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Recent Trends in Mortality in the United Kingdom

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RECENT TRENDS IN MORTALITY IN THE UNITED KINGDOM

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This paper examines trends in mortality rates in the United Kingdom over the decade 1982 to 1992. Whilst the overall rate of mortality has declined, the extent of improvements has varied by sex, age and cause. Male mortality has improved slightly more than female mortality over the period, resulting in a narrowing of the sex differential. Analyses of mortality by age indicate that the greatest improvements have occurred in the 45 and over age group and in the year after birth, with male mortality at the young adult ages actually increasing over the period. Trends in cause of death patterns over the period have also been studied, and the impact of these changes on the shape of the mortality curve described.

CONTENTS

SECTION	PAGE
1. Acknowledgments	3
2. Introduction	3
3. Overall Mortality Trends	4
3.1 Crude mortality rates	4
3.2 Standardised mortality rates	5
3.3 Expectation of life	6
4. Mortality Trends by Age	7
4.1 Mortality rates by age	7
4.2 Mortality improvements by age	9
5. Mortality By Cause	12
5.1 Standardised mortality rates by cause	12
5.2 Probability of ultimately dying due to a particular cause	14
5.3 Change in the expectation of life by cause and age	16
5.4 Mortality by cause for young adults	19
6. The Sex Differential in Mortality	22
6.1 Sex differential in the expectation of life 1982 - 1992	22
6.2 Sex differential by cause	23
6.3 Change in the sex differential by cause	24
7. Summary and Conclusions	26
8. Appendix - Cause of Death Groupings	27
9. References	28

1. Acknowledgments

I would like to thank the World Health Organisation (WHO) for providing data for this project via the WHO Mortality Data Base. Whilst WHO has provided the data used, any analyses and interpretations are my responsibility alone.

2. Introduction

Mortality in the United Kingdom has declined markedly over the twentieth century. For males, the life expectancy at birth based on 1910-1912 data for England and Wales was 51 years, but by 1980-1982 this had increased to 71 years. For females the change has been even more dramatic, the expectation of life having increased from 55 years in 1910-1912 to 77 years in 1980-1982.

The decline in mortality between the start of the century and the early 1980s has occurred at all ages and for both sexes, but the extent and timing of improvements has varied. During this period percentage decreases in rates of mortality have been highest for infants and children, and have been relatively lower at the older ages. In addition, rates of improvement have generally been greater for females, as indicated by the widening of the sex differential in the expectation of life for much of this century.

This paper examines mortality improvements in the United Kingdom over the period 1982 to 1992. Mortality rates have been calculated based on the deaths and mid-year populations in 1982 and 1992 only, with no smoothing or averaging between years. Averaging over years was not thought necessary as the quantity of data is sufficient to give very small standard errors of the mortality rates. The analysis was performed using LIFETIME, a mortality package developed by J. H. Pollard for the World Health Organisation. Because this package incorporates a slight graduation effect, results quoted in this paper may be slightly different to other published data, but these differences are insignificant.

3. Overall Mortality Trends

3.1 Crude Mortality Rates

Table 1 shows the mid-year populations, numbers of deaths and crude mortality rates for males and females for 1982 and 1992. The male crude mortality rate has dropped by almost 10% over the period, compared with a decrease of less than 5% for females, but naturally these crude rates are influenced by changes in the age structure of the population and should be interpreted in light of changes in this age structure.

Table 1: Mid-year population, total number of deaths and crude mortality rate per 100,000 for United Kingdom males and females, 1982 and 1992.

Population	Mid-year population ('00's)	Total number of deaths	Crude mortality rate (per 100,000)
Males, 1982	273,994	329,972	1,204
Males, 1992	283,582	308,536	1,088
Females, 1982	289,414	332,830	1,150
Females, 1992	296,401	325,703	1,099

The LIFETIME package is able to use the method derived by Kitagawa (1955) to split the total improvement in mortality over the decade 1982 to 1992 into the component due to changes in the age structure of the population and the component due to actual changes in underlying mortality. Table 2 shows the contributions of each of these components to the total changes in the crude mortality rates.

It can be seen that the aging of the population has acted to increase the crude mortality rates for males and especially for females, but that this has been more than offset in both cases by improvements in mortality. Hence the trend in the crude rates understates the decline in mortality over the period, especially for females.

Table 2: Crude mortality rates per 100,000 for United Kingdom males and females, 1982 and 1992, and components of the changes in rates.

	Males	Females
Crude mortality rate 1982 (per 100,000)	1,204	1,150
Population structure component of difference	111	141
Mortality rate component of difference	-227	-192
Total difference	-116	-51
Crude mortality rate 1992 (per 100,000)	1,088	1,099

3.2 Standardised Mortality Rates

A more useful measure of mortality change over the period which avoids the distortions inherent in the crude mortality rate is the standardised mortality rate. This is the overall mortality rate that would result if age specific rates were applied to a population with a standard age structure. In this paper, the United Kingdom 1992 combined male and female population has been used as the standard throughout.

Table 3 shows the overall standardised mortality rates for males and females for 1982 and 1992. The difference in standardised rates reflects the full improvement in underlying mortality over the period, which has been about 18% for males and 17% for females.

Table 3: Standardised mortality rates per 100,000 for United Kingdom males and females, 1982 and 1992. Standard population is 1992 United Kingdom males and females combined.

Population	Standardised mortality rate (per 100,000)	
Males, 1982	1,669	
Males, 1992	1,371	
Difference (% of 1982 rate)	-298	(-18%)
Females, 1982	1,009	
Females, 1992	836	
Difference (% of 1982 rate)	-173	(-17%)

3.3 Expectation of Life

Another single index measure of mortality which is not distorted by changes in age structure is the expectation of life. The expectation of life gives more weight to mortality at younger ages than the overall standardised mortality rate. Table 4 shows the expectation of life at birth, age 25 and age 65 for males and females based on 1982 and 1992 United Kingdom mortality rates. These figures are cross-sectional in that they are based on the mortality rates applying for the single years 1982 and 1992. The figures summarise the mortality experience of the population at that point in time rather than representing the true expectation of life for a particular person or cohort of people.

