

SCOTTISH MORTALITY IN A EUROPEAN CONTEXT

1950 – 2000

An analysis of comparative mortality trends

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This work is an extension of the comparative mortality analysis which formed part of 'Understanding the Health of Scotland's Population in an International Context'; a report produced by Professor David Leon and his team at the London School of Hygiene and Tropical Medicine for the Public Health Institute of Scotland. In producing these new analyses, we would especially like to thank Professor Leon for providing the STATA programs to allow the original analysis to be updated, for allowing us to reproduce many parts of his original report and for his helpful comments and advice.

EXECUTIVE SUMMARY

The results presented in this report, which update previously published analyses, provide a contemporary summary of Scotland's mortality position relative to other Western European countries, and describe emerging trends. Note: the European country trends described cover the period 1950-2000, although Scottish figures are presented up to 2003.

All-cause mortality by age group

In terms of deaths from all causes, there have been significant reductions in mortality across all age groups in Scotland and more widely across Western Europe over the last half-century. *Infant* and *childhood* mortality rates in Scotland have declined greatly since 1950, as in other Western European countries, and current differences in rates between countries are relatively small.

It is in the *working age* population (defined as 15-74 years in this analysis) that Scottish mortality rates are highest in comparison to other Western European countries. Despite a reduction in overall mortality over the last 50 years in Scotland, the rate of reduction has not matched that in other Western European countries. As a result, Scotland's relative mortality ranking has deteriorated and, since 1978, it has had the highest overall mortality among working age men in Western Europe and for women since 1958.

Trends in all-cause mortality among the *over 75* population have been steadily downward and by 2000 the Scottish mortality rate was very close to the Western European mean.

Mortality for specific causes in the working age population (15-74 years)

Patterns of mortality for specific causes in the working age population vary greatly by cause and by gender. Of the six cancers analysed (oesophageal, stomach, colorectal, pancreatic, lung and breast), many show improvements, although often Scotland still has one of the highest rates among the countries compared.

Trends in *oesophageal cancer* mortality are a particular cause for concern. Scotland now has the highest rates in Western Europe for both men and women and the rate for men has been rising steadily since the 1960s. In contrast, *stomach cancer* mortality has declined steadily since the 1950s for men and women and is close to the Western European average. *Colorectal cancer* mortality has reduced for both sexes since the 1950s, and although still high, appears to be converging towards the Western European mean, particularly for women. Levels of *pancreatic cancer* mortality are close to the Western European mean for men and women and have dropped for men since a peak in the 1970s.

Levels of *lung cancer* deaths among Scottish men and women have been the highest (or close to the highest) in Western Europe over the last 50 years. However, the trend in lung cancer mortality differs greatly between men and women. For men, lung cancer mortality has declined after peaking around 1975 and, by 2003, the mortality rate had halved from its peak level and there is a notable downward convergence of the Scottish rate towards the Western European mean.

The trend in women is very different to that observed in men: mortality rates rose steadily from the 1950s, stabilising at the beginning of the 1990s before showing signs of a decline in the late 1990s. It is notable that Denmark's rate has been rapidly catching up that of Scotland and in the most recent period (1996-2000) the mortality rate among Danish women overtook Scotland's rate.

Breast cancer mortality rates in Scotland increased up until the mid-1980s, but have been falling since the mid-1990s and most recently it appears that the fall in mortality in Scotland has been steeper than in many other countries, resulting in a degree of convergence toward the Western European mean.

Ischaemic heart disease (IHD) mortality in Scotland has been the highest (or close to the highest) in Western Europe for the last 50 years. However, there have also been significant declines in mortality over this period. IHD mortality rates among working age men have dropped by 64% since 1972 and most recently, there are signs that the Scottish rate is starting to converge towards the Western European country mean. Female mortality has dropped by 72% since 1950 and is now clearly converging with the Western European rate.

The pattern of *cerebrovascular disease* mortality is slightly different to that of ischaemic heart disease: rates for both sexes have been falling since 1950, the decline being particularly consistent among women. Scottish mortality rates, although still the second highest amongst Western European countries, appear to be steadily converging with the Western European country mean for both men and women.

Mortality due to *chronic obstructive pulmonary disease* in men has declined since the 1960s, although this trend has recently levelled off, while for women, the pattern is very different, with mortality having risen slowly since 1955. In men and women of working age, Scotland has one of the highest mortality rates from this cause of any country in Western Europe.

Scottish mortality rates from *chronic liver disease, including cirrhosis* have risen steeply since the early 1990s among men and women. By 2000, Scotland had the second highest mortality rate for men – slightly below the Austrian rate – while the rate for women has been the highest in Western Europe since 1998.

The level of mortality in Scotland from *external causes* among working age men has not altered appreciably over the past 50 years, although clearly rates for specific causes within this category (e.g. suicide (see below)) and within particular age bands may show different patterns. The Scottish mortality rate for men and women is close to the Western European country mean.

Trends in *suicide* mortality among the working age population differ by gender. There has been a rise among men since 1975; the mortality rate is now twice the level it was in 1955 and the Scottish rate now exceeds the Western European mean. In women, mortality from suicide is much lower relatively and has remained more stable; it is currently still at the same rate as it was in 1955 and remains close to the Western European mean.

Mortality from *motor vehicle accidents* in Scotland peaked in the 1970s, but has declined since to below the level it was at in 1950. Currently, mortality from this cause is lower in Scotland than in the majority of Western European countries.

1. BACKGROUND AND INTRODUCTION

1.1 Background

In February 2003 Professor David Leon and colleagues at the London School of Hygiene and Tropical Medicine produced a detailed report focused on understanding Scotland's health in an international context¹. This report reviewed health outcomes - principally mortality - and health determinants comparatively, attempted to explain Scotland's current health position and made recommendations for further research.

