

Public Health Institute of Scotland

Information and Statistics Division

of the Common Services Agency



Chasing the *Scottish Effect*

*Why Scotland needs a step-change in health
if it is to catch up with the rest of Europe*

Chasing the *Scottish Effect*

" unless a step-change in the rate of improvement of health in Scotland can be engineered through the contribution of many organisations and individuals, our relative position is not going to improve"

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Summary of Findings

Death is a poor proxy for health. Nonetheless, death rates are one of the few measures that allow us to compare health between countries. From this analysis it is clear that Scotland has the worst health in the United Kingdom, worse even than comparable areas like the industrial North East of England. Scotland's life expectancy also lags behind comparable Nordic countries like Norway, Sweden and Denmark. In fact, our nearest neighbours in the "league table" of European nations are Slovenia and Portugal.

Life expectancy is, however, improving in Scotland and many health indices are moving in a favourable direction. Unfortunately, the rate of improvement is in the middle of the European spectrum, so we are unlikely to progress at a rate that will change our relative position compared with the rest of the United Kingdom or most of the European Union countries.

One of the key reasons for Scotland's poor health status is deprivation. However, a major finding of this report is that the deprivation profile of Scottish postcodes compared with England now explains less of the gap in mortality between Scotland and England than was shown previously. An analysis of the 1981 census data showed that the vast majority of the excess mortality experienced in Scotland compared to England and Wales could be explained by Scotland's higher levels of deprivation. Our analysis of census and mortality data in the early 1990s, however, shows that deprivation only accounts for approximately 40% of the excess deaths at all ages, and 60% for those under 65 years. The excess deaths in Scotland which are not accounted for by deprivation have been referred to as the

"Scottish Effect". It may, of course, be the case that the technique of basing the estimate of deprivation on data derived from the census is proving less useful in detecting true deprivation than was the case in the 1980s. The alternative explanation is that this "Scottish Effect" is due to psychological, social or behavioural factors which operated in Scotland during the same decade. As soon as data are available from the 2001 census, a further analysis will be carried out to discover what happened between 1991 and 2001.

Implications

The overall implications of this report are clear. Life expectancy in Scotland is poor compared with most other northern European countries and with all other parts of the United Kingdom. Our rate of improvement is not sufficient for us to change our relative position and, while deprivation is one of the key drivers of this deficit, we need to be more sophisticated in our analysis and understanding of the causes of Scotland's poor position.

Analysis is useless without action. The Public Health Institute of Scotland has been created to work with the many organisations and individuals within Scotland who are determined to reverse Scotland's poor health record. The Institute is convinced that the framework created by the Scottish Executive through its Public Health White Paper (Towards a Healthier Scotland) is the appropriate one. Nonetheless, unless a step-change in the rate of improvement of health in Scotland can be engineered through the contribution of many organisations and individuals in Scotland, our relative position is not going to improve.

Introduction

The purpose of this report is to compare the health of the Scottish population with the rest of the United Kingdom and other countries within Europe, and then to address the question of what is required if Scotland's position is to improve. It is the first of a series of "public health briefings" which will be prepared by the Public Health Institute of Scotland. These documents will be underpinned by high quality scientific analysis but presented in less technical language to make them accessible to a wide audience.

This document is in two parts. **Part 1** contains analysis which is divided into two further sections: the first, *Scotland and Europe*, illustrates - by means of league tables - Scotland's position compared to other European countries in relation to all cause mortality, cause-specific mortality and life expectancy(1). It also presents trend analysis of all-cause mortality and life expectancy. The second section, *Scotland and the U.K.*, examines how Scotland fares compared to the rest of the UK and introduces a new piece of work analysing the

mortality profile of Scotland in comparison with England and Wales with specific reference to the role played by deprivation ⁽¹⁾.

Part 2 sets out an analysis of what needs to happen if Scotland is to catch up with its northern European counterpart nations in relation to health.

Obviously, death rates (and their counterpart, life expectancy) are a poor proxy for health. Health is much more than survival and encompasses positive aspects of physical, mental and social functioning as well as freedom from disease. However, if we want to make accurate comparisons between countries, death rates provide one of the few sources of data which are collected in a comparable manner across a large number of countries. Similarly, while quality of life is as important as duration, the countries in Europe with higher levels of life expectancy tend also to have lower levels of disease. Future reports will try and provide a much more detailed analysis of a wider spectrum of health indices across European countries.

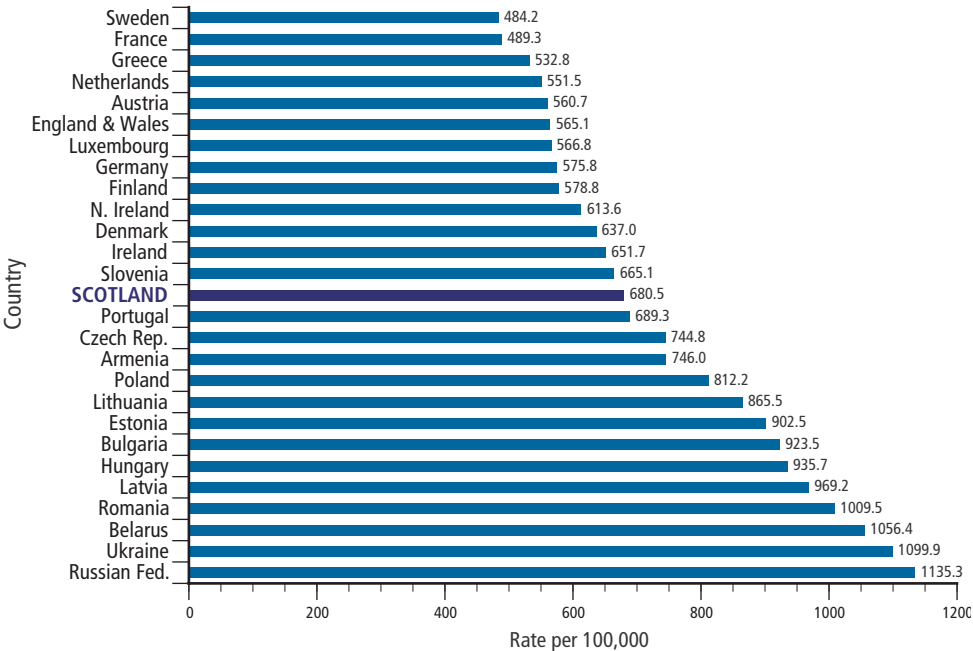
(1) Some of this analysis - conducted by the Public Health Institute of Scotland - has already been reported in the Chief Medical Officer's Annual Report for 2001-2002, but is reproduced here as an integral part of our argument.

Part 1 : analysis of mortality in Scotland from a European and UK Perspective

A. Scotland and Europe: all-cause mortality

Figure 1 shows a ‘league-table’ of age-standardised all-cause mortality rates (expressed per 100,000 population) in 1996 (2) for a wide selection of European countries. This shows Scotland to be lagging behind virtually all the other Western European nations of similar wealth and stature with, bar one or two exceptions, only the poorer Eastern European countries having worse mortality rates. To invoke a simple football analogy, Scotland appears to be either bottom of the ‘Premier League’ or top of the next division.

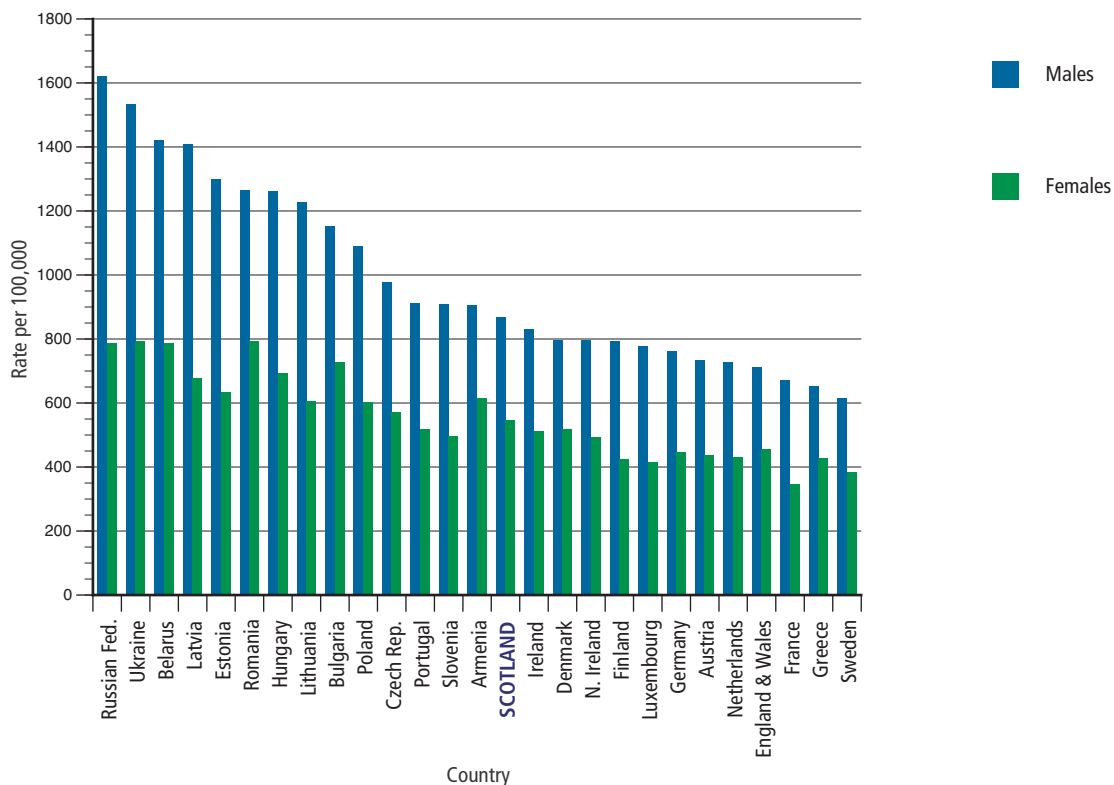
Fig. 1: 1996 age-standardised all-cause mortality rates per 100,000 pop. for selected European countries (Source: W.H.O.)



