



## Trend in life expectancy at birth and at age 65 by socio-economic position based on the National Statistics Socio-economic Classification, England and Wales, 1982—1986 to 2007—2011

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Geographical Area: **Other**  
Theme: **Health and Social Care**  
Theme: **Population**

## Main findings

- The Slope Index of Inequality shows the gap in life expectancy at birth for males widened overall during the past 30 years from 5.6 years to 6.7 years; however, since 1997 to 2001, when it stood at 7.5 years, the gap has narrowed.
- The Slope Index of Inequality in life expectancy at birth for females widened from 3.8 years to 5.3 years and it was widest in 2007 to 2011.
- The improvement in male life expectancy at birth between 1982 to 1986 and 2007 to 2011 ranged from 7.1 years for the Intermediate class to 5.8 years for the Routine class; the Higher Managerial and Professional class gained 6.8 years.
- The improvement in female life expectancy at birth was smaller than that for males, ranging from 4.8 years for the Lower Managerial and Professional class to 3.3 years in the Lower Supervisory and Technical class.
- Despite significant growth in male and female life expectancy at birth across all classes during the past 30 years, the life expectancies of the Routine class in 2007 to 2011 were only similar to that enjoyed by the Higher Managerial and Professional class in 1982 to 1986.
- The widest gender difference in life expectancy at birth in 2007 to 2011 occurred in the Routine class, where females could expect to live 4.2 years longer than males and smallest in the Higher Managerial and Professional class (2.7 years).
- Men classified to the Higher Managerial and Professional class could expect to live a further 20.3 years from age 65, 5 years longer than in 1982 to 1986; women in the same class could expect to live a further 22.5 years, 2.8 years longer than in 1982 to 1986.
- Men classified to the Routine class could expect to live a further 16.4 years from age 65, 3.5 years longer than in 1982 to 1986; women could expect to live a further 19.4 years, 2.6 years longer than in 1982 to 1986.
- The largest gains at age 65 over the 30 year period were to the Higher Managerial and Professional class for men and to the Intermediate class for women.

## Synopsis

All socio-economic classes, including the unclassified group, experienced statistically significant absolute gains in life expectancy at birth and at age 65 between 1982 to 1986 and 2007 to 2011. The gain for males at birth (assigned to one of the occupied classes) ranged from 5.8 years for the Routine class to 7.1 years for the Intermediate class; for females at birth the gain was smaller, ranging from 4.8 years among the Lower Managerial and Professional class to 3.3 years among the Lower Supervisory and Technical class. Relative gains at birth for males ranged from 8% for the Routine class to 10% for the Intermediate class; gains by females were smaller ranging from 4 to 6% across classes.

The gain for men at age 65 (assigned to one of the occupied classes) ranged from 5 years for the Higher Managerial and Professional class to 3.1 years for the Routine class; for women at age 65 the gain was also smaller, ranging from 3.4 years for the Intermediate class to 1.4 years for women assigned to the Lower Supervisory and Technical class.

As these estimates indicate, within each socio-economic class males have gained more life years than females since 1982 to 1986. This is consistent with the longer-term trend for the life expectancy gap between sexes which has narrowed markedly since the early 1980s.

The life expectancy gap at birth is wider in 2007 to 2011 than in 1982 to 1986<sup>1</sup> for both males and females. The trajectory in the absolute inequality in life expectancy at birth among males in the latest period is consistent with a narrowing in the gradient from a high point in 1997 to 2001. However, for men at age 65 the gap narrowed slightly between 1997 to 2001 (the high point) and 2002 to 2006 but persisted during 2007 to 2011. For females the trajectory at birth is irregular across the 6 5-year periods, but there is some evidence of the gap widening during the first decade of the 21st Century; at age 65, the gap has been stable between 1997 to 2001 and 2007 to 2011 but this is higher than earlier periods.

## Notes for Synopsis

1. The gap in this period is affected by health selection bias, which has a tendency to narrow the life expectancy gap. Health selection occurs because of the relationship between unfavourable health status and likelihood of being unclassified at the point of assignment and immediately preceding the follow-up period. It results in a healthier selected group being assigned to an occupied class and therefore a narrower gradient between advantaged and disadvantaged classes. However, the effect on the gap will be small; further information is presented in Annex 3.

## Introduction

This bulletin presents estimates of life expectancy at birth and at age 65 for people in different socio-economic positions using the National Statistics Socio-economic Classification (NS-SEC) for males and females over the past 30 years. The socio-economic position of an individual is an indicator of their collective characteristics such as occupation, education and salary, which can then be used to measure differences in health outcome such as life expectancy and the inequality between different groups. More details on NS-SEC are in Annex 2.

Health inequalities defined by the World Health Organisation and endorsed by the Department of Health are “Differences in health status or in the distribution of health determinants between different population groups.” In this bulletin, the absolute and relative inequality between different groups is estimated using the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) respectively (these metrics are explained in more detail later in the bulletin). The SII is the metric chosen to determine the scale and direction of inequality over time in this bulletin.

NS-SEC has been the measure of socio-economic position used in official statistics since 2001, replacing the historical Registrar General's Social Class (RGSC). In these analyses, NS-SEC is

assigned either on entry to the study or at the earliest available point, which is consistent with previous editions. Wherever possible a person's own NS-SEC is used, although the NS-SEC of another household member, co-resident with the study member, could be used if such information for the study member was expected but missing or not applicable (see methods section). The analyses presented in this report are based on a modified methodology which takes account of information available from the 2011 Census and adds an additional data point, 2007 to 2011, to that previously published for the period 1982–1986 to 2002–2006.

The published series [Trends in life expectancy by social class 1972–2005 \(194.6 Kb Pdf\)](#) was updated previously, to assess the impact of the change in the measure of socio-economic position from RGSC to NS-SEC.

## Life expectancy for males at birth up 7 years since 1982 to 1986

Using the ONS longitudinal study for the period 2007 to 2011, life expectancy at birth for males across England and Wales was 79.1 years, increasing by 7 years since 1982 to 1986 where it stood at 72.1 years. Over the past 30 years there has been a steady increase in male life expectancy.

Individuals in the most advantaged socio-economic position, namely Higher Managerial and Professional, had the longest life expectancy at birth in 2007 to 2011 at 82.5 years (3.4 years longer than the England and Wales average). However, life expectancy decreases in a regular linear pattern towards the least advantaged Routine class (which includes people working in roles such as labourers, lorry drivers and bar staff). In 2007 to 2011, it stood at 76.6 years for those in the Routine socio-economic position, 2.5 years less than the England and Wales average (Table 1).

Of the 7 socio-economic positions, those within the 4 more advantaged classes had statistically significant higher life expectancies than the England and Wales average and those in the least 2 (classes 6 and 7) had statistically significant lower life expectancies<sup>1</sup>.

There was only a small difference in life expectancy at birth between classes 2, 3 and 4. The largest gap between adjacent classes was 1.7 years between class 1 and class 2, while the smallest was 0.4 years between classes 2 and 3 and classes 3 and 4.

**Table 1: Male life expectancy at birth by NS-SEC class, 2007 to 2011**

England and Wales

Years

**National Statistics  
Socioeconomic Classification  
7 analytic class schema**

Class	Class label	Life Expectancy	Confidence Limit Lower	Confidence Limit Upper	p<0.05
1	Higher Managerial and Professional (HMP)	82.5	82.0	83.1	*
2	Lower Managerial and Professional (LMP)	80.8	80.2	81.3	*
3	Intermediate	80.4	79.7	81.1	*
4	Small Employers Own Account Workers (SEOAW)	80.0	79.3	80.6	*
5	Lower Supervisory and Technical (LST)	78.9	78.3	79.4	
6	Semi-Routine	77.9	77.3	78.4	†
7	Routine	76.6	76.1	77.1	†
	Unclassified	74.0	72.9	75.0	†
	England and Wales	79.1	78.9	79.3	

**Table notes:**

1. Source: ONS Longitudinal Study
2. \*Statistically significant higher life expectancy than England and Wales.
3. †Statistically significant lower life expectancy than England and Wales.

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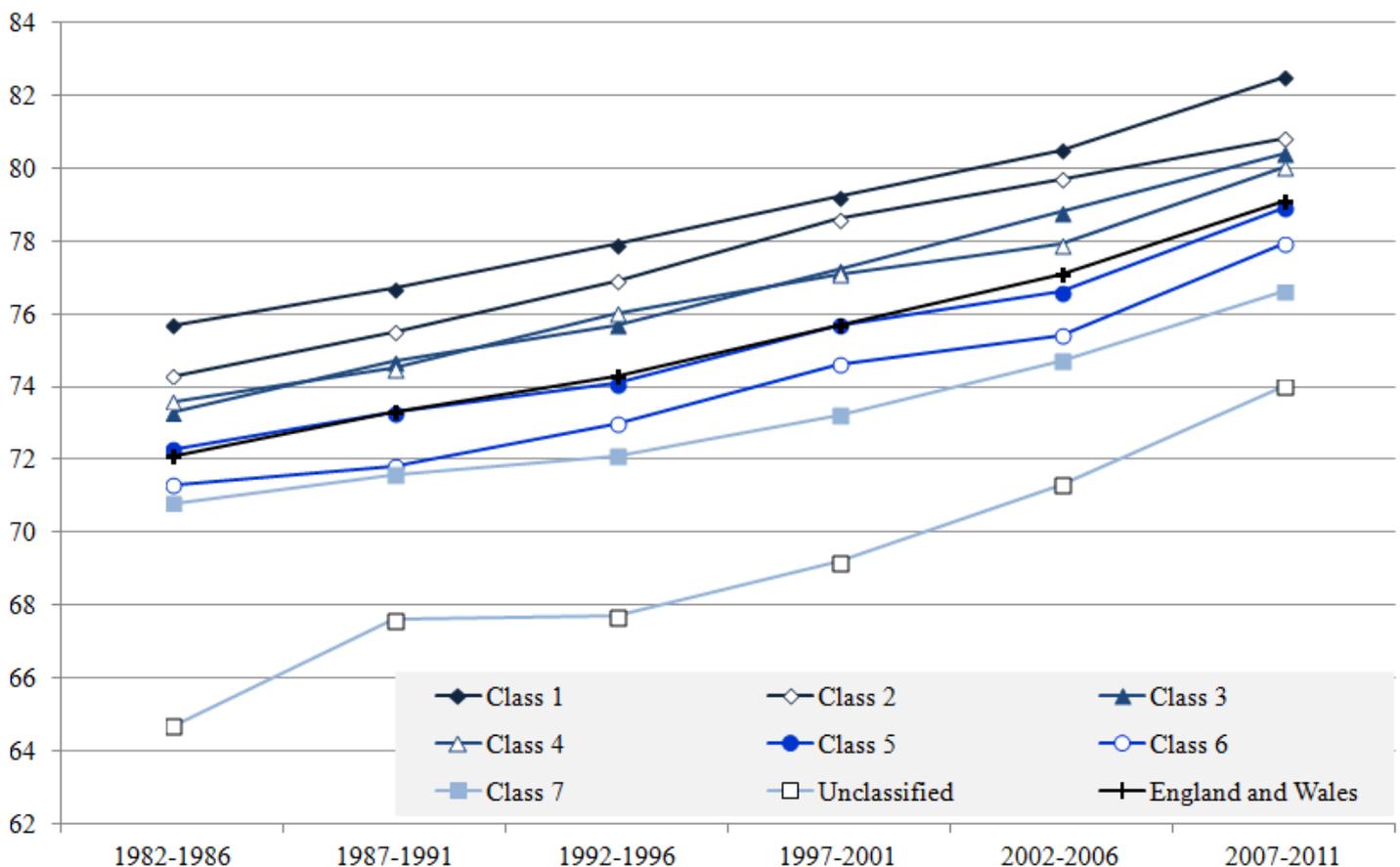
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The only statistically significant higher life expectancies found in 2007 to 2011 in adjacent class contrasts occurred between classes 1 and 2 and classes 6 and 7, which might arise from a socio-economic threshold effect where the effect of a change in level of advantage or disadvantage on mortality risk from class 2 to 1 or class 6 to 7 is more pronounced than adjacent changes in advantage between the intervening classes.

Between 2002 to 2006 and 2007 to 2011, life expectancy at birth for males in England and Wales improved by 2 years, from 77.1 years to 79.1 years, which was the largest improvement when comparing different 5-year periods over the past 30 years. The largest gain in life expectancy over the past 30 years was to the Intermediate class (class 3) at 7.1 years; the Routine class (class 7) had the smallest increase at 5.8 years, 1 year less than Higher Managerial and Professional class (class 1). Each of the other classes had increases of between 6 and 7 years (Figure 1).

**Figure 1: Male life expectancy at birth for expanded NS-SEC classes including the unclassified and England and Wales, 1982-1986 to 2007-2011**

England and Wales, Years



**Notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 2: Lower Managerial and Professional; Class 3: Intermediate; Class 4: Small Employers Own Account Workers; Class 5: Lower Supervisory and Technical; Class 6: Semi-Routine; Class 7: Routine.

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Individuals who could not be allocated to a socio-economic position, known as the unclassified group, had the largest improvement in life expectancy. However there are several factors that contributed to this improvement and so care should be taken when interpreting the increase.

In particular, there is a health selection effect (more details are in Annex 3) which arises because individuals at the start of the study were less likely to be classified to an occupied class if they were not in work for reasons such as limiting long-term illness, long-term unemployment or never having worked. This means that the first life expectancy estimate in 1982 to 1986 for the unclassified group is disproportionately low.

Also for 2007 to 2011, the unclassified group contains a higher proportion of people who are not allocated to a socio-economic position because they were studying than was the case for 1982 to 1986. Those unclassified for study reasons are more likely to have lower mortality risks and better health, which acts to increase the life expectancy estimate of the unclassified group.

Finally, as the analysis keeps the socio-economic position constant from entry to the study, there will be some individuals who were unclassified on entry but who subsequently entered employment and had better life expectancy outcomes in later periods. The combination of these effects gives rise to the large increase in life expectancy over the 30 year period for those in the unclassified group. Annex 1 offers alternative life expectancy estimates for this group that take into account those transitions to occupied classes that can be identified from census data.

Health selection out of the labour market affects Routine and Manual occupations (that is, classes 5 to 7) more than others, partly because of the higher prevalence of disability among those assigned to these classes<sup>2</sup>, which acts to concentrate a healthier rump at lower risk of death in the immediate follow-up period (that is 1982 to 1986) and thereby reduce the scale of inequality at baseline. Table 2 shows the cumulative number of years gained by each NS-SEC class and in England and Wales.

**Table 2: Cumulative gain in male life expectancy at birth by NS-SEC class, 1982-1986 and 2007-2011**

England and Wales

NS-SEC Class label	Life Expectancy Gain				
	1982-1986 to 1987-2001	1982-1986 to 1992-1996	1982-1986 to 1997-2001	1982-1986 to 2002-2006	1982-1986 to 2007-2011
Higher Managerial and Professionals	1.0	2.2	3.5	4.8	6.8
Lower Managerial and Professionals	1.2	2.6	4.3	5.4	6.5
Intermediate	1.4	2.4	3.9	5.5	7.1
Small Employers Own Account Workers	0.9	2.4	3.5	4.3	6.4
Lower Supervisory	1.0	1.8	3.4	4.3	6.6
Semi-Routine	0.5	1.7	3.3	4.1	6.6
Routine	0.8	1.3	2.4	3.9	5.8
Unclassified[1]	2.9	3.0	4.5	6.6	9.3
England and Wales	1.2	2.2	3.6	5.0	7.0

**Table notes:**

1. Source: ONS Longitudinal Study
2. The size of improvement among unclassified males is partly because of health-related selection operating at baseline which causes its estimate during 1982-1986 to be sizeably lower than other classes. This effect wears off during the second half of the decade. It also has the strongest gain because some members unclassified on entry could be classified at later points and therefore for some unclassified males followed-up during the 1990's and 2000's, their mortality risk was more aligned with the occupied class they entered at either 1991 or 2001; however, under traditional methods they would retain their unclassified status on entry and be followed-up in all periods as unclassified. The Annex contains revised estimates taking account of socioeconomic transitions.

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If 1987 to 1991 is used as the baseline period, mitigating any health selection effect into an occupied NS-SEC in 1981, the Routine class gained 5.0 years to 2007 to 2011 compared with 5.8 years for

the Higher Managerial and Professional class, with the Semi-Routine class gaining most at 6.1 years of all the occupied classes.

### **Notes for Life expectancy for males at birth up 7 years since 1982 to 1986**

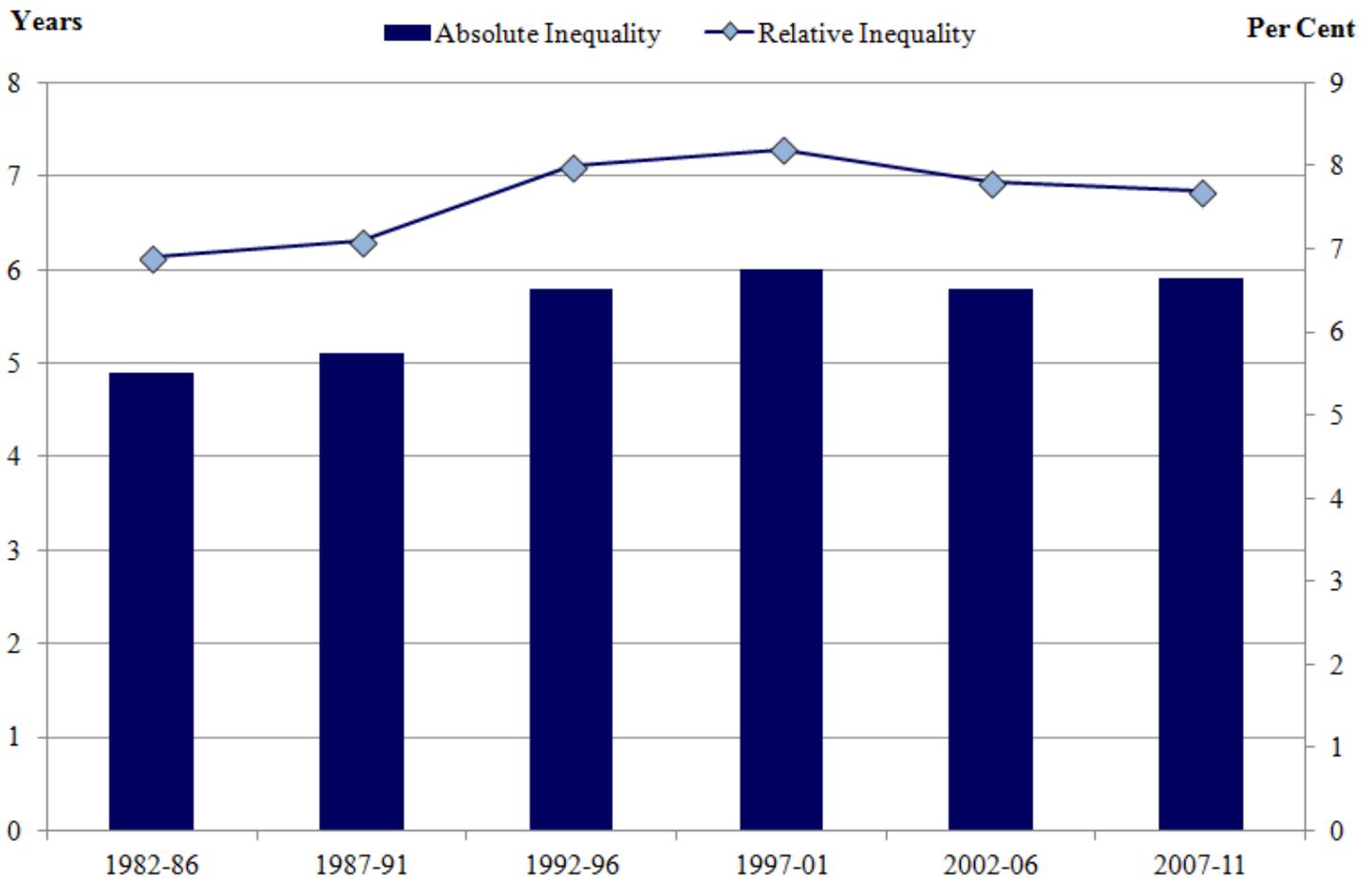
1. Statistical significance means that as the results come from a sample there is a margin of uncertainty around each estimate. After accounting for this margin of uncertainty, if one group's value is still above (or below) another then it is deemed statistically significant and meaningful.
2. In 2011, Census data showed that males and females assigned to class 5, 6 and 7 had higher disability prevalence rates than those assigned to classes 1, 2, 3 or 4 and similar patterns were found in 2001.

### **The socio-economic gap in male life expectancy at birth widened during the 1980s and 1990s before falling back during the 2000s**

Over the past 30 years, because those in the Higher Managerial and Professional class have had a larger increase in life expectancy than those in the Routine class, the inequality between them increased. The absolute gap in life expectancy between the 2 classes was 5.9 years in 2007 to 2011, 1 year wider than in 1982 to 1986. However, the latest period was 0.1 years lower than the highest point of 6.0 years in 1997 to 2001 (Figure 2).

**Figure 2: Trend in absolute and relative inequality in male life expectancy at birth using the simple difference and ratio of classes 1 and 7**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. \* Relative inequality is expressed as a percentage.