Male expectation of life at birth has improved by 2.55 years over the period, whereas the corresponding improvement for females has been slightly less at 2.19 years. The improvement in life expectancy at age 65 was similar for males and females, being between 1.3 and 1.4 years for both. It is evident that both male and female mortality have declined over the decade 1982 to 1992, the rate of improvement for males being slightly greater.

Table 4: Cross-sectional expectation of life at birth, age 25 and age 65 in years for United Kingdom males and females, 1982 and 1992.

Population	$\overset{\circ}{e}_0$ (years)	$\overset{\circ}{e}_{25}$ (years)	$\overset{\circ}{e}_{65}$ (years)
Males, 1982	71.03	47.70	13.03
Males, 1992	73.58	49.77	14.41
Difference	2.55	2.07	1.38
Females, 1982	76.95	53.13	16.93
Females, 1992	79.14	54.97	18.26
Difference	2.19	1.84	1.33

4. Mortality Trends By Age

4.1 Mortality Rates by Age

Whilst mortality has declined over the decade 1982 to 1992, the improvement has not occurred uniformly at all ages. In fact mortality has actually worsened at some ages. Figure 1 shows mortality rates by age for males and females in 1982 and 1992 over the whole age range, and Figure 2 shows the rates for ages 15 to 44 in detail.

It is observed from Figure 1 that mortality rates for both males and females are generally lower in 1992 than in 1982 as expected. However, between ages 26 and 38 for males there has been a slight deterioration in mortality. This feature of the experience is highlighted in Figure 2. The worsening of the male experience at these ages is discussed in section 5.4 and appears to be mainly a result of increased mortality due to AIDS, suicide and violent deaths.

A related feature of the male experience which is worthy of note is the levelling of the “accident hump”. This change is due to improvements in motor accident mortality in the late teens and early twenties, as well as increases in mortality in the late twenties and thirties mentioned above. The combined effect of these changes is that the “accident hump” has flattened out so that there is now a plateau in rates from the early twenties to early thirties. The same trend has been observed recently in Australia (Pollard, 1995).

In contrast to this change for males, the 1992 mortality rates for young adult females are generally lower than those in 1982, the exception being at ages 18 and 19 where the rates in 1992 are slightly higher. This increase may be due, in part, to the method used by LIFETIME to calculate rates at individual ages

from the data (provided in 5 year age bands). The technique used involves a discontinuity between ages 19 and 20, and may account for the apparent hump in the 1992 data. Possible reasons for the low level of overall improvement in female mortality between ages 15 and 24 are suggested in section 5.4.

Aside from this deterioration in young adult mortality, improvements have occurred at all ages for males and females. The improvements appear to be particularly marked at ages 0 to 15, and 45 to 60, and are analysed further in section 4.2.

Figure 1: Mortality rates by age for United Kingdom males and females, 1982 and 1992.

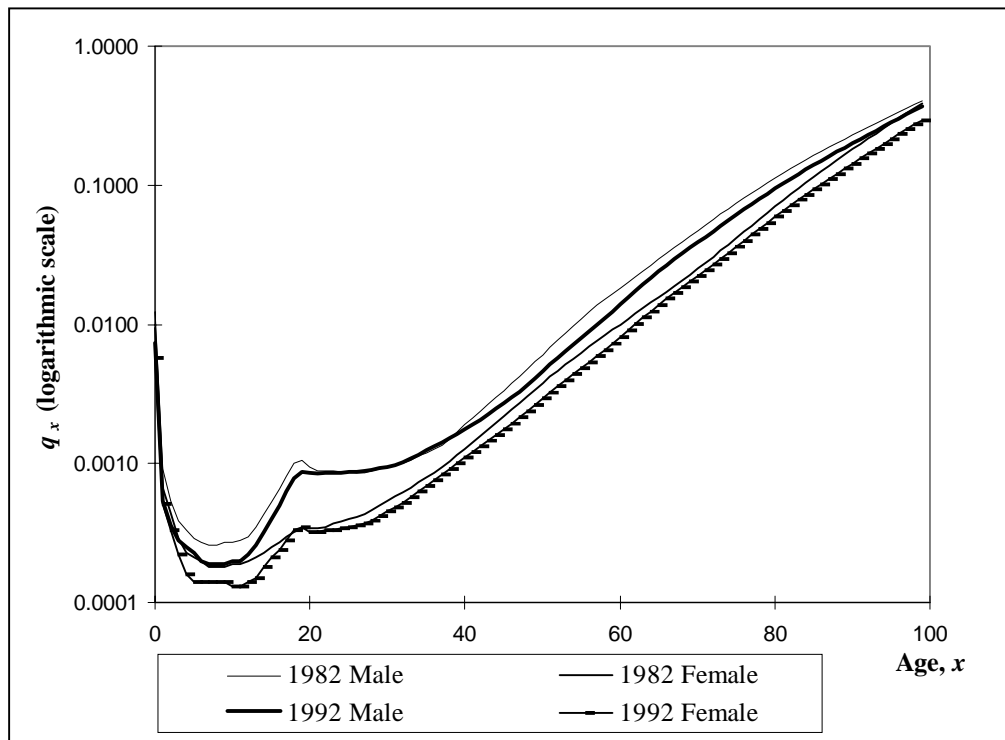
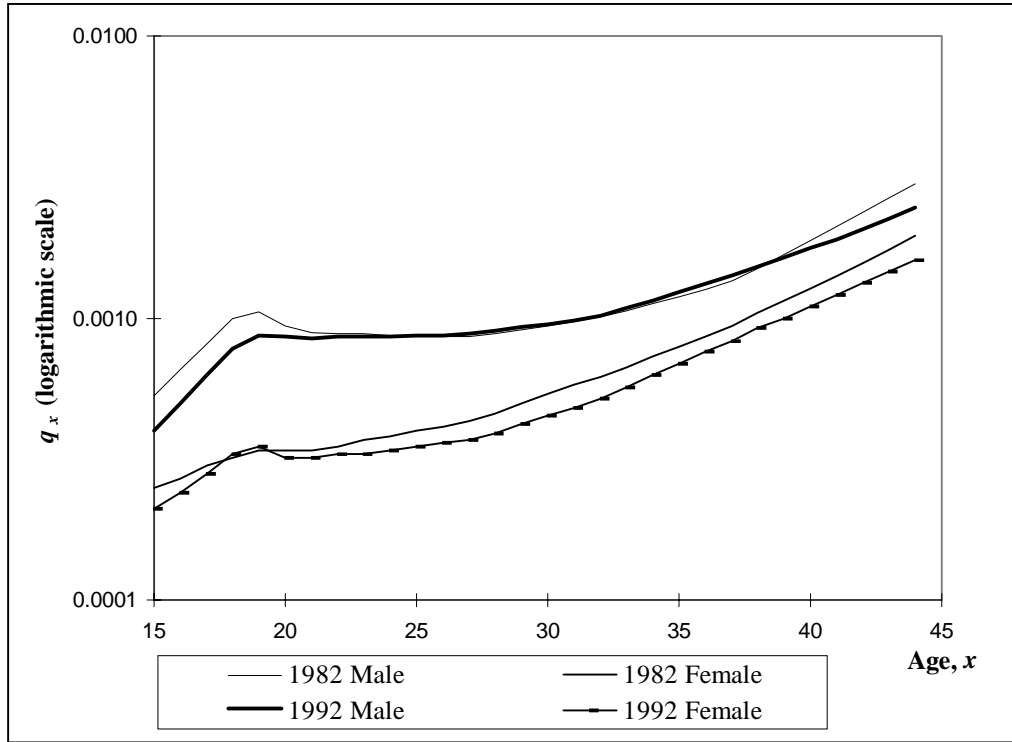