(2) 1996 figures have been used as this is the latest year for which W.H.O. figures are available for all the countries featured.

Figure 2 - age standardised all-cause mortality rates split by sex - shows that there is little difference between males and females in terms of Scotland's place in this European ranking.

Fig. 2: 1996 age-standardised all-cause mortality rates per 100,000 pop. by sex (Source: W.H.O.)



Cause-specific mortality

Figures 3-8 in appendix 1 show the age-standardised mortality rates for these same 27 countries for specific causes of death, namely all cancers (malignant neoplasms), lung cancer (malignant neoplasm of trachea, bronchus and lung), heart disease (diseases of the circulatory system, ischaemic heart disease), strokes (cerebrovascular disease) and respiratory disease.

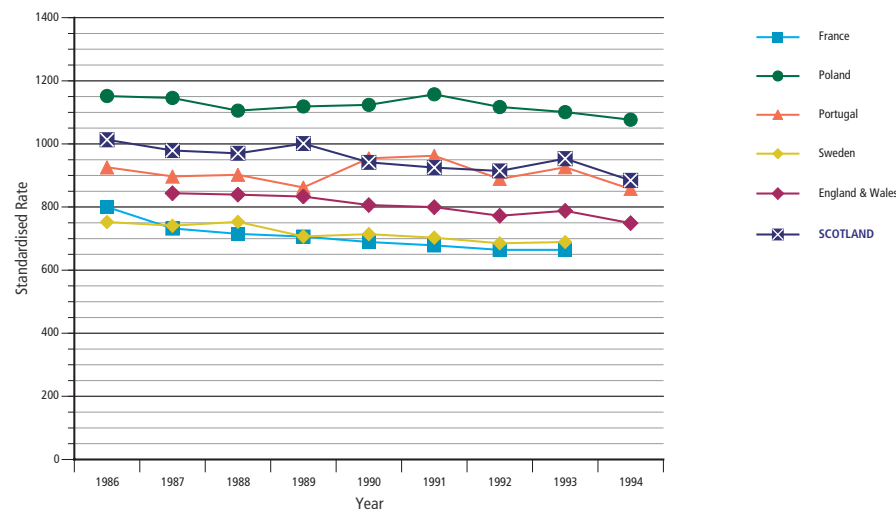
Scotland's overall ranking in relation to the other listed countries does not improve for deaths due to diseases of the circulatory system nor cerebrovascular disease. However, its standing is worse for ischaemic heart disease deaths and is particularly low for all malignant cancers, lung cancer and respiratory disease: note that Scotland is among the worst three countries for these three conditions.

Trends in mortality rates

The lack of available, comprehensive annual data for the majority of the countries examined above means it is impossible to compare mortality trends for all but a small number of these nations. However, figure 9 shows age-standardised all-cause mortality rates by year for the period 1986-1994 for a smaller group of countries: Scotland, England and Wales, Sweden, Portugal, Poland and France (3).

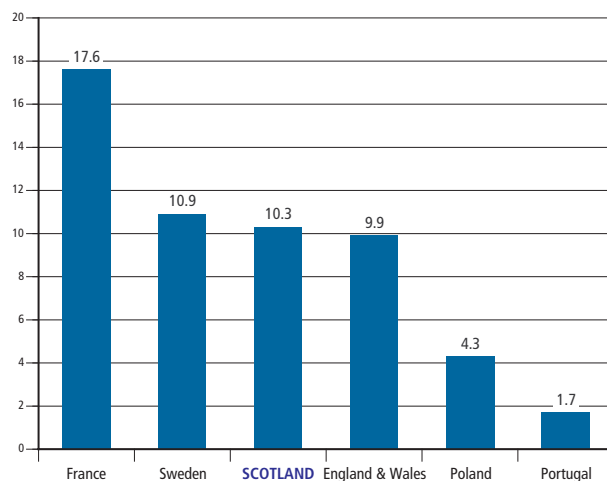
The overall trend for all these countries - with the possible exception of Portugal - appears to be downwards and, indeed, by fitting an estimated trend line to these rates we can calculate the percentage decrease in the predicted mortality rates between 1986 and 1994 (illustrated in figure 10) which shows Scotland's mortality rates decreasing at a rate comparable with England and Wales and Sweden, but at a slower rate than France. The implications of this finding will be discussed later.

Fig. 9: Age standardised all-cause mortality rates per 100,000 population, 1986-1994
(Source WHO; Standardised to European population)



(3) Note that the rates in this chart have been standardised to a population different than that used for the analysis shown in figures 1-8. This chart uses data standardised to a European population, while the previous figures used data standardised to the new W.H.O. world population.

Fig. 10: Estimated trends in age standardised all-cause mortality rates: percentage decrease in predicted rates between 1986



Life expectancy

The picture of life expectancy for Scotland compared to other European countries is, as one would expect, very similar to that of all-cause mortality rates. Figures 11 (males) and 12 (females) show life expectancy at birth in 1996 for the same group of European countries shown in figures 1-8.

Fig. 11: Life expectancy at birth, 1996 - MALES (Source: W.H.O.)

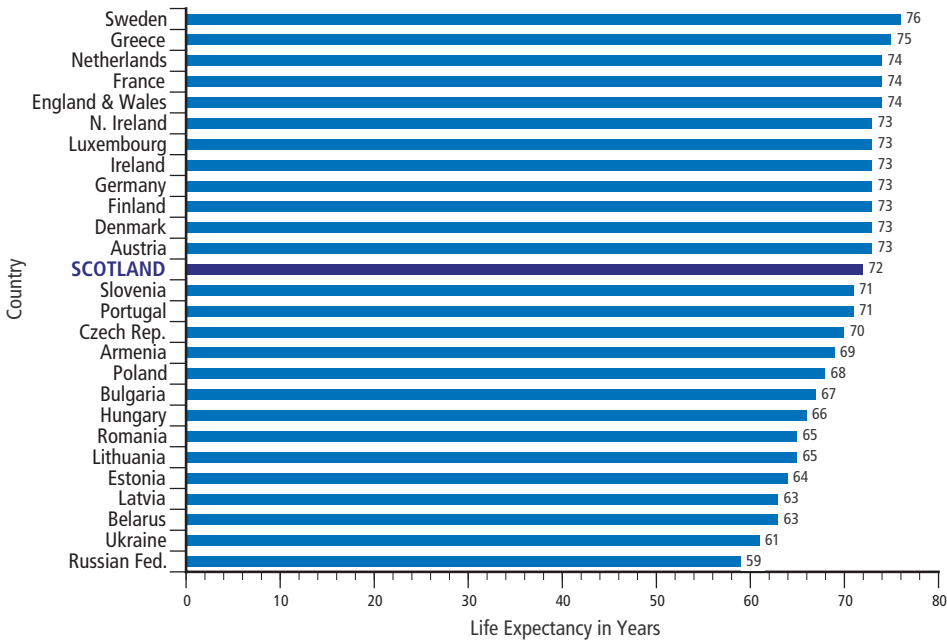
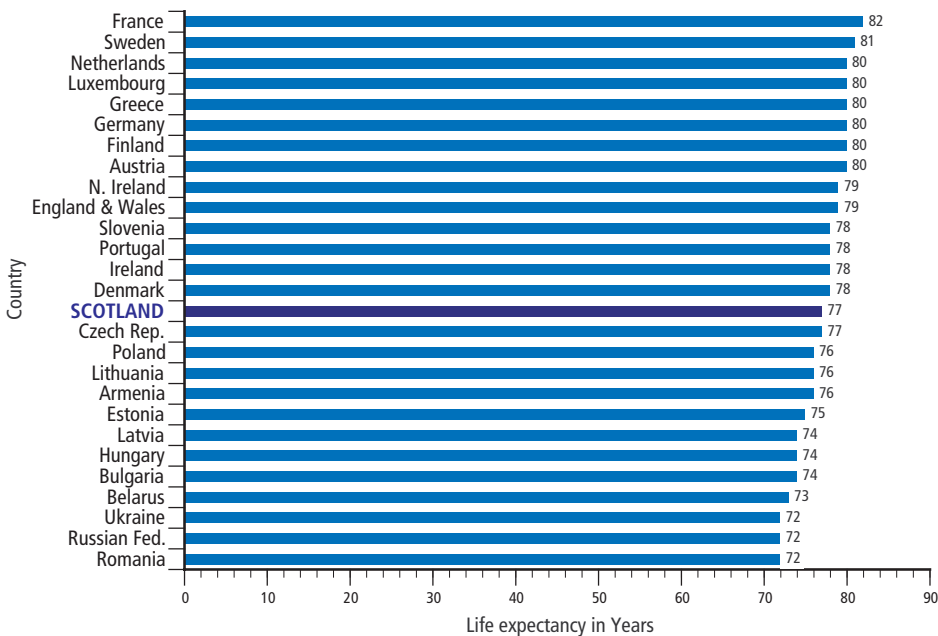


Fig. 12: Life expectancy at birth, 1996 - FEMALES (Source: W.H.O.)



