Population And Migration Statistics (PAMS) Committee Scotland

The introduction by National Records of Scotland of the 2013 European Standard Population

Introduction

1. The European Standard Population (ESP) is an artificial population structure which is used in the weighting of mortality or incidence data to produce age-standardised rates. It was introduced in 1976. Because the age-structures of European countries' populations have changed significantly since then, Eurostat (the statistical institute of the European Union) has brought the ESP up to date. The structure of the new (2013) ESP has been agreed by EU Member States. Members of the Committee are invited to:

    - note the forthcoming introduction of the 2013 ESP for use in official statistics in Scotland; and

    - give their views on the questions (below) on the introduction of the 2013 ESP in the statistics published by National Records of Scotland (NRS).

Background

2. The National Records of Scotland (NRS) website has a section Age-standardised death rates calculated using the European Standard Population which provides several tables of age-standardised death rates that were calculated using the ESP. It also provides introductory and background notes which explain why age-standardised rates are used and describe the structures of both the 1976 ESP and the 2013 ESP. For ease of reference, these appear as Annexes 1 and 2 of this paper.

3. The key point to note about the 2013 ESP is that its age-structure is much closer than that of the 1976 ESP to the age-structure of the current population. The 2013 ESP gives much greater weight to the older age-groups than the 1976 ESP. As a result, because mortality rates tend to increase with age, age-standardised death rates will generally be higher when calculated using the 2013 ESP than when calculated using the 1976 ESP. However, because there will usually be an increase in the value of a calculated rate for every year, there will often be relatively little effect on the percentage change in the rate over time (of course, there will be exceptions: the age-standardised rate for a disease which mainly affects young people may be lower when calculated using the 2013 ESP than when using the 1976 ESP, because the 2013 ESP gives less weight to the younger age-groups).

4. The Office for National Statistics (ONS) is consulting, on behalf of the Government Statistical Service (GSS) as a whole, regarding the implementation within the UK of the 2013 ESP. Details of the consultation (which closes on 3rd October) are available via the ONS website www.ons.gov.uk . Users of NRS's statistics were informed of the consultation in a 'ScotStat News' e-mail sent on 27 August (which also announced the publication on that day of many Vital Events statistics for 2012).

5. Section 3 of ONS's consultation paper includes examples of rates calculated using the 1976 ESP and the 2013 ESP, which show that the latter are generally much higher, and percentage changes over time are not greatly affected.

6. Office for National Statistics is consulting on behalf of the GSS as a whole because several government bodies publish statistics that will be affected. However, because organisations vary in their responsibilities, priorities and resources, they will not necessarily all follow the same approach.

7. NRS, Scottish Government (SG) Health Analytical Services, and the Information Services Division (ISD) of NHS National Services Scotland have discussed how they might introduce the 2013 ESP in their statistics. They felt that, given:

    - the forthcoming publication of rebased population estimates for 2002 to 2010 (to take account of 2011 Census results - see paper PAMS(13)12; and

    - the proposal (which is subject to the approval of the Scottish Parliament) that the boundaries of NHS Boards should be revised, with effect from 1 April 2014, so that they do not cross the boundaries of local authorities;

    1 April 2014 might be a good date to introduce the 2013 ESP for at least some of their statistics. However, it may not be feasible to have a single implementation date for all NRS, SG and ISD statistics (e.g. because of publication schedules, when data become available, and limited staff time). Or, users might prefer the changes for certain statistics to be made on other dates. So**,** what NRS, SG and ISD do will be influenced by the views expressed by users of their statistics (e.g.) in discussion at meetings of this Committee and of other representatives of users, and in the responses to the consultation which ONS is running. NRS, SG and ISD may also have to take account of when GSS colleagues implement the 2013 ESP, to ensure that comparable statistics are available for Scotland and other parts of the UK.

How should NRS introduce the 2013 ESP in the statistics that it publishes?

8. We would welcome the views of Committee members on a number of points.

9. First, when should NRS introduce the 2013 ESP for its statistics? NRS could calculate age-standardised death rates using the 2013 ESP once it has produced the rebased mid-year population estimates for 2002 to 2010. Therefore, the earliest that NRS could publish age-standardised death rates calculated using the 2013 ESP is in December 2013 (such as on the same day as NRS publishes revised birth, marriage and death rates for 2002 to 2011, which NRS will calculate using the rebased population estimates). However, as indicated above, it may be better to wait until 1st April 2014. Other possibilities include August 2014 (when NRS publishes the age-standardised death rates for 2013) and whenever ONS first publishes age-standardised death rates calculated using the 2013 ESP.

10. Second, how far back should NRS calculate age-standardised death rates using the 2013 ESP? As 1974 is the first year in its Vital Events statistical database, NRS could calculate such rates back to 1974 (for those geographies for which population estimates are available for those years). However, NRS's current tables do not include 1974 to 1978 because it used a different classification for the causes of deaths registered then. Section 4.4 of the ONS consultation document suggests that statistical series might be revised back to 1994, as that is roughly the mid-point between 1976 and 2013 (the argument being that, because the 1976 ESP is not appropriate for calculating rates for

2013, the 2013 ESP would be equally inappropriate for calculating rates for 1976.) Another possibility is 1996, because that is when the current local authorities came into existence.