Figure 2: Mortality rates by age, over the age range 15 to 44 years, for United Kingdom males and females, 1982 and 1992.



4.2 Mortality Improvements by Age

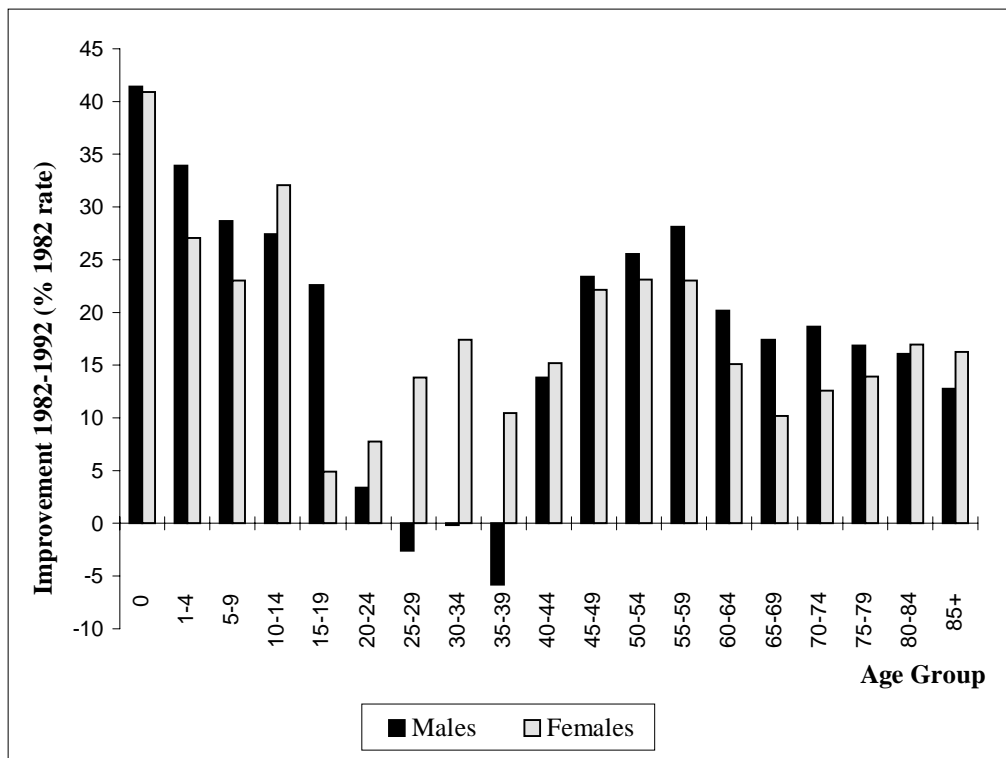
It has been observed that mortality improvements over the decade have varied by age, and Figure 3 demonstrates this fact in more detail. The figure shows, separately for males and females, the improvement in mortality rates between 1982 and 1992, expressed as a percentage of the 1982 mortality rate.

Improvements over the decade below age 15 have been very high, at between 20% and 45% for both males and females. For females the rates of improvement in the 15-19 and 20-24 year age groups are only around 5% and 8% respectively, but the rate of improvement then increases and averages around 15% between ages 25 and 44. In contrast, for males in the age range

25-39 the rates of improvement are negative, with 1992 mortality rates exceeding those in 1982. Between ages 45 and 60 rates of improvement for males and females are between 20 and 30%, the highest of the adult age range for both sexes, with the male rates being slightly higher. Beyond age 60, they are between 10% and 20%, with male improvements exceeding those for females for all age bands except those for ages 80 and over.