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Rather than look at the absolute gap it is possible to look at relative inequality between these 2 groups by considering the ratio of the top class in relation to the bottom class. It increased most markedly between 1987 to 1991 and 1992 to 1996, from 7.1% to 8.0% and continued to grow to 8.2% in 1997 to 2001 before reducing in 2002 to 2006 to 7.8% and contracting slightly in the latest period to 7.7%. Therefore, there is some evidence of a narrowing in the relative inequality in male life expectancy between the 2 extreme socio-economic classes over the past decade; moreover, there is more compelling evidence that relative inequalities were not widening.

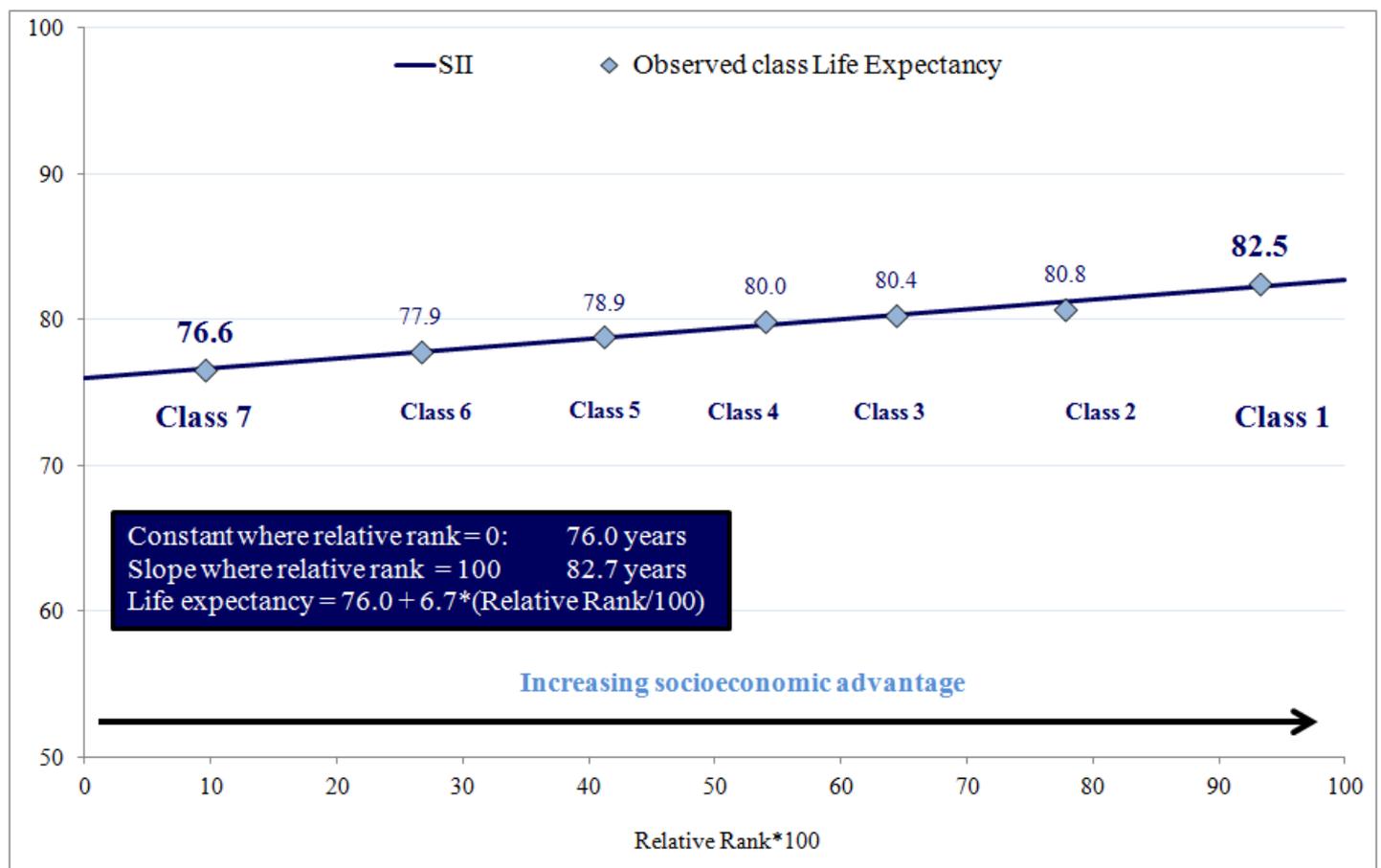
Rather than concentrate on the 2 most extreme classes, it is possible to use a statistical model to create an absolute inequality measure that takes into account the life expectancy across the whole

socio-economic spectrum. This is known as the Slope Index of Inequality (SII) and its advantage is that it reflects the experiences of the entire population.

The SII for the period 2007 to 2011 was 6.7 years and is plotted in Figure 3. The line represents the social gradient in life expectancy across the NS-SEC classes, while the diamonds show the actual observed values for each class. The x axis is a scale of socio-economic position, determined by the mid-point of the cumulative population proportion of each class, where 0 represents the most disadvantaged socio-economic position and 100 the most advantaged. The observed life expectancies for each class are close to the line of best fit suggesting a strong statistical association between life expectancy and socio-economic position.

**Figure 3: Slope Index of Inequality in male life expectancy at birth based on socio-economic position, 2007 to 2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 2: Lower Managerial and Professional; Class 3: Intermediate; Class 4: Small Employers Own Account Workers; Class 5: Lower Supervisory and Technical; Class 6: Semi-Routine; Class 7: Routine.

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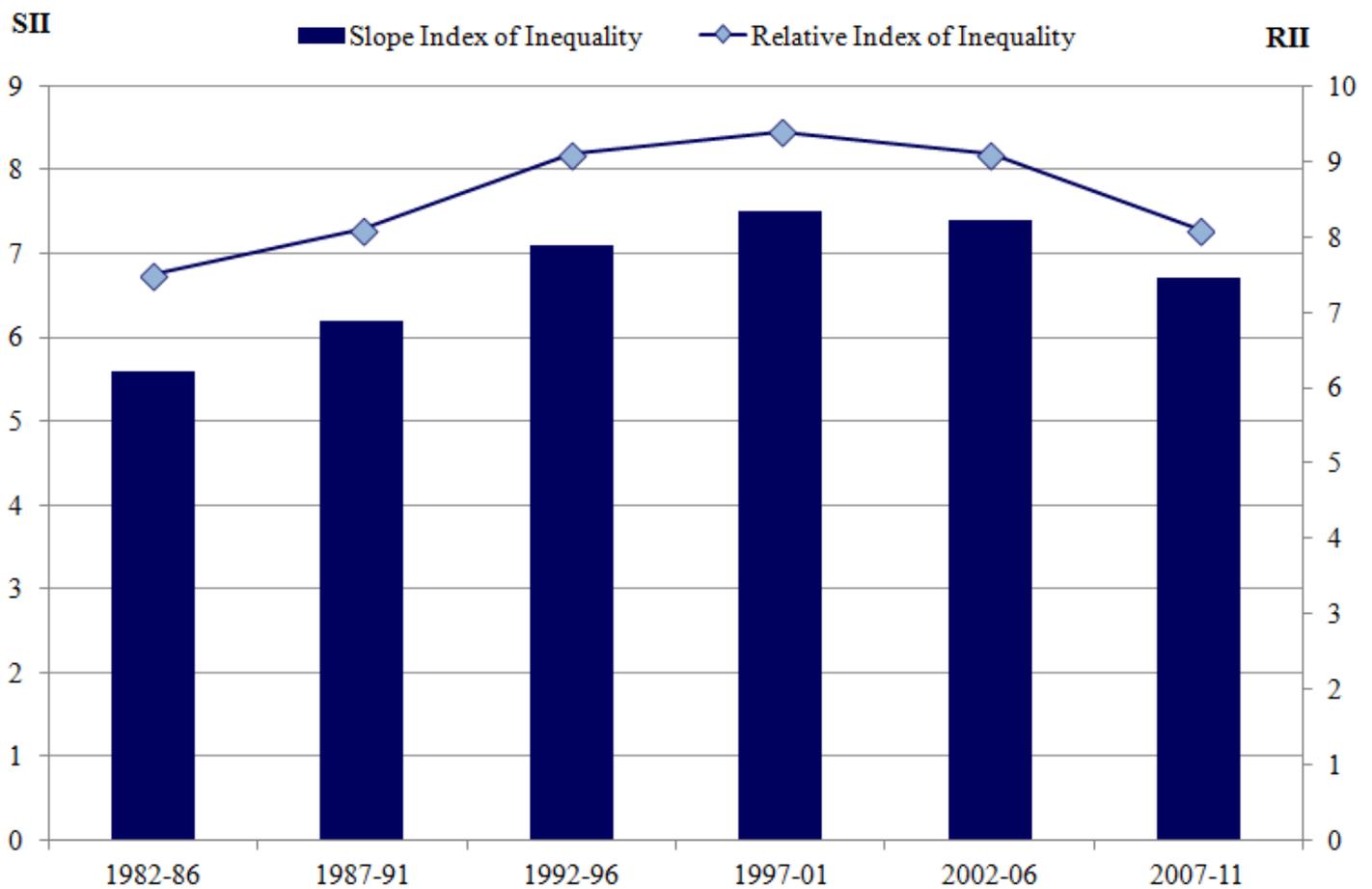
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The SII value at any given time point is an important indicator of inequality, but it is the direction over time that enables judgements to be made about whether the social gradient is on an upward or downward trajectory or whether it is constant.

The index was 5.6 years at baseline (1982 to 1986) and grew steadily until 1997 to 2001 where it peaked at 7.5 years, before falling in 2002 to 2006 to 7.3 years and more prominently in 2007 to 2011 to 6.7 years (Figure 4).

**Figure 4: Trend in Slope Index of Inequality and Relative Index of Inequality in male life expectancy at birth, 1982—1986 to 2007—2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. \*RII is expressed as a percentage

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While no statistically significant differences could be detected as confidence limits are wide because of the small number of observations (that is, 7 classes), these figures suggest the absolute gap in male life years from birth between classes is on a downward trajectory since the turn of the century and the gap in 2007 to 2011 is lower than any point since 1987 to 1991.

There is also the issue of health selection referred to earlier which is likely to reduce the level of inequality in the earliest period as less healthy individuals, particularly in less advantaged socio-economic positions, were more likely to be assigned to the unclassified group on entry to the study rather than an occupied class on entry in 1981. If 1987 to 1991 is used as a benchmark, then the inequality in 2007 to 2011 was only 0.5 years greater than in 1987 to 1991.

The slope index of inequality measure for each period is larger than taking the simple difference of most to least advantaged class by between 0.7 to 1.5 years (Figures 3 and 4). This arises because at relative rank zero, the population is less advantaged than the average for the Routine class and vice versa for the Higher Managerial and Professional class. The wider inequality as measured by the SII demonstrates the importance of including the inequality across all socio-economic positions when determining health gaps.

The Relative Index of Inequality (RII) in Figure 4 can be interpreted as the ratio of the most to least advantaged socio-economic positions expressed as a percentage, and conveys the percentage increase in life expectancy expected by males moving from the least to the most advantaged state (a positive value indicates life expectancy grows with increasing socio-economic advantage). The relative gap shows a sharp rise between 1982 to 1986 and 1992 to 1996, and a smaller rise to the high point in 1997 to 2001, before falling consistently since then. The RII in 2007 to 2011 had fallen to the same level observed in 1987 to 1991, a period which is less prone to health selection effects than 1982 to 1986 explained earlier and more fully in Annex 3.

The co-existence of falling absolute and relative inequality using measures based on the line of best fit across all socio-economic positions suggests that inequality in male life expectancy at birth has started to narrow since the 1990s, but remains stubbornly wider than in 1982 to 1986.

## Life expectancy at age 65 for Higher Managerial and Professional men up 5 years

Rather than look at life expectancy at birth, it is possible to look at life expectancy for those who survive to age 65. Male life expectancy at age 65 in England and Wales over the period 2007 to 2011 was 18.2 years, increasing by 4.8 years since 1982 to 1986 when it was 13.4 years.

At age 65, only the 2 most advantaged classes had statistically significant higher life expectancy than the England and Wales average, while the 2 least advantaged classes had statistically significant lower life expectancy. Males in the Higher Managerial and Professional socio-economic class at age 65 could expect to live a further 20.3 years in 2007 to 2011, 3.9 years longer than men assigned to the Routine class. The largest gap between adjacent classes on the scale was 1.1 years between the Semi-Routine (class 6) and Routine classes (class 7), while the smallest was between the Intermediate (class 3) and Small Employers Own Account Workers (class 4) classes at less than 0.1 of a year (Table 3).

**Table 3: Male life expectancy at age 65 by NS-SEC class, 2007 to 2011**

England and Wales

Years

**National Statistics  
Socioeconomic Classification  
7 analytic class schema**

Class	Class label	Life Expectancy	Confidence Limit Lower	Confidence Limit Upper	p<0.05
1	Higher Managerial and Professional (HMP)	20.3	19.9	20.7	*
2	Lower Managerial and Professional (LMP)	19.3	19.0	19.7	*
3	Intermediate	18.7	18.1	19.2	
4	Small Employers Own Account Workers (SEOAW)	18.7	18.3	19.2	
5	Lower Supervisory and Technical (LST)	18.0	17.6	18.3	
6	Semi-Routine	17.5	17.1	17.9	†
7	Routine	16.4	16.1	16.7	†
	Unclassified	14.8	14.0	15.6	†
	England and Wales	18.2	18.0	18.3	

**Table notes:**

1. Source: ONS Longitudinal Study
2. \*Statistically significant higher life expectancy than England and Wales.
3. †Statistically significant lower life expectancy than England and Wales.

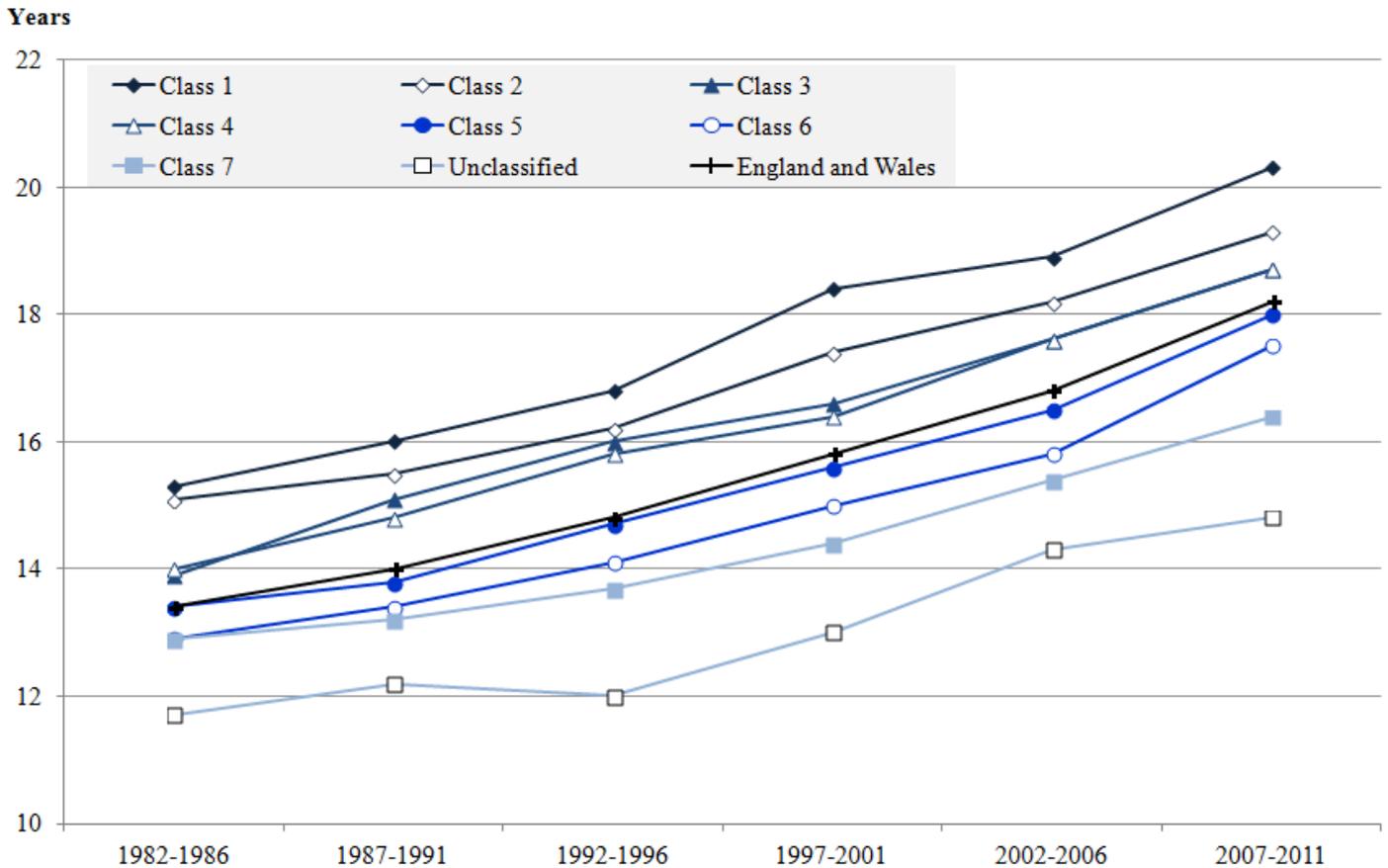
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As well as having the longest life expectancy, those in the Higher Managerial and Professional class also achieved the largest gain in life expectancy over the past 30 years (5.0 years); whilst the Routine class had the smallest increase of 3.5 years (Figure 5).

**Figure 5: Male life expectancy at age 65 by NS-SEC classes and England and Wales, 1982–1986 to 2007–2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 2: Lower Managerial and Professional; Class 3: Intermediate; Class 4: Small Employers Own Account Workers; Class 5: Lower Supervisory and Technical; Class 6: Semi-Routine; Class 7: Routine.

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## The socio-economic gap in male life expectancy at age 65 persists at 4.3 years using the Slope Index of Inequality

The absolute gap in life expectancy between those in the Higher Managerial and Professional class and the Routine class was 3.9 years in 2007 to 2011, up from 2.4 years in 1982 to 1986. The highest gap was 4.0 years in 1997 to 2001 (Figure 6).

The relative gap between these 2 classes was 23.8% in 2007 to 2011, up from 18.6% in 1982 to 1986 with a peak of 27.8% in 1997 to 2001.

Taking account of both the absolute and relative gap between the most and least advantaged classes, there is some evidence to suggest that inequality in male life expectancy at age 65 has started to widen again, and remains considerably wider than at baseline in 1982 to 1986. This contrasts notably with male life expectancy at birth where there is greater evidence of a narrowing in inequality in recent years.

**Figure 6: Trend in absolute and relative inequality in male life expectancy at age 65 using the simple difference and ratio of most and least advantaged occupied classes**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. \* Relative inequality is expressed as a percentage

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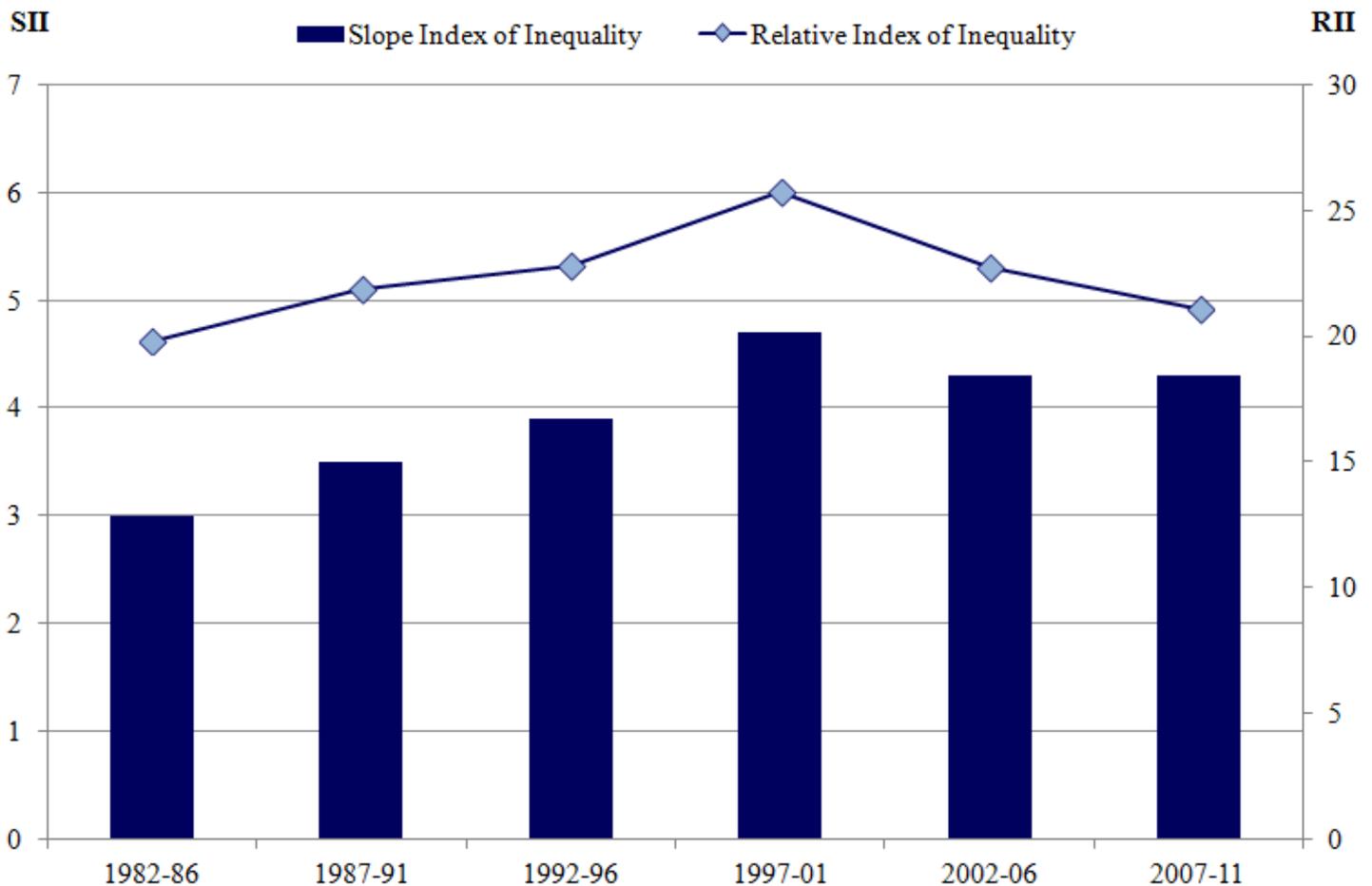
Figure 7 shows the trajectory in the Slope Index of Inequality (SII) and Relative Index of Inequality (RII) between 1982 to 1986 and 2007 to 2011. The slope index was 3.0 years at baseline and grew steadily until 1997 to 2001 when it reached a time series peak of 4.7 years, before falling in 2002 to 2006 to 4.3 years and remaining at that magnitude in 2007 to 2011. The direction since the turn of the 21st century suggests absolute inequalities are persisting, with the gap remaining wider than during the 1980s and first half of the 1990s and no evidence of the fall observed between 1997 to 2001 and 2002 to 2006 continuing further in 2007 to 2011.