A major component of this work was a comparative mortality analysis, which used WHO population and mortality data to examine mortality trends from 1950 to 2000 in 20 European countries. This descriptive work was carried out because of the "absence of any existing systematic description of how mortality rates in Scotland compare with those in other European countries", and as part of an overall aim of improving understanding of the health of Scotland in an international context.

The aim of this report is to update the comparative analysis trends produced by Leon et al, in order to provide a more up-to-date comparison of Scotland's mortality rates relative to other European countries and to describe developing trends.

1.2 Introduction

The analysis approach adopted has remained virtually unchanged from that taken by Leon and colleagues in 2003. However, given changes in coding and availability of data, some minor changes to the analyses have been necessary and these are detailed in the 'Data Sources and Methods' section.

As with Leon's original work we have considered mortality in four different age groups (infancy, childhood, working age adults and the elderly) and then focussed on specific causes of death among working age adults. In doing so – and again in line with the original work – we have studied and compared Scottish trends with those for a selection of other European countries and against the mean, minimum and maximum Western European rates.

The main differences in the updated results are that:

- *Scottish data are available up to 2003 (as opposed to 2000 previously)*
- *Data for the other countries have been updated and this has allowed another five year period (1996-2000) to be including in the comparison of Western European country means, minimums and maximums and overall ranking*

A description of what these analyses show is given in the results section, while the actual mortality trend data are presented as a series of accompanying excel graphs, which can be accessed (along with this report) on the [ScotPHO website](#); see also the 'table of figures' (Table 5) at end of this report.

¹ Understanding the Health of Scotland's Population in an International Context - a review of current approaches, knowledge and recommendations for new research directions, Leon D, Morton S, Cannegieter S & McKee M, February 2003 (2nd revision)

2. DATA SOURCES AND METHODS

2.1 Mortality and population data

Mortality data were obtained from the World Health Organization Statistical Information System (WHOSIS) website (<http://www.who.int/whosis>). This WHO Mortality Database contains counts of deaths by country, 5-year age group, sex, individual year and cause-of-death, coded according to the International Classification of Diseases (ICD) in use at the time of death registration in each country. These are official national statistics as they have been transmitted to the WHO by the authorities of the countries concerned, having been compiled on the basis of reports provided at registration of death. In addition, corresponding mid-year population estimates were also available from the same WHO website.

As an exception to the above, the mortality and population data for Scotland *in 2003* have been taken directly from files provided by the General Register Office for Scotland (GROS).

One final point to make in regard to these data is that both the population and the death registrations data are periodically updated and revised retrospectively by WHO. Thus, mortality rates derived using these data are liable to change. In fact, comparison of Leon's previous analysis with the updated results described later in this report shows this to be the case.

Changes in mortality trends caused by such revisions are difficult to quantify, but some general comments can be made:

- revisions have clearly affected the mortality rates for some countries more than others (e.g. infant mortality rates for Portugal have changed considerably from those reported in Leon's original report)
- changes tend to be most prominent in data for more recent periods
- minor changes in Scottish mortality trends are noticeable from 1981 onwards, presumably due to updates to population data

Finally, it is worth noting that one of the potential knock-on effects after such revisions is that Scotland's ranking compared to other countries may change slightly, particularly in the most recent periods. These points will be worth bearing in mind for the future, if these analyses are updated.

2.2 Countries and time period

These data were analysed for 20 European countries (see Table 1²) for the period 1950-2000, where available. The smallest Western European countries (e.g. Iceland, Luxembourg) were not included because mortality rates were too variable on a year by year basis. For Eastern Europe, Poland and Hungary were included but only for country-specific comparison, and were not included in the comparisons of mortality ranking over time, which were limited to Western European countries (described later on in more detail (see 2.4.2)). For Germany, the rates from former Western Germany were used until 1989 and those from the united Germany starting from 1990. The

² The grouping of countries used is that which Leon used previously.

drawback of this approach is that as mortality rates in Eastern Germany have generally been higher than in Western Germany, this leads to a slight 'step effect' in the mortality trends for Germany around 1990. Nevertheless, considering that Germany only acts as a comparison country for Scotland and is not a focus of interest per se, we felt that this approach was adequate to the task in hand.

It is worth noting also that there are gaps in data availability³ for particular countries in specific years: Spain has no data for 1970; Poland has no data for 1997 & 1998; data for Belgium are only available to 1997; data for Greece are only available from 1961.

2.3 Causes of death

2.3.1 Choice of age groups and causes

Mortality was studied for all causes by age group: infant mortality (under 1 year), child mortality (1-14 year olds), working age mortality (15-74 year olds) and mortality in the elderly (75 years and older)). Specific causes of death were examined only for the adults aged 15-74 years, as it is in this age group that Scotland's mortality is worst in the context of Western Europe. The causes selected for analysis were the major ones together with several of particular interest such as liver disease. The 13 causes include: oesophageal, stomach, colorectal, pancreatic, lung and breast cancer; ischaemic heart disease; cerebrovascular disease; chronic obstructive pulmonary disease; chronic liver disease, including cirrhosis; external causes; suicide; and, motor vehicle accidents.

2.3.2 International Classification of Diseases (ICD)

Causes of death have been coded according to the International Classification of Diseases since the beginning of the 20th century. This has been revised approximately every 10 years. The ICD revisions that have been used after 1950 are ICD6 to ICD10. Table 2 lists the 13 causes analysed, along with their relevant ICD codes under each revision. Table 3 indicates the range of years in which each ICD revision was used by country. In Switzerland an aggregated version of the ICD10 coding scheme (see Table 2) has been used for data from 1995 onwards. The use of this aggregated data limits the comparisons that can be made at a cause specific level for Switzerland. It is not possible to derive comparable figures for chronic obstructive pulmonary disease, motor vehicle accidents and chronic liver disease, including cirrhosis using this aggregated coding system and so Switzerland is missing from the comparative graphs for these causes.