In summary, the greatest percentage improvements in mortality rates over the decade have been between 0 and 15 years and 45 and 60 years of age for both males and females, as well as above age 80 for females. The worst experience has been that for males aged 25 to 40.

Figure 3: Improvement in mortality rate 1982 to 1992 (% of 1982 rate) by age in 5 year bands for United Kingdom males and females.



Another way to illustrate the improvements in mortality by age is to quantify the contribution of each age group to the improvement in the expectation of life over the period using the decomposition method of Pollard (1982). Analyses using LIFETIME based on this technique are shown in Table 5. For example, of the total improvement of 2.55 years in the male expectation of life over the period 1982 to 1992, 0.87 years, or 34%, was due to improved mortality in the 60 to 74 year age group.

The results indicate that there were significant mortality improvements for both males and females in the year after birth as well as at ages 45 and over. The main sources of improvement in the expectation of life were age groups 60 to 74 for males, and 75 and over for females. These results are consistent with those observed in Figure 3, taking into account the fact that the LIFETIME approach gives greater weight to the ages where mortality is heaviest.

Table 5: Contribution by each age group to the improvement in the expectation of life at birth between 1982 and 1992 for United Kingdom males and females, in both hundredths of a year and as a percentage of the total improvement.

Age Group	Contribution to improvement in life expectancy at birth for			
	Males		Females	
	$\frac{1}{100}$ year	% total	$\frac{1}{100}$ year	% total
0	36	14	30	14
1-14	10	4	6	3
15-29	5	2	3	1
30-44	3	1	8	4
45-59	65	26	42	19
60-74	87	34	48	22
75+	49	19	82	37
All Ages	255	100	219	100

5. Mortality By Cause

5.1 Standardised Mortality Rates by Cause

Table 6 shows standardised mortality rates per 100,000 by cause for males and females in 1982 and 1992, as well as the ratio of the 1992 rate to the 1982 rate. A ratio below one indicates that mortality due to the cause under consideration has improved over the decade, greater improvement being indicated by a lower ratio. Ratios are based on the unrounded mortality rates and hence will differ slightly from the ratios of the rates as given in the table.

The cause groupings were compiled from the International Classification of Diseases (Ninth Revision) Basic Tabulations List (WHO, 1977). The appendix to this report gives details of the disease groupings falling into each classification.

The importance of each of the various causes of death is indicated by the absolute magnitude of the standardised mortality rate. For men, it can be seen that ischaemic heart disease is the major killer, followed by respiratory diseases, cerebrovascular disease (mainly strokes) and lung, throat and digestive system cancers.

For females the pattern is similar, with ischaemic heart disease again being the dominant cause of death, followed by cerebrovascular disease, respiratory diseases and other cancers. It is interesting to note that male experience is heavier than female experience for all causes apart from the female-specific classes of female breast cancers and obstetrics.

A consideration of the ratios in Table 6 indicates that proportionate improvements in standardised mortality rates for males have been highest for respiratory diseases and other circulatory diseases, followed by motor and non-motor accidents and congenital/perinatal diseases. For these classes the 1992 mortality rate is less than 75% of the 1982 rate. Significant percentage improvements are also observed for cerebrovascular disease, ischaemic heart disease, lung and throat cancers and digestive system diseases.

Male mortality has not improved for all classes though, with notable deteriorations observed due to other cancers (for a more detailed study of cancer trends in England and Wales between 1970-74 and 1990-94 see Dunnell, 1995), violence and other causes. The most significant proportionate deteriorations, however, are due to prostate cancer and cirrhosis of the liver for both of which the 1992 mortality rate is almost 140% of that for 1982.

For females the experience is similar, with major improvements due to other circulatory diseases, respiratory diseases, suicides, motor and non-motor accidents and congenital/perinatal diseases; smaller proportionate improvements for cerebrovascular disease, ischaemic heart disease, violence and digestive system diseases and cancers; and deteriorations due to lung and throat and other cancers, cirrhosis and other causes.

There are two notable differences between the trends in male and female experience. Firstly, suicide and violent deaths have improved for females but deteriorated for males. Secondly, lung and throat cancer experience over the decade has worsened for females but improved somewhat for males. A very similar pattern in sex-specific mortality rates for lung and throat cancers was observed by Pollard (1995) for Australian experience over the same period.

Table 6: Standardised mortality rate per 100,000 by cause for United Kingdom males and females for 1982 and 1992 and ratio of 1992 rate to 1982 rate. Standard population is 1992 United Kingdom males and females combined.

Cause	Standardised mortality rate per 100,000 for					
	Males			Females		
	1982	1992	Ratio	1982	1992	Ratio
Cancers						
• Lung, throat etc.	140	120	0.86	35	41	1.17
• Digestive system	107	105	0.98	65	59	0.92
• Female breast	-	-	-	44	45	1.01
• Male prostate	33	45	1.39	-	-	-
• All other neoplasms	85	97	1.14	76	80	1.06
Ischaemic heart disease	487	395	0.81	228	193	0.85
Cerebrovascular disease	169	136	0.80	149	114	0.77
Other circulatory disease	156	95	0.61	120	66	0.55
Respiratory diseases	290	165	0.57	147	85	0.58
Digestive system diseases	36	32	0.89	29	27	0.93
Cirrhosis of the liver	6	8	1.37	4	5	1.21
Infectious diseases	6	6	1.07	4	4	1.08
AIDS/related conditions	0.0	1.9	-	0.0	0.1	-
Obstetrics	-	-	-	0.2	0.2	1.00
Congenital/perinatal	13	10	0.73	10	8	0.75
Motor vehicle accident	16	12	0.74	6	5	0.75
Non-motor accident	22	16	0.73	16	10	0.61
Suicide	13	13	1.01	6	4	0.60
Violence	5	7	1.22	3	3	0.89
Other	85	107	1.26	67	87	1.30
Total	1,669	1,371	0.82	1,009	836	0.83

5.2 Probability of Ultimately Dying due to a Particular Cause

Table 7 gives the probability of ultimately dying due to a particular cause based on the mortality rates for 1982 and 1992, and the ratio of the 1992 probability to the 1982 probability. A higher ratio indicates that the cause being considered has become relatively more important. It should be noted, however, that a ratio of over 100% does not necessarily imply worsening experience, but only that experience has improved less than the average.