Trends in life expectancy

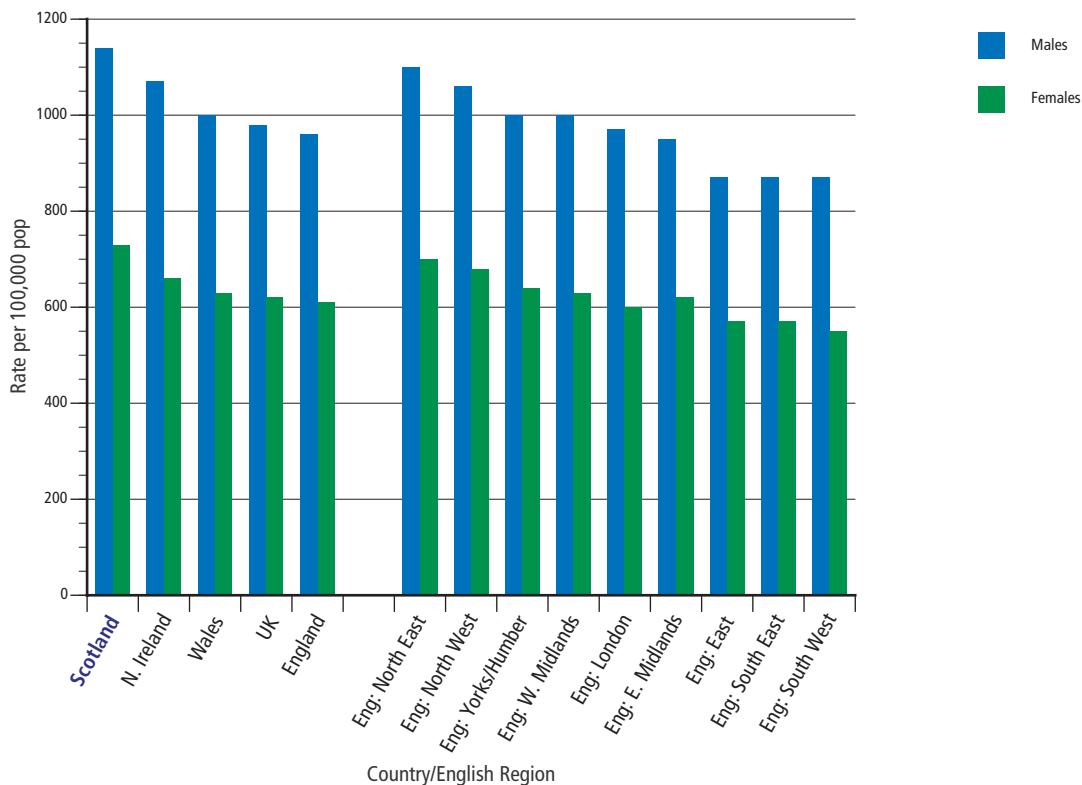
Figures 13a-13d and 14a-14d (appendix 2) show life expectancy by year between 1988-1998 for Scotland and selected European Community countries. Two points are obvious from these. First, Scotland's life expectancy is, with the single exception of Portuguese males, consistently lower than all the other listed EC nations. Second, each country's life expectancy appears to be on a generally upwards trend, with Scotland's improving at neither the worst nor the best rate. This latter observation is confirmed in figures 15a and 15b (appendix 2), which show the percentage increases in predicted life expectancies for each country for males and females, once estimated trend lines have been fitted to each set of values. For males, the increases range from 5.0% (Luxembourg) to 1.6% (Greece), with Scotland (2.9%) set in the middle of the range. The picture for females is similar, with the values ranging from 2.8% (Austria) to 0.3% (Netherlands): Scotland's predicted increase is 2.1%.

B. Scotland and the U.K.

The preceding section clearly illustrates that Scotland lags behind not only the majority of the Western European nations, but also England and Wales and Northern Ireland. This of course confirms the findings of other studies which have examined inequalities in health within the United Kingdom. For instance, Dorling⁽²⁾ showed that a widening north-south divide took place in Great Britain between the early 1980s and early 1990s, and in comparing the worst and best areas, he found residents of Glasgow to be 66% more likely to die prematurely than residents of rural Dorset, and 31% more likely than those living in Bristol. Shaw et al⁽³⁾, examined mortality rates by UK parliamentary constituency, and found that the six constituencies with the highest levels of premature mortality were all located in Glasgow, while only one of the worst 15 constituencies was situated outwith Scotland and the north of England. Conversely, only one of the fifteen constituencies with the lowest rates was located outwith the south of England.

Further evidence of this was provided recently by a report by the Office of National Statistics (ONS)⁽⁴⁾. This showed that between 1991 and 1997, not only did Scotland have higher mortality rates than the other countries in the UK, but that in fact its rates were higher than those of each individual region of England, including those in the north. This was true for both sexes, and when examined within age bands, for virtually every age group: all ages, 15-44, 45-64, and 65 years and over. The rates for all ages are shown in figure 16.

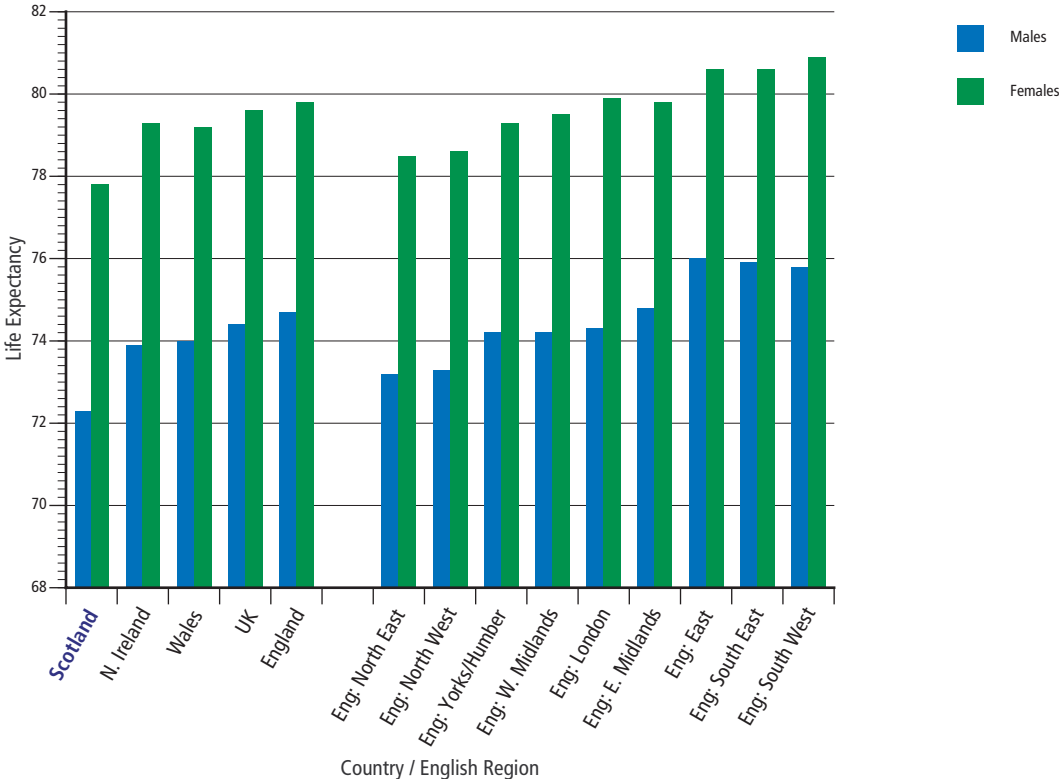
Fig. 16: Age-standardised all-cause mortality rates by country and English government region, 1991-1997 (Source: ONS)



Similarly, when analysed on a local authority level, the council area with the highest age-standardised all-cause mortality rates was Scottish (again Glasgow City), while the figures for the ‘best’ Scottish local authority still compared poorly with those of the best performing authorities of the other home countries and every English region. This was again the case for both males and females.

A similar ONS⁽⁵⁾ study focussing on life expectancy rather than mortality rates found nearly identical results. Between 1995 and 1997, life expectancy at birth in Scotland for both males and females was not only lower than that of the other UK countries, but indeed lower than the figures for every English region (figure 17).

Fig.17: Life expectancy at birth by country and English government region, 1995-1997 (Source: ONS)



Scotland and the U.K. : Mortality and Deprivation

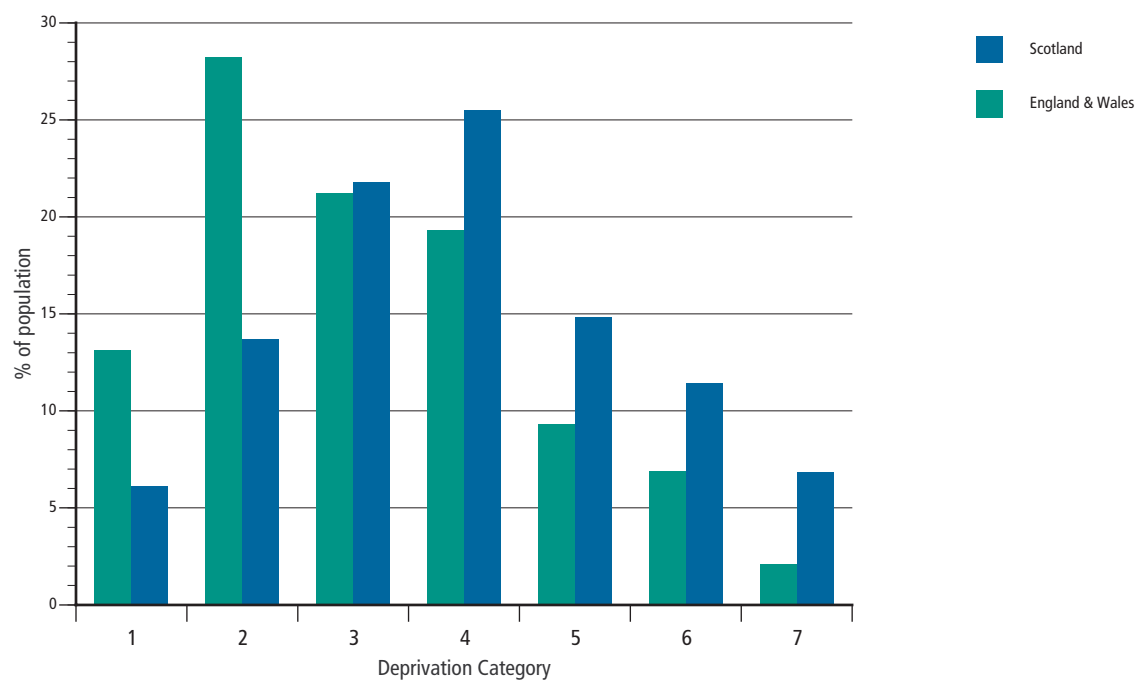
In examining reasons for the disparity in health between the different areas of the United Kingdom, most authors have concentrated on issues of social class and deprivation. Carstairs and Morris^(7,8) found that in the early 1980s most of the excess mortality experienced by Scotland compared to England and Wales was attributable to Scotland’s higher levels of deprivation: once deprivation was accounted for, the excess mortality in Scotland stood at only 3%. With this - and other studies - in mind, a new piece of research has now been carried out, looking again at Scotland’s excess mortality and the issue of deprivation, but using data from the 1990s.

