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How bad are life expectancy trends across the UK, and what would it take to get back to previous trends?

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ABSTRACT

Background Within the UK, there has been debate on whether life expectancy is increasing or decreasing in particular single or 3-year periods, but there has been less thinking whether overall trends have changed. This paper considers the extent to which the trends in life expectancy for the UK and its nations have changed before and after 2011.

Methods We used the Office for National Statistics period life expectancy data for the UK and its nations. We used Lee's approach to project life expectancy based on repeated sampling of year-to-year change in the baseline periods (1990–2011 and 1980–2011) and applied that to 2012 onwards.

Findings Improvements in period life expectancy were substantially and consistently lower between 2012 and 2018 than predicted from the trends from 1980 and, especially, from 1990. By 2018, life expectancy was lower than projected for females and males, respectively, by 1.22 and 1.52 years (England), 1.44 and 0.95 years (Northern Ireland), 1.30 and 1.44 years (Scotland), 1.53 and 1.63 years (Wales) and 1.24 and 1.49 years (UK overall), based on the 1990–2011 baseline period. Using a longer baseline period, which includes the slower rates of improvement during the 1980s, slightly reduces the gap between the current life expectancies and the projected medians.

Interpretation Future academic and policy focus should be on the deviation of the life expectancy trends from the baseline projection rather than on year-to-year variation. Concerted policy focus to return life expectancy to the projected trends is now urgently required.

INTRODUCTION

Life expectancy at birth improved continuously from 1950 to 2010 across most high-income countries.[1 2] However, some of these countries subsequently experienced slower life expectancy improvements, and in some cases a decline.[3 4] The UK, USA and the Netherlands have been some of the countries experiencing the most profound changes in trends, but many other countries (including Denmark, much of Eastern Europe, Korea and Japan) have continued to experience improving trends.[5]

Much of the early discussion about the trends focused on the extent to which this was due to higher deaths in a single year or winter period.[6 7] This was largely due to concerns about the severity of the influenza season in 2015 and also 2018.[7 8] Similar debates have centred on whether 3-year rolling average figures, which are commonly used in the UK to avoid random fluctuations being over-interpreted, had clouded the importance of 2015 in explaining the overall trends.[7] It has also been considered important by some to look at whether more deaths in the winter months are responsible for the recent trends.[9]

The range of ways of looking at mortality—including crude weekly and monthly death counts, quarterly age-standardised mortality, annual life expectancy or 3-year rolling average life expectancy—have generated a lot of debate in the UK about whether the trends are getting worse or better, and therefore how worried we should be about the trends.[10 11]

This paper aims to frame the debate around recent life expectancy trends in the UK by comparing the life expectancy data from 2012 onwards with projected trends using data from earlier time periods. This should reveal the size of the gap between the actual and projected figures, the extent of change in the long-run trends and the lack of importance of data from any single year.

METHODS

Data source

We used the annual period life expectancy at birth data for the UK and its nations recently published by the Office for National Statistics (ONS).[12] Our approach to projections is simpler than that of the ONS in that it does not look at different trends by age group, but the results are very similar. The differences are detailed further in the 'Discussion' section.

Analytical approach

Ronald Lee co-created the Lee-Carter model for mortality projection[13 14] in the early 1990s. As a result of analyses by White[15] and Oeppen and Vaupel,[16] he subsequently accepted that a much simpler modelling approach is often adequate for life expectancy forecasting. This approach involves modelling life expectancy at birth (e_0) directly, rather than individual age-specific mortality rates (m_x) and quantities derived from them (a 'drift parameter' k) as in Lee-Carter's original model specification.

Although Lee (2002) presents a number of refinements of a basic linear life expectancy forecast model specification, including models which allow for negative autocorrelation between change in years, the article states that the basic strategy for forecasting should be 'to use the appropriate or preferred equation for de_t/dt [change in life expectancy] to estimate $e0$ 1 year later, and then continue recursively'.[17] This is the approach we use in this paper.

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Modelling strategy

We extracted $e_0(s,t)$, the period life expectancy at birth for sex s and time t, for each single year between 1980 and 2018 for the UK and each of its nations. We defined $\Delta e_0(s,t)$ as the change in life expectancy for sex s from year t to year $t+1$. We plotted both e_0 against t by s, and Δe_0 against t by s, to identify appropriate pre-slowdown time periods, that is, the range of years prior to 2012 (our assumed breakpoint in mortality trends) to use to calibrate projections of life expectancy trends from 2012 to 2018 onwards. Based on these plots and background knowledge, we selected two pre-slowdown periods:

- P_1: 1980–2011 inclusive
- P_2: 1990–2011 inclusive

For both of these pre-slowdown periods, we calculated the mean annual change observed by sex (ie, $E(\Delta e_0(t \in P, s))$) and the variance in mean annual changes over the same period (ie, $Var(\Delta e_0(t \in P, s))$).

