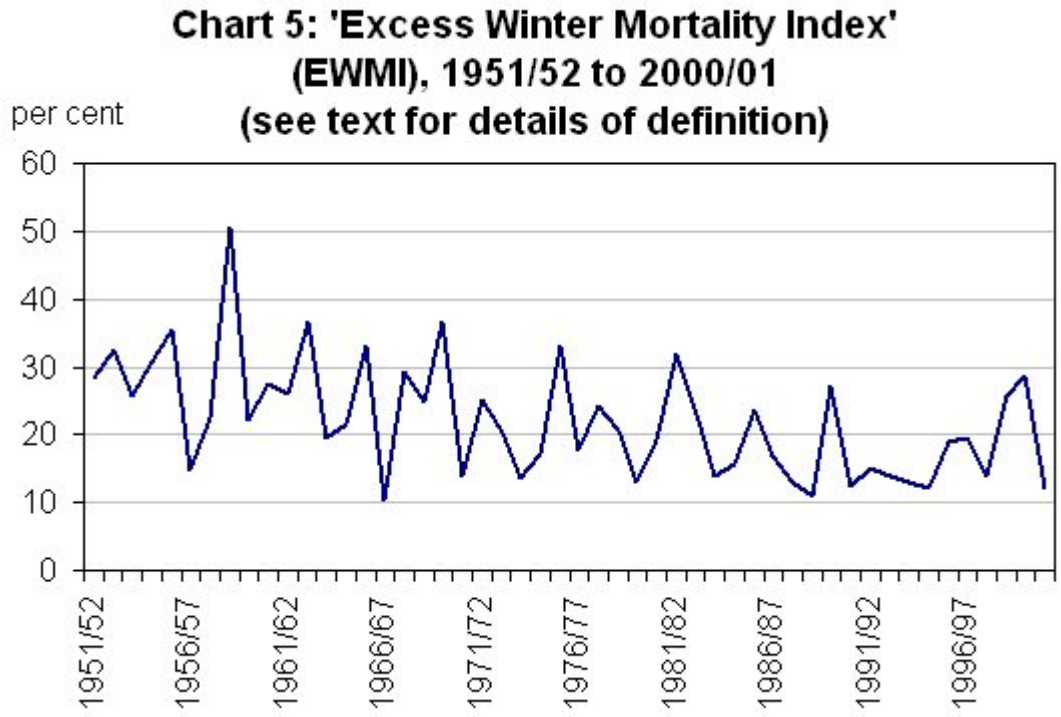
Chart 4: Different definitions of 'Excess Winter Deaths', 1989/90 to 2000/01



In recent years the Office for National Statistics (ONS) has used the third definition outlined above in answers to parliamentary questions and in statistical publications about 'excess winter mortality'. In general the winter peaks shown for this measure can be seen to coincide with those seen in Chart 3 for the period 1989/90 - 2000/01. However there is one clear exception - the winter of 1993/94, where the November peak is missed by the ONS definition.

In effect these measures are rather arbitrary and the absolute numbers of 'excess winter deaths' they produce are difficult to interpret. In particular, it should be not be assumed that all 'excess winter deaths' are avoidable. However any of these summary measures could be used to monitor longer-term trends in winter mortality levels and to provide figures for comparison with other countries.

A variation of the ONS definition is the ratio of the number of deaths in December to March to the average number of deaths in the preceding and following four-month periods. Chart 5 shows this 'excess winter mortality index' (EWMI) for the second half of the twentieth century. Overall it shows a marked reduction in 'excess winter mortality' during the last fifty years.