The results in Table 7 confirm the findings of section 5.1 regarding the important causes of death, and the sources of mortality improvement. The table indicates that about three out of every ten deaths for males are due to ischaemic heart disease, compared with about 2.3 of every ten for females. The increasing relative importance of cancer as a cause of death, due in part to improvements in heart disease mortality, is also emphasised.

Table 7: Probability of ultimately dying due to a particular cause for United Kingdom males and females for 1982 and 1992 and ratio of 1992 probability to 1982 probability.

Cause	Probability (%) of death by cause for					
	Males			Females		
	1982	1992	Ratio	1982	1992	Ratio
Cancers						
• Lung, throat etc.	9.2	9.0	0.98	3.2	4.1	1.29
• Digestive system	6.8	7.9	1.16	6.2	6.6	1.06
• Female breast	-	-	-	4.0	4.5	1.13
• Male prostate	1.8	3.2	1.76	-	-	-
• All other neoplasms	5.4	7.2	1.32	6.9	8.3	1.20
Ischaemic heart disease	30.2	29.1	0.96	22.6	23.4	1.03
Cerebrovascular disease	9.5	9.7	1.02	15.1	14.8	0.98
Other circulatory disease	8.8	6.9	0.78	12.6	8.6	0.68
Respiratory diseases	15.7	11.7	0.75	15.5	11.4	0.73
Digestive system diseases	2.1	2.3	1.10	2.9	3.3	1.15
Cirrhosis of the liver	0.4	0.6	1.48	0.3	0.4	1.27
Infectious diseases	0.4	0.5	1.22	0.3	0.4	1.28
AIDS/related conditions	0.0	0.1	-	0.0	0.0	-
Obstetrics	-	-	-	0.0	0.0	-
Congenital/perinatal	1.0	0.7	0.74	0.8	0.6	0.77
Motor vehicle accident	1.1	0.9	0.78	0.5	0.4	0.79
Non-motor accident	1.4	1.2	0.85	1.6	1.1	0.73
Suicide	0.9	0.9	1.05	0.5	0.3	0.60
Violence	0.4	0.5	1.26	0.3	0.2	0.90
Other	4.9	7.6	1.56	6.7	11.6	1.73
Total	100.0	100.0		100.0	100.0	

5.3 Change in the Expectation of Life by Cause and Age

In sections 5.1 and 5.2, improvements in mortality by cause over the decade 1982 to 1992 were analysed by considering standardised mortality rates and probabilities of death by cause respectively.

Another method of analysis involves apportioning the total improvement in the expectation of life into the components due to each cause, using the method described by Pollard (1982). This method of analysis gives more weight to the more important causes as well as to causes which tend to act earlier in the lifespan. Tables 8 and 9 indicate the contributions made by the various causes to the changes in expectation of life over the period 1982 to 1992 for males and females respectively by age.

For males, it has been observed that the 2.55 year improvement in the cross-sectional expectation of life has been almost entirely due to mortality improvements in the year after birth, and for ages 45 and above (especially ages 60 to 74).

The main source of improvement has been ischaemic heart disease, accounting for 35% of the total improvement in the expectation of life over the decade. This result indicates that the downward trend observed in mortality rates due to this cause between 1973-74 and 1979-80 (Heller, Hayward & Hobbs, 1983) has continued over the decade 1982 to 1992. Other significant sources of improvement have been respiratory disease, other circulatory diseases, cerebrovascular disease, and lung and throat cancers, all of which have had the greatest effect at ages above 60.

AIDS, suicide and violence have been important sources of worsening mortality for the 15-44 age group, and are analysed further in section 5.4.

Table 8: Contribution by cause to improvement in expectation of life between 1982 and 1992 in hundredths of a year for United Kingdom males.

Cause	Contribution to improvement in the expectation of life at birth from age group							All Ages
	0	1-14	15-29	30-44	45-59	60-74	75+	
Cancers								
• Lung, throat etc.	0	0	0	1	8	10	2	21
• Digestive system	0	0	0	0	1	0	0	1
• Female breast	-	-	-	-	-	-	-	-
• Male prostate	0	0	0	0	0	-3	-3	-6
• All other neoplasms	0	2	1	0	0	-2	-3	-2
Ischaemic heart disease	0	0	0	6	36	37	11	90
Cerebrovascular disease	0	0	1	1	4	11	6	23
Other circulatory disease	0	0	0	0	6	11	13	30
Respiratory diseases	7	2	1	1	7	21	27	66
Digestive system diseases	0	0	0	0	1	2	1	4
Cirrhosis of the liver	0	0	0	-1	-1	-1	0	-3
Infectious diseases	0	0	0	0	0	0	0	0
AIDS/related conditions	0	0	-1	-3	0	0	0	-4
Obstetrics	-	-	-	-	-	-	-	-
Congenital/perinatal	19	1	0	0	0	0	0	20
Motor vehicle accident	0	2	7	1	1	0	0	11
Non-motor accident	1	2	2	1	1	1	1	9
Suicide	0	0	-3	-2	1	1	0	-3
Violence	0	0	-2	-1	0	0	0	-3
Other	9	1	-1	-1	0	-1	-6	1
Total	36	10	5	3	65	87	49	255

For females the 2.19 year improvement in the expectation of life is also almost entirely due to improvements in the year after birth and for ages 45 and over, with the greatest improvements occurring in the oldest (75 and over) age band. The single most significant source of improvement for females is respiratory disease, followed by other circulatory diseases, ischaemic heart disease and cerebrovascular disease. Table 9 also shows a significant deterioration in mortality at the oldest ages due to other causes, and small overall deteriorations due to cirrhosis and lung and throat cancers. In contrast to males, there is no worsening of experience due to suicide, violence or AIDS.