2.3.3 Coding

As five different ICD revisions have been used over the past 50 years, this invariably has given rise to some problems with coding, due to changes in nomenclature, methods of diagnosis, classification and coding instructions. Two issues need to be considered: first of all, coding practices may change when a new ICD revision is introduced, and secondly there will be differences in certification and coding between countries in any particular period/ ICD revision. For some countries, this may lead to

³ Based on the content of the WHO database at the date of extraction – December 2004.

'step effects' in the curve at the time when a new ICD-version was introduced. We have chosen to use the codes that we deem to be most compatible with Scottish practice i.e. those which minimise any inflections in the Scottish curves, even though this might occasionally cause sudden discontinuities in the trends for other countries. Analysis of these discontinuities is beyond the scope of this report.

There are several causes of death for which specific problems are known to exist:

Ischaemic heart disease: The main problem here lies in the broadening of the category 'arteriosclerotic heart disease, including coronary disease' from ICD6/7 to 'ischaemic heart disease' in ICD8. The term 'coronary heart disease' has progressively replaced more non-specific terms such as myocardial degeneration and arteriosclerosis⁴.

Chronic obstructive lung disease: This is a relatively recent term which has also been described as well as chronic bronchitis and emphysema. Until 1968, it was often categorised with 'other respiratory diseases', for which reason this category has been included for ICD revision 6/7 and 8. Only with the ninth ICD revision was it given a category of its own¹.

2.4 Statistical aspects

2.4.1 Age-standardised rates

When comparing mortality rates between different countries, it is necessary to take account of differences in the age composition of populations both between countries and over time. To do this we have adjusted the rates using direct age standardisation. This method averages age-specific rates in a study population using as weights the population distribution of a specified population. For this report, the European standard population was used⁵ (See Table 4).

2.4.2 Western European country means, minimums and maximums

For each year considered, we have calculated the Western European country mean as a simple average of all the rates. In addition, for each year we have identified the minimum and maximum rate among the comparison countries. For each cause of death, these rates are displayed in a graph for the period 1955 to 2000. These cut-off points were chosen due to the availability of data for most countries over this period. However, it should be noted that four countries of the 20 countries originally selected were excluded from the calculation for various reasons - Belgium⁶, Greece⁷, Poland and Hungary⁸ - leaving 16 contributing to the calculation. In each graph, mortality rates for Scotland are superimposed, to illustrate Scotland's position in Europe.

⁴ Doll R., Darby S., Whitley E. Trends in mortality from smoking-related diseases. In Charlton J. and Murphy M. (eds), *the Health of Adult Britain 1841 -1994*. Office for National Statistics, London 1997.

⁵ Waterhouse, J. *et al.* (eds). *Cancer incidence in five continents*. Lyon, IARC, 1976 (Vol. 3, p1456). In *1995 World Health Statistics Annual*. World Health Organization. Geneva 1996.

⁶ Data on deaths in Belgium at the time of extraction from the WHO database were only available up to 1997.

⁷ At the time of extraction from the WHO database Greece had no population data for 2000 and mortality data were only available from 1961.

⁸ Hungary and Poland are excluded because their recent history as communist countries makes them less comparable to other parts of Western Europe.

2.4.3 Rank position

To quantify Scotland's position in Europe, we calculated every country's rank position for each year. Subsequently the mean rank position for every five-year period from 1956 to 2000 was determined, to take account of random variation. For each five-year period, Scotland's rank position has been added to the graphs that contain the minimum, maximum and mean rates. The country with the highest mortality rate was defined as rank position one, and that with the lowest as rank position 16.

3. RESULTS

Note: in this section mortality rates are reported as per 100,000 per year. One exception to this is infant mortality rates, which are reported as deaths per 1000 live births per year.

Note also that the data described below relates to Scottish trends for the years 1950 to 2003 and European trend comparisons between 1950 and 2000.

3.1 All cause mortality

3.1.1 Infants (0-1 years old) (*fig AIM – A7F*)

Scottish trends

Mortality rates for both boys and girls have declined significantly: from 43 to 5 and from 34 to 5 per 1000/year respectively between 1950 and 2003; by 2003, therefore, the infant mortality rates for boys and girls had fallen by just over 85% from the levels in 1950.

Comparison of Scottish trend with Western European country mean

Since the early 1960s, Scottish rates for both boys and girls have quite closely followed the Western European country mean. Before that time Scottish rates were slightly lower.

Position in Europe

In the 1950s, there were huge differences between European infant mortality rates with very high rates in Southern Europe and Portugal in particular. However over the last 50 years infant mortality rates have decreased in all countries and converged. Current differences between countries are very small: in 2000, minimum and maximum rates ranged between 4 and 7 per 1000/year for boys and 3 and 5 per 1000/year for girls, respectively. It is notable though that infant mortality rates in Scandinavian countries (with the exception of Denmark) have been the lowest in Western Europe, consistently.

3.1.2 Children (1-14 years old) (*fig BIM – B7F*)

Scottish trends

Since 1950, mortality rates in children have decreased considerably, dropping from 114 to 20 for boys and from 86 to 16 for girls.

Comparison of Scottish trend with Western European country mean

Rates in Scotland in the 1950s were close to the European minimum, and have remained low since that time. The subsequent decrease in the Western European country mean has meant that Scottish rates have been close to this mean since 1975.

Position in Europe

In the 1950s, huge differences existed between the mortality rates of Western European countries. In Southern Europe, mortality was very high, with an extreme of four times Scotland's rate occurring in Portugal. Rates in all countries have since decreased and converged on the Western European country mean, and recent European rates are actually very similar to Scottish rates (with the exception of Portugal, Hungary and Poland, where they remain slightly higher). For this reason, rank position is not particularly informative in this context.