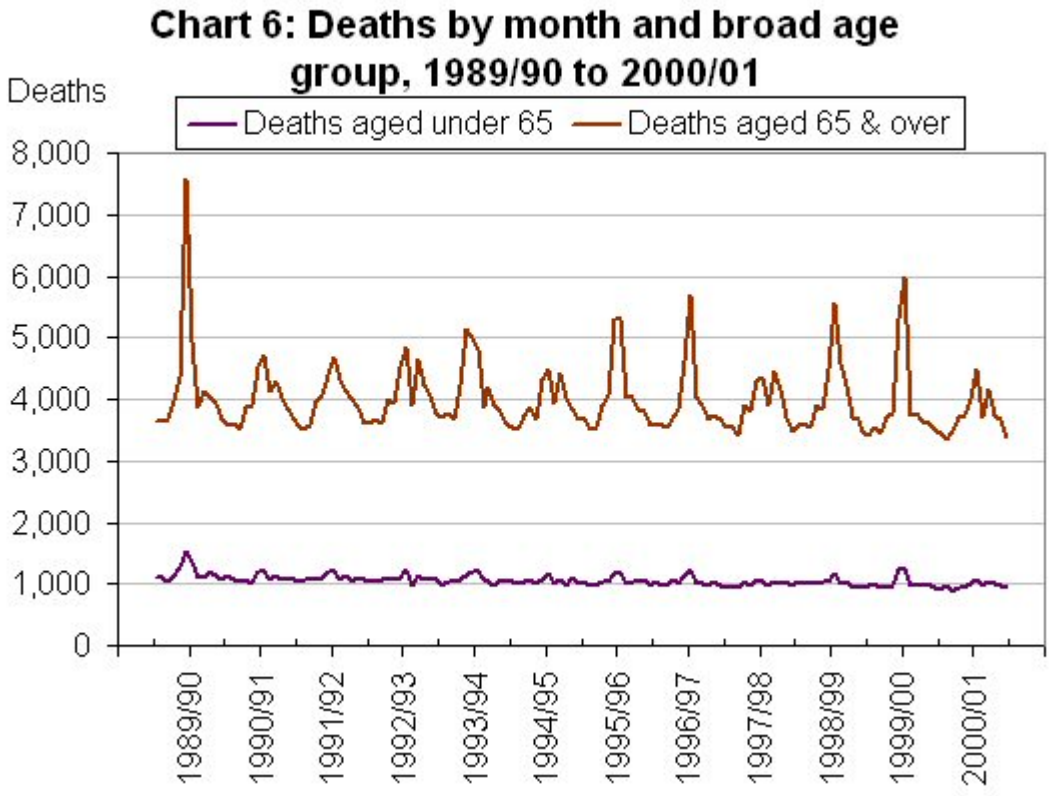


International comparisons have shown that Scotland, like the rest of the United Kingdom, has relatively high levels of 'excess winter mortality', even when compared with countries with more extreme winters. EWMI figures given by Curwen (1997) showed that 'excess winter mortality' in the United Kingdom was approximately double that of Scandinavian and other Northern European countries. However the EWMIs for the Irish Republic, Spain, Portugal, and Italy were comparable to, or higher than those for the countries of the UK.

There is still no consensus on the underlying reason for this observation.

Winter mortality and the elderly

Chart 6 shows monthly deaths over the period 1989/90 to 2000/01 split into those aged under or over 65. As can be seen the winter peaks are particularly marked for the elderly. The rest of this paper concentrates on deaths of persons aged 65 and over.



Cause of death

Two particular causes of death often thought to have a particular relevance to winter mortality are hypothermia and influenza. The following paragraphs consider these in turn

- Hypothermia

For many years the General Register Office for Scotland (GROS) has monitored hypothermia-related deaths in Scotland. These have been defined as all deaths where the term 'hypothermia' was mentioned on the certificate of cause of death. Also included have been a small number of deaths where a related term such as 'exposure' has appeared. Over the last twenty years the number of hypothermia-related deaths has fallen from around 200 to around 100. Some 70 per cent of cases have been persons aged 65 and over. Table 1 gives figures for persons aged 65 and over during the period 1989/90 to 2000/01. These figures must be qualified, however, as it is not always possible to identify the extent to which low environmental temperature was the primary cause of the hypothermia or whether the hypothermia resulted from a medical condition such as a stroke. What is certain is that hypothermia was recorded as the underlying cause of death in under a half of these deaths; and moreover such deaths included some cases where death occurred outdoors. Given the qualifications outlined above, it is clear that deaths from hypothermia represent only a very small fraction of 'excess winter mortality'.