To project forward estimates of life expectancy trends based on pre-slowdown observations in a way that takes into account observed variation in annual changes, we sample and accumulate k draws from normal distributions calibrated on the sample means and variances from the pre-slowdown period (P_1 or P_2), where k refers to the number of annual periods we want to project forward from 2011. As we want to project forward to 2018, we therefore select $k=7$. This exercise is repeated $m = 10,000$ times to allow credible intervals in forecasts to be calculated using a Monte Carlo approach. Life expectancy projections for each year 2012–2018 inclusive are produced by summing up the draws from the first projected period onwards; the life expectancy from 2011 (the last observation in the pre-slowdown period) is added to these summed values to produce predicted life expectancies rather than cumulative gains or losses in life expectancy since 2011. Algebraically, this can be expressed as follows:

$$e_0^*(t=\tau+K) = e_0(t=\tau) + \sum_{k=1}^{K} N_k$$

$$N \sim Normal\left(\mu = E\left(\Delta e_0(P), \sigma^2 = Var(\Delta e_0(P))\right)\right)$$

where τ refers to 2011, K the discrete number of periods to forecast after τ and $\Delta e_0(P)$ the series of annual changes over the pre-slowdown period P.

As for each sex and number of discrete projection periods K (from 1 to 7 periods), m replicates have been produced, the observed life expectancy $e_0(t=\tau+K)$ can be compared against the Monte Carlo distribution of m corresponding projections for the same period $e_0^*(t=\tau+K)$. This comparison is shown both graphically, using shaded regions to indicate the 90% and 95% credible intervals from the projected distributions, and by counting up the proportion of the m projected values which exceed the observed values for each post-2011 period K. For both pre-trend periods, P_1 (1980–2011) and P_2 (1990–2011), the same random number seed was used. All data preparation and analysis were performed using the R programming language.[18] All of the R code relating to the analysis in this paper is available at https://github.com/JonMinton/bayes_factor_slowdown/blob/master/scotland_projections.Rmd.

RESULTS

Steadily increasing trends in period life expectancy were projected for the UK overall and each of its nations using both the longer (1980–2011 inclusive, table 1) or shorter (1990–2011 inclusive, table 2) baseline period (figure 1). The longer baseline period projected a smaller increase in life expectancy than the shorter period, because of more rapid increases from the late 1990s to 2011 than there were during the 1980s and early 1990s. The cones of uncertainty for the UK overall and England were much smaller because there was less year-to-year variation in the baseline period for those countries with larger populations.

The actual life expectancy data for the UK overall and for each of the nations diverged rapidly and consistently from the median projected figures from 2012 to 2018 (figure 1). Although the divergence was similar across all of the nations, the difference from the expected remained within the cone of uncertainty for Northern Ireland, and for some of the estimates for Scotland and Wales, because of the greater imprecision in the estimates for these nations.

Using the projections based on the 1990–2011 baseline, life expectancy in England for females and males was 1.22 and 1.52 years respectively lower than the median projection in 2018. The equivalent figures for females and males respectively were 1.44 and 0.95 years (Northern Ireland), 1.30 and 1.44 years (Scotland), 1.53 and 1.63 years (Wales) and 1.24 and 1.49 years (UK overall).

Based on the 1990–2011 baseline projections to 2028, an annual increase in life expectancy of 0.33 and 0.44 years for females and males respectively would be required for achievement of the projected median by 2028 in England. The equivalent figures for females and males were 0.35 and 0.37 years (Northern Ireland), 0.40 and 0.35 years (Scotland), 0.35 and 0.42 years (Wales) and 0.33 and 0.43 years (UK overall).

Using the alternative baseline based on the 1980–2011 data, life expectancy in England for females and males was 1.15 and 1.41 years respectively lower than the median projection in 2018. The equivalent figures for females and males respectively were 1.63 and 1.17 years (Northern Ireland), 1.07 and 1.15 years (Scotland), 1.49 and 1.62 years (Wales) and 1.16 and 1.39 years (UK overall). To achieve the projected median for 2028 based on the 1980–2011 baseline data would require annual increases in life expectancy for females and males respectively of 0.31 and 0.41 years (England), 0.40 and 0.43 years (Northern Ireland), 0.29 and 0.36 years (Scotland), 0.34 and 0.41 years (Wales) and 0.31 and 0.40 years (UK overall).