The gap in relative inequality as measured by the RII suggests a narrowing during the 2000s from the high point in 1997 to 2001 when it stood at 25%. The further fall observed in 2007 to 2011 caused the relative gap to be smaller in 2007 to 2011 than it was in 1987 to 1991, although it remained higher than at baseline in 1982 to 1986.

The evidence provided by the SII suggests absolute inequality has persisted, though there is more evidence supporting a fall in relative inequality since 1997 to 2001.

**Figure 7: Trend in Slope Index of Inequality and Relative Index of Inequality in male life expectancy at age 65, 1982–1986 to 2007–2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. \*RII is expressed as a percentage

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**Female life expectancy at birth up 4.5 years over the 30 year period; but the most advantaged gain more than the least advantaged**

Female life expectancy at birth in England and Wales in 2007 to 2011 was 82.4 years, increasing by 4.5 years since 1982 to 1986 when it stood at 77.9 years (Table 4).

As was the case for males, females in the Higher Managerial and Professional class had the longest life expectancy at birth in 2007 to 2011 at 85.2 years (2.8 years longer than the England and Wales average). For those in the Routine socio-economic position, life expectancy at birth for females was 80.8 years (1.6 years less than the England and Wales average).

**Table 4: Female life expectancy at birth by NS-SEC class, 2007 to 2011**

England and Wales

Years

**National Statistics  
Socioeconomic Classification  
7 analytic class schema**

Class	Class label	Life Expectancy	Confidence Lower Limit	Confidence Limit Upper	p<0.05
1	Higher Managerial and Professional (HMP)	85.2	84.5	85.9	*
2	Lower Managerial and Professional (LMP)	84.5	84.0	84.9	*
3	Intermediate	83.9	83.4	84.4	*
4	Small Employers Own Account Workers (SEOAW)	83.5	82.8	84.3	*
5	Lower Supervisory and Technical (LST)	81.9	81.2	82.5	
6	Semi-Routine	81.7	81.2	82.2	
7	Routine	80.8	80.4	81.3	†
	Unclassified	78.5	77.6	79.3	†
	England and Wales	82.4	82.2	82.6	

**Table notes:**

1. Source: ONS Longitudinal Study
2. \*Statistically significant higher life expectancy than England and Wales.
3. †Statistically significant lower life expectancy than England and Wales.

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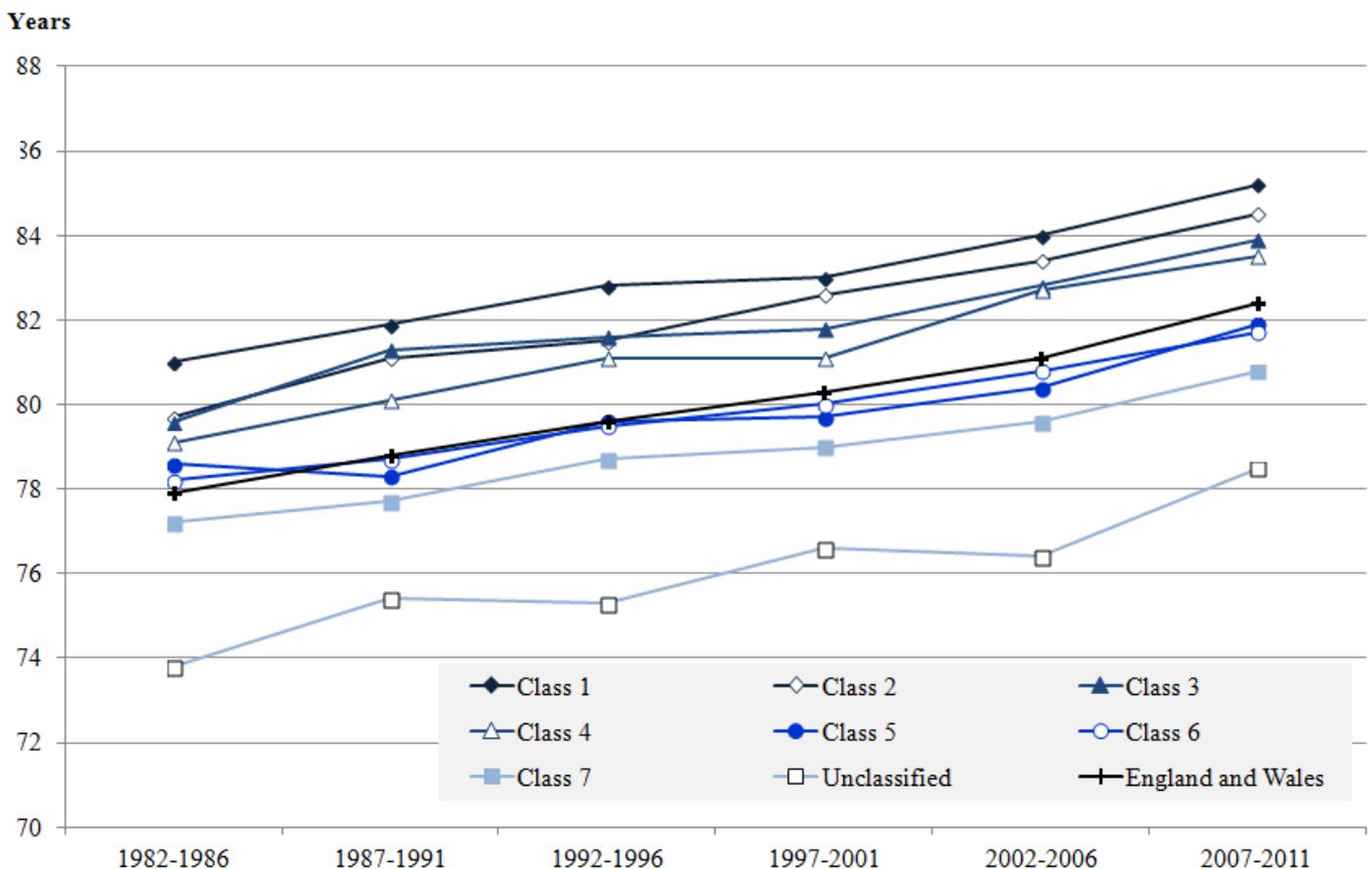
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Of the 7 socio-economic positions, those within the top 4 classes had statistically significant higher life expectancies than the England and Wales average and it was just those in the least advantaged Routine class that had a statistically significant lower life expectancy.

There was only a small difference in life expectancy at birth between classes 2, 3 and 4. The largest gap between adjacent classes on the scale was 1.6 years between classes 4 and 5, while the smallest was 0.2 years between classes 5 and 6.

Over the past 30 years, those in the Lower Managerial and Professional socio-economic position (class 2) had the largest gain in life expectancy at birth for females, up 4.8 years to 84.5 years. Those in the Lower Supervisory and Technical class had the smallest gain, up 3.3 years to 81.9 years (Figure 8).

**Figure 8: Female life expectancy at birth for NS-SEC classes, 1982–1986 to 2007–2011**  
England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 2: Lower Managerial and Professional; Class 3: Intermediate; Class 4: Small Employers Own Account Workers; Class 5: Lower Supervisory and Technical; Class 6: Semi-Routine; Class 7: Routine.

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Overall, the more advantaged socio-economic positions (that is, classes 1 to 4) gained more than 4 years over these decades and the less advantaged (classes 5 to 7) gained less than 4 years (Table 5).

As noted for males, the unclassified group had a large increase in life expectancy, up 4.7 years over the past 30 years. This estimate has a health selection and compositional effect behind it, explained earlier. However, the health selection effects have less of an impact for females than males because of their lower exposure to the labour market back in the early 1980s particularly. If 1987 to 1991 is used as the baseline, the unclassified group gained only 3.1 years, half a year less than the England and Wales average gain for females.

**Table 5: Cumulative gain in female life expectancy at birth by NS-SEC, 1982–1986 to 2007–2011**

England and Wales

Years

NS-SEC Class label	Life Expectancy Gain				
	1982-1986 to 1987-2001	1982-1986 to 1992-1996	1982-1986 to 1997-2001	1982-1986 to 2002-2006	1982-1986 to 2007-2011
Higher Managerial and Professional	0.9	1.8	2.0	3.0	4.2
Lower Managerial and Professional	1.4	1.8	2.9	3.7	4.8
Intermediate	1.7	2.0	2.2	3.2	4.3
Small Employers Own Account Workers	1.0	2.0	2.0	3.6	4.4
Lower Supervisory	-0.3	1.0	1.1	1.8	3.3
Semi-Routine	0.5	1.3	1.8	2.6	3.5
Routine	0.5	1.5	1.8	2.4	3.6
Unclassified <sup>1</sup>	1.6	1.5	2.8	2.6	4.7
England and Wales	0.9	1.7	2.4	3.2	4.5

**Table notes:**

1. Source: ONS Longitudinal Study
2. See footnote to table 3.

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## The socio-economic gap in female life expectancy at birth persists at 5.3 years and is wider than at any point during the 1980s or 1990s using the Slope Index of Inequality

The absolute gap in life expectancy at birth between the Higher Managerial and Professional class and the Routine class for females stood at 4.4 years in the period 2007 to 2011. This was 0.6 years wider than in the period 1982 to 1986 where it stood at 3.8 years. Following the earliest period the absolute gap grew to 4.2 years by 1987 to 1991, before falling back slightly during the 1990s but then increasing in 2002 to 2006 to 4.4 years where it remained in 2007 to 2011 (Figure 9).

The relative inequality (ratio of class 1 to class 7) was more stable over time: life expectancy at birth for females in the Higher Managerial and Professional socio-economic class was 4.9% higher than those in the Routine socio-economic class in the period 1982 to 1986 and by 2007 to 2011 it was 5.4%. Over the 30 year period it peaked at 5.5% in the period 2002 to 2006.

**Figure 9: Trend in absolute and relative inequality in female life expectancy at birth using the simple difference and ratio of classes 1 and 7**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. \* Relative inequality is expressed as a percentage

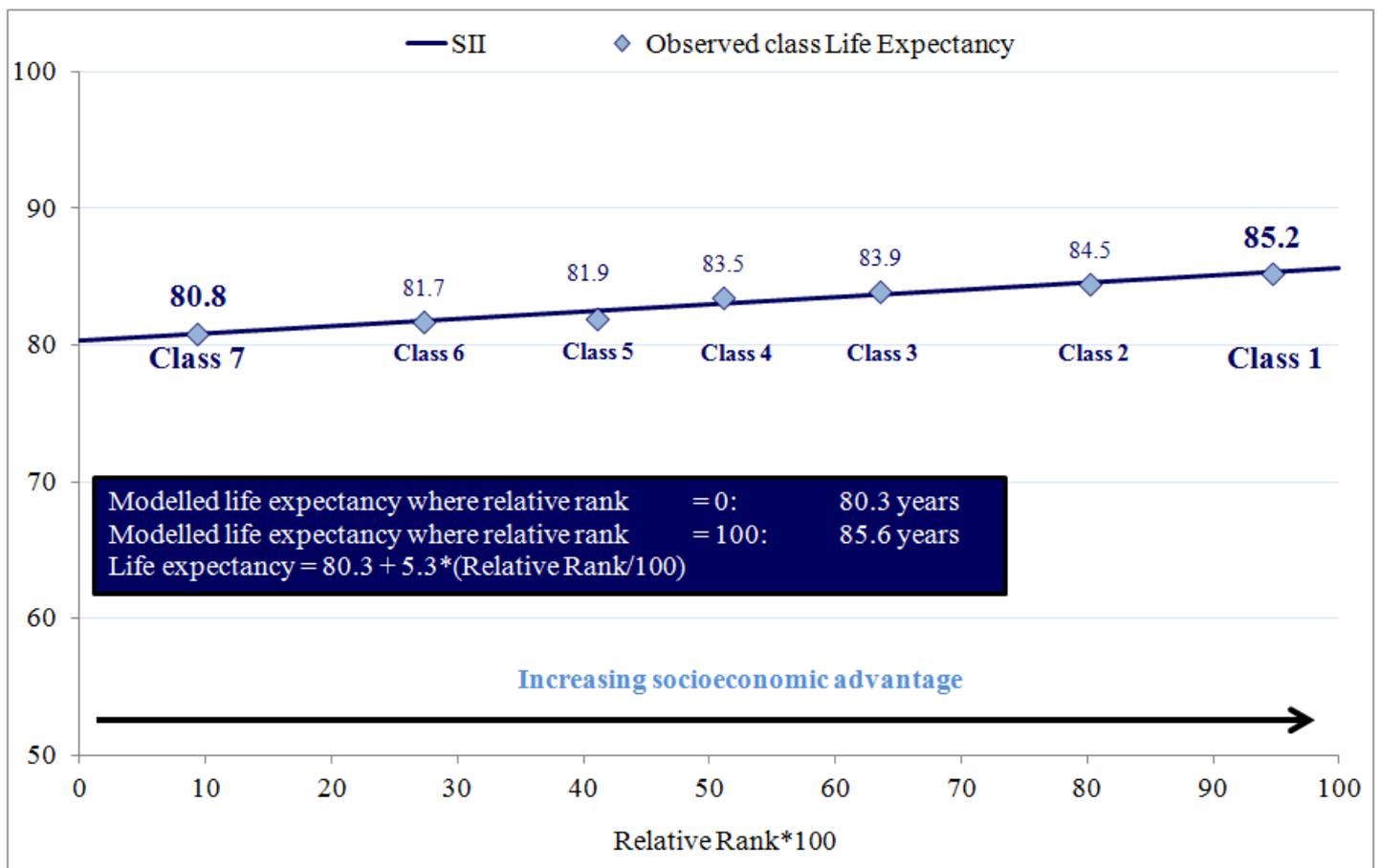
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Based on information across all of the socio-economic classes and using the slope index of inequality, the absolute gap between the most and least advantaged females was 5.3 years in 2007 to 2011 (Figure 10). The observed estimates for life expectancy for each of the socio-economic classes were on, or close to, the line of best fit, demonstrating the same strong association between life expectancy and socio-economic advantage that was observed for males.

**Figure 10: Slope Index of Inequality in female life expectancy at birth based on socio-economic position, 2007 to 2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 2: Lower Managerial and Professional; Class 3: Intermediate; Class 4: Small Employers Own Account Workers; Class 5: Lower Supervisory and Technical; Class 6: Semi-Routine; Class 7: Routine

**Download chart**

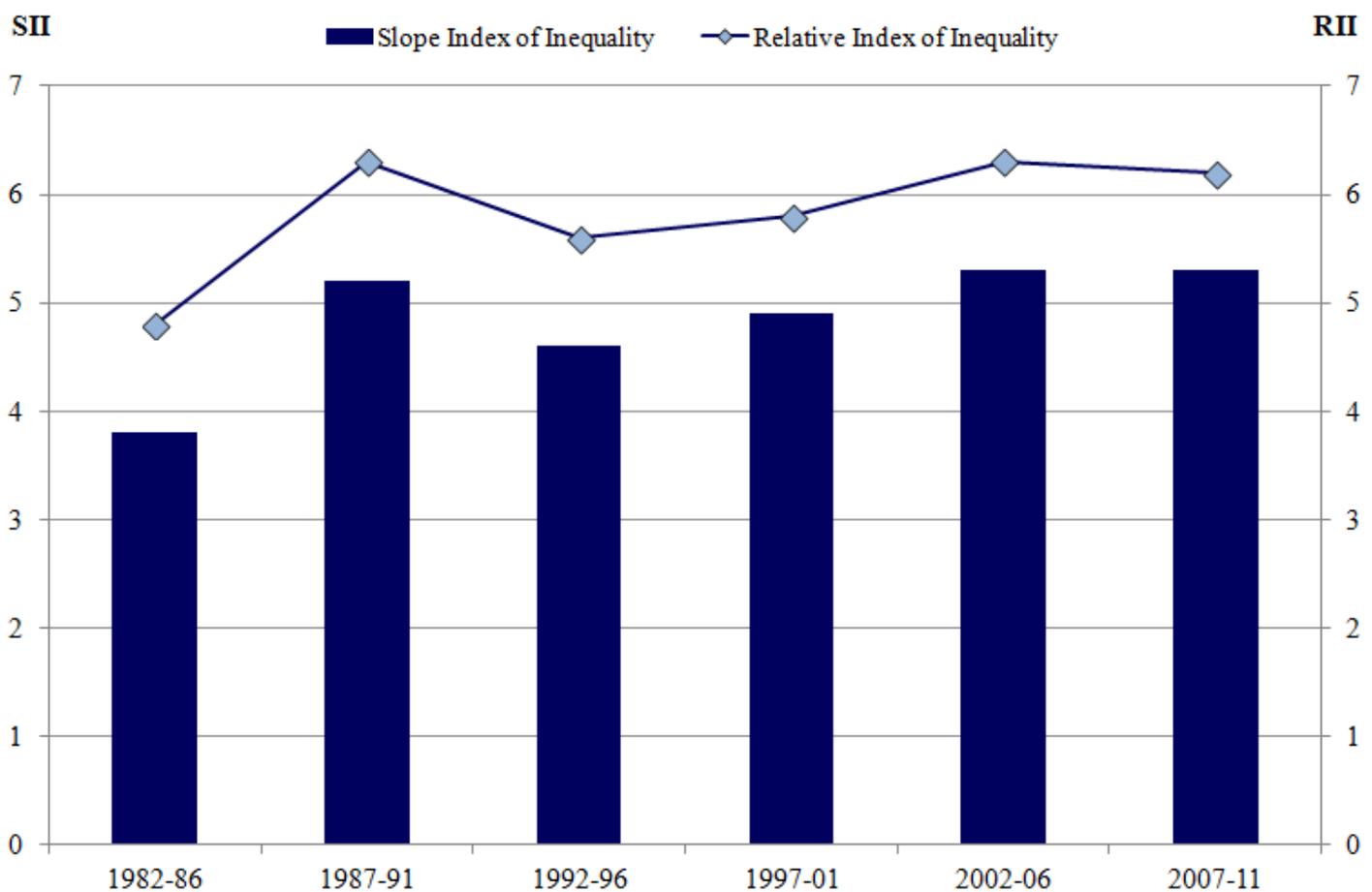
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The Slope Index of Inequality (SII) for 2007 to 2011 was the same as in 2002 to 2006 and 1.5 years wider than in 1982 to 1986 (Figure 11). The SII increased by 1.4 years between 1982 to 1986 and 1987 to 1991, before falling back to 4.6 years in 1992 to 1996. Since then the SII has increased and remains wider in 2007 to 2011 than at any time during the 1980s or 1990s. These estimates suggest the trend in the absolute inequality in female life expectancy at birth has been widening since the mid-1990s.

The Relative Index of Inequality (RII) suggests that female life expectancy at birth in 2007 to 2011 was 6.2% higher among the most advantaged compared with the least, rising from a low point of 4.8% higher in 1982 to 1986. Most of the widening in the relative index of inequality happened between the period 1982 to 1986 and 1987 to 1991. Since 1987 to 1991, the relative index of inequality fell during the 1990s before increasing again in the early part of the 2000s.

**Figure 11: Trend in Slope Index of Inequality and Relative Index of Inequality in female life expectancy at birth, 1982–1986 to 2007–2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. \*RII is expressed as a percentage

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## **The most advantaged women live 1.9 years longer than women in general from age 65**

Female life expectancy at age 65 in England and Wales was 20.6 years in 2007 to 2011, an improvement of 3.3 years from 17.3 years in 1982 to 1986.

Females in the Higher Managerial and Professional class had the longest life expectancy at 22.5 years, while the lowest was in the Routine class at 19.4 years (Table 6). The largest gap between adjacent classes on the scale was 1.8 years between the Small Employers and the Lower Supervisory and Technical classes; the smallest was 0.2 years between the Lower Managerial and Professional class and the Intermediate class. Of interest is the higher life expectancy observed among the Semi-Routine class compared with the Lower Supervisory and Technical class, despite the latter having a more advantaged socio-economic position than the former.