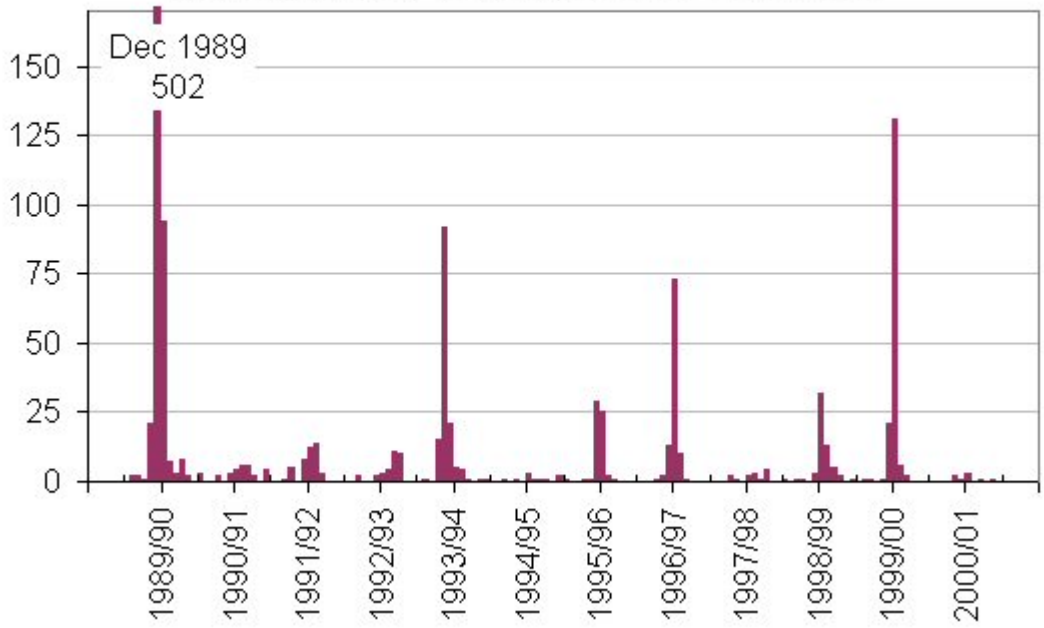
Table 1: Deaths aged 65 & over with a mention of hypothermia or influenza

	All deaths aged 65 & over	Deaths with a mention of:	
		Hypothermia	Influenza
1989/90	51,403	135	642
1990/91	47,628	97	30
1991/92	47,641	74	43
1992/93	48,837	89	32
1993/94	49,657	125	141
1994/95	47,027	91	10
1995/96	48,594	71	60
1996/97	47,656	73	100
1997/98	46,598	47	13
1998/99	48,206	75	59
1999/00	47,461	70	163
2000/01	44,922	59	8

- Influenza

Table 1 also gives the numbers of deaths aged 65 and over where influenza was mentioned on the medical certificate of cause of death. For some 80 per cent of these deaths influenza was recorded as the underlying cause of death. As with hypothermia-related deaths, it shows that deaths directly attributed to influenza represent a small proportion of 'excess winter mortality'. However Chart 7, which shows the monthly pattern of deaths aged 65 and over with a mention of influenza, reveals a pattern that matches that of the all causes totals shown in Chart 6.

Chart 7: Deaths aged 65 & over with a mention of influenza, by month, 1989/90 to 2000/01



Measures of the incidence of influenza

Since 1972 the Scottish 'flu spotter scheme' has been collecting data on the incidence of flu-like illness. The information, which is collated by the Scottish Centre for Infection and Environmental Health (SCIEH), is provided by some 90 GP practices in 13 health board areas. The sample practices cover approximately 10 per cent of the Scottish population. Returns are made on a weekly basis for the period October to May. The data collected cover all ages. More information on the flu spotter scheme is available from the SCIEH website.