3.1.3 Adults (15-74 years old) (fig CIM – C7F)

Scottish trends

Following a period of reasonable stability since the 1950s, male mortality rates have been decreasing since the 1970s. The mortality rates in 1950 and 2003 were 1253 and 692 respectively; this represents a decrease of 45%. The female trend has been somewhat different, with a steady decrease apparent since the 1950s. The female mortality rate has declined from 881 in 1950 to 412 in 2003, representing a decrease of 53% over the period.

Comparison of Scottish trend with Western European country mean

In men, Scottish mortality rates have been falling at a similar pace to the Western European country mean and have, accordingly, remained consistently higher than this mean; in 2000, the Scottish rate was 24% above the Western European country mean. In women however, the Western European country mean has fallen at a faster pace and, consequently, the difference between these rates has increased; in 1955 the mortality rate for Scottish women was 17% higher than the Western European country mean, but by 2000 this relative excess had risen to 37%.

Position in Europe

The decline in mortality has been greater in other European countries than Scotland. Therefore, apart from a few exceptions⁹, Scotland has had the highest mortality rates for men in Western Europe since 1978 and for women since 1958.

Over the last half-century trends in mortality in most Western European countries have run approximately in parallel to those in Scotland, but with consistently lower mortality rates. Finland had very high mortality rates for men until 1970, since which time there has been a steep decline. In 2000 it had the third highest male mortality of the sixteen Western European countries, lower than Portugal and higher than Ireland. Other countries that have had high mortality rates at some point during the past 50 years are Northern Ireland, Denmark, Ireland, Austria, Germany and Portugal. Trends in Hungary and Poland are generally rather different from the rest of Europe, although the most recent female mortality rates in Poland are very similar to those in Scotland.

A number of countries have actually made a 'step-change' in rank position over the past 50 years: for men the positions of Ireland and Denmark deteriorated and those of Austria and France improved; for women the positions of England & Wales, Denmark, the Netherlands and Norway deteriorated whilst those of Finland and Spain improved.

Danish mortality trends are of particular interest. Denmark's mortality ranking relative to other countries has worsened over the period 1950-2000 for both men and women. In 1955 Denmark had the 4th lowest male mortality among the countries in this comparison, but by 2000, after a rise in the mortality rate from the 1960s to 1980 and then a slight reduction in recent years, Denmark had the 5th highest mortality. For women, a similar, if more pronounced, trend is apparent. From having the 4th lowest mortality in 1955, mortality rates actually increased slightly between the mid-1970s and 1990s before dropping again more recently, leading to Denmark having the 2nd highest mortality in 2000.

⁹ The exceptions are: between 1965-75 when in a few years female mortality rates were slightly higher in Ireland; in 1995 and 1999 when mortality among Danish women was higher; and in 1990 when Finnish men had slightly higher mortality.

3.1.4 Elderly (over 75 years old) (fig DIM – D7F)

Scottish trends

Mortality rates decreased slightly in men until 1980, following which there was a steadier decline to 11257 in 2003: this represents an overall relative reduction in mortality of 34% since 1950. For women, a different pattern is observed. The mortality rate declined fairly fast until 1985, but subsequently there was not much further decrease: the mortality rate reached 8475 in 2003, representing a reduction in the mortality rate of 41% since 1950.

Comparison of Scottish trend with Western European country mean

The maximum, minimum and mean Western European rates follow an approximately parallel pattern, with a decline in men since 1975 and a steady decline in women since 1955. The Scottish mortality rate for men in this age group has consistently fallen between the Western European country mean and maximum rates, although in 2000 the Scottish rate had dropped to a level slightly below the mean. In women, the Scottish rate used to lie close to the mean but fell at a slower rate than the Western European country mean in the 1980s and 1990s. However, in 2000, the rate for women was close to this mean again.

Position in Europe

Trends are quite varied between the European countries: some rates have declined, others have remained stable or displayed peaks in mortality rates. Scotland has been ranked third for much of the time since 1955 and currently is ranked 5th among Western European countries. Countries that have had higher rates than Scotland in the past are Northern Ireland, Finland, Ireland, Austria, Germany and Portugal. Rates in Hungary and Poland have changed little and are also currently higher than the Scottish rates. It is worth noting that in the most recent years (from 1998 onwards) some countries' rates have fluctuated quite erratically. This may reflect inconsistencies in data quality and thus it may be prudent to not read too much into data trends where such fluctuations are apparent.

3.2 Cause specific mortality (15-74 year olds)

3.2.1 Oesophageal cancer (fig E1M – E7F)

Scottish trends

The mortality rate for men has been steadily increasing since the beginning of the 1970s and the rate in 2003 was more than 60% higher than in 1950. The mortality rate for women having risen slightly from the late 1960s into the 1990s, by 2003 had returned to approximately the same level as it had been in the early 1950s. In 2003, 318 men and 100 women (aged 15-74), respectively, died from this cause.

Comparison of Scottish trend with Western European country mean

Until 1970, Scottish rates in men were close to the Western European country mean. Since then Scottish rates have risen steadily away from the mean and are now the highest in Western Europe. In women, the mean rate also remained stable thus resulting in a divergence with the Scottish rate. Since 1980, Scotland has had - with the exception of a few individual years - the highest female mortality rate from oesophageal cancer in Western European countries.

Position in Europe

In men, a wide variety of trends are observed: England and Wales and Northern Ireland follow a similar pattern to Scotland, but at a lower level; in Northern Europe rates are decreasing in Finland but increasing in Denmark; France and Switzerland previously had very high rates which subsequently fell and are now clearly lower than in Scotland. Rates in Ireland, Netherlands and Belgium are also increasing but at a lower level. In the other countries, mortality has remained reasonably stable, with the exception of Hungary, where mortality has increased sharply since 1980 and is now only slightly below the level in Scotland.