Compared to the England and Wales average, the more advantaged classes experienced statistically significant longer life expectancies; however, only the Routine class had a statistically significant lower life expectancy than England and Wales.

**Table 6: Female life expectancy at age 65 by NS-SEC class, 2007-11**

England and Wales

Years

**National Statistics  
Socioeconomic Classification  
7 analytic class schema**

Class	Class label	Life Expectancy	Confidence Lower Limit	Confidence Limit Upper	p<0.05
1	Higher Managerial and Professional (HMP)	22.5	21.9	23.1	*
2	Lower Managerial and Professional (LMP)	21.9	21.6	22.3	*
3	Intermediate	21.7	21.4	22.0	*
4	Small Employers Own Account Workers (SEOAW)	21.9	21.3	22.5	*
5	Lower Supervisory and Technical (LST)	20.1	19.6	20.6	
6	Semi-Routine	20.4	20.1	20.7	
7	Routine	19.4	19.0	19.7	†
	Unclassified	18.3	17.8	18.9	†
	England and Wales	20.6	20.5	20.7	

**Table notes:**

1. Source: ONS Longitudinal Study
2. \*Statistically significant higher life expectancy than England and Wales.
3. †Statistically significant lower life expectancy than England and Wales.

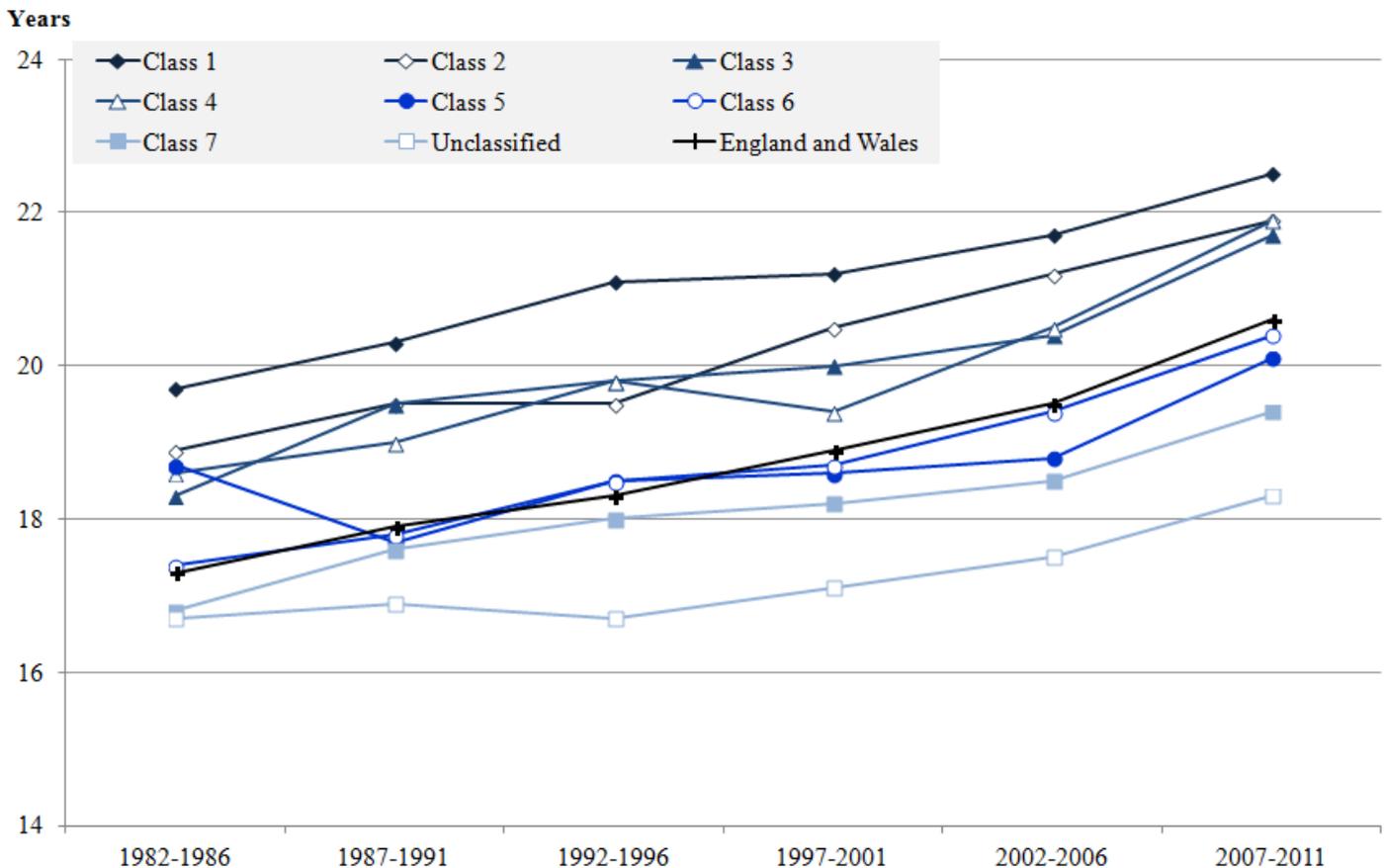
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Of the improvement in female life expectancy at age 65 over the past 30 years, the greatest period on period improvement occurred between 2002 to 2006 and 2007 to 2011 where it increased by 1.1 years for England and Wales. With the exception of the Lower Managerial and Professional socio-economic position (class 2), all of the other classes had their greatest period on period improvement between 2002 to 2006 and 2007 to 2011 (Figure 12).

**Figure 12: Female life expectancy at age 65 for NS-SEC classes and England and Wales, 1982–1986 to 2007–2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 2: Lower Managerial and Professional; Class 3: Intermediate; Class 4: Small Employers Own Account Workers; Class 5: Lower Supervisory and Technical; Class 6: Semi-Routine; Class 7: Routine

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Since 1982 to 1986 there were instances of life expectancy contracting for some classes between adjacent periods. There was a 1 year fall among the Lower Supervisory and Technical class

between 1982 to 1986 and 1987 to 1991, with some of this explained by the health selection effects that impact the first period.

The Small Employers Own Account Workers class also experienced a fall of 0.4 years between 1992 to 1996 and 1997 to 2001, which may have been affected by downward social mobility following the early nineties economic downturn.

The largest gain in life expectancy over the 30 year period occurred among Intermediate women (class 3) who gained 3.4 years. Females in the Higher Managerial and Professional class gained 0.2 of a year more than those in the Routine class over the entire period which meant there was very little difference in the absolute level of inequality between the most and least advantaged classes.

### **Socio-economic gap in female life expectancy at age 65 is wider in 2007 to 2011 than in the 1980s or 1990s**

The absolute gap in female life expectancy at age 65 based on the range between the Higher Managerial and Professional and Routine classes was 2.9 years in 1982 to 1986, falling to 2.7 years in 1987 to 1991 before rising to 3.1 years in 1992 to 1996. It peaked in 2002 to 2006 at 3.2 years and ended in 2007 to 2011 at 3.1 years. The relative gap also fluctuated over the past 30 years but ended lower in 2007 to 2011 than in 1982 to 1986 (Figure 13).

**Figure 13: Trend in absolute and relative inequality in female life expectancy at age 65 using the simple difference and ratio of the most and least advantaged classes**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. \* Relative inequality is expressed as a percentage

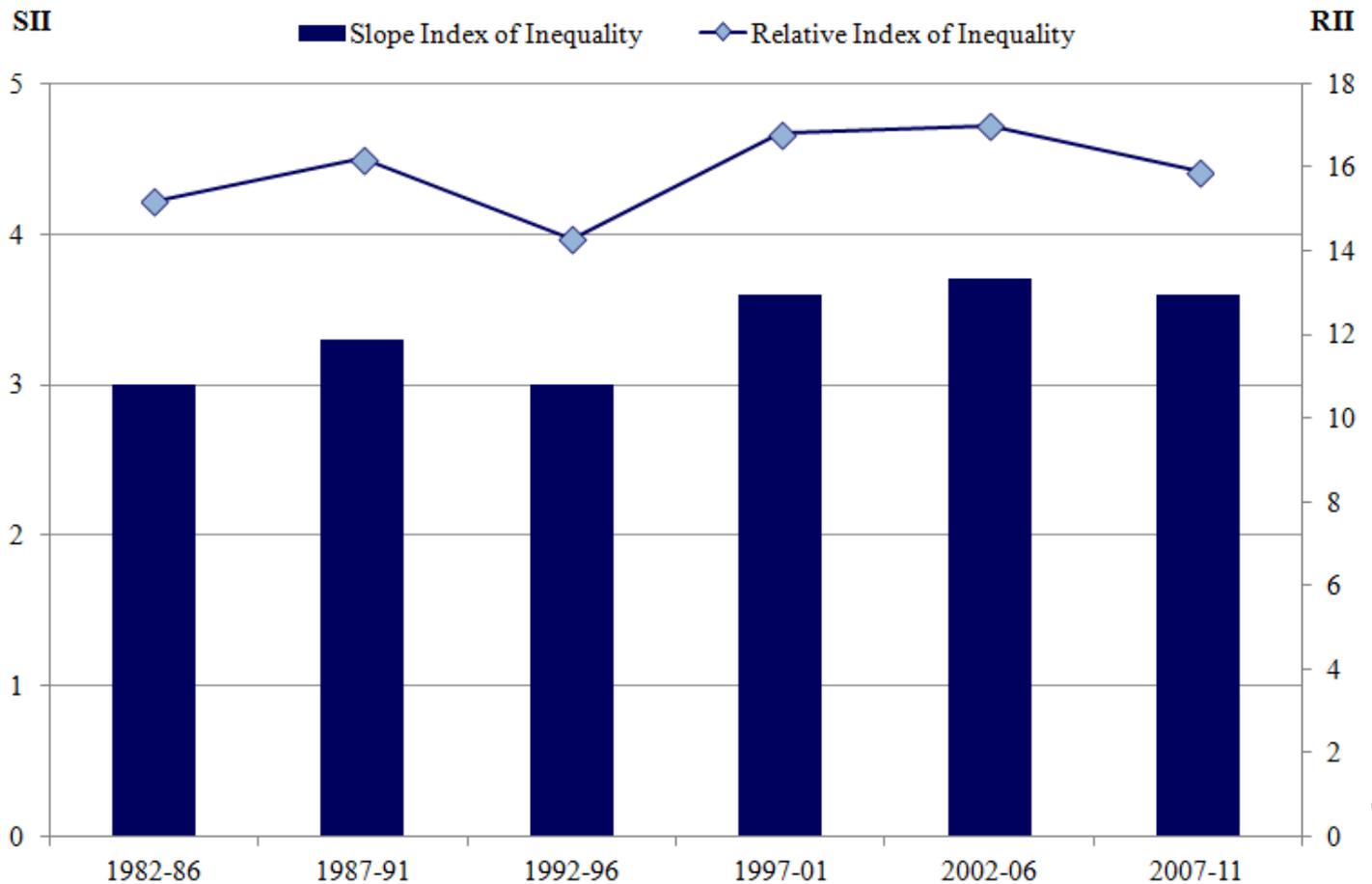
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Using information across all of the socio-economic classes based on the Slope Index of Inequality (SII), the gap between the most and least advantaged populations was 3.0 years in 1982 to 1986, increasing to 3.6 years in 2007 to 2011. Within the 30 year period, the slope index grew to 3.3 years in 1987 to 1991 before falling back to 3.0 years in 1992 to 1996. However, since then it grew twice to 3.6 years in 1997 to 2001 and to 3.7 years in 2002 to 2006 (Figure 14).

**Figure 14: Trend in Slope Index of Inequality and Relative Index of Inequality in female life expectancy at age 65, 1982–1986 to 2007–2011**

England and Wales



Source: Office for National Statistics

**Notes:**

1. Source: ONS Longitudinal Study
2. \*RII is expressed as a percentage

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The relative index of inequality was widest in 2002 to 2006 at 17.0% and fell to 15.9% in 2007 to 2011; however, this was still somewhat higher than at the lowest point in 1992 to 1996 when it was at 14.3%. In the 1982 to 1986 period it was 15.2%.

There is no compelling evidence that the socio-economic gap in female life expectancy at age 65 has narrowed across time in relative terms, but in absolute terms the trend is more consistent with a widening.

## **The most advantaged males outlive the least advantaged females for the first time in 2007 to 2011**

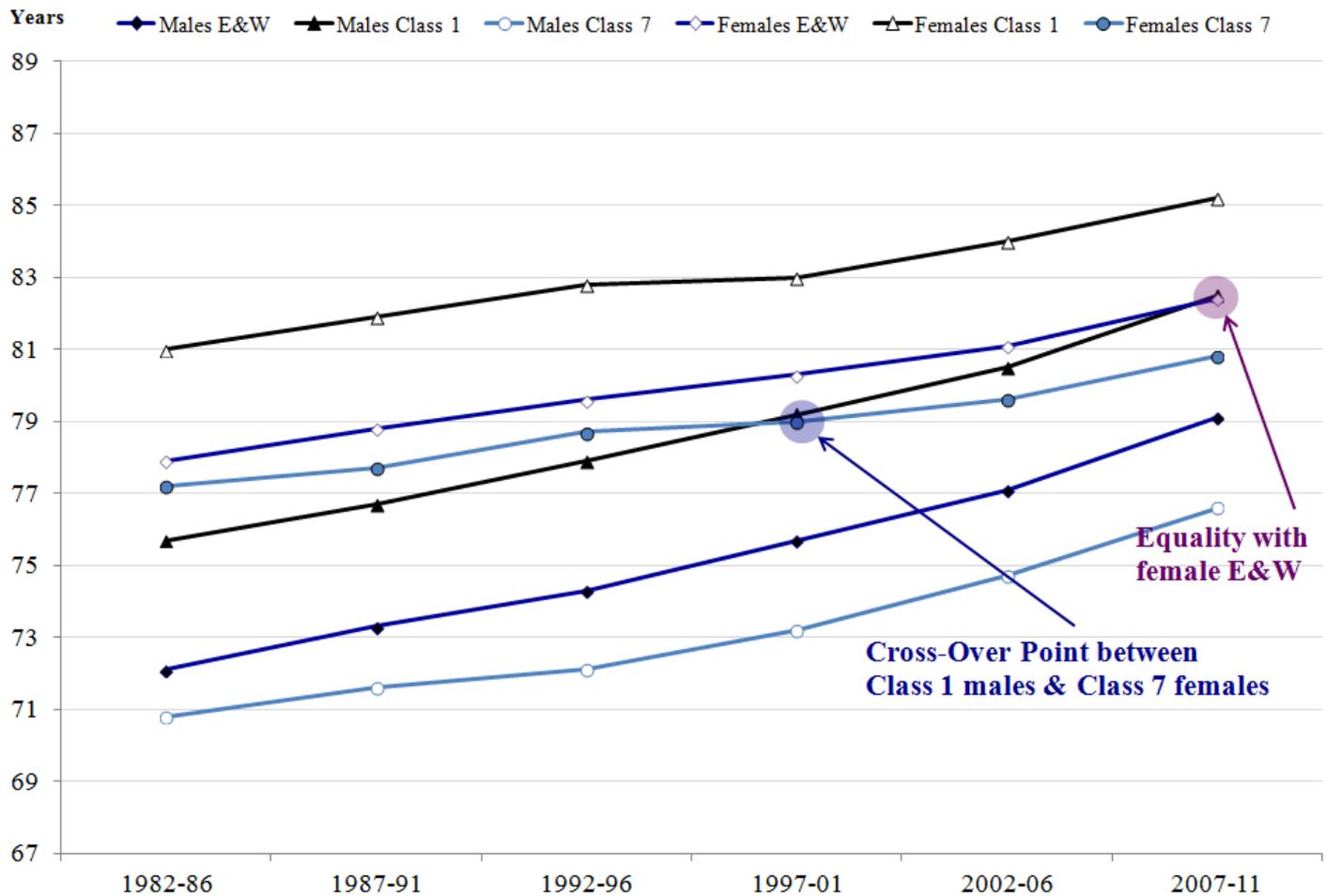
Historically, females have lived longer lives than males; in England and Wales in 2007 to 2011, life expectancy at birth for females was 3.3 years higher than for males (82.4 years versus 79.1 years). In the period 1982 to 1986, the gap was 5.8 years so there has been a reduction in the inequality in life expectancy between the sexes generally. Across all 6 time periods, females had statistically significant higher life expectancy at birth for each equivalent socio-economic class. This pattern observed among Longitudinal Study members concurs with the general trend in attenuating sex inequality in life expectancy since the early 1980s found in the national life table series.

Across all 6 time periods, females had statistically significant higher life expectancy at birth for each equivalent socio-economic class; however, in 1982 to 1986, females in the least advantaged Routine class had a statistically significant 1.5 years higher life expectancy than that of males in the most advantaged Higher Managerial and Professional class (Figure 15). In 1982 to 1986, females in the least advantaged Routine class had a statistically significant 1.5 years higher life expectancy than that of males in the most advantaged Higher Managerial and Professional class (Figure 15). However, over time, this picture started to reverse. By 1987 to 1991 and in 1992 to 1996, the difference in life expectancy at birth between females in the Routine class and males in the Higher Managerial and Professional class ceased to be statistically significant despite remaining higher among females in the Routine class. By 1997 to 2001, males in the Higher Managerial and Professional class started to outlive females in the Routine class; in 2007 to 2011, male life expectancy at birth among those in the Higher Managerial and Professional class was statistically significantly higher by 1.7 years than the life expectancy of females in the Routine class for the first time.

This occurred as a result of the much greater increase over the 30 year period in male life expectancy in the Higher Managerial and Professional class of 6.8 years compared with a more modest gain of 3.6 years among females in the Routine class. Moreover, Higher Managerial and Professional males were achieving the average female life expectancy at birth for England and Wales by 2007 to 2011; but in 1982 to 1986 they lagged behind by 2.2 years.

**Figure 15: Trend in male and female life expectancy at birth by selected NS-SEC classes, England and Wales, 1982—1986 to 2007—2011**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 7: Routine

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**Conclusion**

There is a plethora of research reviews linking socio-economic position and other individual, household and area circumstances to mortality risks and wider health outcomes<sup>1,2,3,4,5</sup>. NS-SEC is a measure of employment relations, which primarily reflects employment conditions, but is associated with other characteristics which have been shown to affect health. Such factors include educational attainment, lifestyle and behavioural characteristics, use of and access to services, disposable income, housing tenure and quality, and the living environment.

Studies of the influence of aspects of employment conditions on health, such as physical working conditions, autonomy, security of employment, psychosocial support, job strain and effort-reward imbalance have shown that they are more relevant for those who are economically active. Positive aspects of these conditions are also most concentrated among the Higher Managerial and Professional class, whereas negative aspects are most concentrated among the Routine class<sup>6,7</sup>. For people who are economically inactive, links to employment conditions are more difficult to determine as they will be based on past exposures (for those that are retired) or not based on exposure at all (for those yet to engage in the labour market formally). For economically inactive people, previous research has shown that the general social advantage of the household (as measured by the [Cambridge Social Interaction and Stratification scale](#)) is more discriminatory in predicting future health risks<sup>8,9</sup>.

The analyses reported on here have not separated out economically active and inactive populations as life expectancy requires all ages to be included and some will have been economically inactive for some or all of the periods investigated. In that sense any inferences of socio-economic effects on mortality risk depends on linkage between employment conditions and how they translate into wider household factors known to influence health risks such as income, relationships, exposure to deprivation and social capital.

The analyses point to significant and meaningful gains in longevity across classes by males and females both at birth and at age 65. Such health improvement should be welcomed and provides evidence for the beneficial effects of past health policies designed to improve the life chances of all.

It also demonstrates that the distance between the state pension age and life expectancy has grown markedly since 1982 to 1986 across all socio-economic classes. For example, a male assigned to the Routine class from birth could expect to live 5.8 years beyond the state pension age in 1982 to 1986; by 2007 to 2011 this had grown to 10.6 years. For a Higher Managerial and Professional male, it was 10.7 years in 1982 to 1986 and 17.5 years in 2007 to 2011. If a male assigned to the Routine class had survived to age 65, their life expectancy from this age in 1982 to 1986 was a further 12.9 years; however this grew to 16.4 years by 2007 to 2011. The comparable life expectancies for the most advantaged males were 15.3 years in 1982 to 1986 and 20.3 years in 2007 to 2011.

Males outgained females by 60% at the England and Wales level across the 30 year period. However, among the Lower Supervisory and Technical class, males gained twice the life years of females. Such gender variation in improvement suggests the long-held sex imbalance in longevity is on a downward trajectory in the long-term. Such a pattern has been observed in the [national principal cohort life expectancy projections](#) which project a 2.7 year gap between males and females by 2062: it was 3.3 years in 2007 to 2011 in these analyses.

Despite the significant gains, the estimates for the latest period provide evidence of a continuing sizeable inequality in life expectancy by a measure of socio-economic advantage and a definitive sex distinction in the trajectory of the inequality over time. For males the gaps are wider and the pattern across classes more consistent with a linear association; however, there are indications of a narrowing in the inequality in male life expectancy at birth as there were 2 consecutive periods

where the absolute and relative inequality based on the Slope and Relative Indexes of Inequality narrowed from a high point in the period 1997 to 2001.

For females at birth, the indications are that inequality has persisted from a high point in 2002 to 2006 and are 1.5 years wider than in 1982 to 1986. The increase in female inequality may be related to a stronger foothold in the labour market during the 1990s and 2000s, meaning their socio-economic position relates more strongly to their own working lives. It also means the health risks associated with varying employment conditions has greater relevance.