Using a combination of mortality data from 1990-1992 and 1991 census data, and employing methodologies described elsewhere⁽¹⁾, this new piece of work highlighted four key points:

(a) Overall deprivation

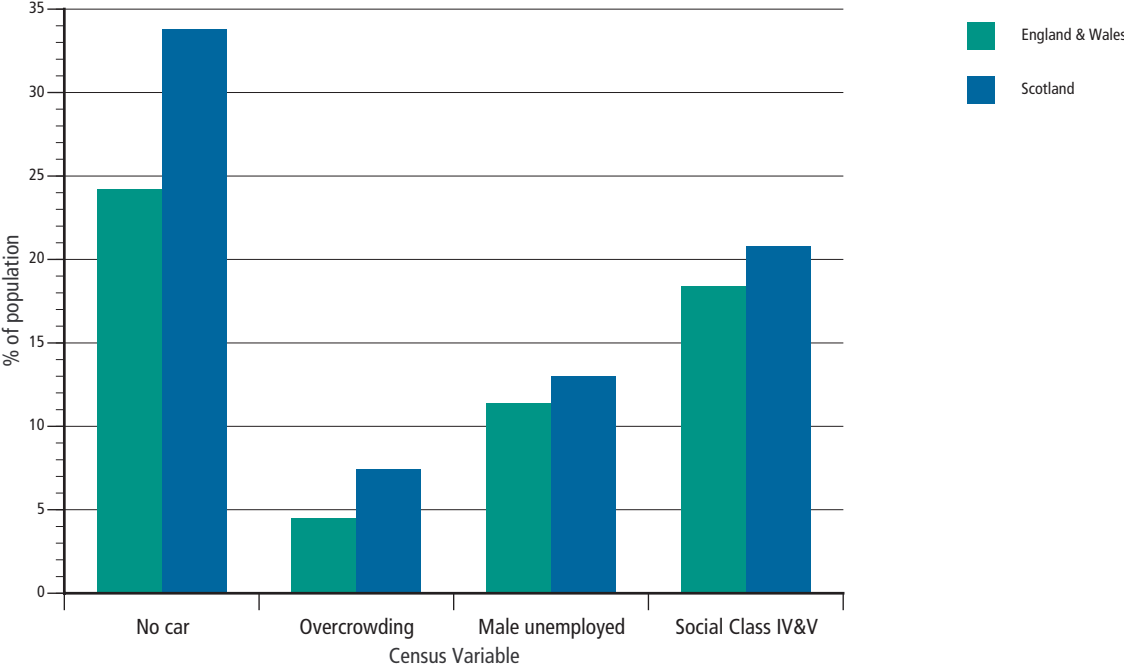
First, the study again confirmed Scotland's more deprived socio-economic status in comparison to England and Wales. Using the Carstairs and Morris method of categorising deprivation, in 1991 18% of the Scottish population were deemed to be living in areas of high deprivation (categories 6 and 7) compared to 9% in England and Wales.

Fig. 18: Percentage of population of Scotland and England & Wales by deprivation category, 1991



This particular index of deprivation is calculated using four census variables - car ownership, overcrowding, unemployment and social class (derived from occupation) - and the difference between the Scottish population and the rest of Great Britain in 1991 with regard to these individual factors is illustrated in figure 19.

Fig. 19: Comparison of 1991 deprivation-related census variables by populations of Scotland and England & Wales



(b) Health inequalities within Scotland

Table 1 shows directly standardised mortality rates by age, deprivation quintile (4) and country for the period 1990-1992. Other than once again showing Scotland to have consistently higher mortality rates than England and Wales in this period, what is also apparent is a much more marked gradient in mortality rates between areas of low and high deprivation in Scotland compared to England and Wales, indicating that health inequality in this period was much more manifest in Scotland than in the rest of Great Britain.

Table 1. Directly standardised mortality rates 1990-92 by age, country and deprivation quintile. Rates are standardised for age and sex and shown per 1000 population.

Age	Country	Deprivation quintile					All	Deprivation Ratio ⁽¹⁾
		1	2	3	4	5		
All	E&W	10.12	10.53	11.08	11.89	12.85	11.22	1.27
	Scotland	10.76	11.53	11.79	12.50	14.16	12.65	1.32
15-34	E&W	0.539	0.567	0.612	0.655	0.790	0.635	1.47
	Scotland	0.526	0.571	0.664	0.718	0.994	0.770	1.89
35-64	E&W	3.64	4.17	4.72	5.65	6.80	4.87	1.87
	Scotland	3.96	4.66	5.08	6.01	7.99	6.13	2.02
65+	E&W	53.3	54.6	56.6	59.3	62.3	56.9	1.17
	Scotland	56.5	59.6	60.1	62.2	67.4	62.8	1.19

(1) Ratio of mortality rate for highest relative to lowest deprivation quintile.

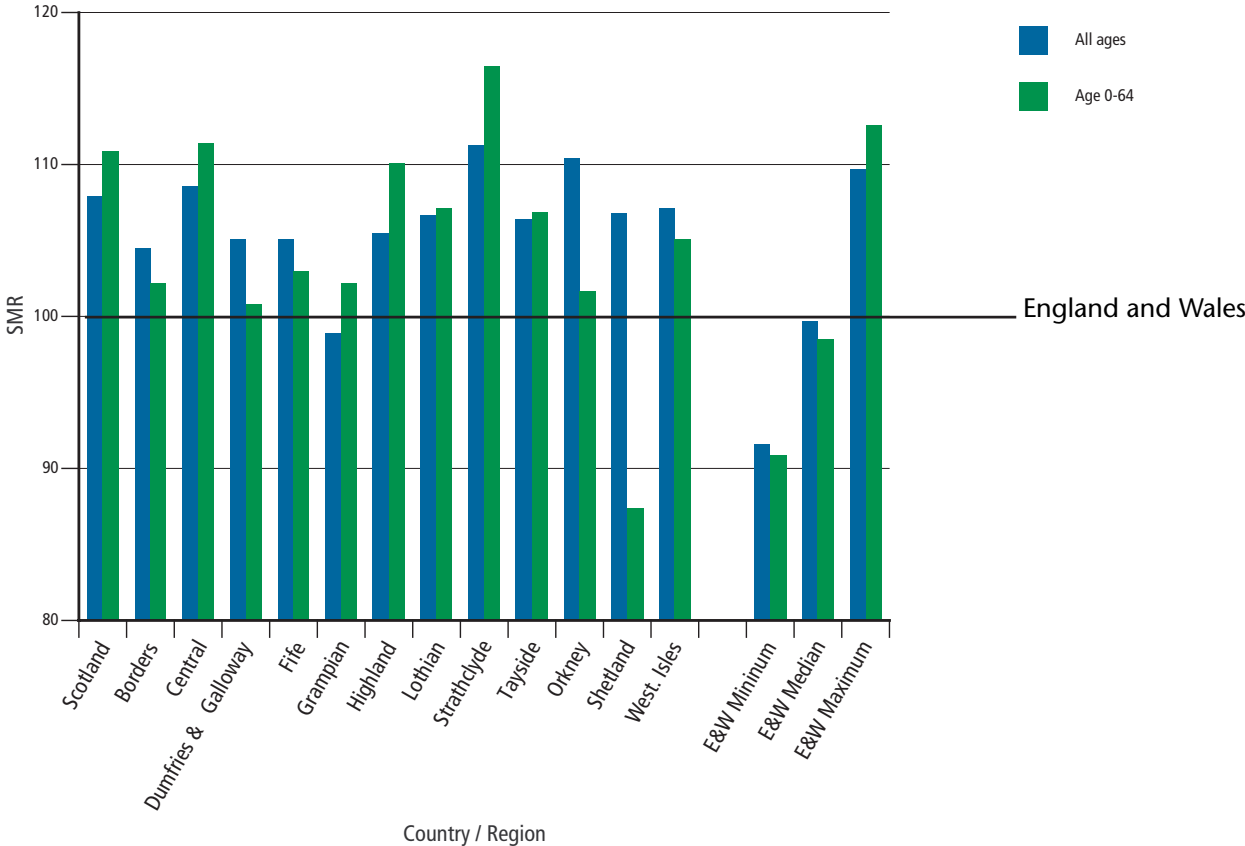
(4) The deprivation quintiles are five approximately equal groups of the GB population divided according to the level of deprivation (1=least deprived; 5=most deprived), as calculated from the four census variables for the postcode sector (listed in figure 19).

(c) Regional variation in mortality

Again confirming the findings of previous studies, figure 20 - standardised mortality ratios (SMRs) (5) by Scottish region, adjusted for age, sex and deprivation - shows that within Scotland, Strathclyde had by far the greatest level of excess mortality compared to England and Wales. Indeed, even when controlling for deprivation, this region has not only the highest SMR within Scotland, but was also higher than the ‘worst’ of the English regions.

It is important to note, however, that with the single exception of Grampian, all the Scottish regions had - when analysed on an all-ages basis - SMRs greater than 100. Thus, despite the clear influence of Strathclyde, the exclusion of that region from the results would still produce excess mortality in Scotland compared to England and Wales from the remaining areas of the country.

Fig. 20: SMRs relative to England & Wales adjusted for age, sex and deprivation category for Scottish regions and a summary of E&W counties.