In women, mortality rates in most countries have remained low and stable. Exceptions are Northern Ireland and Ireland where the mortality rates have been very similar to the Scottish rate. In Finland, mortality has decreased sharply from the highest rate to one of the lowest.

In both men and women, Scotland's rank position has deteriorated to be 1st for men and women from the mid-1990s.

3.2.2 Stomach cancer (*fig F1M – F7F*)

Scottish trends

Mortality due to stomach cancer in Scotland has been steadily decreasing since 1950 for both men and women. In 2003, 216 men aged 15-74 died of stomach cancer in Scotland with the rate of mortality in that year being one-fifth of that in 1950; while among women there were 71 deaths, equating to a rate of mortality that was one-tenth of that of 1950.

Comparison of Scottish trend with Western European country mean

Rates have been steadily decreasing throughout Europe, and the rate in Scotland has followed the Western European country mean rate in both men and women.

Position in Europe

Countries with higher rates than Scotland include Portugal and Italy for both men and women. Finland, which had very high rates up until 1980, now has very similar rates to Scotland. In Hungary and Poland, mortality from stomach cancer has always been higher, and is declining at a parallel rate to Scotland in men, whereas in women the gap in mortality has narrowed and mortality is only slightly higher than in Scotland.

3.2.3 Colorectal cancer (*fig G1M – G7F*)

Scottish trends

Colorectal cancer mortality rates in men fell between 1955 and the early 1980s and after a period of stability dropped again from 2000 onwards. By 2003, the mortality rate for males had dropped 44% compared to the rate in 1955. In women, the rate has fallen steadily since 1955 and by 2003 had more than halved from the 1955 level. In 2003, 448 men and 331 women (aged 15-74), respectively, died from this cause.

Comparison of Scottish trend with Western European country mean

The Western European country mean has risen slightly for men over the period and has fallen since the mid-1970s for women. For both men and women the Scottish rate has gradually converged with the mean.

Position in Europe

Up until the early 1970s, Scottish rates were the highest in Western Europe for men and women. In the most recent period Scotland had the 3rd highest male mortality rate among the comparator countries and the 5th highest level of female mortality. Rates in Denmark and Ireland have been on a par with Scotland or higher for both males and females, while in Switzerland and Southern European countries, particularly Greece, mortality has been consistently lower.

3.2.4 Pancreatic cancer (*fig H1M – H7F*)

Scottish trends

Mortality due to cancer of the pancreas in men rose from 1955 to a peak in the early 1970s, and with the exception of another isolated peak in 1977 has declined steadily since. There is a suggestion of a similar, but less pronounced pattern among women. In 2003, 194 men and 168 women (aged 15-74), respectively, died from this disease.

Comparison of Scottish trend with Western European country mean

The Western European country mean has also shown a pattern of increase followed by slight decrease among men, while for women an initial slight increase has given way to a stable mean rate. Rates among Scottish men and women have both converged downwards towards the Western European country mean, and are now fluctuating around it.

Position in Europe

For both men and women Scotland has improved its rank position relative to other Western European countries since 1955: male mortality in Scotland was ranked 2nd highest of the countries compared in 1956-1960, but only 11th highest in 1996-2000; the ranking of female mortality over the same period shifted from 1st to 10th highest. These changes are partly a consequence of sharp increases in mortality in Southern European countries, and less pronounced increases in countries such as Austria and Germany.

3.2.5 Lung cancer (*fig I1M – I7F*)

Scottish trends

Mortality from lung cancer in men declined after having reached a peak around 1975 and by 2003 the mortality rate had halved from this peak level. The trend in women is very different to that observed in men: mortality rates rose steadily from the 1950s, stabilising at the beginning of the 1990s. In the most recent years there is a suggestion of a slight decline. In 2003, there were 1302 male deaths from lung cancer among 15-74 year olds and 936 deaths among women.

Comparison of Scottish trend with Western European country mean

The Western European country mean for men also shows a pattern of increase followed by decrease. However, the timing and extent of these trends is later and less marked than for Scotland, resulting in a pronounced downward convergence of the Scottish rates towards the mean. In women, the Western European country mean has been increasing, but at a much slower pace, resulting in a very marked divergence of the Scottish rate away from the mean.

Position in Europe

Scottish lung cancer mortality in women has consistently been the highest in Western Europe for women over almost the entire period. However, Denmark's rate has been

rapidly catching up that of Scotland and in the most recent period (1996-2000) the mortality rate among Danish women overtook Scotland's rate. The mortality rate for men has been the highest among the countries compared for virtually the entire period, although, since 1983, the rate in Belgium - not included in the comparison group due to only having data available to 1997 - has been higher.

3.2.6 Breast cancer (fig J1F – J7F)

Scottish trends

Breast cancer mortality rates in Scotland increased up until the mid-1980s. Since the mid-1990s they have been falling. In 2003, there were 681 female deaths from breast cancer among 15-74 year olds.

Comparison of Scottish trend with Western European country mean

The Western European country mean has followed a similar - although slightly less pronounced - trajectory. However, most recently it appears that the fall in mortality in Scotland has been steeper than in many other countries, resulting in a degree of convergence.

Position in Europe

Scottish rates are not the highest in Western Europe, but do lie close to the maximum. The mortality rates of other parts of the UK, Denmark, Ireland and Belgium are very similar to those in Scotland. In contrast, the mortality rates in Scandinavian countries (excluding Denmark), Germanic countries and in Southern European countries are all considerably lower than in Scotland.