For both males and females, there is no evidence that the inequality in life expectancy at age 65 is narrowing; the findings are more consistent with entrenchment during the 2000s from a narrower base during the 1980s. Therefore, these estimates indicate that once survival to age 65 has been achieved, there are residual effects of socio-economic position which impact on life chances. This provides supportive evidence both for healthy ageing and future pension age policy.

Following the Acheson Inquiry into Health Inequalities<sup>10</sup>, a national target was set for narrowing health inequalities in infant mortality and life expectancy in 2001. It was underpinned by two detailed objectives: one aimed to narrow the socioeconomic inequality in infant mortality between the routine and manual group and the population as a whole by at least 10% by 2010 from a baseline in 1997 to 1999; the second aimed to reduce by at least 10 per cent the gap between the fifth of areas with the worst health and deprivation indicators (the spearhead group) and the population as a whole<sup>11</sup>. The life expectancy part of the target was revised in 2004 to include the spearhead group.

A national health inequalities strategy<sup>12</sup> was developed to deliver the 2010 target and to support a long term sustainable reduction in health inequalities. A wide range of activities were undertaken, such as improving the access of the disadvantaged to health care, health promotion campaigns and primary care services to raise awareness of the health risks associated with smoking, unhealthy diets and physical inactivity and support behavioural change, as well as social determinants actions such as poverty reduction. A number of specific initiatives contributed to the implementation of these activities. While Public Health Departments in Health Authorities had been required to conduct formal needs assessments of their local populations since the 1990s, local government and the NHS were given a statutory responsibility to conduct joint strategic needs assessments (JSNAs) in 2007.

Additionally, health inequalities national support teams (NSTs) were established by the Department of Health in 2006 to support local areas (including Local Authorities, Primary Care Trusts (PCTs) and their partners) to tackle complex public health issues more effectively, using the best available evidence. A further NST focusing on infant mortality was then established in 2008. It is difficult to say to what extent the cumulative impacts of these actions may have contributed to stemming the previously widening gap in life expectancy among males that was observed between 1982 to 1986 and 1997 to 2001. Life expectancy is a high level outcome indicator that is relatively slow to change and there is a lag time before actions could plausibly be expected to have an impact on life expectancy gaps. An update for a future time period (that is 2012 to 2016) would provide additional material on which to base such an assessment.

## Notes for Conclusion

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## General methods

The measurement of life expectancy by socio-economic position requires a data source which collects data on age, sex and occupation for individuals and co-resident household members and links these characteristics with birth, death, immigration and emigration records. The general methods section provides an overview of:

- the study population used
- the size of the population at risk of death across the 6 discrete time periods by class membership
- how people who cannot be assigned to NS-SEC are treated in the analysis
- what is period life expectancy
- how inequalities in life expectancy by NS-SEC are measured

## Study population investigated

The ONS Longitudinal Study is a 1% representative sample of the population of England and Wales which links census, life events and migration records since 1971. The earliest point in the study that National Statistics Socio-economic Classification (NS-SEC) can be derived was at the 1981 Census.

Study population counts by class membership during each follow-up period based on the imposed assignment rules<sup>1</sup>, exclusions, de-selections and censoring are shown below by sex in Table M1.

**Table M1: NS-SEC populations by sex and follow-up period**

England and Wales

							Counts
NS-SEC Class	Periods						
	1982 to 1986	1987 to 1991	1992 to 1996	1997 to 2001	2002 to 2006	2007 to 2011	
Males							
Class 1	28,163	29,788	33,297	34,624	37,235	37,977	
Class 2	36,841	38,492	42,523	44,229	47,121	48,808	
Class 3	22,647	23,295	25,004	25,082	25,806	26,090	
Class 4	23,428	25,163	28,380	29,420	31,136	32,265	
Class 5	38,722	38,892	40,195	40,015	39,959	39,445	
Class 6	37,377	38,098	40,630	40,851	41,729	42,050	
Class 7	53,122	53,637	55,934	55,009	54,263	53,400	
Unclassified	17,549	16,458	18,172	17,012	16,939	16,742	
Total	257,849	263,823	284,136	286,242	294,187	296,777	
Females							
Class 1	19,267	21,224	24,259	26,051	28,472	30,014	

NS-SEC Class	Periods					
Class 2	37,810	39,940	44,440	46,287	49,641	51,413
Class 3	39,775	40,761	43,503	43,043	43,077	42,425
Class 4	18,307	20,310	22,983	24,206	26,018	27,759
Class 5	24,132	25,346	26,971	27,717	28,487	28,954
Class 6	41,778	43,312	46,752	47,168	48,293	48,470
Class 7	49,018	50,779	53,757	53,482	53,240	52,617
Unclassified	43,646	36,768	34,800	29,001	26,290	23,807
Total	273,733	278,440	297,465	296,955	303,518	305,459

**Table notes:**

1. Source: ONS Longitudinal Study
2. Class 1: Higher Managerial and Professional; Class 2: Lower Managerial and Professional; Class 3: Intermediate; Class 4: Small Employers Own Account Workers; Class 5: Lower Supervisory and Technical; Class 6: Semi-Routine; Class 7: Routine

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Males assigned to the Routine class were most numerous across all follow-up periods, but their absolute numbers were stable, meaning their proportion over time fell. There were notable increases in the Higher and Lower Managerial and Professional classes and the Small Employers Own Account Workers Class. The smallest class was the Intermediate class, and there was a slight contraction in unclassified males from almost 7% in 1982 to 1986 to 5.6% in 2007 to 2011.

Among females the Lower Managerial and Professional and Routine classes were the largest and there was a notable reduction in the proportion of unclassified females, suggesting increasing female participation in the labour market during the 1990s and 2000s.

**The treatment of the unclassified group**

The unclassified population in these analyses represents a sample of residents in England and Wales who could not be classified to an NS-SEC occupied class at entry to the study or at the first census they were present at. However, some in this population would have been classifiable to an occupied class at a subsequent census. For this study, those unclassifiable on entry remained in the unclassified group even if they could be classified to an occupied class later in the study. This means follow-up to survival or death for the unclassified group includes people that could have been followed-up in an occupied class for later periods. This affects the scale of improvement in life expectancy observed among the unclassified group as a whole, as it contains some individuals whose health attributes are more in line with those of the occupied classes that they have moved into since entering the study.

From an inequalities perspective, the unclassified group is of particular interest because it does include some of the most disadvantaged groups in society, such as the long-term unemployed, those restricted to intermittent casual work that is difficult to code to NS-SEC and those that have never worked because of a lack of labour market related skills, or because of functional impairments which disable their participation in the world of work in their own right or disable them because of a lack of adaptations to the physical or social environment. Such groups are known to have worse outcomes than those assignable to an occupied class; their removal from investigations into the pattern of inequality over time is therefore likely to underestimate the true scale of inequality by socio-economic position.

Annex 1 separates out those who are attributed to the unclassified group on entry to the study but that can be assigned to an occupied class at a later point. This is to give an indication of the difference in life expectancy that would be found if the unclassified group were restricted wholly to those that cannot be classified at any point during the study. Such a population would be expected to be more homogeneous in terms of having limited or intermittent contact with the labour market in their own right (or, for those born into the study during the 1980s to 2000s, their parents having had limited contact) and for whom any contact with the labour market was likely to relate to casual work where occupation was difficult to describe and code. Exposure to material deprivation and social exclusion is more common amongst people with these characteristics and therefore those followed-up as unclassified during the 1990s and 2000s, having allowed for movement into occupied classes where appropriate, would be expected to represent a more distinct disadvantaged population.

### **What is life expectancy?**

All figures presented in this bulletin are period life expectancies. Period expectation of life at a given age for a population sub-group such as NS-SEC class in a given time period is an estimate of the average number of years a person of that age would survive if he or she experienced the particular class's age-specific mortality rates for that time period throughout the rest of his or her life. The figure reflects mortality among those with these socio-economic characteristics in each time period. It is not therefore the number of years a person in a given class in each time period could actually expect to live, both because the death rates of the class are likely to change in the future and because many of those in a class at birth may occupy a different class for part of their lives.

Period life expectancy at birth is also not a guide to the remaining expectation of life at any given age. For example, if female life expectancy at birth was 80 years for a given class, the life expectancy of women aged 65 years in that class is likely to exceed 15 years. This reflects the fact that survival from a particular age depends only on the death rates beyond that age, whereas survival from birth is based on death rates at every age. For example, period life expectancy at age 65 in 2007 to 2011 using the abridged life table method would be worked out using the mortality rate for age bands 65 to 69, 70 to 74, 75 to 79, 80 to 84, 85 to 89 and 90 and over in 2007 to 2011 allowing for Longitudinal Study members ageing into and out of these age parameters during the aggregated 5-year period.

Period life expectancy answers the question, “for a group of people aged  $x$  in a given year or period, how long would they live, on average, if they experienced the age-specific mortality rates above age  $x$  of the period in question over the course of their remaining lives<sup>2</sup>?” They are useful measures of mortality rates actually experienced over a given period and, for past years, provide an objective

means of comparison of the trends in mortality over time, between different groups within a country and with other countries.

## How inequalities are measured

These analyses report 4 inequality indicators; 2 of which use weighted linear regression to model the inequality by taking account of the size of the gaps across all adjacent classes and the relative contributions they make to the overall inequality based on the proportion of the total population each socio-economic class contains (thereby taking account of its influence on the inequality, based on its population size). The Slope Index of Inequality (SII) represents the hypothetical absolute difference in an outcome of interest (in this case life expectancy) between the least and most advantaged states, while the Relative Index of Inequality (RII) measures the relative inequality. These indicators are the ones used in making judgements about the pattern of inequality over time in this bulletin.

Absolute measures of inequality inform the public health relevance by showing the size of differences between classes: the SII informs the likely average total impact on the difference in life years through a change in the population distribution between classes and the likely life years gained should other classes have a similar mortality rate to the most advantaged. It can also be used as a benchmark to assess the public health relevance of differences and the impact of actions designed to close the gap.

Relative measures of inequality show how much more likely an outcome of interest occurs in one population sub-group to another, and in this context, shows the strength and meaningfulness of the relationship between socio-economic position (that is, NS-SEC class) and longevity. Once a strong relationship has been established, it is then necessary to judge the size of the problem in population terms to justify investments to close the absolute gap.

Two simpler types of inequality indicators are also included to show how the gap in life expectancy between the most advantaged class (HMP), and the least advantaged class (Routine) varies over time. The first calculates the simple difference between the most and least advantaged classes to calculate the absolute gap in years, and the second calculates the ratio of the most to least advantage class to show the relative gap as a percentage where positive values indicate life expectancy improves with growing socio-economic advantage. These indicators ignore the inequality among the intervening classes and are considered less meaningful. However, they are included for context and to provide users with an alternative measure.

The values for the relative measures are presented as a percentage by adding the resultant ratio of life expectancy by -1 and multiplying by 100. So if an RII value was 1.08, the resultant percentage used in the tables and charts in this bulletin would be 8%.

## Notes for General methods

1. The assignment rules of NS-SEC are on entry or first census at which the Longitudinal Study member was present at. At this point the LS member's own NS-SEC was derived if available. If unavailable, another household member's NS-SEC was used in a defined order of spouse, then father, then mother.

## 2. ONS (2011). [Guide to period and cohort life expectancy](#)

### Detailed methods

The detailed methods applied in these analyses can be grouped into 6 sections:

- generating NS-SEC
- assigning NS-SEC
- linkage of National Health Service de-registrations to derive censor dates
- applying study population exclusion and de-selection criteria
- measurement of person years of risk and life tables
- calculation of measures of inequality based on weighted regression

### Generating NS-SEC

There are 3 methods of deriving National Statistics Socio-economic Classification (NS-SEC) (full, reduced and simplified) depending on the data available. For this analysis the reduced method is used because not all the data sets used in this analysis collected all the data needed to classify on the basis of the full method. The reduced method derives NS-SEC from the SOC 2000 code and employment status (Employers in large organisations, Self-employed, Employee Manager, Employee Supervisor, Other Employee) variables collected at census and in birth and death registrations. The main effect of using the reduced method is to slightly increase the proportion of the study population assigned to class 1 Higher Managerial and Professional (HMP), and slightly reduce the proportion working in class 2 Lower Managerial and Professional (LMP).

During the development of the NS-SEC, a version for use with data coded to the Standard Occupational Classification 1990 (SOC 90) was made available (referred to as NS-SEC90) and is used in this analysis. However, in order to produce a 30 year time series of life expectancy by NS-SEC, it is necessary to obtain age-specific mortality rates (ASMRs) for all years going back to 1982. This requires an assignment of NS-SEC at an earlier point than the 1991 Census; specifically, the 1981 Census, for those alive at this time point, and for those new birth entrants into the study between Census day 1981 and Census day 1991, the father's and mother's occupation recorded at birth.

For NS-SEC to be derived from occupational information recorded at the 1981 Census or on the birth record during the 1980s and very early 1990s, we developed a new NS-SEC derivation matrix (NS-SEC80). NS-SEC80 is based on the reduced NS-SEC90 analytic class matrix and uses a method which maps the 1981 Census and 1980s birth registration codes (known as Classification of Occupations 1980 (CO80)) to SOC90 codes.

Details of the research conducted to produce the NS-SEC80 derivation matrix can be found in the HSQ article [Deriving Trends in Life Expectancy by NS-SEC using the ONS Longitudinal Study](#).

### Study population inclusion criteria

This research is based on the ONS Longitudinal Study. All Longitudinal Study members (LSM) deemed to be at risk of death at the start of 6 discrete time periods were included in the analyses.

This includes members joining the study at its commencement on Census day 1971, as well those entering the study subsequently at birth or through immigration into England and Wales, or enumerated at a later census. LS entry is based on 4 birth dates and represents an approximate 1% sample of the population of England and Wales. Further details about the [ONS Longitudinal Study](#) can be found on our website.

### **Assembling class candidates for each study population member**

There are a number of opportunities to assign an NS-SEC class to a sample member. Occupation is recorded at each census at which the Longitudinal Study member (LSM) was present; therefore, for an analysis period covering three decades, there are 4 censuses (1981, 1991, 2001, 2011), and 4 time points at which an NS-SEC class could be assigned from census records. In addition, there is the question of whose class to use to classify a person? The LSM could be classified at census using their own or their spouses occupational history (particularly relevant for those women who have had relatively little contact with the paid labour market which was more common during the earliest analysis period 1982 to 1986); in addition for children, assignment can take place at birth or a future census based on their father's or mother's NS-SEC.

The approach taken to resolve these questions was founded on 2 principles: firstly, assignment to an occupied class should be as early as possible and precede follow-up to the outcome of interest, in this case death, as socio-economic position is being used as an explanatory variable, whose exposures influence and discriminate future risk of death; secondly, assignment approaches applied in previous editions should be retained unless compelling observations uncovered during the analyses warranted modification. Convention and continuity are important, but so is the ability to keep up with changes in household structures, societal relationships, and social mobility. That is why further research, to be published at a later date, will investigate the impact of alternative assignment approaches and social mobility to better understand the mortality risk impacts of social transitions in each direction.

Assignment of class at the point of entry to the study is the most logical approach and has been the conventional guiding principle in our previous productions of life expectancy estimates based on socio-economic position. The analyses in this report also adopt this approach except for the analysis reported in Annex 1, where a limited form of transition was applied to those LSMs unclassified on entry to the study, but who could be classified to an occupied class at a future census; specifically, those members entering the study before the 1991 Census and unclassified on entry but classifiable to an occupied class at the 1991 Census would be followed-up as unclassified for the periods 1982 to 1986 and 1987 to 1991, but would then be reassigned to an occupied class and followed-up as a member of that class for the remainder of the study period to which they survived. Similarly, those not classifiable in 1991 but classifiable in 2001 would be reassigned to an occupied class in 2001 and followed-up in that class during 2002 to 2006 and 2007 to 2011 if they survived. However, the headline estimates in the main body of the report are based on assignment at entry, including for the unclassified group.

The overwhelming reason for classifying someone as early as possible is that early life experiences have been shown to have the biggest effect on health, and health selection effects reduce the longer the period of follow-up from assignment.

Another convention applied in previous publications was to use a preferential ordering for whose class to use. The person's own analytic NS-SEC class at the first census they were expected to be present at if they had one was used in preference to all others. If their own occupational information was deficient, their spouse's class at census was used if they had one, or failing that their father's and then their mother's, all at census. If, following this process, the person still did not have an "occupied" NS-SEC, or the person has never attended a census, then their father's NS-SEC at birth is used, and failing that, their mother's. If the LSM still cannot be assigned to an occupied class, they enter the study as "unclassified"<sup>1</sup>.

### **Rules for assigning NS-SEC**

It is necessary to impose rules for assigning the NS-SEC to use from the candidates available if more than one exists. A compound variable with binary coding was constructed to identify presence at census and in particular, the earliest. The conditions for presence at censuses and entry to the study are then computed using the derived variable CPRES which has the following values:

**Table M2: Indicators to determine National Statistics Socio-economic Classification (NS-SEC) assignment**

CPRES Value	Definition
2	Present (Entered) 1981 Census
3	Present (Entered) 1991 Census
0	Present (Entered) 2001 Census
12	Present (Entered) 2011 Census
5	Second decade new births (born between 5 April 1981 and 21 April 1991) not present at any census
6	First decade immigrants (that is, immigrated between 25 April 1971 and 4 April 1981) and not present at any census
7	Second decade immigrants (that is, immigrated between 5 April 1981 and 21 April 1991) and not present at any census
8	Third decade new births (born between 21 April 1991 and 28 April 2001) not present at any census
9	Third decade immigrants (that is, immigrated between 21 April 1991 and 28 April 2001) and not present at any census
10	Fourth decade new births (born between 29 April 2001 and 26 March 2011) not present at any census
11	Fourth decade immigrants (that is, immigrated between 29 April 2001 and 26 March 2011) and not present at any census
13	Fifth decade new births (born after 26 March 2011)
14	Fifth decade new births (born after 26 March 2011)

**Table notes:**

1. Source: ONS Longitudinal Study
2. CPRES = Present at a Census Indicator

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(18.5 Kb)

A number of assignment steps were applied following a logical order. For those present at the first possible census in this analysis (the 1981 Census) a CPRES value of 2 was recorded. If CPRES=2 and the Longitudinal Study member's (LSM's) own NS-SEC, derived using the NS-SEC80 matrix from occupational information available from the 1981 Census record, is within the "occupied" range (that is, analytic classes 1 to 7) , that LSM is assigned that NS-SEC class for the duration of the study. A source value of 811 is recorded to identify that these sample members obtained their NS-SEC class from their own NS-SEC at the 1981 Census. If the LS member was enumerated at the 1981 Census but their own occupational information failed to place them in the "occupied" range, but they were married, their spouse's NS-SEC was used if it was in the "occupied" range and a source value of 812 is then recorded, signifying the LS member attained their NS-SEC from their spouse's occupational credentials.

If both own and spouse's NS-SEC fail to assign an LS member to an occupied class, the process continues to examine the LSM's father's occupational information if they are co-resident with him. If so, and his class is in the occupied ranged, the LSM is assigned to that class and a source value of 813 is recorded signifying the LSM received their NS-SEC from their father's occupational information at 1981. If the LSM is still unclassified, mother's NS-SEC at 1981 is used if in the occupied range and if so a source value of 814 is recorded.

Finally for the 1981 Census, if a person is present and does not have a valid NS-SEC after all 4 candidate NS-SECs from each available source have been exhausted, they are followed-up as "unclassified" for the remainder of their survival time and a source value of 800 is recorded signifying the LS member could not be assigned an occupied NS-SEC from their own or household information available at the 1981 Census.

For those LS members born or immigrating into England and Wales between Census day 1981 and Census day 1991 and enumerated at the 1991 Census<sup>2</sup> or for those entering the study via enumeration at the 1991 Census, a similar approach to NS-SEC assignment was taken to that for the population enumerated at the 1981 Census.

However, in the case of those born between Census day 1981 and Census day 1991 and enumerated at the 1991 Census, the occupational information of the father, or failing that, the mother, on the birth record is used to derive NS-SEC if no occupational information is recorded for the parents on the 1991 Census record. The NS-SEC source values used for 1991 Census assignment and second decade birth assignment are shown in Table M3:

**Table M3: National Statistics Socio-economic Classification (NS-SEC) source values for those present at 1991 Census but not earlier**

Source code	Definition
911	Assigned from Own occupational information at 1991 Census; not present at 1981
912	Assigned from Spouse's occupational information at 1991 Census; not present at 1981
913	Assigned from Father's occupational information at 1991 Census; not present at 1981
914	Assigned from Mother's occupational information at 1991 Census; not present at 1981
923	Assigned from Father's occupational information at birth (5 April 1981 to 21 April 1991)
924	Assigned from Mother's occupational information at birth (5 April 1981 to 21 April 1991)

**Table notes:**

1. Source: ONS Longitudinal Study

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A similar approach was taken to assigning LSMs enumerated at the 2001 and 2011 Censuses and not enumerated at an earlier census and for those born in the third or fourth decades and present at the 2011 Census. The source values for these cases are shown in Table M4:

**Table M4: National Statistics Socio-economic Classification (NS-SEC) source values for those present at 2001 and 2011 Censuses but not earlier**

Source code	Definition
11	Assigned from Own occupational information at 2001 Census; not present 1981,1991
12	Assigned from Spouse's occupational information at 2001 Census; not present 1981,1991
13	Assigned from Father's occupational information at 2001 Census; not present at 1981, 1991
14	Assigned from Mother's occupational information at 2001 Census; not present at 1981, 1991
23	Assigned from Father's occupational information at birth between 22 April 1991 and 28 April 2001
24	Assigned from Mother's occupational information at birth between 22 April 1991 and 28 April 2001
1111	Assigned from Own occupational information at 2011; not present 1981, 1991, 2001
1112	Assigned from Spouse's occupational information at 2011 Census; not present 1981,1991, 2001
1113	Assigned from Father's occupational information at 2011 Census; not present at 1981, 1991, 2001
1114	Assigned from Mother's occupational information at 2011 Census; not present at 1981, 1991, 2001
1123	Assigned from Father's occupational information at birth between 29 April 2001 and 26 March 2011
1124	Assigned from Mother's occupational information at birth between 29 April 2001 and 26 March 2011

**Table notes:**

1. Source: ONS Longitudinal Study

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For those born into the LS during the second, third, fourth or fifth decades but not present at any census, the father's NS-SEC from the birth record was used and failing that the mother's. For first,

second, third, fourth and fifth decade immigrants aged 0 to 15, the father's NS-SEC from the death record was used and failing that the mother's. The source values for these categories of assignment are shown in Table M5.