(5) Standardised Mortality Ratio: the ratio of observed to expected deaths in Scotland, multiplied by 100. The ‘expected’ number is derived from applying age-specific death rates for England and Wales to the corresponding age-specific population of Scotland. As the basis of comparison, the SMR for England and Wales is 100.

(d) The “Scottish Effect”

The principal finding of this piece of work, however, is illustrated in Table 2. As mentioned above, the original Carstairs and Morris study showed that in the early 1980s deprivation accounted for most of the excess mortality experienced in Scotland compared to England and Wales. As this table shows, however, in the early 1990s it would appear that deprivation only accounts for approximately 40% of the excess deaths for all ages (SMR decreasing from 113.0 to 107.4 when adjusted for deprivation), and 60% of those under 65 (decrease in SMR from 123.9 to 110.0).

Table 2: Standardised mortality ratios (SMRs) for all-cause mortality in Scotland relative to England and Wales (E&W) adjusting for age, sex and deprivation. Confidence Intervals (CI) are shown in italics

Variables adjusted for	All ages		Age 0-64	
	SMR ⁽¹⁾	95% CI	SMR ⁽¹⁾	95% CI
Age and sex	113.0	<i>(112.5, 113.6)</i>	123.9	<i>(122.7, 125.2)</i>
Age and sex and deprivation category ⁽²⁾	107.4	<i>(106.9, 107.9)</i>	110.0	<i>(108.9, 111.1)</i>

(1) England and Wales = 100 (2) Seven category deprivation index of Carstairs and Morris (1989)

Thus, deprivation as defined by the Carstairs index can no longer be used to explain the excess mortality experienced by Scotland in the early 1990s. The implications of this are discussed in part 2 of this report.

Part 2 : How will Scotland respond to the Health Divide and the Scottish Effect ?

Sections A and B lead us to the following conclusions:

- 1 Scotland's health compared to the rest of the European Union and other comparable countries in northern Europe is poor.
- 2 Scotland's health compared to the rest of the United Kingdom is poor.
- 3 Strathclyde region (representing the area most affected by industrialisation and de-industrialisation) has the worst health. However, the health divide between Scotland and England and Wales affects nearly all the Scottish regions.
- 4 The gradient of health inequalities within Scotland seems sharper than elsewhere in Great Britain.
- 5 The proportion of the health gap between Scotland and England and Wales that could be explained by 'deprivation' (or at least the census variables that act as proxies for deprivation) has decreased between the 1981 and the 1991 censuses. This unexplained part of the health gap has been called the 'Scottish effect'.
- 6 The rate of improvement in life expectancy within Scotland is not yet sufficiently great to confront the health gap within the United Kingdom or between Scotland and the rest of Europe.

What has caused the 'Scottish Effect'?

We do not know what has caused the Scottish Effect. It may simply be that in 1981 the four census variables (car ownership, overcrowding, male unemployment and proportion in social class IV and V) used to estimate deprivation were more appropriate at that time than had become the case by 1991. If this is correct, deprivation is still the main reason for Scotland's poor health but we need better ways of measuring the concept as its manifestations change.

Alternatively, it may be that the reasons for the gap between life expectancy in Scotland and the rest of the UK are due to a wider set of psychological, social or behavioural factors which were less important in 1981 and had become more influential by 1991. Obviously, as soon as data are available for the 2001 census this question can be addressed.

Either way, Scotland needs to continue its efforts to confront the ill-health effects of deprivation and to understand other factors within Scottish society which are determining our health status.

What factors determine health and health inequalities? "It all matters"

One way of thinking about factors that determine health in a population is the phrase 'it all matters'. What this means is that there is a complex interaction of the physical environment, social environment, individual response and behaviour, genetic endowment and the provision of services

interacting with economic and other influences from which the health status of a nation emerges.

These factors interact and combine over the human life-span to create or destroy health. These influences give rise to the patterns of inequalities which are now observed in Scotland. They also provide the intellectual framework which should allow us to devise strategies to improve health.

It is clear, therefore, that health is a complex construct. The determinants of health are multiple, interactive and complex but we understand enough of this complexity to devise detailed strategies to confront the system as a whole and to target specific determinants of health.

If you want to make a difference you have got to make a difference

The understanding of how health is created or destroyed outlined above was captured in the Scottish Executive's White Paper on public health⁽⁹⁾ under three headings: life circumstances, life styles and disease themes. The Scottish Executive has been rightly applauded for taking such a broad view of the determinants of health. Does this mean that if we simply continue with the strategies that are currently in place, Scotland's relatively poor performance in life expectancy will improve in comparison with its European and UK counterparts?

At this point we move into the realm of speculation. Our analysis suggests that Scotland requires a 'step-change' in the trajectory of its health improvement if its relative standing within Europe and the UK is to improve. How is such a step-change to be achieved? The key point is that 'if we want to make a difference we have to make a difference'. If health is to improve, the determinants of health will have to change. Determinants of health have been characterised above as the physical environment, social environment, personal behaviours, prosperity and

service provision. The responsibility for changing the determinants of health cannot lie solely in the hands of any one agent of change - government, professional groups, organisations or individuals. To take an obvious example, the social environment in which we live and work is created by a combination of policy making, individual behaviour and organisational actions. Indeed, it is concerning that whenever health issues are discussed in the media there is a tendency to either blame the victim of particular health related behaviour (the smoker, the drinker, the over-eater) or blame government for not spending or doing enough. These reactions (while sometimes understandable) are not going to bring about a step change in Scotland's health.

If we are going to change the health of Scotland we will have to change the determinants of health. We will have to change the physical environment of our most deprived areas. We will have to confront problems of social isolation, stress and fear of crime. We will have to change key behaviours like smoking and the rising problem of obesity. Scotland may have to examine its approach to alcohol as never before. We need a national debate about how we are to respond to the pressures which lead to widening differentials in wealth that lead to greater inequalities in health.

The role of the Public Health Institute is to work with others to provide the evidence of the link between the determinants of health and health outcomes (to help inform strategies and plans) and to bring together individuals and organisations that want to make a difference. The purpose of this report is to stimulate a debate about how Scotland is to create a pro-health culture which acknowledges that in terms of how health is created and destroyed, 'it all matters' but also that 'if we want to make a difference, we have to make a difference'.

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Appendices

Appendix 1: Figs 3-8: age standardised mortality rates for specific causes of death

Fig.3. 1996 age-standardised mortality rates for ALL MALIGNANT NEOPLASMS per 100,000 population for selected European countries (Source: W.H.O.)

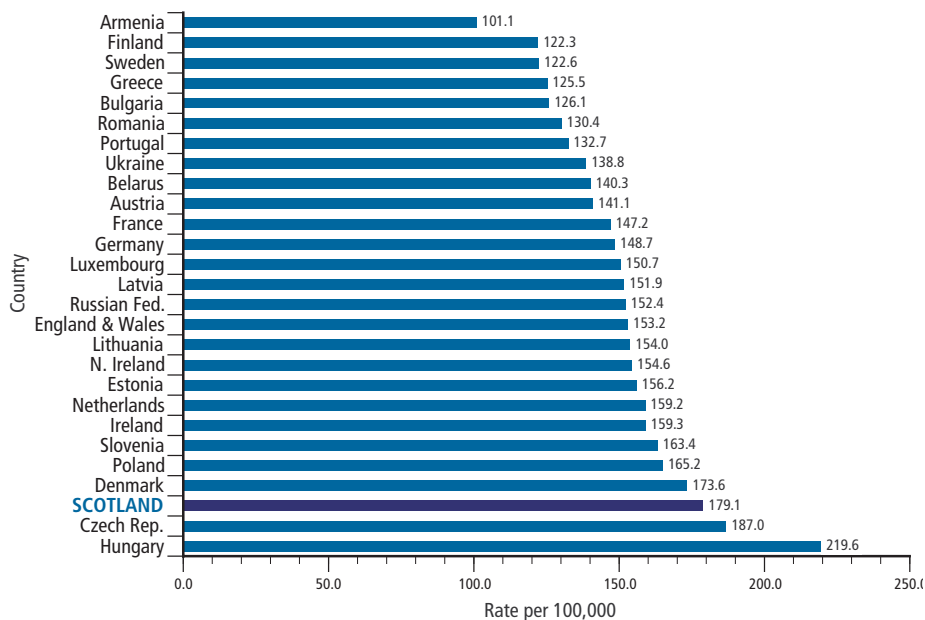


Fig. 4. 1996 age-standardised mortality rates for MALIGNANT NEOPLASM OF TRACHEA, BRONCHUS & LUNG per 100,000 population for selected European countries (Source: W.H.O.)

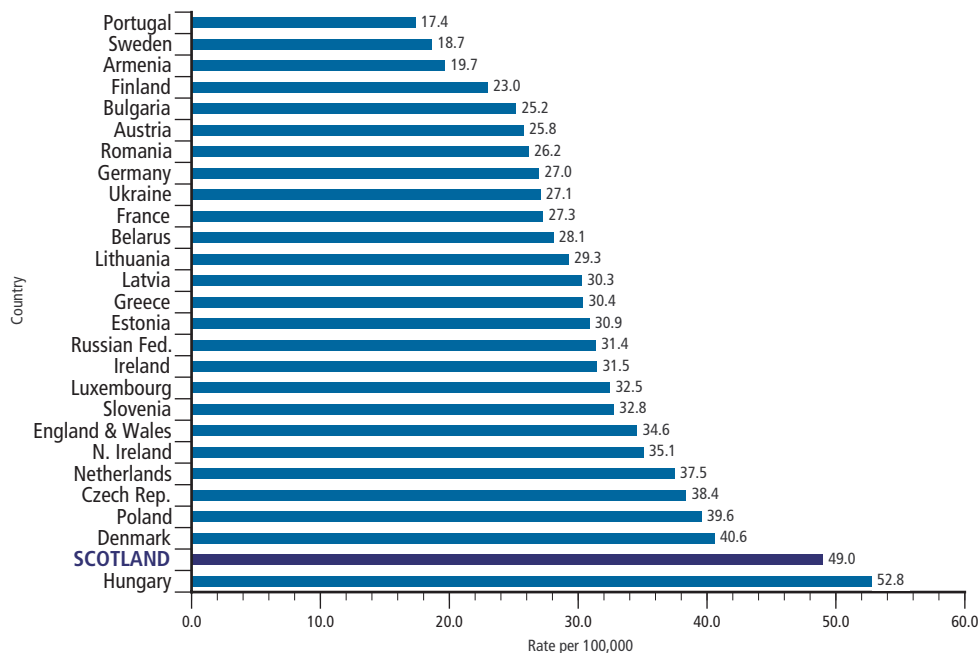


Fig. 5. 1996 age-standardised mortality rates for DISEASES OF THE CIRCULATORY SYSTEM per 100,000 population for selected European countries (Source: W.H.O.)