3.2.7 Ischaemic Heart Disease (IHD) (fig K1M – K7F)

Scottish trends

Mortality rates for IHD in men increased from the 1950s, reached a plateau for a few years and then started declining at an increasingly steep rate from the early 1970s; since 1972 the rate has dropped by 64%. The trend in women is very different, being one of intermittent decline that has become steadier and more marked since the early 1980s; female mortality has dropped by 72% since 1950. In 2003, 3098 men and 1336 women (aged 15-74), respectively, died from this cause.

Comparison of Scottish trend with Western European country mean

In general, the Scottish rates for men have run parallel to the Western European country mean, which also had a peak around the 1970's. Most recently, it appears that the curves are starting to converge.

For women, the Western European country mean slowly fell whilst the Scottish rate remained stable until the late 1980s, meaning the two curves diverged slightly. Since then, the Scottish rate has started to fall and is now clearly converging with the Western European average rate.

Position in Europe

There are huge differences between the IHD mortality rates of European countries. Scottish rates in women have consistently been the highest in Western Europe since the 1950s. Among men, Scotland was displaced from the number 1 position by Finland in the 1960s and 1970s, but has clearly had the highest mortality in Western Europe since the 1980s. Rates in Northern Ireland have been particularly close to those of Scotland throughout the past 50 years. In Eastern Europe rates are steadily

increasing, and rates in Hungary have recently overtaken Scottish rates in both men and women.

3.2.8 Cerebrovascular disease (fig LIM – L7F)

Scottish trends

The pattern of cerebrovascular disease is different to that of ischaemic heart disease: rates for both sexes have been falling since 1950, the decline being particularly consistent among women. By 2003, male mortality from cerebrovascular disease had fallen by 71% from the level in 1950 and by 80% for women. In 2003, 771 men and 670 women (aged 15-74), respectively, died from this cause.

Comparison of Scottish trend with Western European country mean

The Western European country mean and minimum have also declined, as has the maximum rate since 1980. As with IHD mortality, Scottish mortality appears to be converging with the Western European country mean in men. In women, there has also been a gradual convergence toward the Western European country mean.

Position in Europe

Portugal has extremely high mortality rates, especially in men. However, after Portugal, Scotland has the highest mortality rates in Western Europe, although recently mortality rates for males and females in Greece (not included in the 16 country comparison) have exceeded those for Scotland. Other Western European countries with high mortality are Northern Ireland, Finland and Ireland.

3.2.9 Chronic Obstructive Pulmonary Disease (fig M1M – M7F)

Scottish trends

Following a peak around 1960, mortality due to chronic obstructive lung disease in men started a long period of decline that has only recently levelled off. In women, the pattern is very different, with mortality slowly rising since 1955. In 2003, 603 men and 614 women (aged 15-74), respectively, died from this cause.

Comparison of Scottish trend with Western European country mean

In men, the Western European country mean rate has been falling since 1970. The Scottish rate has been consistently higher than this mean and has been one of the highest rates among the comparison countries over the whole period. In women, the mean has remained relatively stable, while the rising Scottish rate has been diverging away from it since the early 1970s.

Position in Europe¹⁰

For men and women Scotland has one of the highest mortality rates from this cause of any of the comparator countries in Western Europe. Rates among men have been close to those in Northern Ireland and England and Wales since 1970. Ireland has also had similar rates, and indeed Irish rates have often been higher than those of Scotland. In 2000, Scotland had the highest rate of mortality among men. Among women, Scotland has had one of the highest rates in Western Europe over most of the period. However rates in Denmark have increased very steeply since the early 1970s and are now appreciably greater than those in Scotland.

¹⁰ No Swiss data available from 1995 onwards due to their use of an aggregated ICD10 coding scheme which makes it impossible to calculate mortality for this cause on the same basis as for other countries.

3.2.10 Chronic liver disease, including cirrhosis¹¹ (fig NIM – N7F)

Scottish trends

Scottish mortality rates from chronic liver disease were essentially static between 1950 and the early 1970s. Since then in both sexes they have been increasing. This increase has been particularly steep since the early 1990s. In 2003, 718 men and 355 women (aged 15-74), respectively, died from this cause.

Comparison of Scottish trend with Western European country mean

The European mean rates for both men and women have exhibited similar patterns – with slight upward trends that peaked in the mid-1970s, followed by gradual decline. This has resulted in Scottish rates in both sexes first of all converging upwards towards the mean, crossing and then diverging away since the early 1990s.

Position in Europe

The trends described above have resulted in Scotland's rank position deteriorating dramatically from the mid-1990s onwards. By 2000, Scotland had the second highest mortality rate for men – slightly below the Austrian rate – while the rate for women has been the highest among the Western European comparator countries since 1998. However the Scottish rates remain low in comparison with those in Hungary. The change in Scotland's ranking has only partly been driven by its increasing mortality rates. It is also influenced by the steep declines over the past 20 years in the extremely high mortality rates experience by countries such as France, Austria and the countries of Southern Europe. In this way, Scotland is going in the opposite direction to most of Western Europe.

3.2.11 External causes (fig OIM – O7F)

Scottish trends¹²

Among men, Scottish mortality rates from external causes – which include deaths from injuries, poisonings, accidents, suicide and homicide - have not changed noticeably over the past 50 years. The rate rose slightly until the 1970s but has decreased since and is now back at the 1950 level. The trend in women is quite similar: the mortality rate is at the same level now as in 1950, although higher levels were observed during the 1970s. In 2003, 1125 men and 398 women (aged 15-74), respectively, died from external causes.

Comparison of Scottish trend with Western European country mean

In men, mortality from external causes has until recently remained below the Western European country mean, although the Scottish rate and the mean rate have now converged due to the slow decline of the mean. Mortality related to external causes among Scottish women has followed the mean rate closely over the last 50 years.