**Table M5: National Statistics Socio-economic Classification (NS-SEC) source values for those not present at any census**

Source code	Definition
823	Assigned from Father's occupational information at birth between 5 April 1981 and 21 April 1991
824	Assigned from Mother's occupational information at birth between 5 April 1981 and 21 April 1991
873	Assigned from Father's occupational information at death between 1 January 1982 and 21 April 1991
874	Assigned from Mother's occupational information at death between 1 January 1982 and 21 April 1991
923	Assigned from Father's occupational information at birth between 22 April 1981 and 28 April 2001
924	Assigned from Mother's occupational information at birth between 22 April 1981 and 28 April 2001
973	Assigned from Father's occupational information at death between 21 April 1991 and 28 April 2001
974	Assigned from Mother's occupational information at death between 21 April 1991 and 28 April 2001
23	Assigned from Father's occupational information at birth between 29 April 2001 and 26 March 2011
24	Assigned from Mother's occupational information at birth between 29 April 2001 and 26 March 2011
73	Assigned from Father's occupational information at death between 29 April 2001 and 26 March 2011
74	Assigned from Mother's occupational information at death between 29 April 2001 and 26 March 2011
1123	Assigned from Father's occupational information at birth between 29 April 2001 and 26 March 2011

Source code	Definition
1124	Assigned from Mother's occupational information at birth between 29 April 2001 and 26 March 2011
1173	Assigned from Father's occupational information at death between 28 March 2011 and 31 December 2011
1174	Assigned from Mother's occupational information at death between 28 March 2011 and 30 December 2011

**Table notes:**

1. Source: ONS Longitudinal Study

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**Notes for Detailed methods**

1. The only exception to this rule was for immigrant children who died as children (less than 16 years old) in the same decade they immigrated and therefore had no available birth record or census record. In these circumstances NS-SEC classification on death was used.
2. If the first Census is 1991 then CPRES=3; this value, by definition, excludes all LSMs with a CPRES value of 2 from assignment at 1991 even if they were present. For second decade births and immigrants 1991 is the first feasible census they could be present at.

**Detailed methods: Linkage of National Health Service de-registrations to derive censor dates**

The ONS Longitudinal Study suffers from an unknown rate of unobserved embarkation<sup>1</sup>: it is problematic as to whether to include these individuals or not, since it is not clear whether such Longitudinal Study members (LSMs) were resident in England and Wales (and therefore “at risk”) but not enumerated, or abroad.

The NHS Central Register formerly used the Central Health Register Information System (CHRIS) which is now replaced by Medical Research Information Service Integrated Database Administrative System (MIDAS) in 2011. These systems identify patients that should be de-registered from the patient register on grounds of death, transfer or observed embarkation (positive indicators of follow-up). However, where there has been no contact on the part of the patient with the GP (usually 3 years), it is problematic as to whether to include these individuals or not, since it is not clear whether they were in the country (and therefore “at risk”) but not enumerated, or abroad. Extensive tests suggest that a high proportion of these individuals do not have further events and there is a good

case to assume that they are not at risk. The dates of these de-registrations, therefore, act as an indicator for exiting these sample members from the study and details of the tests undertaken can be found in the article referred to in footnote 1.

These dates of de-registration are lagged by 1 year and the resultant date used to censor members from the study and curtail their contribution to person years of risk. However, further positive evidence of residence in the country in the form of re-entry and/or enumeration at a future census after the censor date deletes the censoring indicator. Approximately 46,000 LS members are censored at some point during this analysis.

### **Notes for Detailed methods: Linkage of National Health Service de-registrations to derive censor dates**

1. Embarkations are linked exit events from the LS which arise when emigrants inform their General Practitioner that they are about to emigrate; the subsequent de-registration from the patient register is then flagged and their ONS LS record is updated with a date of embarkation. Further information on unobserved embarkation can be found in the publication: [Blackwell L, Johnson B. Review of methods for estimating life expectancy by social class using the ONS Longitudinal Study. Health Statistics Quarterly 2007; 35: 28-36.](#)

### **Detailed methods: Applying study population exclusion and de-selection criteria**

#### **General exclusions**

The first section of the analysis program designed to measure survival across the 30 year period deals with general exclusions. Exclusions apply to those Longitudinal Study members (LSMs) where there is good evidence to suggest pronounced doubt concerning the validity of their entry criterion of being born on one of 4 specific birth dates, or their migration history is so complex it becomes intractable to measure, with any validity, the periods in which they were resident in England and Wales.

#### **Date of birth discrepancies**

Those with a date of birth discrepancy in migrant records: specifically immigration, embarkation and re-entry records where the date of birth credentials on entry are discrepant with other information held. These are excluded because there is a risk of date of birth recording errors which sheds doubt on the validity of their inclusion. 1,836 LSMs were dropped as a result of a date of birth discrepancy.

#### **Embarkations**

New exclusion rules for the treatment of embarkations were applied in this bulletin which differed to previous analyses<sup>1</sup>. The addition of the 2011 Census and the increasing likelihood of LSMs having 2 or more embarkations with the passage of time (which would have excluded them altogether, despite the fact that they may have spent a large part of the analysis period resident in England and Wales and at risk of death) were good reasons to review this exclusion rule.

The approach applied was to keep participants in the analysis if they were enumerated at the next census after their respective embarkation dates; the reasoning behind this decision was that positive forms of follow-up information should outweigh previous migration history. Therefore, LSMs who embarked for the first time but showed up at the next census and did not embark again were not treated as embarkations and those second embarkations were also set to missing when census follow-up meant they were in the country. Their presence at the next census was taken as evidence that they either did not embark or embarked but had returned to the country and therefore would have been at risk for part of the decade. Therefore, they remained in the analysis until death or end of the study period. This had the effect of increasing the population at risk and death events occurring to them.

Similarly, death registrations only take place in the UK if participants died in the UK. Therefore, if they died in the same decade as they embarked it is assumed that they were still in the country and did not embark for very long. These participants were not treated as embarkations and remained in the analysis until death.

Following these adjustments, all remaining second or more embarkations were assumed to be genuine long-term embarkations and these LSMs were dropped, amounting to 3,619 exclusions. In addition, those LSMs embarking before Census day 1981 and not present at the 1981 Census were dropped, amounting to 7,632 exclusions.

### **Re-entries**

Previous analyses dropped all re-entries. This convention was also reviewed in the latest analyses. The outcome was to modify this rule to keep as many people in the study for as long as possible. The principle used for this was that presence at a later census should be taken to indicate that the re-entry was genuine and the individual was back in England and Wales. To apply this approach, those LSMs enumerated at the following census after re-entry were given a revised entry date of the first census they were present at after re-entering, and only contributing person years of risk after this date. If they missed the first census after re-entering, they were dropped as they may not have genuinely re-entered so may not have been contributing person years of risk. This includes those with re-entries in the 1970s not present at the 1981 Census. A total of 6,085 LSMs were dropped as result of re-entry and not present at the next census after re-entry.

### **Not traced**

LS members not traced at the National Health Service Central Register were excluded as death events occurring to them could not be linked to their record. A total of 24,968 LSMs were dropped on these grounds.

### **De-selections and adjustments**

#### **Censor date adjustments**

Adjustments were made to the censoring date, setting it to missing if the Longitudinal Study member (LSM) had a valid death or embarkation date during the study period. Also, if the LSM was present at the 2001 Census, any censoring date during the intervening period between the 1991 and 2001 Censuses is set to “missing”. A similar approach was applied to the censoring date between the

2001 and 2011 Censuses if the LSM was enumerated at 2011. However if the LSM was not found at the next census after a censor date being set, the censor date retained its value and the LSM ceased to be followed-up after that censor date.

### **Other date adjustments**

For analyses of life expectancy based on person years of risk contributed, entry and exit dates need to be derived. The LSM's entry date is set to the earliest of first census, new birth date or immigration date. Exit date is set to the earliest of date of death, embarkation, censoring date or the end date of the study in 2011.

In cases where the new birth date of the LSM postdates a death date, the birth date is adjusted to the beginning of the birth month. For those with a death date the same as their birth date, death date is advanced by 1 day to avoid danger of the Stata<sup>2</sup> program not counting the death because it occurred on the same day as entry to the study.

Records were excluded if the immigration date was later than the emigration date, since these members will have an entry date later than their exit date.

Those for whom the derived exit date predates the derived entry date are excluded.

### **Sporadic census histories or no Census histories**

Those who entered the LS as immigrants after the 1971 Census and were not enumerated at any subsequent census were dropped from the analysis as there was no bona fide method to allocate them to NS-SEC before follow-up.

For LS members with a 1971 record but no subsequent census information and not known to have died or embarked were dropped because again there was no means to assign them to NS-SEC. Those that died or embarked during the 80's were retained to the point of death or embarkation, but if they died or embarked post the 1991 Census they were dropped.

For LS members with sporadic census histories, in our previous reported analyses of life expectancy by socio-economic position, they were de-selected if they missed more than 1 census after entry at which they were expected. This was revised in order to avoid the bias associated with disproportionately excluding those that are more likely to have more sporadic census histories because they are not randomly allocated across socio-economic position strata; specifically those of lower socio-economic are more likely to have sporadic census histories. To keep as many person years of risk (and equivalent deaths) in the analysis as possible, such people were censored the date after the next census at which they were expected, rather than being dropped entirely from the analysis. However, if an LS member had an existing censoring date, this date was retained regardless of whether they missed the next census at which they were expected because this information is a known indicator of likely earlier embarkation. Missing a census with no further information, however, is an uncertain indicator as it may be because of embarkation, linkage error or non-compliance with completing the census form.

Those LSMs who entered the study through immigration and were enumerated at a subsequent census, were left censored, which effectively pushed back their entry date for inclusion in analyses to the date of that census. Therefore, immigrants contributed no person years of risk in the period between immigration date and date enumerated at a census.

LSMs born between the 1981 and 1991 Censuses and not enumerated at any future census, were censored the day after the 2001 Census if they were not known to have died or embarked or they died or embarked after Census day 2001. If they died or embarked before the 2001 Census they were not censored.

LSMs born between the 1991 and 2001 Censuses and not present at neither the 2001 nor the 2011 Census and not known to have died or embarked or died or embarked after Census day 2011 were censored the day after the 2011 Census.

### **Notes for Detailed methods: Applying study population exclusion and de-selection criteria**

1. The previous method excluded all LS members with two or more embarkation records.
2. Further details about Stata can be found on the [Stata website](#).

## **Detailed methods: Measurement of age-specific mortality rates**

### **Calculation of person years of risk**

Stata software was used for the calculation of person years of risk to survival or death or embarkation or censoring. After the [Stata survival time](#) set procedure is applied, an interim saved base file is retrieved and entry and exit dates calculated for each year. The [survival time split](#) procedure is then used to create person-years and deaths at 5-year intervals of life. These are then collapsed to produce aggregate deaths and person years by age band, sex and NS-SEC for each year.

Within the looped records using death date, embark date or censor date preceding 1 January of a given year (“Yr”), where “Yr” is the year referred to by the loop, such records will be dropped from calculation for that year and any subsequent year. Similarly, if an LSM’s entry date should fall after the end of the given year (31 December), the record is dropped for calculation for that year, but it will become active from its future entry date for calculation of person years of risk contributed. If a censoring date falls in a year for which the person years are being calculated, it will have the same effect as embark date; the record will drop out of the analysis from that date. After each pass, the person years and deaths for the year are calculated and appended to a master file which contains deaths and person year counts for each year within the analysis period (that is, 1982 to 2011).

### **Life Table calculations**

Abridged life tables are used to estimate life expectancy. Age specific mortality rates are grouped into 5-year age bands. The Chiang II method of abridgement<sup>1</sup> and conversion of the central age-specific mortality rate into the probability of survival in the age stratum is used and complies with

the [standard ONS approach to estimate life expectancy at subnational level \(192.5 Kb Excel sheet\)](#). One modification is that these analyses use an upper age stratum of 90 and above, rather than 85 and above.

### Notes for Detailed methods: Measurement of age-specific mortality rates

1. Chiang C (1978) Life Table and Mortality Analysis. World Health Organisation.

### Detailed methods: Measurement of inequality using the Slope and Relative Index of Inequality

The Slope Index of Inequality (SII) was calculated in Stata using weighted least squares regression. The socio-economic classes were ordered from least advantaged (Routine class) to most advantaged (Higher Managerial and Professional class). The fraction of the population for each class from the least to most advantaged was calculated ( $c_i$ ), where  $c_i$  represents the cumulative proportion in each successive class. Each class was then assigned a median social rank:

$$x = (c_i + c_{i-1})/2$$

The life expectancy for each class,  $y$ , was then regressed against the median social rank, using the square root of the class population totals as weights, yielding a straight line estimate,  $y = a + bx$ , where (a) is the hypothetically least advantaged proportion of the population, the slope index of inequality (b) represents the difference in life expectancy between the hypothetically least and most advantaged socio-economic positions.

The Relative Index of Inequality (RIIKM) and associated confidence intervals is based on [Fieller's method](#)<sup>1</sup> of computing the Kunst Mackenbach RII. Fieller's method uses the following formulae:

RIIKM numerator = mean life expectancy across classes weighted by class size - (SII\*0.5)

RIIKM denominator = mean life expectancy across classes weighted by class size + (SII\*0.5)

and the resulting ratio is then added by -1 and expressed as a percentage the using the formula  $(RII-1)*100$ .

And the confidence interval (CI) for RIIKM is computed as:

RIIKMCI = mean life expectancy across classes weighted by class size - [SII  $\pm$   $c^*$  SE(SII)] \* 0.5 /

mean life expectancy across classes weighted by class size + [SII  $\pm$   $c^*$  SE (SII)] \* 0.5

where  $c$  is the critical value of the  $t$  distribution used in the calculation of the variances of the coefficients. SE is the standard error of the SII available from the weighted regression equation.

The unclassified group are not used in inequality measurement.

## **Notes for Detailed methods: Measurement of inequality using the Slope and Relative Index of Inequality**

1. Hayes, LJ and Berry, G. (2002). Sampling variability of the Kunst-Mackenbach relative index of inequality. *J Epidemiol Community Health* 2002;56:762-765

## **Annex 1: Further investigation into the unclassified population**

### **Brief synopsis**

The principal purpose of this annex is to outline how the composition of those followed-up as unclassified varies in 1981 compared with 2001, both for those of working age and those of retirement age. Children aged below 16 years are not considered in tables focusing on economic position but are included in the section at the end that cover the trajectory of the unclassified study members that subsequently become classified: this can occur for instance, where a child is unclassified because their parents do not have an occupation that can be classified at the 1981 Census, but subsequently has his or her own occupation at 2001 that can be classified.

The composition of the unclassified by economic position category at 1981 and 2001 among those aged 16 to 64 and 65 and over is shown in Table A1<sup>1</sup>.

**Table A1: Broad economic position at 1981 and 2001 Censuses of unclassified study members who were followed up as unclassified on entry to the study by age and sex**

England and Wales

Percent

Economic position	1981 Census		2001 Census		1981 Census		2001 Census	
	Males		Females		Males		Females	
	16 to 64	65 and over						
Working or about to start work	8.3	0.8	2.3	0.2	57.2	4.0	43.6	3.2
Unemployed	30.3	:	6.5	:	9.0	:	4.4	:
Permanently Sick or Disabled	18.1	6.2	6.5	3.6	12.9	17.3	11.3	12.9
Looking after home or family	3.0	2.7	68.3	69.8	2.7	:	21.5	2.2
Wholly retired	3.7	89.6	5.9	26.1	1.0	69.5	4.0	72.9
Student	28.9	:	9.7	:	10.2	1.6	7.3	:
Other Inactive	7.8	0.4	0.9	:	7.0	6.0	7.9	8.2

**Table notes:**

1. Source: ONS Longitudinal Study
2. : Suppressed because of low cell counts
3. Excludes temporarily sick

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(19 Kb)

Under the conventional rules used for the main analyses described in this bulletin, people assigned as unclassified on entry retained this unclassified status for the duration of the follow-up period. As can be seen in Table A1, only 8.3% of male unclassified Longitudinal Study members (LSMs) aged 16 to 64 at the 1981 Census and enumerated had an economic position of working or about to start work. Almost a third were unemployed, almost a fifth permanently sick or disabled and 29% were students. However, this distribution changes markedly in 2001. The 2001 population is composed

of those assigned unclassified in 1981 and surviving to the 2001 Census and enumerated together with new births and immigrants into the study after Census day 1981 and those enumerated for the first time at either 1991 or 2001. At 2001, the residual earlier assignments to unclassified together with those unclassified at 2001 show that almost three-fifths are working full- or part-time or waiting to start a job acquired, while the students and permanently sick or disabled have shrunk markedly. A similar effect occurs among females.

The importance of this notable change in the distribution is that the unclassified in 2001 have a much higher proportion being followed during 2002 to 2006 and 2007 to 2011 who were working full- or part-time (most of which would be classifiable to an occupied NS-SEC) or waiting to take up a job acquired. Therefore life expectancy estimates for the unclassified during the 2000s are higher than during the 1980s when the composition was much more skewed towards the categories of unemployed and permanently sick disabled which research has shown are at a greater risk of health-damaging exposures and mortality<sup>2</sup>.

## Introduction

The material in this annex decomposes the population of Longitudinal Study members (LSMs) that are unclassified to NS-SEC at the start of the follow-up periods by age, sex and economic position. The unclassified category, in the analysis reported in the body of the bulletin, is a residual group of study members that could not be assigned at entry to an occupied NS-SEC, either from their own occupational information, or, if co-resident, from their spouses, father's or mother's occupational information from the first census they were enumerated at, or from their birth record if they were born into the study. However, because some of this group will be classifiable into an occupied NS-SEC at a later time point, and could therefore be followed-up as members of an occupied class in later periods, the life expectancy reported for the unclassified group is likely to be higher in later periods because it contained occupied people whose life chances were shown to be greater than the unclassified across all periods.

The unclassified group is heterogeneous, containing people 16 years and above who have never worked or are long-term unemployed, as well as full-time students and people with occupations that are inadequately described for coding to an occupied NS-SEC: people with no, limited or only casual contact with the labour market are likely to suffer greater levels of disadvantage than those with contact, but the inclusion of full-time students in this group complicates the treatment of the unclassified as a disadvantaged population and the extent to which any inferences can be drawn regarding its impact on life expectancy.

NS-SEC has the following residual categories namely:

- occupation inadequately described
- never worked or long-term unemployed
- unclassified for other reasons (other than full-time students)

But these can only be specified in 2001.

The assignment method to NS-SEC as documented earlier in the bulletin is at entry and for this to remain fixed throughout the follow-up period the study member survives, or embarks or is censored.

Consequently, this means that the unclassified group will include those LSMs unclassified at entry but classifiable at a later census, with the implication that some of those who had been unclassified at entry because they had never worked or were long-term unemployed, had subsequently had contact with the labour market and were therefore less disadvantaged and likely to have improved life chances than those which remained never worked or long-term unemployed.

The increase in male life expectancy at birth over the entire 30 year period for the unclassified group is larger than for any occupied class (Table 2 in the main body of the bulletin), and for female life expectancy at birth it is the second highest (Table 5). One reason for this is health selection out of the labour market, which is much more likely for those unclassified at entry, and particularly at 1981 when the bulk of the study population were assigned. The traditional way to adjust for this is to assign those not classifiable to an occupied class at a given time to a socio-economic position reported previously if they had one (that is, to a LSM's occupation recorded at the 1971 Census). However, this was not possible in this analysis because NS-SEC is not derivable from the occupational classification used at that time and only becomes possible using the Classification of Occupations 1980 coded at the 1981 Census.

The health selection effect operating in the immediate follow-up period following entry reduces the life expectancy of the unclassified group, particularly in the 1982 to 1986 period compared with later periods. Improvement over time among the unclassified group is also compounded by the fact that because the assignment cannot change, this group becomes more heterogeneous over time, containing those moving into the labour market after entry. The resulting bias is possible to control (in these analyses) by allowing unclassified people to make transitions into an occupied class at a future census and then following them up in the next 5-year period following that census as a member of an occupied class.

For those assigned to an occupied class at entry, the impact of the health selection effect is to improve the life expectancy of the occupied classes, particularly in the 1982 to 1986 period. This causes the scale of improvement among the occupied classes over the 30 year period to be somewhat lower because the health selection bias inflated their baseline life expectancy. The traditional way to control for such bias is to ignore the first follow-up period and to estimate their improvement from the second period to allow this health selection effect to wear off.