It is interesting to note that female lung and throat cancer and other neoplasms mortality improved at ages below 60, but worsened noticeably at the older ages. Alderson and Ashwood (1985) examined mortality rates in England and Wales between 1946 and 1984 for cancer of the trachea, bronchus and lung by sex, age (for ages over 60) and year of birth. They found that whilst male rates had peaked for those born around the turn of the century, female rates had increased in all age groups. It will be interesting to observe whether future trends in age-specific female mortality rates for lung cancer indicate that female rates have peaked for a particular cohort, although it is of course too early to suggest the existence of such a trend on the basis of the current data.

Table 9: Contribution by cause to improvement in expectation of life between 1982 and 1992 in hundredths of a year for United Kingdom females.

Cause	Contribution to improvement in the expectation of life at birth from age group							All Ages
	0	1-14	15-29	30-44	45-59	60-74	75+	
Cancers								
• Lung, throat etc.	0	0	0	0	3	-4	-3	-4
• Digestive system	0	0	0	0	2	2	2	6
• Female breast	0	0	0	1	3	0	-1	3
• Male prostate	-	-	-	-	-	-	-	-
• All other neoplasms	0	1	1	1	2	-2	-3	0
Ischaemic heart disease	0	0	0	1	10	17	13	41
Cerebrovascular disease	0	0	0	1	5	13	17	36
Other circulatory disease	0	0	0	1	6	11	30	48
Respiratory diseases	6	2	1	1	6	8	37	61
Digestive system diseases	0	0	0	0	1	1	1	3
Cirrhosis of the liver	0	0	0	0	-1	0	0	-1
Infectious diseases	0	0	0	0	0	0	0	0
AIDS/related conditions	0	0	0	0	0	0	0	0
Obstetrics	0	0	0	0	0	0	0	0
Congenital/perinatal	15	0	0	0	0	0	0	15
Motor vehicle accident	0	1	1	1	1	0	0	4
Non-motor accident	1	1	0	0	1	2	3	8
Suicide	0	0	0	1	2	1	0	4
Violence	0	0	0	0	0	0	0	0
Other	8	1	0	0	1	-1	-14	-5
Total	30	6	3	8	42	48	82	219

5.4 Mortality by Cause for Young Adults

The poor mortality experience for males in the 15 to 44 age band over the period 1982 to 1992 has been noted previously, and Table 10 shows this experience in more detail, with Table 11 showing the corresponding results for females.

For males, mortality has worsened for the 25 to 39 year age group. Mortality prior to age 25 has shown a net improvement largely due to improved motor accident mortality, and mortality for ages 40 and over has improved, largely due to a decline in ischaemic heart disease mortality.

For the 25 to 39 year age band, small improvements in mortality due to motor and non-motor accident and ischaemic heart disease have been more than offset by deteriorations due to AIDS, suicide and violence. Dunnell (1991) has observed similar results for males aged 15-39 over the mid to late 1980s. It is important to note that the effect of AIDS in 1992 is likely to have been understated due to incomplete identification of AIDS deaths from death registration (McCormick, 1994).

Suicide has been identified as a source of deteriorating mortality for young adult males over the decade to 1992. Charlton, Kelly, Dunnell, Evans, & Jenkins (1993) have observed that suicide rates for males aged 25-44 have generally increased over the 1970s and 1980s in England and Wales, Scotland and Northern Ireland. They suggest that the increasing numbers of divorced and single men may account for up to half of the observed increase in suicides in England and Wales between the early 1970s and the late 1980s.

Table 10: Standardised mortality rate per 100,000 for major cause groupings in 5-year age bands for United Kingdom males aged 15 to 44, 1982 and 1992. Standard population is 1992 United Kingdom males and females combined.

Cause	Standardised mortality rate per 100,000 for males in age group					
	15-19	20-24	25-29	30-34	35-39	40-44
All Cause Rate 1982	81	89	86	101	136	238
Ischaemic heart disease 1982	0	1	2	9	25	73
Ischaemic heart disease 1992	0	0	2	6	19	45
Improvement	0	1	0	3	6	28
AIDS/related conditions 1982	0	0	0	0	0	0
AIDS/related conditions 1992	0	1	2	5	5	5
Improvement	0	-1	-2	-5	-5	-5
Motor vehicle accident 1982	37	32	18	13	12	11
Motor vehicle accident 1992	23	23	15	12	10	9
Improvement	14	9	3	1	2	2
Non-motor accident 1982	11	13	12	13	12	15
Non-motor accident 1992	6	10	10	11	10	13
Improvement	5	3	2	2	2	2
Suicide 1982	4	10	15	15	15	16
Suicide 1992	6	17	17	17	19	20
Improvement	-2	-7	-2	-2	-4	-4
Violence 1982	4	7	6	6	6	7
Violence 1992	5	10	10	9	8	8
Improvement	-1	-3	-4	-3	-2	-1
All Other Causes 1982	25	26	33	45	66	116
All Other Causes 1992	23	25	32	42	71	106
Improvement	2	1	1	3	-5	10
Total Improvement	18	3	-2	-1	-6	32
All Cause Rate 1992	63	86	88	102	142	206

For females, mortality has improved in all age bands between 15 and 44, although the decline has been minor at ages below 30. Improvements in motor and non-motor accident, suicide and other causes have offset small deteriorations due to violence and AIDS. Dunnell (1991) has suggested that the lack of improvement for females in this age range between the mid and late

1980s may also be due in part to increased numbers of deaths from cancers of the breast and cervix as well as digestive and nervous system disorders, but this subdivision of causes has not been considered here. It can be seen that the effect of AIDS is small for females.