Position in Europe

Many countries have much higher mortality rates than Scotland, with Finland displaying the highest rate for males. In men, the rates that are most comparable to Scotland are seen in Northern Ireland, the Scandinavian countries (with the exception of Finland), Ireland, Greece and Spain. In women, different trends are observed, but

¹¹ In the previous report this section was labelled 'Liver Cirrhosis', but in this report has been renamed as "Chronic liver disease, including cirrhosis" in line with the definition used by NCHOD (National Centre for Health Outcomes Development) – see <http://www.nchod.nhs.uk/>

¹² It is worth noting that deaths to non-residents of Scotland, which occurred in Scotland, are included. A notable effect of this is that the victims of the Lockerbie bombing in December 1988 are included among Scottish death registrations in 1988 and 1989.

Scotland seems to be most similar to Norway, Sweden, Ireland, Germany and Portugal.

3.2.12 Suicide (fig P1M – P7F)

Scottish trends

Mortality due to suicide in men remained low and stable until about 1975. Since then it has slowly risen to a level that is now twice as high as it was in 1955. In women, mortality from suicide is much lower relatively and has remained more stable; it is currently still at the same rate as it was in 1955. In 2003, 396 men and 140 women (aged 15-74), respectively, died by suicide.

Comparison of Scottish trend with Western European country mean

There has been a steady convergence of suicide rates in men with the mean since the mid-1970s. By 2000, the Scottish rate was slightly above the mean. In women, the mean rate has remained stable, and the Scottish rate runs parallel (and close) to this mean.

Position in Europe¹³

Suicide rates vary considerably between countries. In men, the highest rates in Western Europe are currently in Finland, France and Belgium, Austria and Switzerland, while rates in Hungary, in particular, and in Poland are higher than in Scotland. The only other countries apart from Scotland where recent mortality increases are observed are Ireland and Poland. Among women, rates for most countries are either stable or falling. The highest rates are found in the same countries as for men. The most similar patterns to Scotland are in Northern Ireland, Norway, Ireland, the Netherlands and Poland.

3.2.13 Motor vehicle accidents (fig Q1M – Q7F)

Scottish trends

Mortality from motor vehicle accidents is currently below the level it was at in 1950. During the interim it has been about twice as high, peaking in the 1970s. Absolute rates are much lower in women, but the pattern is similar to men with a peak in the 1970s. In 2003, 202 men and 70 women (aged 15-74), respectively, died as a result of motor vehicle accidents.

Comparison of Scottish trend with Western European country mean

The mean mortality rate due to road accidents has followed the same pattern as in Scotland with a peak in the 1970s. However, the Scottish rate has (with the exception of one year) always been lower than the Western European country mean rate for both men and women.

Position in Europe

Mortality due to road accidents is much lower in Scotland than in many European countries, but is also falling in most. Countries following a trend most similar to Scotland are England and Wales, Northern Ireland, the Nordic countries, Ireland and the Netherlands. Rates in the Central, Southern European and Eastern European countries have in general been much higher than in Scotland.

¹³ Polish rates through the 1970s appear incomplete and have been removed from the graphs.

4. CONCLUSIONS

This report is an update of previous comparative mortality work by Prof David Leon and colleagues carried out for the Public Health Institute of Scotland. The results present Scottish mortality trends for a range of causes compared to a selection of European countries in the period 1950-2000 - although Scottish figures are presented up to 2003. The trends and patterns that have emerged vary by age, gender and cause. The key findings are summarised below.

In Scotland, mortality from all causes has fallen considerably over the last fifty years, in line with trends across the rest of Western Europe. However, while mortality rates for Scottish children are close to the Western European average, mortality among working age Scots, both men and women, is the highest in Western Europe and has been since the late 1970s.

Trends in adult mortality (15-74 years) across the 13 broad disease groups and causes analysed vary considerably. Scotland now has the highest rates of oesophageal cancer in Western Europe for both men and women. Lung cancer mortality rates for men and women remain among the highest in Western Europe, although the male rate has reduced considerably since the mid 1970s and is gradually becoming closer to the average for Western Europe. Rates of colorectal cancer mortality (for men and women) and breast cancer mortality, although still relatively high, have been falling and appear to be converging towards the Western European mean. Rates of stomach cancer and pancreatic cancer mortality are close to Western European average.

There have been significant reductions in mortality from ischemic heart disease and cerebrovascular disease for both men and women over the last half-century. Despite this, mortality rates in Scotland from both causes remain among the highest in Western Europe. However, there are signs that the gap between Scottish mortality rates and the Western European average is narrowing. Mortality rates from chronic obstructive pulmonary disease are among the highest in Western Europe, although mortality for males has fallen considerably since the 1960s.

Scottish mortality rates from 'chronic liver disease, including cirrhosis' have risen steeply since the early 1990s among men and women: rates of mortality for Scottish men and women are now the highest (or close to the highest) in Western Europe.

Suicide mortality among adult men in Scotland has risen since 1975 and the male mortality rate is now twice the level it was in 1955. In contrast, mortality from motor vehicle accidents in Scotland has declined since the mid-1970s and Scottish death rates are now lower than in the majority of Western European countries.

The analyses reported here provide a summary of key mortality trends in Scotland over the last 50 years, combined with a description of Scotland's mortality position within Europe. It is intended that these results will be updated periodically in order to monitor and understand developing trends in mortality in Scotland and Europe.