Chart 8 presents the weekly flu spotter data for 1989/90 to 2000/01, expressed as cases per 100,000 population, together with weekly deaths aged 65 and over for the same period. As can be seen there is a striking correlation between the peaks of flu activity and mortality. Chart 9 shows the same information for the four years to 2000/01. This shorter time span permits two of the key relationships to be seen more clearly. First, in those winters with a pronounced peak of influenza activity (e.g. 1998/99 and 1999/2000) the peak of deaths extends for a week or so beyond the flu spotter peaks. Secondly, even in years with low influenza activity (e.g.1997/98 and 2000/01) there is a clear and close relationship between the two data series.

Chart 8: Weekly deaths and 'flu spotter' rates, 1989-90 to 2000-01

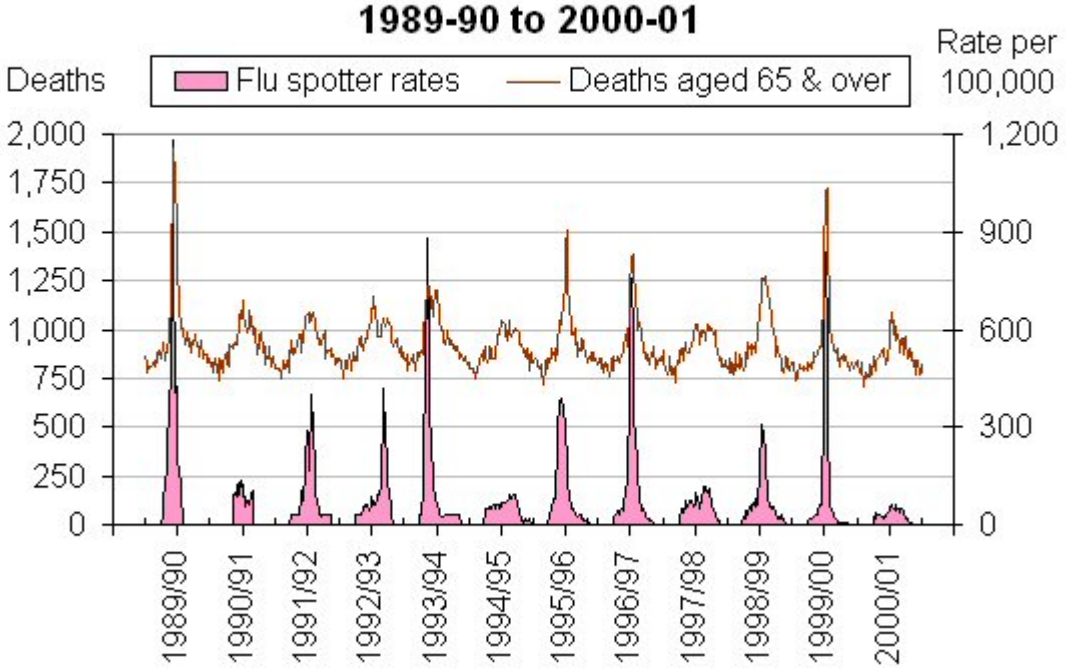
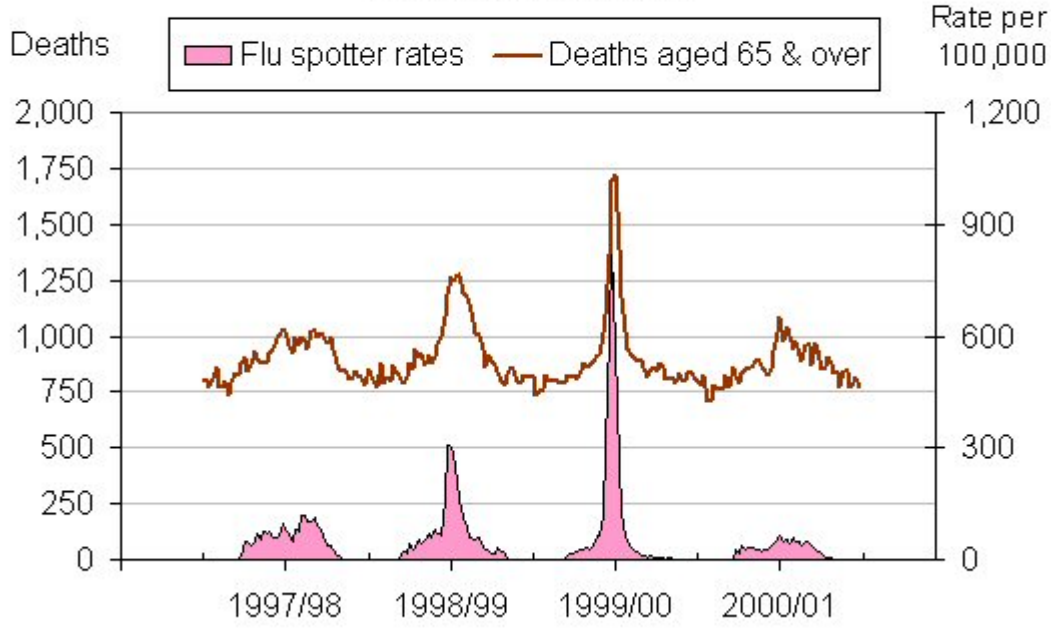