The main objectives for the analysis in this annex is to examine the composition of the unclassified group over time by sex, age and economic position, and to look at the impact on the life expectancy trend for the unclassified group of allowing those who move into employment to move from the unclassified group to an occupied class, to provide evidence on whether:

- the unclassified group represents a reasonably homogeneous and distinctively disadvantaged group (particularly if exit into occupied classes is allowed)
- the large increase in life expectancy for the unclassified group at entry is influenced markedly by health selection at the beginning of the study and future movement of some into an occupied class

While LSMs entering the study at an earlier time point cannot have the residual categories determined to the same specification as 2001, indications of their circumstances can be inferred from their economic activity the week before the Census in 1981 and/or 1991 at which they were

present. However, using economic activity from these censuses will not enable the residual categories above to be derived to the same specification as in 2001 as last year worked or never worked were not collected at either 1981 or 1991. For comparison of circumstances to be consistent between censuses, it is therefore necessary to rely on economic position throughout.

## Notes for Annex 1: Further investigation into the unclassified population

1. Economic position categories have been harmonised where possible to aid comparability
2. Bartley, M. (1994). Unemployment and ill health: understanding the relationship. *Journal of Epidemiology and Community Health* 1994;48:333-337

## Annex 1: 1981 Census and 1980s births

### Age and sex breakdown of unclassified Longitudinal Study members (LSMs)

The mean age of unclassified men enumerated at the 1981 Census was 38.3 years compared with 35.5 years among occupied men (Table A2). Among women the contrast is much more sizeable with unclassified women having an average age of 57.9 years, 23.1 years older than occupied women. This reflects the greater proportion of women close to retirement age at the time of the 1981 Census having had much more limited contact with the labour market than would be expected both in the 1990s and the 2000s and also unable to be assigned from a spouse's occupational information in 1981 partly on grounds of earlier death of a spouse.

**Table A2: Mean age of Longitudinal Study members enumerated at 1981 Census, by sex and classification status**

England and Wales

	Years	
<b>1981 average age</b>	<b>Males</b>	<b>Females</b>
Occupied	35.5	34.8
Unclassified	38.3	57.9

**Table notes:**

1. Source: ONS Longitudinal Study

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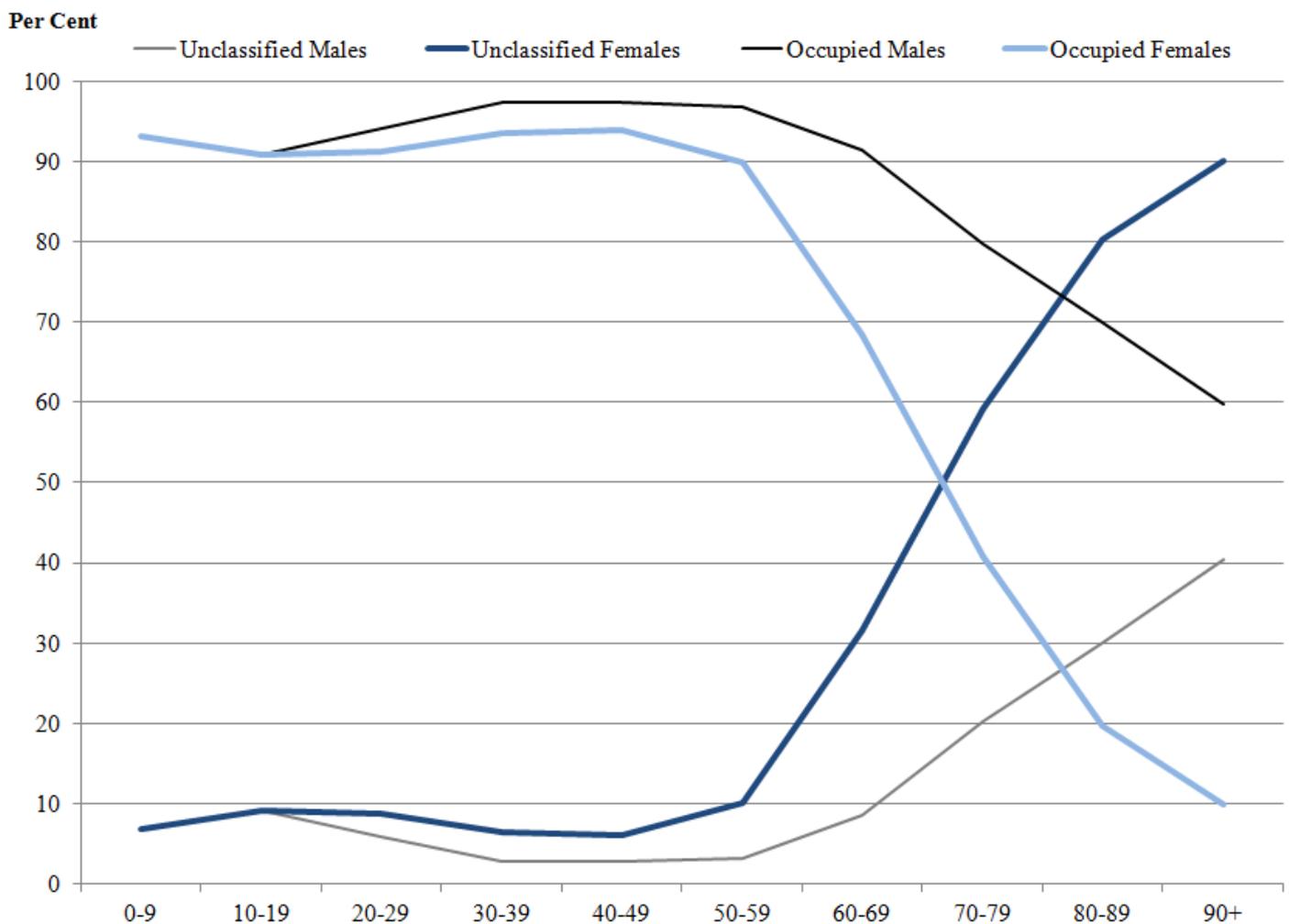
The first point of entry to the study for these analyses was the 1981 Census which was held on 5 April 1981. The proportion of LSMs occupied (that is, assigned to a specific NS-SEC analytic

class) or unclassified at this census or born during the second decade of the study (that is, between Census days 1981 and 1991) is shown below by sex (Figure A1).

This chart shows the overwhelming majority of males were classifiable to the point of the state pension age, but there remained a greater proportion of occupied males than unclassified males across all ages. For females, there was also a clear majority classifiable to the point of the female state pension age of 60, from whence the gap between classified and unclassified females contracted more abruptly, with equality by ages 70 to 74 and unclassified females becoming dominant after age 74.

**Figure A1: Per cent of Longitudinal Study members who were occupied or unclassified at the 1981 Census or at birth between 1981 and 1991 Censuses, by age and sex**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study

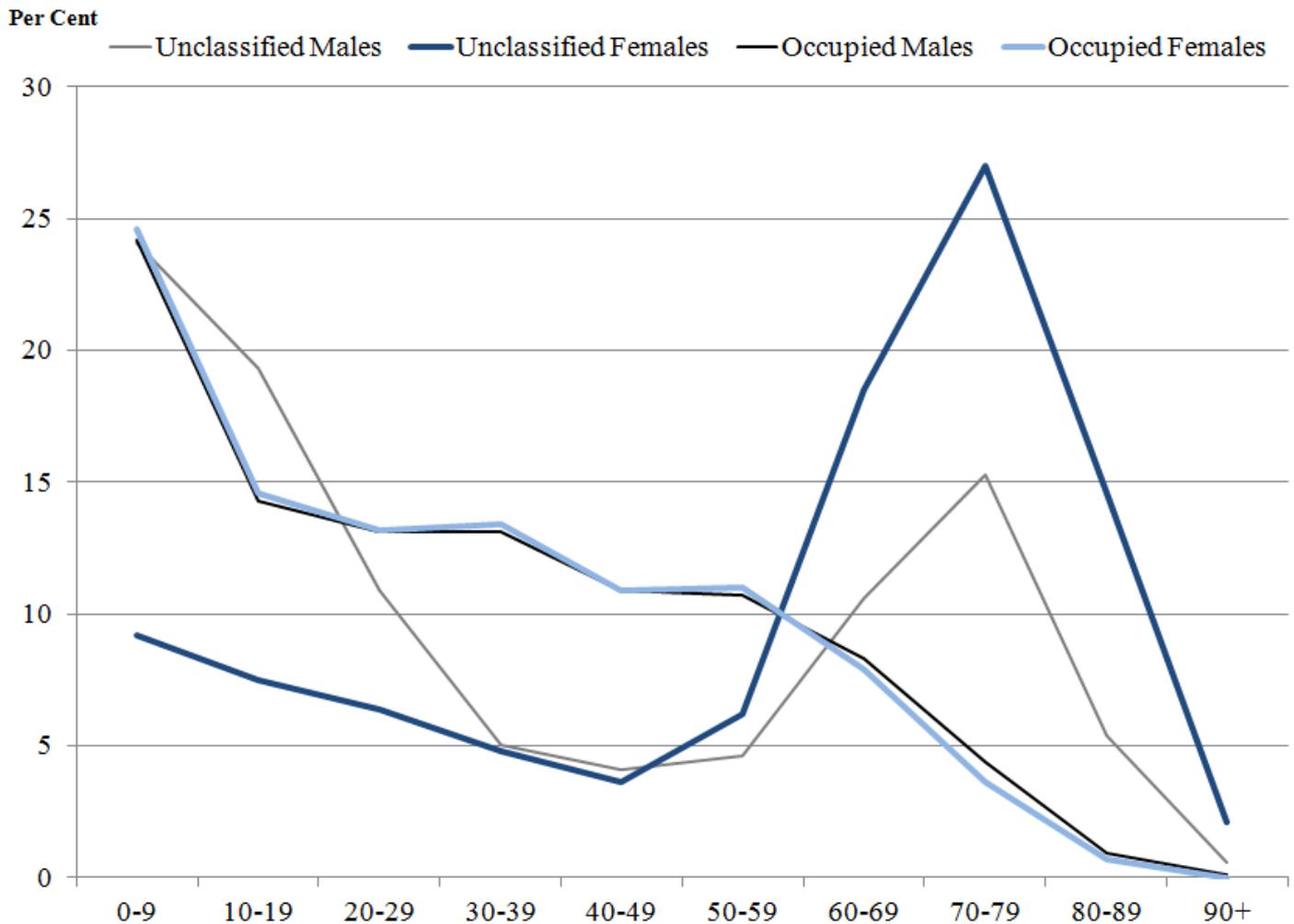
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(32 Kb)

Figure A2 shows the age distribution of occupied and unclassified LSMs; the occupied had a more conventional age distribution. However, the unclassified had much fewer men and women of working age. This partly reflects the lower contact women had with the labour market during the 1970s and 1960s, and the economic downturn in 1981 will have affected the ability of young men to have had an occupation recorded at the 1981 Census or on the birth records for those that were fathers.

**Figure A2: Age distribution of unclassified and occupied Longitudinal Study members at 1981 or born between the 1981 and 1991 Censuses, by sex**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study

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**Economic position of Longitudinal Study members (LSMs) at 1981**

A LSM's economic position was recorded at the 1981 Census; the categories available were:

**Box A1: Economic positions at 1981 Census**

<b>Economically Active</b>	<b>Economically Inactive</b>
Working Full-time	Permanently sick disabled
Working Part-time	Housewife
Waiting to take up a job acquired	Wholly Retired
Seeking Work (unemployed)	At School\Student
Temporarily sick	Other Inactive or not applicable

The distribution of LSMs to these categories of economic position are shown in Table A3.

**Table A3: Percentage of unclassified and occupied Longitudinal Study members at 1981, by economic position, age and sex**

England and Wales

<b>Economic Position 1981</b>	<b>Age group</b>			
	<b>16 to 64</b>		<b>65 and over</b>	
	<b>Unclassified</b>	<b>Occupied</b>	<b>Unclassified</b>	<b>Occupied</b>
<b>Males</b>				
Working Full or Part time	7.1	81.9	0.9	15.7
Waiting to take up a job acquired	0.5	0.4	:	0.0
Seeking work	27.6	7.9	0.4	0.9
Temporarily Sick	2.6	0.8	0.2	0.2
Permanently Sick Disabled	15.7	1.7	7.1	2.6
Housewife \Househusband	2.7	0.1	2.8	0.1
Wholly Retired	2.7	0.9	88.1	80.5
At School\Student	26.7	3.8	:	:
Other Inactive	14.4	2.5	0.4	:
	<b>16 to 59</b>		<b>60 and over</b>	
	<b>Unclassified</b>	<b>Occupied</b>	<b>Unclassified</b>	<b>Occupied</b>
<b>Females</b>				

Age group				
Working Full or Part time	2.4	59.5	0.2	17.9
Waiting to take up a job acquired	0.3	0.3	:	:
Seeking work	8.3	3.4	0.1	0.2
Temporarily Sick	1.6	0.4	0.1	0.1
Permanently Sick Disabled	6.5	0.7	3.8	1.5
Housewife \ Househusband	62.7	28.3	70.2	52.1
Wholly Retired	0.8	0.2	25.2	28.1
At School \ Student	12.6	4.6	:	:
Other Inactive	4.7	2.7	0.3	:

**Table notes:**

1. Source: ONS Longitudinal Study
2. : Suppressed because of low cell counts

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(27.5 Kb)

Table A3 is only relevant for making judgements about level of disadvantage based on economic position for those of working age, but after working age proportions are shown for completeness. The data shows pronounced differences between the proportions of unclassified and occupied males and females aged 16 to 64 and 16 to 59 respectively that are working full- or part-time. More than four-fifths of occupied males of this age were working full- or part-time whereas less than one tenth of unclassified males were. Conversely, more than two-fifths of unclassified males were either seeking work or were permanently sick or disabled. However, a quarter were economically inactive students, likely to be younger and have a different mortality risk profile. Among females, more than three-fifths were in a housewife role and fewer seeking work, permanently sick or disabled or students.

The level of disadvantage judged by economic position at working age is clearly different for males and females; however, the small proportions of unclassified males and females working full or part time suggests they are likely to be more disadvantaged than their occupied peers.

The relatively low life expectancy at birth of unclassified males during 1982 to 1986 reported earlier in the bulletin is mostly explained by a selection effect whereby chances of being occupied are diminished because more than a quarter are either permanently sick or disabled or seeking work, both of which are known to be circumstances that carry health and future mortality risks.

Among females the health selection effect operating during 1982 to 1986 is less pronounced, but the difference between unclassified females and Routine females during this period is also affected to some extent by the much higher relative proportions of females who were permanently sick or disabled or seeking work among the unclassified, compared with the occupied population, but further investigation is needed comparing the economic positions of unclassified females with females assigned to the Routine class.

### **Destination of unclassified Longitudinal Study members (LSMs) in 1991**

The conventional method of assignment used to calculate estimates of life expectancy by socio-economic position is to assign on entry and maintain that assignment for the duration of the follow-up period. However, some LSMs will be unclassified on entry because of a lack of occupational information but subsequently be classifiable at a later point. Such transitions are important for estimating life expectancy for a heterogeneous population such as the unclassified as those entering employment status have different health risk profiles to those more likely to remain unclassified for the duration of the study because of no subsequent occupational information at a future census at which they were enumerated.

To determine the destination of LSMs' NS-SEC assignments on entry at the 1981 Census or at birth during the second decade of the study, occupational information at the 1991 Census was used and is shown in Table A4.

Of those males unclassified at entry before the 1991 Census and enumerated at the 1991 Census, 45% remained unclassified; for females it was 67.9%. The destination for most males and females making a transition to an occupied class were the Routine or Semi-Routine classes, but there were also a notable number of transitions into the Higher and Lower Managerial and Professional classes. The transition to an occupied class was more common among males and therefore the impact on life expectancy for unclassified males is likely to be greater than for females.

Table A4 suggests following-up more than half of males and a third of females as unclassified during the 1992 to 1996 and subsequent periods based on their entry unclassified status would cause the unclassified life expectancy to improve as these LSMs have health risks more in common with the occupied classes they joined. Removing these members from the unclassified group would reduce the heterogeneity somewhat but the nature of the LS and these methods mean that new joiners to the study at 1991 and during the 1990s would to some extent replace these members who made a transition. This would maintain a level of heterogeneity that may affect the extent to which this group could be considered representative of a clearly distinct disadvantaged population.

**Table A4: Destination class of unclassified males and females in 1991**

England and Wales

	percent	
Class in 1991 if Unclassified at entry before 1991 Census	Males	Females
Higher Managerial and Professional	5.7	1.8
Lower Managerial and Professional	7.1	4.4
Intermediate	4.8	5.3
Small Employers Own Account Workers	6.1	2.3
Lower Supervisory and Technical	5.8	1.7
Semi-Routine	10.7	8.4
Routine	14.9	8.1
Unclassified	45.0	67.9

**Table notes:**

1. Source: ONS Longitudinal Study

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(18 Kb)

## Annex 1: 1991 Census and 1990s births

### Age and sex breakdown of unclassified Longitudinal Study members (LSMs)

This section examines the unclassified population who were:

- LSMs unclassified at the 1981 Census and could not be assigned at the 1991 Census
- LSMs born into the study between the 1981 and 1991 Censuses and unclassified both from the birth record and at the 1991 Census
- LSMs immigrating in England and Wales between 1981 and 1991 Censuses and unclassified at the 1991 Census
- LSMs entering at 1991 Census and unclassified from their 1991 Census record

Under the 1991 classification, there are fewer unclassified males and females of working age than in 1981 or during the 1980s follow-up period. This is indicative of a less heterogeneous and more likely more disadvantaged population than those unclassified in 1981. This is emphasised by the fact the average age of unclassified males in 1991 was 47.7 years compared with 38.3 years in 1981. Occupied males had an average age of 38.3 (Table A5). Unclassified females had an average age of 65.2 years compared with 37.2 years for occupied females.

**Table A5: Mean age of Longitudinal Study members enumerated at 1991 Census, by sex and classification status**

England and Wales

	Males	Females
Occupied	38.3	37.2
Unclassified	47.7	65.2

**Table notes:**

1. Source: ONS Longitudinal Study

**Download table**

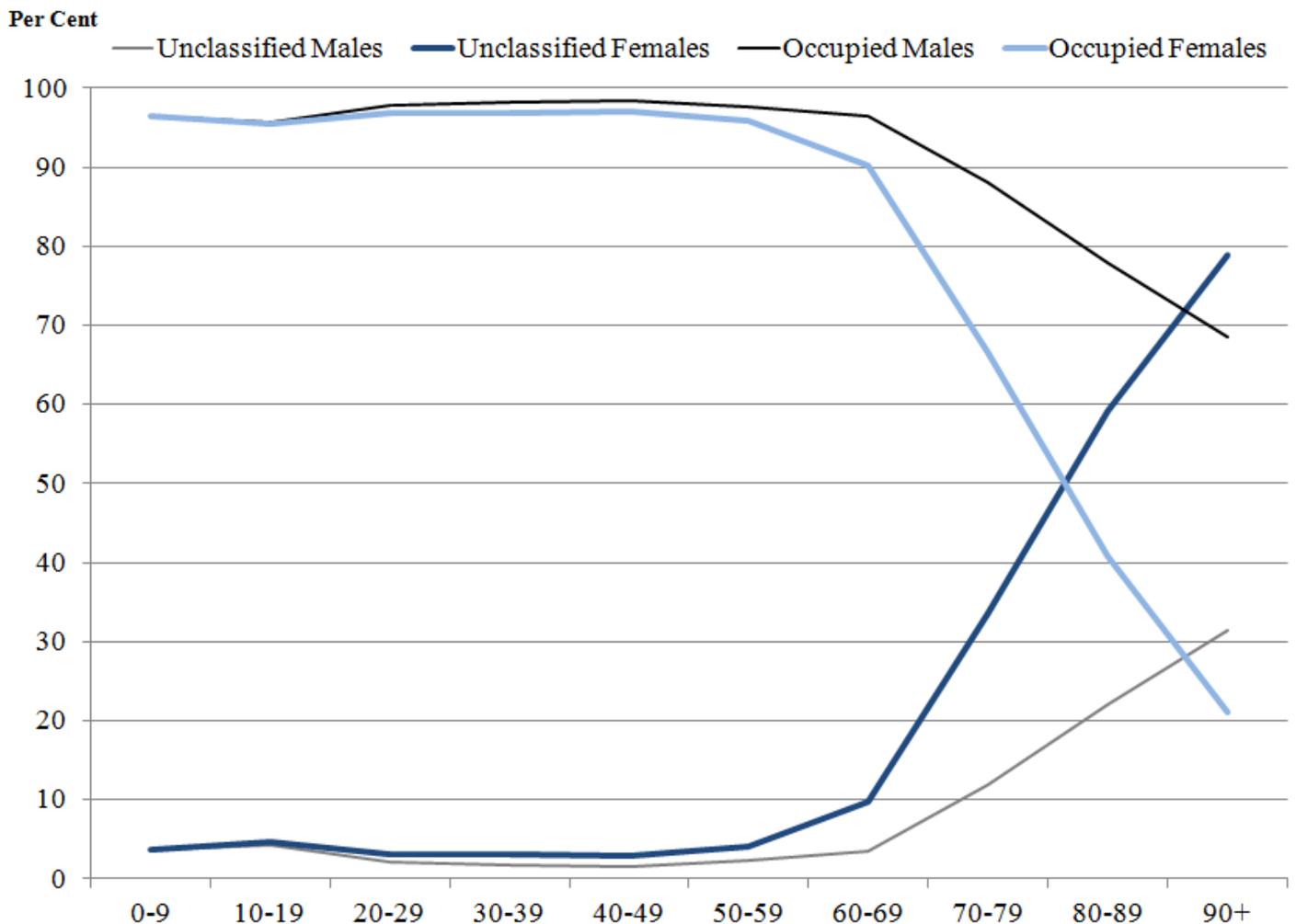
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(25.5 Kb)

The proportion of LSMs unclassified and occupied at 1991 and during the third decade of the study is shown in Figure A3.