Table 11: Standardised mortality rate per 100,000 for major cause groupings in 5-year age bands for United Kingdom females aged 15 to 44, 1982 and 1992. Standard population is 1992 United Kingdom males and females combined.

Cause	Standardised mortality rate per 100,000 for females in age group					
	15-19	20-24	25-29	30-34	35-39	40-44
All Cause Rate 1982	30	35	43	62	94	157
Ischaemic heart disease 1982	0	0	0	1	5	11
Ischaemic heart disease 1992	0	0	0	1	4	8
Improvement	0	0	0	0	1	3
AIDS/related conditions 1982	0	0	0	0	0	0
AIDS/related conditions 1992	0	0	1	0	0	0
Improvement	0	0	-1	0	0	0
Motor vehicle accident 1982	10	7	4	3	3	3
Motor vehicle accident 1992	7	6	3	3	3	3
Improvement	3	1	1	0	0	0
Non-motor accident 1982	2	3	3	4	4	4
Non-motor accident 1992	2	2	2	3	3	4
Improvement	0	1	1	1	1	0
Suicide 1982	1	3	5	5	6	7
Suicide 1992	2	3	4	4	4	5
Improvement	-1	0	1	1	2	2
Violence 1982	2	3	3	3	4	4
Violence 1992	2	4	4	3	4	4
Improvement	0	-1	-1	0	0	0
All Other Causes 1982	15	19	28	46	72	128
All Other Causes 1992	15	18	23	38	65	109
Improvement	0	1	5	8	7	19
Total Improvement	2	2	6	10	11	24
All Cause Rate 1992	28	33	37	52	83	133

6. The Sex Differential in Mortality

6.1 Sex Differential in the Expectation of Life 1982 - 1992

In almost all countries of the world, mortality for all causes combined is lower for females than for males, and for many years this differential was widening (Pollard, Yusuf & Pollard, 1974). The report on the English life tables no. 14 (OPCS, 1987) traces changes in the expectation of life over the century, based on data for England and Wales, and the results are reproduced in Table 12. It can be seen that the sex differential widened until at least the early 1970s, reflecting the greater rates of mortality improvement for women until this time.

Table 12: Expectation of life at birth based on English life tables nos. 8 to 14 for males and females and the sex differential.

Table	Male e_0 (years)	Female e_0 (years)	Sex differential (years)
ELT 8 (1910-12)	51.50	55.35	3.85
ELT 10 (1930-32)	58.74	62.88	4.14
ELT 11 (1950-52)	66.42	71.54	5.12
ELT 12 (1960-62)	68.09	74.00	5.91
ELT 13 (1970-72)	69.00	75.25	6.25
ELT 14 (1980-82)	71.04	77.00	5.96

On the basis of data for the United Kingdom as a whole, the sex differential in life expectancy at birth has generally been narrowing over the period 1982 to 1992. Table 13 shows the sex differential in the expectation of life for each year in this period, and whilst small fluctuations from year to year can be observed, a decreasing trend in the sex differential is evident. A narrowing sex differential has also been observed in Australia for the same period (Pollard, 1995), although in the Australian case the differential narrowed by over a year from 7.03 years to 5.99 years, compared with a change of about a third of a year for the United Kingdom.

Table 13: Expectation of life at birth in years for the years 1982-1992 for United Kingdom males and females and the sex differential.

Year	Male e_0 (years)	Female e_0 (years)	Sex differential (years)
1982	71.03	76.95	5.92
1983	71.27	77.20	5.93
1984	71.67	77.54	5.87
1985	71.63	77.35	5.72
1986	71.84	77.67	5.83
1987	72.31	78.03	5.72
1988	72.41	78.10	5.69
1989	72.64	78.11	5.47
1990	72.96	78.57	5.61
1991	73.14	78.76	5.62
1992	73.58	79.14	5.56

6.2 Sex Differential by Cause

Table 14 shows the contribution made by the various causes of death to the sex differential in the expectation of life at birth in 1992. The total sex differential is 5.56 years, and the table shows the contribution made by each cause expressed in hundredths of a year.

The most significant contributor to the sex differential is ischaemic heart disease, the lower female mortality due to this cause contributing 2.21 years, or 40% of the total sex differential. The second most significant contribution is from lung and throat cancers (contributing 0.78 years), followed by respiratory diseases (0.59 years), digestive system cancers (0.48 years) and male prostate cancer (0.35 years). The only negative contributions are from breast cancer (a major contributor at 0.62 of a year) and obstetrics, reflecting the lighter female mortality for all other causes.

Table 14: Contribution by cause to the sex differential in the expectation of life at birth in 1992 in hundredths of a year for United Kingdom males and females.