TABLES

Table 1. Countries included by region

Region	Countries
UK	Scotland England & Wales Northern Ireland
Northern Europe	Denmark Finland Norway Sweden
Western Europe	Belgium France Ireland The Netherlands
Central Europe	Austria Germany Switzerland
Southern Europe	Greece Italy Portugal Spain
Eastern Europe	Hungary Poland

Table 2. Codes used for each ICD revision as specified in the WHOSIS database

Causes of Death	ICD Revision				
	ICD 6/7†	ICD 8†	ICD 9†	ICD 10	Swiss (ICD10 based) aggregated coding in use from 1995
All causes	A000	A000	B00	AAA	1000
Oesophageal cancer	A045	A046	B090	C15 – C159	1028
Stomach cancer	A046	A047	B091	C16 – C169	1029
Colorectal cancer	A048, 153	A049, 153	B093, B094	C18 – C219	1030
Pancreatic cancer	157	157	B096	C25 – C259	1032
Lung cancer	A050	A051	B101	C33 – C349	1034
Breast cancer	A051	A054	B113	C50 – C509	1036
Ischaemic heart disease	A081	A083	B27	I20 – I259	1067
Cerebrovascular disease	A070	A085	B29	I60 – I699	1069
Chronic obstructive pulmonary disease	A093, A097	A093, A096	B323, B325	J40 – J46	no equivalent code*
Chronic liver disease, incl. cirrhosis	A105	A102	B347	K70 – K709, K73 – K739, K74 – K749	no equivalent code*
External causes	A138 – A150	A138 – A150	B47 – B56	V01 – Y89	1095
Suicide	A148	A147	B54	X60 – X84	1101
Motor vehicle accidents	A138	A138	B471	V02 – V04, V09, V12 – V14, V19 – V79, V86 – V89	no equivalent code*

*The aggregated ICD10 coding used by the Swiss makes it impossible to compare the Swiss mortality data against equivalent data in other countries.

† The codes displayed are from condensed ICD lists used by WHO, derived in turn from actual ICD codes.

Table 3. Time periods with data available for each ICD revision by country (all causes)

Countries	ICD revision			
	ICD 6/7	ICD 8	ICD 9	ICD 10
UK				
Scotland	1950 – 1967	1968 – 1978	1979 – 1999	2000 – 2003
England & Wales	1950 – 1967	1968 – 1978	1979 – 2000	2001 – 2002
Northern Ireland	1950 – 1967	1968 – 1978	1979 – 2000	2001 – 2002
Northern Europe				
Denmark	1952 – 1968	1969 – 1993	*	1994 – 2000
Finland	1952 – 1968	1969 – 1986	1987 – 1995	1996 – 2002
Norway	1951 – 1968	1969 – 1985	1986 – 1995	1996 – 2001
Sweden	1951 – 1968	1969 – 1986	1987 – 1996	1997 – 2001
Western Europe				
Belgium	1954 – 1967	1968 – 1978	1979 – 1997	
France	1950 – 1967	1968 – 1978	1979 – 1999	2000
Ireland	1950 – 1967	1968 – 1978	1979 – 2001	
The Netherlands	1950 – 1968	1969 – 1978	1979 – 1995	1996 – 2000
Central Europe				
Austria	1955 – 1968	1969 – 1979	1980 – 2001	2002
Germany	1952 – 1967	1968 – 1978	1979 – 1997	1998 – 2001
Switzerland **	1951 – 1968	1969 – 1994	*	1995 – 2001
Southern Europe				
Greece	1961 – 1967	1968 – 1978	1979 – 2001	
Italy	1951 – 1967	1968 – 1978	1979 – 2001	
Portugal	1955 – 1970	1971 – 1979	1980 – 2001	2002
Spain	1951 – 1967	1968 – 1979	1980 – 1998	1999 – 2001
Eastern Europe				
Hungary	1955 – 1968	1969 – 1978	1979 – 1995	1996 – 2002
Poland	1959 – 1968	1969 – 1979	1980 – 1996	1999 – 2002

Note: These years may vary for some specific diseases

*: These countries never used ICD9

** : Switzerland used an aggregated ICD10 coding system from 1995

Table 4. European Standard population

<u>Age</u>	<u>Weight</u>
0-1	1600
1-4	6400
5-9	7000
10-14	7000
15-20	7000
20-24	7000
25-29	7000
30-34	7000
35-39	7000
40-44	7000
45-49	7000
50-54	7000
55-59	6000
60-64	5000
65-69	4000
70-74	3000
75-79	2000
80-84	1000
85 & over	1000

Table 5. Table of Figures

Infant mortality (in children under 1 year).....	A1M – A6F
All cause mortality in children aged 1-14.....	B1M – B7F
All cause mortality in adults aged 15-74.....	C1M – C7F
All cause mortality in elderly aged 75 years and over.....	D1M – D7F
Oesophageal cancer mortality in adults aged 15-74.....	E1M – E7F
Stomach cancer mortality in adults aged 15-74.....	F1M – F7F
Colorectal cancer mortality in adults aged 15-74.....	G1M – G7F
Pancreatic cancer mortality in adults aged 15-74.....	H1M – H7F
Lung cancer mortality in adults aged 15-74.....	I1M – I7F
Breast cancer mortality in adults aged 15-74.....	J1F – J7F
Ischaemic heart disease mortality in adults aged 15-74.....	K1M – K7F
Cerebrovascular disease mortality in adults aged 15-74.....	L1M – L7F
Chronic obstructive pulmonary disease mortality in adults aged 15-74.....	M1M – M7F
Chronic liver disease, incl. cirrhosis mortality in adults aged 15-74.....	N1M – N7F
External causes mortality in adults aged 15-74.....	O1M – O7F
Suicide mortality in adults aged 15-74.....	P1M – P7F
Motor vehicle accidents mortality in adults aged 15-74.....	Q1M – Q7F

Format of results

The age-standardised mortality rates that were calculated are presented in figures by age group, sex, cause of death and region. For each age group and cause of death summary graphs were produced that contained the minimum, maximum and mean rates for each year, with Scotland’s rates added in a o—o—o format. These figures also contain information on the Scottish rank position for each 5 year period starting from 1956. The Scottish trends and its position in Europe are described in the ‘Results’ section and relate directly to these graphs.