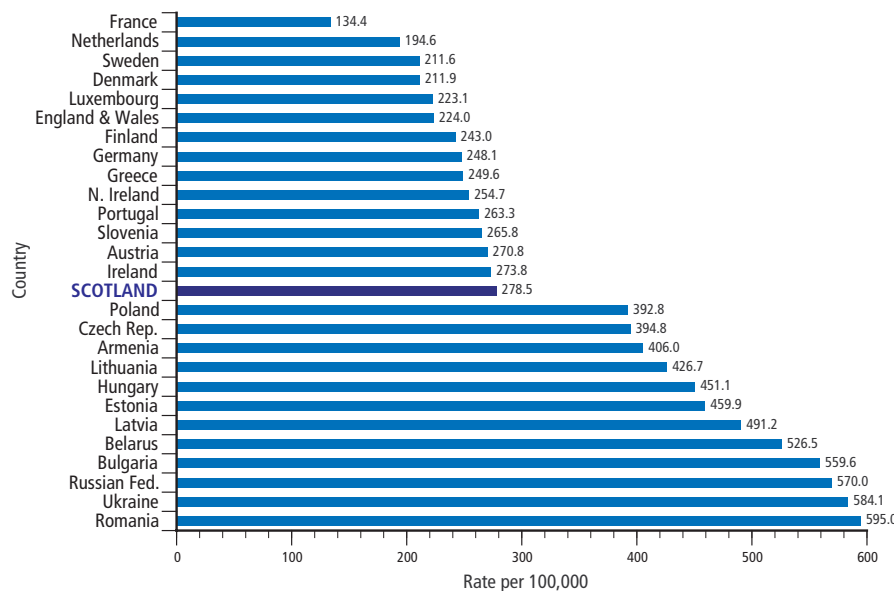


Fig. 6. 1996 age-standardised mortality rates for ISCHAEMIC HEART DISEASE per 100,000 population for selected European countries (Source: W.H.O.)

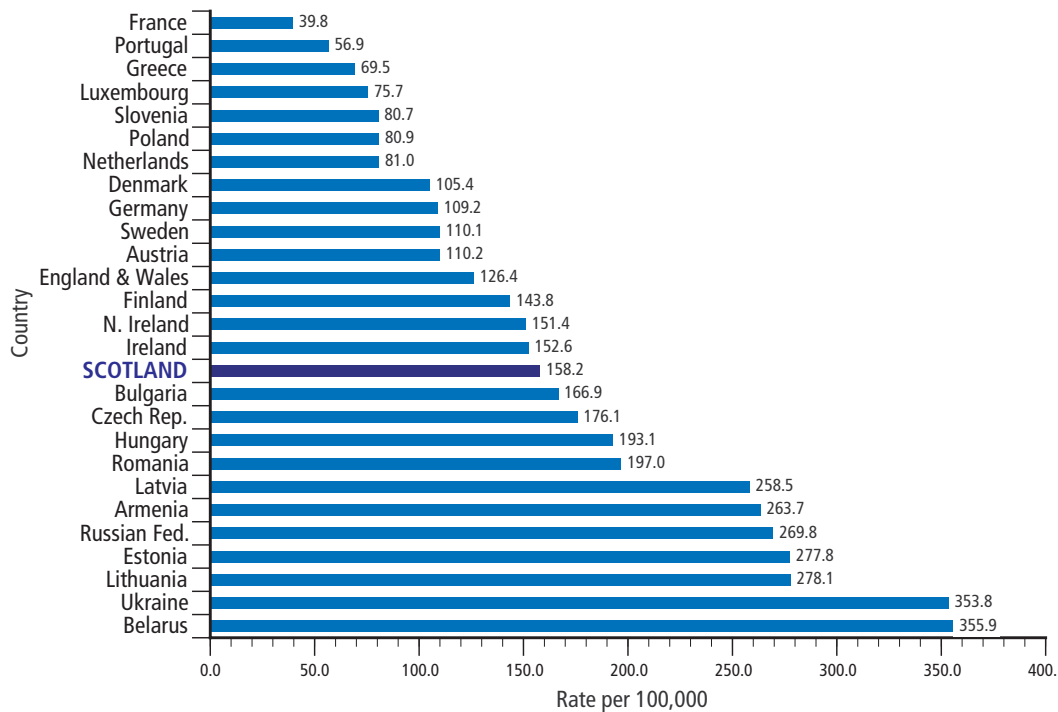


Fig. 7. 1996 age-standardised mortality rates for CEREBROVASCULAR DISEASE per 100,000 population for selected European countries (Source: W.H.O.)

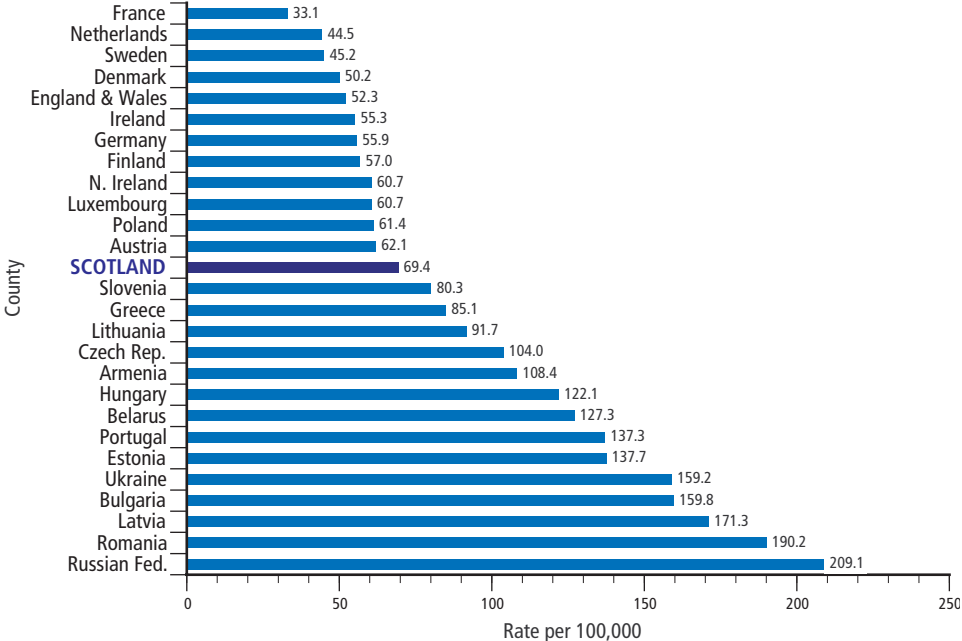
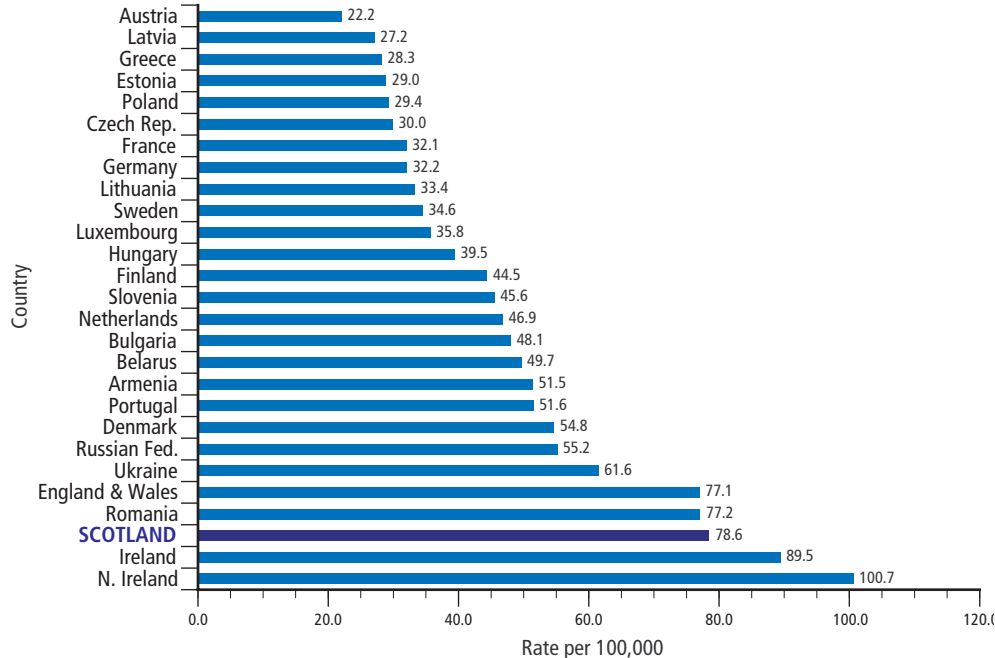


Fig. 8. 1996 age-standardised mortality rates for RESPIRATORY DISEASE per 100,000 population for selected European countries (Source: W.H.O.)