**Figure A3: Age-specific percentages of Longitudinal Study members who were occupied or unclassified at 1991 or at birth between 1991 and 2001 Censuses, by sex**

England and Wales



**Notes:**

1. Source: ONS Longitudinal Study

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(32.5 Kb)

**Economic position of Longitudinal Study members (LSMs) at 1991**

The economic position categories collected in 1991 were largely harmonised with 1981 but students could be classified as economically active if they were working or seeking work or waiting to take up work acquired. Other students were coded as economically inactive. There was also the category government scheme which provided work experience opportunity for those seeking work, but remuneration remained the seeking work benefit applicable at the time. The distributions at 1991 are shown in Table A6.

**Table A6: Percentage of unclassified and occupied Longitudinal Study members at 1991, by economic position, age and sex**

England and Wales

<b>Age Group</b>				
Economic Position 1991	<b>16 to 64</b>		<b>65 and over</b>	
	<b>Unclassified</b>	<b>Occupied</b>	<b>Unclassified</b>	<b>Occupied</b>
<b>Males</b>				
Working Full or Part time	6.7	77.1	1.0	10.7
Waiting to take up a job acquired	0.4	0.3	:	:
Seeking work \Government Scheme	33.9	10.1	0.7	0.7
Temporarily Sick	Not coded in 1991			
Permanently Sick Disabled	27.9	4.5	7.5	4.3
Housewife \Househusband	3.3	0.6	1.2	0.4
Wholly Retired	3.5	2.0	87.9	83.8
At School\Student	16.2	3.6	:	:
Other Inactive	8.3	1.9	0.4	0.1
<b>Age Group</b>				
	<b>16 to 59</b>		<b>60 and over</b>	
	<b>Unclassified</b>	<b>Occupied</b>	<b>Unclassified</b>	<b>Occupied</b>
<b>Females</b>				
Working Full or Part time	3.2	63.5	0.5	11.6
Waiting to take up a job acquired	0.3	0.2	0.0	0.0
Seeking work \Government Scheme	14.6	4.9	0.2	0.2
Temporarily Sick	Not coded in 1991			

<b>Age Group</b>				
Permanently Sick Disabled	16.7	2.7	5.0	2.6
Housewife \ Househusband	50.2	21.9	20.9	21.9
Wholly Retired	1.7	0.8	73.0	63.6
At School \ Student	8.7	4.0	0.0	0.0
Other Inactive	4.7	4.0	0.4	0.0

**Table notes:**

1. Source: ONS Longitudinal Study
2. Economically active students coded to economically active categories whichever applied to them

:Suppressed because of small cell counts

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(28 Kb)

The working age economic positions of LSMs enumerated at 1991 again show marked contrasts between the unclassified and occupied populations, especially among males. Those males seeking work or on a scheme was slightly more than a third and there were similar proportions permanently sick or disabled to that in 1981. This distribution for men has approximately three-fifths in economic position categories known to have harmful health and future mortality risks and exceeds the proportion observed in 1981.

The proportion of females seeking work or on a scheme or permanently sick or disabled has also increased among the unclassified population compared to 1981, with almost a third in those categories carrying greater health risks.

Consequently, this suggests that for the unclassified population at 1991 (with those that could be occupied at 1991 but were formerly unclassified filtered out, and those entering the study) there is a level of disadvantage that is greater than that observed for the unclassified in 1981, and that group in 1991 is also less heterogeneous.

**Destination of unclassified Longitudinal Study members (LSMs) in 2001**

The residual LSMs remaining unclassified after the 1991 Census and those entering as unclassified in 1991 or through birth entrance during the period between the 1991 and 2001 Censuses were followed to the 2001 Census and their occupational information investigated to see whether any transitions into an occupied class had occurred.

More than two-fifths of males and more than three-fifths of females remained unclassified at 2001 (Table A7). These are lower percentages than those observed in 1991, showing more made a transition to an occupied class. Assigning unclassified LSMs to an occupied class in 2001 will

further refine the characteristics associated with an unclassified status that endures across follow-up periods.

**Table A7: Destination class of unclassified males and females in 2001**

England and Wales

Class in 2001 if Unclassified at entry before 2001 Census	Percent	
	Males	Females
Higher Managerial and Professional	4.9	1.6
Lower Managerial and Professional	7.9	5.2
Intermediate	3.6	4.9
Small Employers Own Account Workers	6.9	2.2
Lower Supervisory and Technical	7.6	2.9
Semi-Routine	11.9	11.1
Routine	15.4	9.8
Unclassified	41.8	62.2

**Table notes:**

1. Source: ONS Longitudinal Study

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(18 Kb)

Of those male LS members of working age at the 2001 Census and unclassified previously and remaining unclassified in 2001, 52.9% were permanently sick or disabled while 9% were seeking work and 9% were economically inactive students; applying the same selection criteria, 4% of females were seeking work, 32% were permanently sick or disabled and 7% were economically inactive students. However, when the unclassified at 2001 are examined in their entirety (that is, adding in unclassified new entrants in 2001), the seeking work proportion increases slightly to 10%, but the permanently sick disabled proportion contracts to 24%, while the economically inactive students grows to 31%: among females the percentages were 5%, 18% and 23% respectively.

Therefore of this filtered unclassified group followed up during 2002 to 2006 and 2007 to 2011, a third were students at relatively lower risk which partly explains the improved performance of the life expectancy estimates of the unclassified during the noughties. As a result the refinement of the unclassified group by allowing those with occupational information at 2001 to be classified to an occupied class improves the homogeneity of those entering earlier and remaining unclassified

(and representing therefore a more disadvantaged population), this is somewhat offset by the large volume of students entering as unclassified at the 2001 Census.

For the unclassified population to be more representative of a distinctly disadvantaged population and labeled accordingly, it would be necessary to create a clearer definition based on economic position at the census preceding follow-up; for those unclassified at birth or children at census, the economic position of their parents or guardians could be used as a proxy. Separate estimates of life expectancy could then be calculated for this population and comparisons made with the occupied classes. However, this requires further investigation and testing and is not part of the scope of this existing project.

On the basis of these investigations, the characteristics that are most associated with unclassified status on entry and at future censuses are:

1. Not of working age at assignment points
2. Looking after the home or family if female of working age
3. Permanently sick or disabled if male of working age
4. Seeking work at census for each sex of working age
5. Economically inactive student of working age

### **Life expectancy for unclassified Longitudinal Study members (LSMs) by assignment method**

The life expectancy estimates presented earlier in the bulletin for the unclassified population are based on earliest assignment and retention of an unclassified status throughout the follow-up period the member either survives or exits through death, embarkation or censoring. This section presents alternative estimates of life expectancy for unclassified LSMs which filters out those members capable of being assigned to an occupied class in either 1991 or 2001. These members are then followed-up as members of the class they were assigned to at that census.

For example, an LSM present and enumerated at the 1981 Census and unable to be classified to an occupied class would be followed-up as unclassified during the periods 1982 to 1986 and 1987 to 1991. However, if that member could be classified to an occupied class at the 1991 Census, then they would be followed-up in that class during 1992 to 1996 and to 2007 to 2011 if they survived or did not embark before then. A similar process was applied in 2001 for those LSMs still unclassified at 1991 but entering earlier, or entering at 1991 and unclassified or entering at birth unclassified. If they could be assigned to an occupied class at the 2001 Census they ceased to be unclassified and would be followed-up during the periods 2002 to 2006 and 2007 to 2011 if they survived and did not embark.

The adaptation of the assignment method is justified on the grounds that occupied LSMs have had occupational information of sufficient quality to assign to NS-SEC on at least one occasion in the past which makes them distinct to those that cannot be classified at all, notwithstanding that some LSMs will only have had one opportunity to be assigned and may be assignable at a future census date. The 2011 Census assignments have not been used in these analyses because of the need for a lag period, that is, between Census day 2011 and the end of 2011 before follow-up in the next discrete period 2012 to 2016.

## Comparison between conventional and transition method

Life expectancy at birth and at age 65 for the unclassified population across time periods is shown in Table A8. The 1982 to 1986 and 1987 to 1991 periods are excluded because transitions into occupied classes do not occur in these periods.

**Table A8: Life Expectancy at birth and at age 65 by sex and period**

England and Wales

Males at birth	Conventional method			Transition method		
	Life expectancy	Confidence Limit Lower	Confidence Limit Upper	Life expectancy	Confidence Limit Lower	Confidence Limit Upper
1992 to 1996	67.7	66.5	68.9	66.5	65.2	67.9
1997 to 2001	69.2	68.0	70.3	68.4	67.1	69.8
2002 to 2006	71.3	70.2	72.5	70.5	70.2	72.2
2007 to 2011	74.0	72.9	75.0	72.1	70.4	73.7
<b>Females at birth</b>						
1992 to 1996	75.3	74.3	76.3	73.7	72.5	74.8
1997 to 2001	76.6	75.7	77.4	75.0	73.9	76.1
2002 to 2006	76.4	75.3	77.4	74.0	72.5	75.6
2007-2007	78.5	77.6	79.3	75.8	74.3	77.3
<b>Males at age 65</b>						
1992-1996	12.0	11.4	12.5	11.9	11.3	12.4
1997-2001	13.0	12.3	13.6	12.9	12.2	13.6
2002-2006	14.3	13.6	15.0	13.8	12.8	14.7
2007 to 2011	14.8	14.0	15.6	13.7	12.4	15.0
<b>Females at age 65</b>						
1992 to 1996	16.7	16.4	17.1	16.6	16.2	16.9
1997 to 2001	17.1	16.7	17.5	16.8	16.3	17.2
2002 to 2006	17.5	17.0	18.0	16.8	16.0	17.5
2007 to 2011	18.3	17.8	18.9	17.3	16.4	18.2

**Table notes:**

1. Source: ONS Longitudinal Study

## Download table

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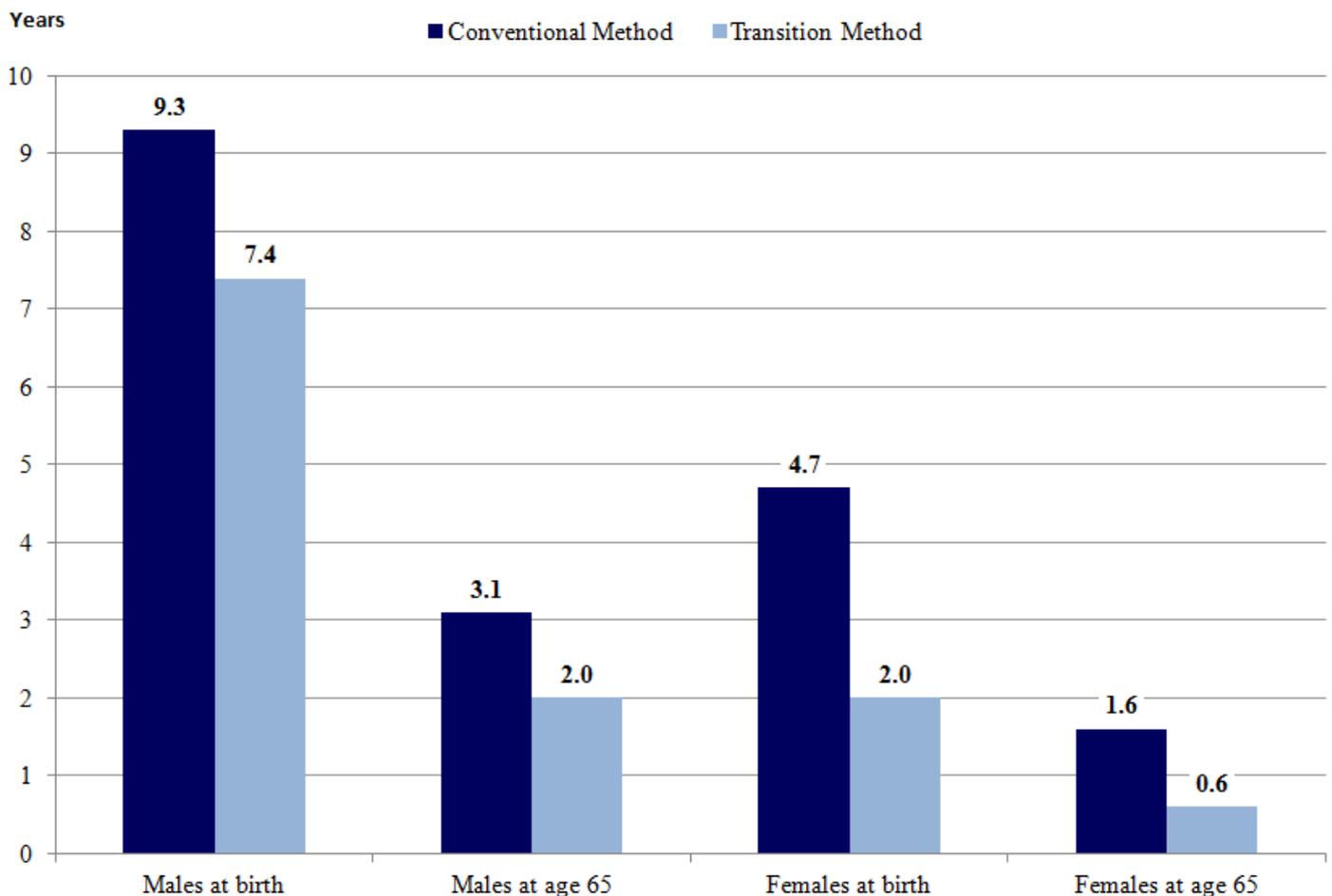
(27.5 Kb)

The effect of allowing LSMs to enter an occupied class at a future census and then follow them up as occupied does depress the estimates of life expectancy both at birth and at age 65 for males and females alike across all periods. However, the only statistically significant reduction occurs among females at birth during the period 2007 to 2011.

The transition method does produce a more realistic improvement in life expectancy for the unclassified class between 1982 to 1986 and 2007 to 2011 (Figure A4) that is more in line with occupied class and national gains.

**Figure A4: Life expectancy gain for the unclassified population under the conventional and transition method at birth and at age 65, by sex, 1982-1986 to 2007-2011**

England and Wales



### Notes:

1. Source: ONS Longitudinal Study

## Download chart

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(26 Kb)

## Annex 2: What is NS-SEC?

The National Statistics Socio-economic Classification (NS-SEC) was developed on the basis of a classification of employment relations, and aims to reflect the socio-economic structure of 21st century societies and the major shift in the UK economy away from manufacturing towards a more service-based economy. Important distinguishing features include the separation of small employers and own-account workers into a discrete class, the removal of the historical distinction between manual occupations and other occupations of a routine or semi-routine nature and an increase in the size of the class populations at the extremes of the scale.

### Diagram 1: NS-SEC schema

**Diagram1: National Statistics Socio-economic Classification**



Specifically, the NS-SEC allows the relationship between mortality and socio-economic positions based on employment conditions to be investigated. To distinguish populations, the relative advantage conferred on occupiers of various occupations and employment statuses is in relation to reward structures, career opportunities, the scale of autonomy allowed in performing roles and employment security; the most favourable circumstances across these attributes are most concentrated in class 1 (Higher managerial and professional occupations) and least concentrated in class 7 (Routine occupations); the intervening classes experience greater or lesser levels of these attributes between these extremes.

For those occupying Routine, Semi-Routine and Lower Supervisory and Technical socio-economic classes, a number of characteristics about the nature of employment are present:

- short-term exchange of money for effort
- payment by the time or piece of work done and more likely to be on the minimum wage
- no or limited access to occupational pension or health schemes
- short-term contract easily terminated
- zero hours contracts more common-place and a low level of job security
- shift work and unsocial hours
- exposure to more hazardous working conditions such as chemical and physical hazards

For those occupying the Higher Managers and Professionals or the Lower Managers and Professionals classes and, to a lesser extent, the Intermediate class, the following characteristics are common-place:

- a more long-term exchange of service for compensation
- greater job security and employability
- a learning culture with opportunities for at work-based training and career development
- a clearly defined salary incremental on skills development with greater opportunities for bonus payments
- occupational pension and health schemes such as sick pay
- greater control over the job (creative self-expression)
- standard hours and flexible working more commonplace
- trust between employer and employee
- office-based working conditions commonplace

Those self-employed in class 4 encompass a wide range of roles such as scaffolders, roofers and other skilled manual labour that carry greater exposure to physical work hazards, but also hairdressers, opticians, self-employed teachers and shop owners which may have better physical working conditions but may also need to work long hours and be unable to close their business down for vacations. They also may need to work intensively during specific parts of the years such as a self-employed tour guide whose working pattern is seasonal. The advantages of such jobs are autonomy, flexibility and rewards potential, but security of employment will be more closely aligned to fluctuations in the economy and access to pension schemes and health insurance will have to be privately funded.

The NS-SEC and the socio-economic positions of each class have been shown to condition and shape the lives of their occupants; in this bulletin the aim is to link an important health outcome (life expectancy) with social organisation and structure that the NS-SEC measures.

The NS-SEC also contains so called residual operational categories; specifically:

- never worked and long-term unemployed
- full-time students
- occupations not stated or inadequately described
- unclassified for other reasons

In these analyses, the residual categories were aggregated to form a heterogeneous group labelled Unclassified. Because this group is preponderantly heterogeneous, they are excluded from the statistical commentary and not used in inequality measurement; however, the group contains some

of the most deprived and marginalised groups in society and therefore the estimates are indicative markers of the health status of such groups such as the long-term unemployed, which have been shown to have notably worse health outcomes compared with the occupied classes (White et al 2007; Clemens et al 2009). To understand the composition of the Unclassified over time, and how this composition may affect the estimates of life expectancy for this group, we have included an Annex which focuses specifically on the unclassified and the impact of later assignment to NS-SEC on later follow-up periods.

It is important to state the greater validity in estimating health inequality between different population groups which is based on individual socio-economic position rather than ecological placement of individuals on the socio-economic spectrum based on area of residence. Placing people based on the level of deprivation operating in their area of residence will misclassify some as advantaged when they are disadvantaged and vice versa. Previous research has shown that the cumulative effect of individual and area circumstances expands the health inequality between the least and most disadvantaged groups (Wiggins et al 1998, 2002; Joshi et al 2000; White et al 2005).

### **Annex 3: Issue of health selection effects in these analyses**

Health selection can act as a systematic bias when sample members are either more or less likely to be classified to a socio-economic position based on occupation when assignment of class takes place because of health.

Those with a limiting long-term illness have a higher risk of not being able to be classified to an occupied socio-economic position (and therefore are placed into an unclassified group for follow-up, while those with a favourable health status are more likely to be classified to one of the occupied classes. The former study member have a relatively high probability of dying soon after assignment of class; the traditional approach to mitigate such health selection effects is to assign such study members from information at an earlier census. However, because NS-SEC cannot be derived for Occupational Classification used at the 1971 Census, this was not available to analysts.

The health selection out of the labour market effect has been shown to affect Routine and Manual occupations (that is, those assigned to the Lower Supervisory and Technical, Semi-Routine and Routine classes) more than other classes, so a bias is introduced where those in the least advantaged classes appear to have a lower mortality rate (and therefore higher life expectancy) than they otherwise would have done because of the healthy worker effect operating in the period immediately following classification (Fox et al., 1985). The approach to dealing with health selection into employment status at the time of assignment is to allow such effects to wear off during the first 4 to 5 years of follow-up.

In this analysis, the first period of follow-up, namely 1982 to 1986, is more susceptible to selection effects and to mitigate this effect, the period 1987 to 1991 can be used as an alternative baseline period to make judgements about the scale of health improvement and the trajectory of the inequality between socio-economic classes.

The unclassified males at birth using the “transition method” (see Annex 1 and the reference tables accompanying this release) would have only gained 4.5 years between 1987 to 1991 and 2007 to 2011, a much lower gain than all the other occupied classes between these periods. This

demonstrates the important inflating effect of both outward transitions into an occupied class from the unclassified class at baseline among working age individuals and the influence of health selection out of the labour market depressing the unclassified life expectancy in 1982 to 1986 (baseline).

### **Female unclassified**

Health selection effects are an issue for females too, but to a lesser extent than for males. The composition of the unclassified class is less determined by health status and more affected by the need to fulfil family roles. However, if 1987 to 1991 is used as the baseline period, then the Lower Supervisory and Technical class gained the most at 3.6 years and the Intermediate class the least at 2.6 years, with the Routine class gaining 3.1 years and the HMP class 3.3 years.

If the unclassified are restricted to those than cannot be classified throughout the follow-up period (“transition method”) then the gain between 1987 to 1991 and 2007 to 2011 is only 0.4 of a year. This is likely to be influenced by the greater contact with the labour market among females during the 1990s and 2000s, which meant that a meaningful proportion of women that were unclassified at entry at the 1981 Census were entering the labour market at a later time point, but under conventional rules of assignment would be followed as unclassified for the duration and inflating the life expectancy of the unclassified class accordingly.

### **Background notes**

1. Details of the policy governing the release of new data are available by visiting [www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html](http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html) or from the Media Relations Office email: [media.relations@ons.gsi.gov.uk](mailto:media.relations@ons.gsi.gov.uk)

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