Cause	Contribution by cause in hundredths of a year to sex differential in expectation of life for age group							All Ages
	0	1-14	15-29	30-44	45-59	60-74	75+	
Cancers								
• Lung, throat etc.	0	0	0	2	14	39	23	78
• Digestive system	0	0	0	2	10	24	12	48
• Female breast	0	0	-1	-8	-24	-20	-9	-62
• Male prostate	0	0	0	0	2	14	19	35
• All other neoplasms	0	1	2	-1	-3	3	9	11
Ischaemic heart disease	0	0	1	11	57	99	53	221
Cerebrovascular disease	0	0	0	0	2	9	8	19
Other circulatory disease	0	0	1	1	4	13	9	28
Respiratory diseases	1	0	1	2	3	18	34	59
Digestive system diseases	0	0	0	0	1	2	2	5
Cirrhosis of the liver	0	0	0	1	2	1	0	4
Infectious diseases	0	0	0	1	1	1	1	4
AIDS/related conditions	0	0	1	3	1	0	0	5
Obstetrics	0	0	0	-1	0	0	0	-1
Congenital/perinatal	9	0	0	0	0	0	0	9
Motor vehicle accident	0	2	12	5	2	1	0	22
Non-motor accident	0	2	5	5	4	1	0	17
Suicide	0	0	8	9	5	1	0	23
Violence	0	0	4	3	1	0	0	8
Other	3	1	3	3	2	4	7	23
Total	13	6	37	38	84	210	168	556

6.3 Change in the Sex Differential by Cause

It has been noted that the sex differential in life expectancy at birth has narrowed from 5.92 years in 1982 to 5.56 years in 1992. A comparison of the contributions by each cause to the sex differentials applying for each of the years 1982 and 1992 may indicate the possible reasons for the decline.

Table 15 shows the contribution in hundredths of a year made by the various causes of death to the sex differential in the expectation of life at birth in 1982. The major contributions are from ischaemic heart disease (2.56 years), lung and throat cancers (0.91 years) and respiratory diseases (0.85 years).

Table 15: Contribution by cause to the sex differential in the expectation of life at birth in 1982 in hundredths of a year for United Kingdom males and females.

Cause	Contribution by cause in hundredths of a year to sex differential in expectation of life for age group							All Ages
	0	1-14	15-29	30-44	45-59	60-74	75+	
Cancers								
• Lung, throat etc.	0	0	0	2	20	48	21	91
• Digestive system	0	0	0	2	9	19	8	38
• Female breast	0	0	-1	-9	-24	-17	-5	-56
• Male prostate	0	0	0	0	1	9	9	19
• All other neoplasms	0	2	2	-2	-5	1	4	2
Ischaemic heart disease	0	0	1	16	83	112	44	256
Cerebrovascular disease	0	0	0	0	2	10	4	16
Other circulatory disease	0	0	1	1	5	15	8	30
Respiratory diseases	2	1	1	1	6	33	41	85
Digestive system diseases	0	0	0	1	1	3	1	6
Cirrhosis of the liver	0	0	0	1	1	1	0	3
Infectious diseases	0	0	0	0	1	1	1	3
AIDS/related conditions	0	0	0	0	0	0	0	0
Obstetrics	0	0	0	-1	0	0	0	-1
Congenital/perinatal	12	2	0	0	0	0	0	14
Motor vehicle accident	0	2	17	5	3	1	0	28
Non-motor accident	0	2	8	5	4	1	0	20
Suicide	0	0	6	5	3	1	0	15
Violence	0	0	2	2	1	0	0	5
Other	6	1	2	1	1	3	4	18
Total	20	10	39	30	112	241	140	592

From a comparison of Tables 14 and 15 it can be seen that the contributions to the sex differential in the expectation of life from the three major contributors (ischaemic heart disease, lung and throat cancers and respiratory disease) were higher in 1982 than in 1992. Hence, mortality trends for these classes have contributed to the narrowing of the sex differential. It is probable that the worsening experience for male prostate cancer and the poor experience of males relative to females for other cancers, suicide and violence have offset this narrowing trend to some degree.

7. Summary and Conclusions

Mortality rates in the United Kingdom have been declining since the start of this century or earlier, and improvements have continued over the period 1982 to 1992. The cross-sectional expectation of life at birth for males has risen by 2.55 years to 73.58 years over this period, and for females by 2.19 years to 79.14 years in 1992.

Male mortality has improved slightly more than female mortality, despite the fact that male mortality rates between ages 26 and 38 deteriorated over the period, due to AIDS and an increase in suicide and violent deaths. Improvements for males were particularly marked in the 45 to 74 year age group, the major sources of improvement at these ages being ischaemic heart disease, respiratory diseases and lung and throat cancers.

For females, the biggest effect of improvements in mortality was felt at the older ages, and especially in the 75 and over age group, with respiratory diseases and other circulatory diseases being major sources of improvement. In contrast to males, lung and throat cancer mortality deteriorated over the period, and this factor, along with the relatively lower rate of improvement in ischaemic heart disease mortality for females, has contributed to a narrowing of the sex differential in expectation of life at birth by about a third of a year.

8. Appendix - Cause of Death Groupings

The cause of death groupings used throughout this paper are taken from the International Classification of Diseases, Ninth Revision Basic Tabulations List (WHO, 1977) as outlined in Table 16.

Table 16: Cause groupings used and corresponding codes from the Basic Tabulations List from the International Classification of Diseases - Ninth Revision.

Cause	ICD - 9 Basic Tabulation List Codes
Cancers	
• Lung, throat etc.	08, 10
• Digestive system	09
• Female breast	11.3
• Male prostate	12.4
• All other neoplasms	11-17 excluding 11.3, 12.4
Ischaemic heart disease	27
Cerebrovascular disease	29
Other circulatory disease	25, 26, 28, 30
Respiratory diseases	31, 32
Digestive system diseases	33, 34 excluding 34.7
Cirrhosis of the liver	34.7
Infectious diseases	01-07
AIDS/related conditions	18.4, 18.5
Obstetrics	38, 39, 40, 41
Congenital/perinatal	44, 45
Motor vehicle accident	47.1
Non-motor accident	47-53 excluding 47.1
Suicide	54
Violence	55, 56
Other	18-24, 35-37, 42-43, 46 excluding 18.4, 18.5
Total	01-56

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