

## **Fluctuations in age-standardised death rates, and underlying numbers of deaths, for areas within Scotland**

**Please Note:** Different versions of this note have given different figures. This first version (published in August 2012) used the rates that were available then. They were for 2006 to 2011, and were calculated using the original population estimates for those years and the 1976 European Standard Population (ESP). The current version (published in March 2014) uses the rates available then: for 2006 to 2012; calculated using the rebased population estimates and the 1976 ESP. There are some small percentage differences from the rates in the first version.

Age-standardised death rates (calculated using the European Standard Population, or ESP), for all ages and for people aged under 75, for Local Authority and NHS Board areas, are available from the [Age-standardised death rates](#) section of the National Records of Scotland (NRS) website. Also provided are age-standardised death rates, and the underlying numbers of deaths, for some causes of death for NHS Board areas.

Such figures should be used with caution, particularly in the case of figures for under 75s, or for areas which have relatively small populations, or for some specific causes of death. This is because, if the underlying numbers of deaths are relatively small, they and the calculated death rates may be affected by relatively large percentage year-to-year fluctuations.

The potential for fluctuations is greatest in the case of figures for deaths aged under 75 from specific causes of death, which are likely to have the smallest underlying numbers of deaths. For example, the age-standardised death rate for cancer (per 100,000 population, calculated using the ESP) for people aged under 75, for Scotland as a whole, declined from 136.5 in 2006 to 125.0 in 2012. However, there were some apparently large percentage changes in the figures for some NHS Board areas, such as:

- Ayrshire & Arran - 13% increase from 123.4 in 2006 to 139.2 in 2007; 14% fall from 132.5 in 2011 to 113.5 in 2012;
- Borders - 17% fall from 126.0 in 2006 to 104.6 in 2007, followed by 9% rise to 114.5 in 2008; 18% fall from 103.0 in 2010 to 84.8 in 2011, then 24% rise to 105.1 in 2012;
- Western Isles - 26% increase from 129.0 in 2008 to 162.6 in 2009, followed by 15% fall to 137.5 in 2010, and 29% fall from 132.4 in 2011 to 94.3 in 2012.

In these cases, the underlying numbers of deaths from cancer of people aged under 75 in each year were (very roughly, on average, for the years concerned) around 600 for Ayrshire & Arran, around 170 for Borders, and around 50 for Western Isles, so the likely ranges of year-to-year variation are about +/-8% for Ayrshire & Arran, +/-15% for Borders and +/-28% for Western Isles. These 'likely ranges' are calculated using the method described in the note on how fluctuations in the numbers of deaths may be represented as the outcome of a Poisson process. As happens occasionally, fluctuations may be outwith the expected likely range.

There are some relatively large percentage year-to-year fluctuations in the figures for deaths of all ages from specific causes. For example, the age-standardised death rate for cancer (per 100,000 population, calculated using the ESP), for Scotland as a whole, declined from 205.7 in 2006 to 194.7 in 2012.

However, there were some apparently large percentage fluctuations in the figures for some NHS Board areas, such as:

- Borders - 12% fall from 192.1 in 2006 to 168.4 in 2007, followed by 7% rise to 179.6 in 2008; 13% fall from 171.5 in 2010 to 149.2 in 2011, followed by 12% rise to 166.6 in 2012;
- Dumfries & Galloway - 9% fall from 193.6 in 2007 to 176.6 in 2008, followed by 4% rise to 184.1 in 2009;
- Western Isles - 18% increase from 201.9 in 2008 to 238.7 in 2009, followed by 12% fall to 209.8 in 2010; 25% fall from 208.5 in 2011 to 156.3 in 2012.

In these cases, the underlying numbers of deaths from all causes in each year were (very roughly, on average) around 350 for Borders, around 500 for Dumfries & Galloway, and around 100 for Western Isles, so the likely ranges of year-to-year variation are about +/-11% for Borders, +/-9% for Dumfries & Galloway and +/-20% for Western Isles.

There are also some quite large fluctuations in the age-standardised death rates, for people under 75, for all causes of death. For example, the age-standardised death rate for people aged under 75 (per 100,000 population, calculated using the ESP), for Scotland as a whole, declined from 394.5 in 2006 to 335.6 in 2012. However, there were a number of fluctuations in the figures for individual NHS Board areas, such as:

- Ayrshire & Arran - 6% increase from 392.0 in 2006 to 416.7 in 2007 and then 6% decrease to 391.5 in 2008;
- Dumfries & Galloway - 6% increase from 330.0 in 2006 to 349.2 in 2007 and then 7% decrease to 323.8 in 2008;
- Fife - 4% increase from 347.9 in 2007 to 360.7 in 2008 then 3% decrease to 349.7 in 2009.

In these cases, the underlying numbers of deaths of people aged under 75 in each year were (very roughly, on average) around 1,750 for Ayrshire & Arran, around 650 for Dumfries & Galloway, and around 1,450 for Fife, so the likely ranges of year-to-year variation are about +/-5% for Ayrshire & Arran, +/-8% for Dumfries & Galloway and +/-5% for Fife.

It is more difficult to recognise the potential unreliability of any given year's figure, or year-to-year change, when one uses death rates than when one uses the underlying numbers, because death rates do not have the 'warning' that is implicit in the (relatively) small size of the actual numbers. One is more likely to recognise that a '50%' increase in deaths from a particular cause in (say) Clackmannanshire could well be simply a year-to-year fluctuation if one sees that the number has risen from (say) 10 to 15 than if one sees that it has increased from (say) 20 to 30 per 100,000 population. Users of figures for areas within Scotland may be 'misled' by the apparent precision and theoretical technical superiority of age-standardised rates, when looking at the numbers of deaths would help them to understand better the actual scale of the problems. Therefore, NRS has no plans to produce more detailed age-standardised death rates (e.g. for particular types of cancer): being based on even smaller numbers of deaths, they could be subject to even larger percentage year-to-year fluctuations.