Chart 9: Weekly deaths and 'Fluspotter' rates, 1997/98 to 2000/01

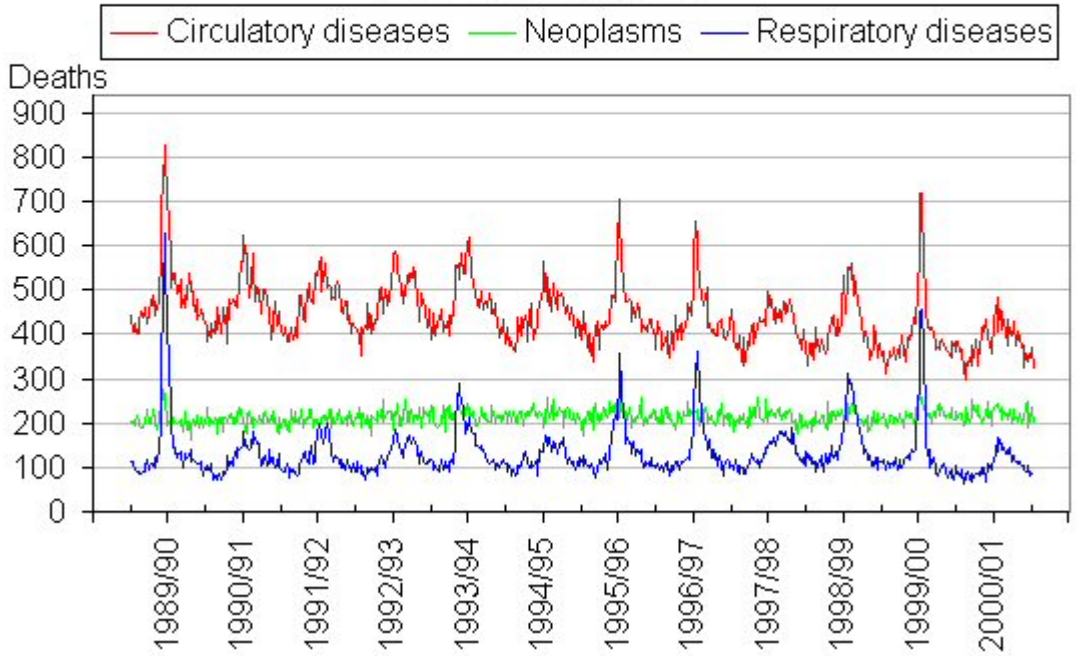


Despite the close relationship revealed by Chart 8 and Chart 9, the evidence from Table 1 and Chart 7 on the numbers of deaths where influenza is mentioned on the death certificate suggests that the impact of influenza is likely to be underestimated in routine cause of death statistics. This phenomenon of 'hidden influenza deaths' has been noted before (e.g. Curwen, Dunnell and Ashley, 1990).