Appendix 2:

Figs 13a-13d: male life expectancy at birth, Scotland and selected EEC countries, 1988-1998 (Sources: Eurostat, GRO(S))

Fig. 13a Males: Scotland, Belgium, Denmark, Germany, Greece, Spain

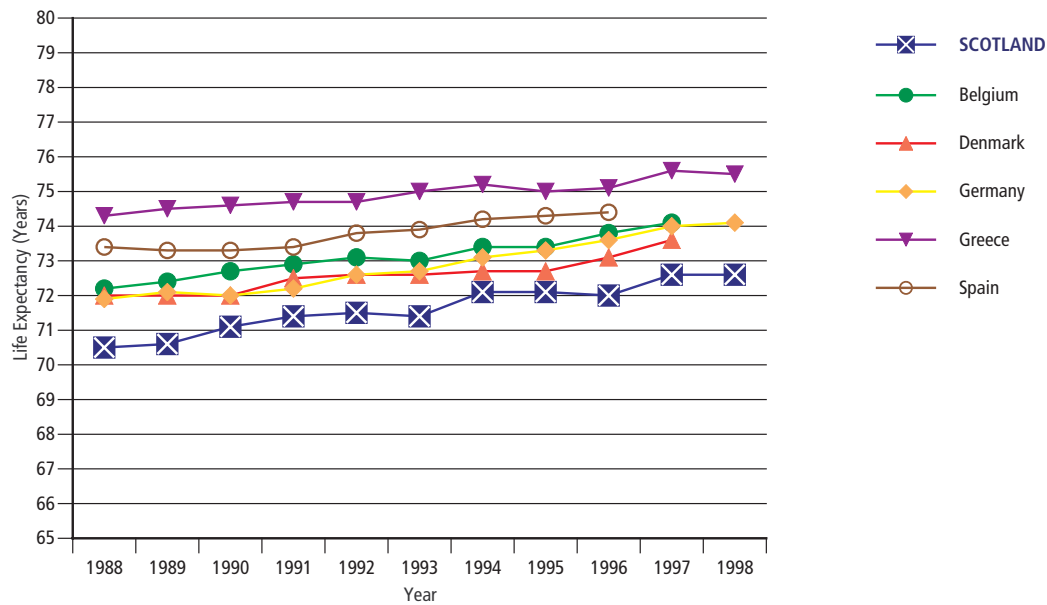


Fig. 13b Males: Scotland, France, Ireland, Italy, Luxembourg, Netherland

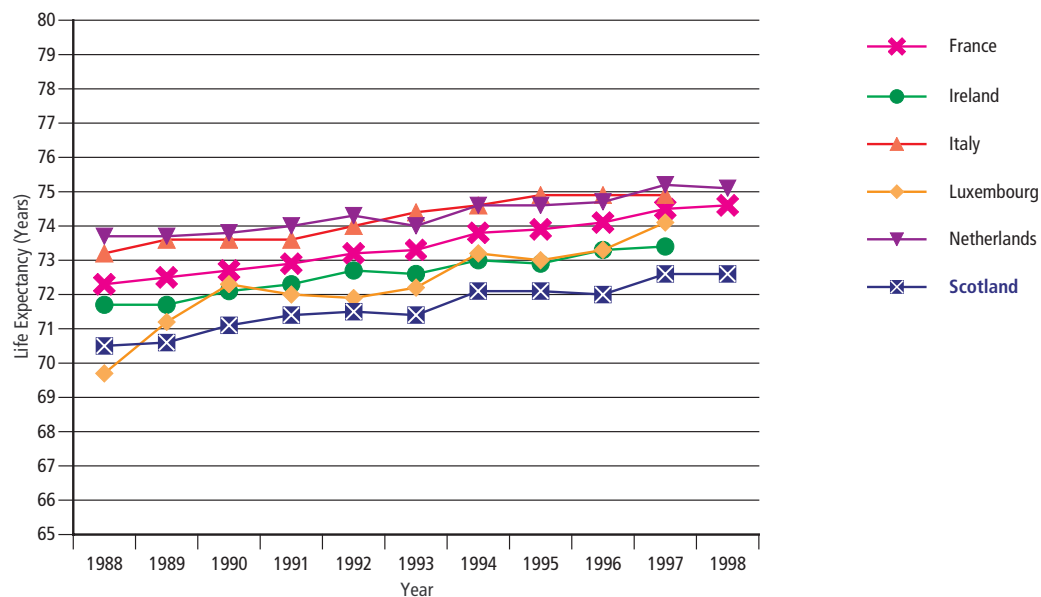


Fig. 13c Males: Scotland, Austria, Portugal, Finland, Sweden

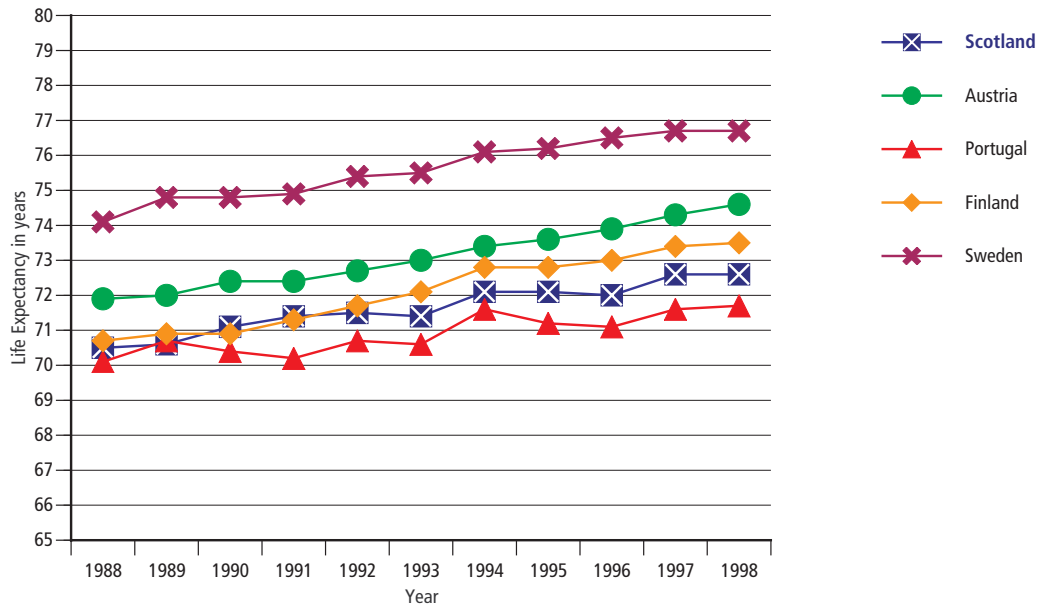
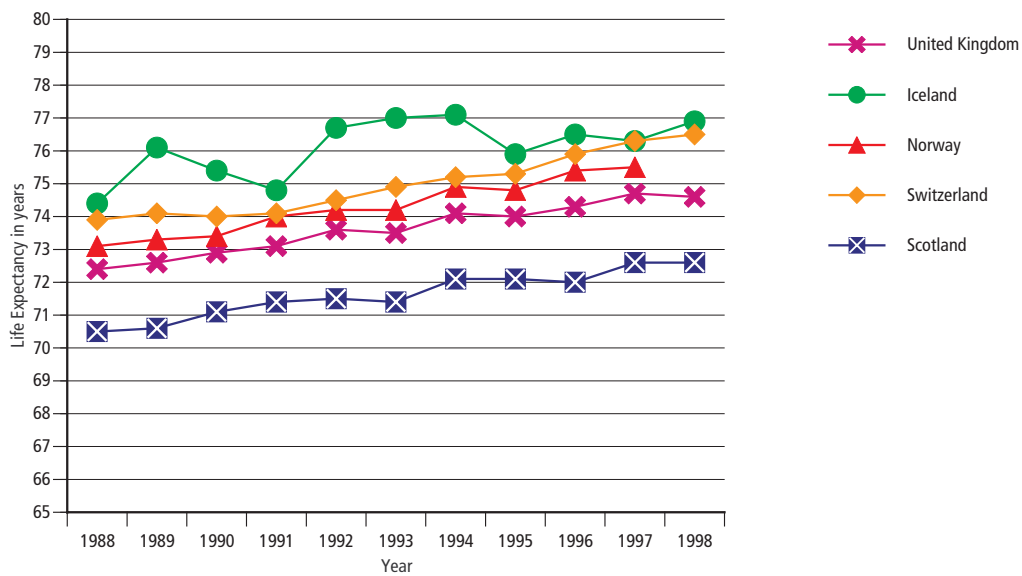


Fig. 13d Males: Scotland, Iceland, UK, Norway, Switzerland



Figs 14a-14d: female life expectancy at birth, Scotland and selected EEC countries, 1988-1998 (Sources: Eurostat, GRO(S)).