11. Third, for how long should the NRS web site provide separate tables of rates calculated using the two versions of the ESP? There could well be a period in which some users of NRS statistics want to continue to use rates which were calculated using the 1976 ESP (e.g. in connection with targets which were set for the next year or two, and for which users may feel it best to assess the outcome using rates based on the 1976 ESP), whereas other users want to use rates which were calculated using the 2013 ESP (e.g. for comparison with other countries' rates on that basis). NRS could publish separate versions of its 'age-standardised death rates' tables, calculated using the two ESPs (with the basis of each set of tables being clearly described) for as long as enough users require both sets of rates to justify the work involved. With effect from the date on which NRS implements the 2013 ESP, to reduce the likelihood of people inadvertently using the 1976 ESP-based figures, the 'Main Points' would refer only to the rates that were calculated using the 2013 ESP, and the tables of rates calculated using the 1976 ESP would be moved to a 'lower' web page (so as to be available only to those who choose to use them).

Other points

12. A minor technical point is that the 2013 ESP distinguishes between the '90 to 94' and '95 and over' age-groups, but NRS's mid-year population estimates for areas within Scotland have only a single '90 and over' age-group (and this will remain the case for at least a few years). Therefore, NRS will be unable to calculate age-standardised rates for areas within Scotland on the precise basis that is specified in the 2013 ESP. However, any resulting inaccuracy will be small, because the age-groups concerned represent only 1% of the 2013 ESP (90-94: 0.8%; 95+: 0.2%). In any case (see section 4.5 of the ONS document) it may be best to use '95+' as the upper age-group only for calculating 'national' rates, with '90+' as the upper age-group for rates for lower geographies. In the longer-term, these age-groups may account for an increasing percentage of the population, and, in due course, NRS will consider expanding its mid-year population estimates to provide their numbers separately.

13. Finally, the ONS document's questions about the method of implementation and the order of priority do not apply in the case of NRS's introduction of the 2013 ESP. Because NRS publishes only half-a-dozen tables of age-standardised death rates that were calculated using the ESP, it can introduce the '2013 ESP' versions of all those tables at the same time.

14. Members of the Committee are invited to comment on the questions that appear above, and on any other aspect of these matters that they wish to raise.

NRS: Vital Events
1 October 2013

Annex 1 'Introduction' note from National Records of Scotland (NRS) web site

Age-standardised death rates calculated using the European Standard Population

Introduction

The simplest death rate is the so-called 'crude' death rate, which is calculated from the total number of deaths and the size of the population. However, because the probability of death tends to increase with age, changes in the age-distribution of the population could have an effect on any apparent trend shown by the 'crude' death rate. The extent (if any) to which death rates are really changing over time should be seen if one uses a time-series of rates which have been 'age-standardised' to adjust for changes in the distribution of the population by age, and so show more clearly any trend in mortality.

Similarly, if two countries' populations have different age-distributions, a comparison of their 'crude' death rates could give a misleading impression. Again, using 'age-standardised' death rates will remove the effect of the differences between the countries' age-structures, and should show which one has the higher mortality.

Age-standardised death rates that are comparable over time and between different countries can be calculated using the European Standard Population (ESP). This is a theoretical population, defined as having a particular distribution by age, which does not change. The original ESP was introduced in 1976. Since then, age-structures may have changed greatly, so (in summer 2013) Eurostat (the European Union's statistical institute) introduced a new version of the ESP, whose distribution by age was designed to represent the 'average' of the age-structures of most European countries in the years from 2011 to 2030. In order to distinguish between the original ESP and the new one, they may be referred to as 'the 1976 ESP' and the 'the 2013 ESP' respectively.

Two points in particular should be noted about age-standardised rates that were calculated using the ESP:

- the first applies to rates that were calculated using either version of the ESP. Because the ESP's age-distribution differs from that of the Scottish population, an age-standardised death rate which was calculated using the ESP is not directly comparable to a 'crude' death rate which was calculated simply from Scotland's number of deaths and total population - so the age-standardised death rates which appear here are not comparable to the 'crude' death rates which appear elsewhere on the web site; and
- the second applies mainly to rates that were calculated using the 1976 ESP. In general, age-standardised death rates which were calculated using the 1976 ESP are lower than the actual death rates for Scotland - this is because the 1976 ESP gives more weight to the younger age-groups, which usually have lower death rates. There will probably be much less difference between age-standardised deaths rates calculated using the 2013 ESP and the actual death rates for Scotland, because the age-distribution of the 2013 ESP is much closer to the (current) age-distribution of the population of Scotland.

More information about the 1976 ESP and the 2013 ESP is available in a separate note, which provides additional Background on these matters.