Other causes of death

Chart 10 shows trends in selected broad cause of death categories for the period 1989/90 to 2000/01. As might have been expected, deaths from respiratory diseases show marked increases that coincide with the peaks in Chart 8. However, there are similar marked increases for circulatory diseases. Indeed, although the additional deaths for this cause are proportionately lower than for respiratory causes they represent similar absolute increases. On the other hand deaths from neoplasms (almost all are malignant neoplasms i.e. cancer) show minor increases only during periods of high influenza incidence.

Chart 10: Weekly deaths aged 65 & over, selected cause of death categories, 1989-90 to 2000-01



Discussion

Whilst the charts presented in this paper show a clear link between marked winter mortality peaks and the incidence of influenza, they also show that there is still 'excess winter mortality' in years when influenza incidence is at a low level. In particular Chart 10 shows that deaths from circulatory and respiratory diseases display marked seasonality for all years.

There has been much research into why this should be the case; and why, as mentioned above, it is greater in Scotland (and rest of UK) than in many other countries with more extreme winters. A number of key studies are mentioned briefly below (full references are given at the end of the paper). Whilst there a number of common themes, as yet there is no consensus on the precise physiological and environmental factors that give rise to the relatively high levels of winter mortality experienced in the United Kingdom.

Curwen (1997) concluded that when the effects of influenza were disregarded there was a significant correlation between 'excess winter mortality' and temperature, but he was unable to shed any light on the observed differentials between England and Wales and most of the countries in Northern Europe. In their 1997 Lancet article, the Eurowinter Group reported on a detailed study of the relationships between inside and outside temperatures, and the types of winter clothing worn, in various European regions. They concluded that there was some evidence that people in countries with relatively mild winters did not take appropriate protective measures during cold spells. In a Scottish study, Gemmell et al (2000) expressed a similar view. They concluded that ' ... the strength of this relationship [between temperature and mortality] is a result of the population being unable to protect themselves adequately from the effects of temperature rather than the effects of temperature itself'. Recent research by Wilkinson et al (2001) has given detailed consideration to the impact of housing conditions on 'excess winter deaths' in England. This study concluded that ' ... indoor temperature and factors associated with poor thermal efficiency of dwellings, including property age, are associated with increased vulnerability to winter death from diseases of the heart and circulation'.

Finally, ongoing work of special interest is a project entitled 'Forecasting the nation's health', funded by the Department of Health, currently being undertaken by the Meteorological Office under the direction of Dr William Bird. As well as looking for links between meteorological data and patterns of morbidity, and therefore use of the health service, the project team has been considering the relatively high levels of winter mortality in the United Kingdom. More information about this work may be found on the Met Office website.

Notes:

1. All data on which the charts are based are available from GROS.
2. Data for 2001 presented in the charts are provisional.

References:

Curwen M, 1997. Excess winter mortality in England and Wales with special reference to the effects of temperature and influenza. The Health of Adult Britain 1841 -1994. Volume 1, 205 - 216. The Stationery Office.

Curwen M, Dunnell K, and Ashley J, 1990. Hidden influenza deaths: 1989-90. Population Trends, 61: 31 - 33.

Gemmell I, McLoone P, Boddy FA, Dickinson GJ, and Watt GCM, 2000. Seasonal variation in mortality in Scotland. International Journal of Epidemiology, 29: 274 - 279.

The Eurowinter Group, 1997. Cold exposure and winter mortality from ischaemic heart disease, cerebrovascular disease, respiratory disease, and all causes in warm and cold regions of Europe. The Lancet, 349: 1341 - 1346.

Wilkinson P, Armstrong B, and Landon M, 2001. Cold comfort: The social and environmental determinants of excess winter deaths in England, 1986-1996. The Policy Press. A summary of the findings of this work may also be found on the website of the Joseph Rowntree Foundation.