Fig. 14a Females: Scotland, Belgium, Denmark, Germany, Greece, Spain

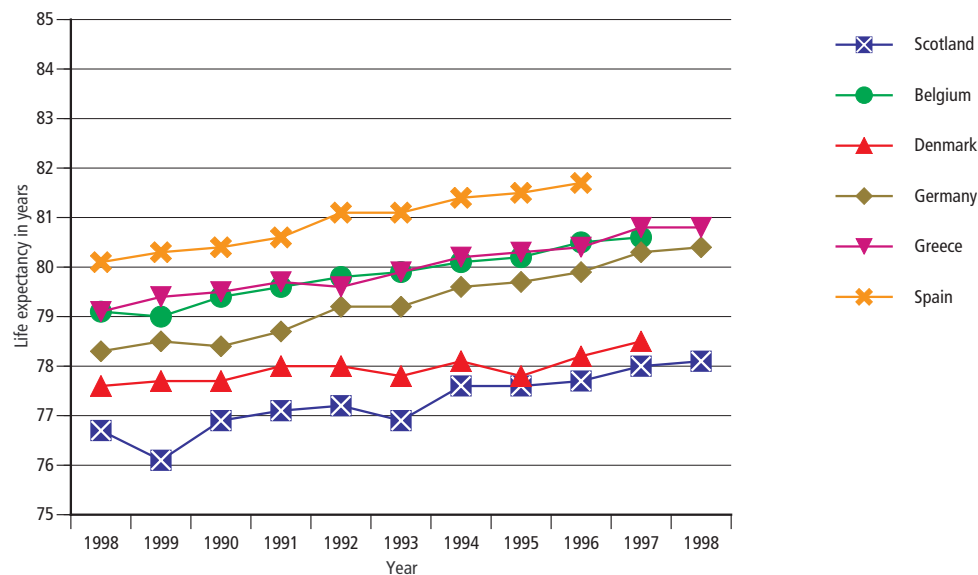


Fig. 14b Females: Scotland, France, Ireland, Italy, Luxembourg, Netherlands

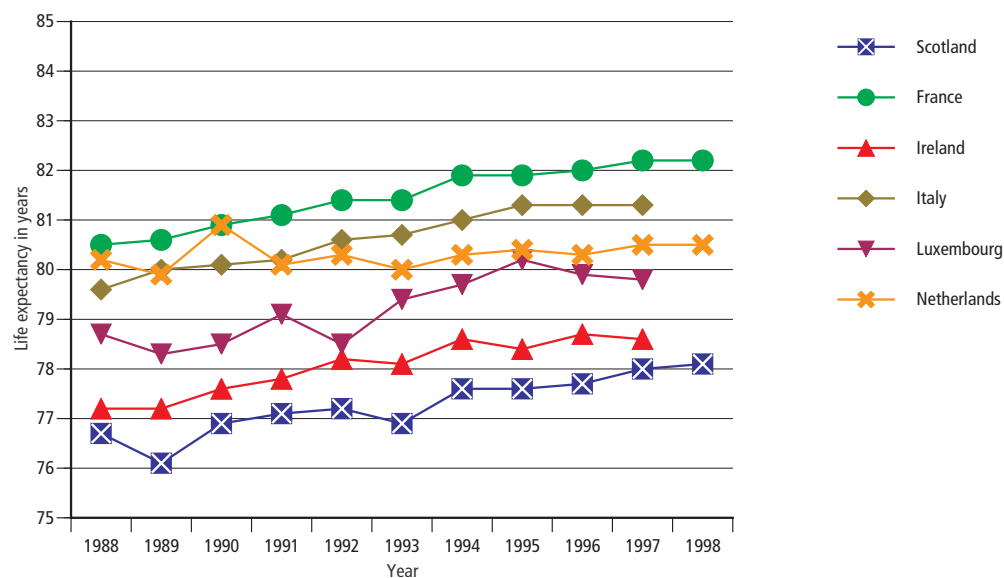


Fig. 14c Females: Scotland, Austria, Portugal, Finland, Sweden

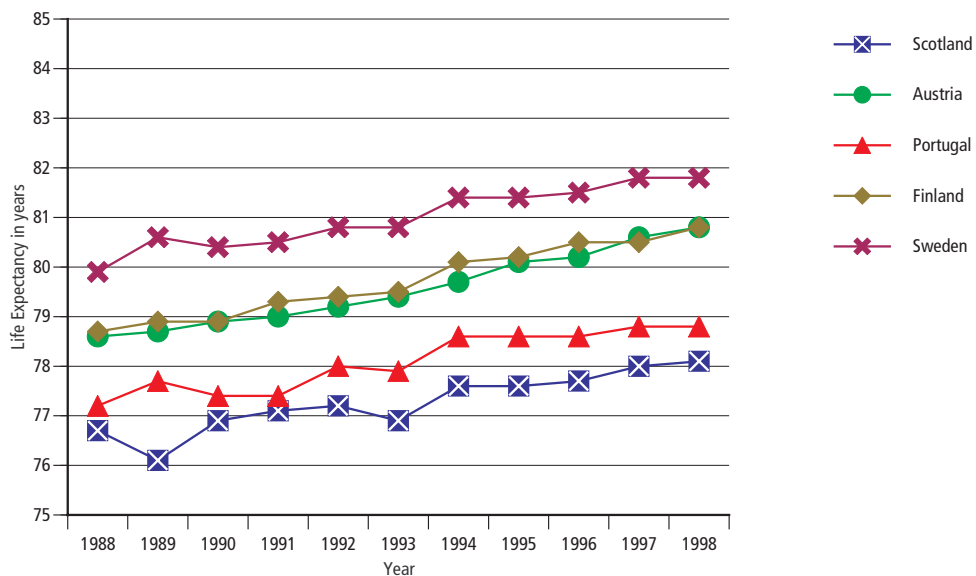


Fig. 14d Females: Scotland, Iceland, UK, Norway, Switzerland

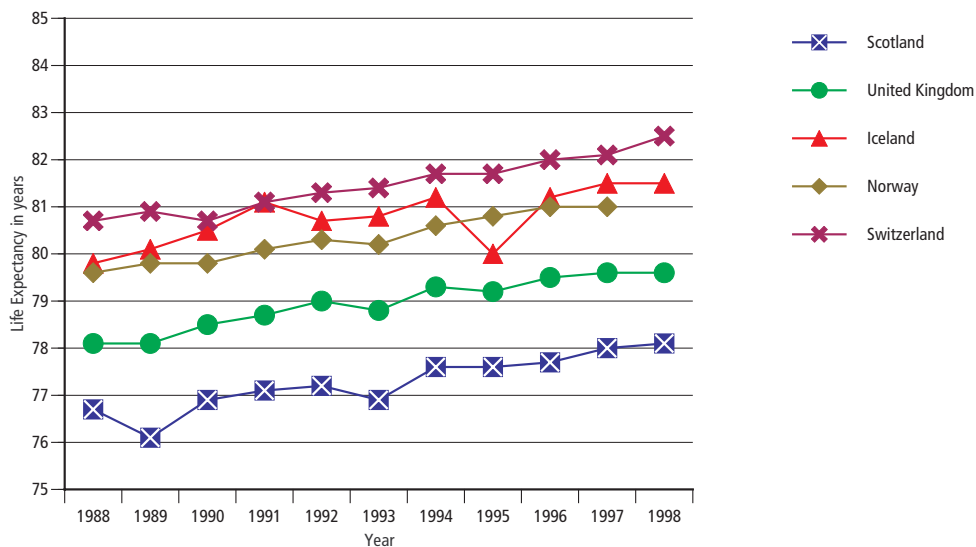


Fig 15a: Estimated trends in life expectancy: % increase between 1988 and 1998 in predicted life expectancy for selected countries (MALES)

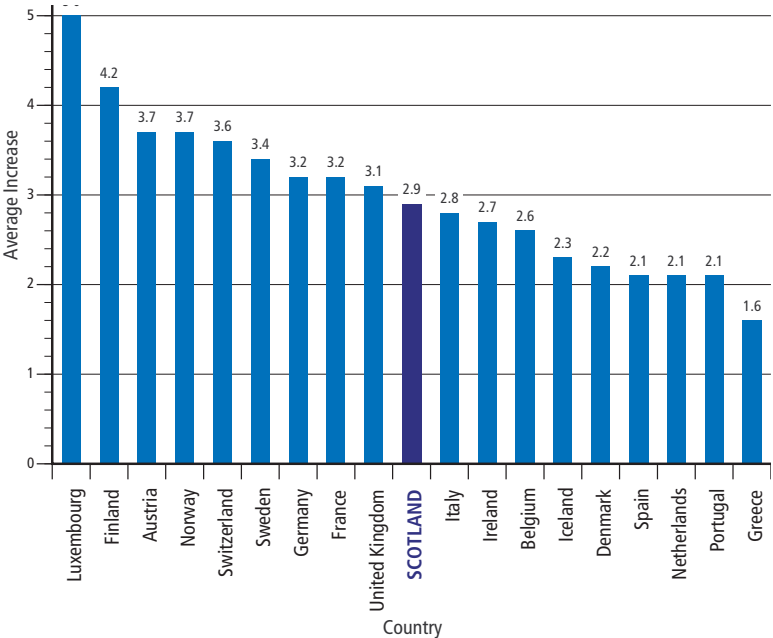
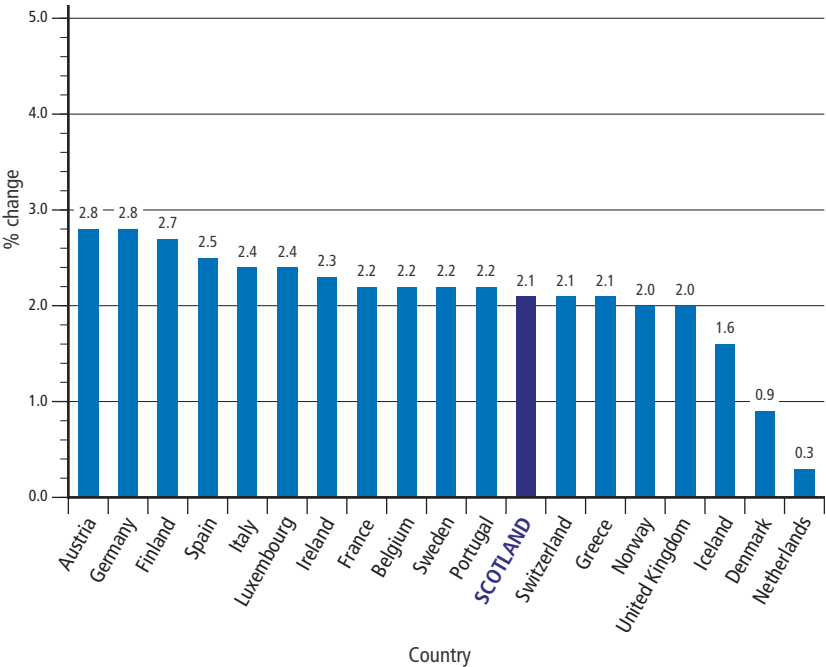


Fig 15b: Estimated trends in life expectancy: % increase between 1988 and 1998 in predicted life expectancy for selected countries (FEMALES)



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