Annex 2 ‘Background’ note from NRS web site

Age-standardised death rates using the European Standard Population

Background

A time-series of death rates which have been ‘age-standardised’ should show more clearly if there is any underlying trend in mortality because changes in the values of an ‘age-standardised’ rate should not be affected by any changes in the distribution of the population by age. Similarly, a comparison of the ‘age-standardised’ death rates for different countries will be unaffected by any differences in the age-distributions of their populations.

The World Health Organisation (WHO)’s rationale for using age-standardised mortality rates is as follows.

> The numbers of deaths per 100 000 population are influenced by the age distribution of the population. Two populations with the same age-specific mortality rates for a particular cause of death will have different overall death rates if the age distributions of their populations are different. Age-standardized mortality rates adjust for differences in the age distribution of the population by applying the observed age-specific mortality rates for each population to a standard population.

WHO adds that:

> The age-standardized mortality rate is a weighted average of the age-specific mortality rates per 100 000 persons, where the weights are the proportions of persons in the corresponding age groups of the WHO standard population.

and:

> [The] WHO Standard Population is defined to reflect the average age structure of the world's population over the next generation, from the year 2000 to 2025.

For the purposes of producing age-standardised death rates solely for European countries, the WHO Standard Population is not particularly appropriate, because its age-structure differs markedly from those of European populations (for example, 26% of the WHO Standard Population is aged 0-14 compared with 16% of the population of Scotland in 2010; for ages 65 and over, the corresponding figures are 8% and 17%). Instead, use is made of the European Standard Population (ESP). This is a theoretical population, which is defined as having a particular distribution by age. The first version of the ESP was introduced in the 1976, and the second version in 2013. The age-distributions of the two versions are shown on the next page. Because National Records of Scotland (NRS) has not yet published any age-standardised death rates that were produced using the 2013 ESP, the comments in subsequent paragraphs relate only to the 1976 ESP.

Demographic changes since the 1976 ESP was developed mean that it is not an ideal standard population for use today, but (compared with the WHO Standard Population) its age structure is a bit more like Scotland's: for example, the 1976 ESP has 22% aged 0-14 and 11% age 65 and over - both these figures are nearer to the Scottish percentages than are the WHO Standard Population's percentages (see the figures that were given earlier).

The 1976 and 2013 European Standard Populations: distributions by age

Age-group	1976 European Standard Population	2013 European Standard Population
*0 **	*1.6% **	1.0%
*1 - 4 **	*6.4% **	4.0%
0 - 4	8%	5.0%
5 - 9	7%	5.5%
10 - 14	7%	5.5%
15 - 19	7%	5.5%
20 - 24	7%	6.0%
25 - 29	7%	6.0%
30 - 34	7%	6.5%
35 - 39	7%	7.0%
40 - 44	7%	7.0%
45 - 49	7%	7.0%
50 - 54	7%	7.0%
55 - 59	6%	6.5%
60 - 64	5%	6.0%
65 - 69	4%	5.5%
70 - 74	3%	5.0%
75 - 79	2%	4.0%
80 - 84	1%	2.5%
85+ ** / 85 - 89	1%	1.5%
90 - 94 **	(included in 85+)	0.8%
95+ **	(included in 85+)	0.2%

* the definition of the ESP distinguishes between ages "0" (or "under 1") and "1-4", and specifies a separate weight for each of those age-groups. However, they are combined into a single "0-4" age-group (whose weight is the sum of the weights for the separate age-groups) when NRS calculates age-standardised death rates using the ESP.

** the 1976 ESP has a single age-group for "85+": it does not separate the 85-89, 90-94 and 95+ age-groups in the way that is done in the 2013 ESP.

Some points to note about age-standardised death rates that were calculated using the 1976 ESP

Because the distribution of the ESP by age differs from that of the Scottish population by age, a death rate which has been standardised using the ESP is not comparable to an actual death rate which was calculated using Scotland's total number of deaths and its total population. For example, the overall death rate for Scotland in 2010 was 10.3 per 1,000 population, or 1,033 per 100,000 population - but it is only 656 per 100,000 population when age-standardised using the 1976 ESP.

In general, death rates which were age-standardised using the 1976 ESP will tend to be smaller than the actual death rates for Scotland. This is because the 1976 ESP gives less weight to the older age-groups (which usually have higher death rates) than the actual population of Scotland (for example, as mentioned earlier, in 2010, 17% of the population of Scotland was aged 65 and over, compared with only 11% of the 1976 ESP). So, when a weighted average of the death rates for different age-groups is produced by applying the 1976 ESP's age-distribution to the age-specific death rates, relatively high weights are given to the (usually) low death rates of the younger age-groups, and relatively low weights are given to the (usually) higher death rates of the older age-group. As a result, the final 1976 ESP-weighted average death rate will be disproportionately influenced by the death rates of the younger age-groups, and therefore will usually be lower than the actual overall death rate.