DISCUSSION

Main results

Life expectancy trends in the UK overall, and for England, Northern Ireland, Scotland and Wales, diverged between 2012 and 2018 from those experienced previously. Based on the 1990–2011 baseline, life expectancy was lower than the median projection in 2018, for females and males respectively, by 1.22 and 1.52 years (England), 1.44 and 0.95 years (Northern Ireland), 1.30 and 1.44 years (Scotland), 1.53 and 1.63 years (Wales) and 1.24 and 1.49 years (UK overall). To get back to this previous trend by 2028, annual increases in life expectancy for females and males respectively of 0.33 and 0.44 years (England), 0.35 and 0.37 years (Northern Ireland), 0.40 and 0.35 years (Scotland), 0.35 and 0.42 years (Wales) and 0.33 and 0.43 years (UK overall) would be required each year from 2018. The longer baseline period (1980–2011) projects a slightly lower future life expectancy for Scotland, England and the UK, slightly reducing the gap between the current life expectancies and the projected medians for those populations, because there was a faster period of life expectancy improvement during the late 1990s and 2000s.

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Table 1 Trends in life expectancy at birth for England, Northern Ireland, Scotland, Wales and the UK, 2012–2018, compared with projected trends based on 1980–2011, with projections to 2028

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
England males																	
Median projection	79.36	79.63	79.90	80.16	80.43	80.69	80.96	81.22	81.49	81.76	82.03	82.30	82.57	82.84	83.10	83.37	83.63
Upper 95th percentile	79.66	80.05	80.41	80.76	81.09	81.43	81.76	82.08	82.39	82.70	83.01	83.31	83.63	83.93	84.24	84.55	84.86
Lower 95th percentile	79.06	79.20	79.37	79.55	79.75	79.96	80.17	80.38	80.59	80.81	81.05	81.26	81.49	81.71	81.94	82.16	82.38
Actual trend	79.26	79.27	79.51	79.34	79.52	79.59	79.55										
England females																	
Median projection	83.16	83.36	83.56	83.76	83.96	84.15	84.35	84.54	84.74	84.94	85.14	85.34	85.54	85.74	85.94	86.13	86.33
Upper 95th percentile	83.52	83.87	84.18	84.48	84.75	85.04	85.31	85.57	85.82	86.07	86.33	86.56	86.82	87.06	87.31	87.56	87.81
Lower 95th percentile	82.80	82.85	82.92	83.02	83.14	83.26	83.40	83.52	83.65	83.79	83.96	84.08	84.24	84.38	84.54	84.68	84.82
Actual trend	82.92	82.99	83.23	82.96	83.11	83.23	83.20										
Northern Ireland males																	
Median projection	78.16	78.47	78.79	79.10	79.41	79.71	80.01	80.31	80.63	80.95	81.26	81.57	81.88	82.19	82.50	82.81	83.10
Upper 95th percentile	78.78	79.36	79.85	80.34	80.77	81.25	81.68	82.10	82.50	82.90	83.30	83.68	84.09	84.47	84.87	85.27	85.67
Lower 95th percentile	77.54	77.59	77.69	77.82	77.99	78.18	78.38	78.56	78.74	78.95	79.20	79.39	79.63	79.85	80.07	80.29	80.50
Actual trend	78.05	78.07	78.61	78.17	78.75	78.38	78.84										
Northern Ireland females																	
Median projection	82.64	82.88	83.13	83.37	83.61	83.84	84.07	84.30	84.55	84.80	85.04	85.28	85.52	85.76	86.00	86.24	86.46
Upper 95th percentile	83.34	83.88	84.32	84.76	85.14	85.56	85.94	86.30	86.64	86.98	87.33	87.64	88.00	88.31	88.66	88.99	89.33
Lower 95th percentile	81.95	81.90	81.89	81.94	82.02	82.12	82.24	82.34	82.43	82.56	82.74	82.84	83.00	83.14	83.28	83.42	83.55
Actual trend	82.26	82.22	82.38	82.22	82.27	82.43	82.44										
Scotland males																	
Median projection	76.74	76.99	77.23	77.48	77.72	77.96	78.20	78.43	78.68	78.93	79.17	79.42	79.66	79.91	80.15	80.39	80.62
Upper 95th percentile	77.18	77.61	77.98	78.35	78.68	79.04	79.37	79.69	79.99	80.30	80.61	80.90	81.22	81.51	81.82	82.12	82.42
Lower 95th percentile	76.31	76.37	76.46	76.58	76.72	76.88	77.05	77.20	77.35	77.53	77.73	77.89	78.08	78.26	78.44	78.62	78.79
Actual trend	76.79	77.02	77.32	76.95	76.96	77.13	77.05										
Scotland females																	
Median projection	81.00	81.18	81.37	81.55	81.73	81.90	82.08	82.26	82.44	82.63	82.81	82.99	83.18	83.36	83.54	83.72	83.89
Upper 95th percentile	81.53	81.94	82.27	82.60	82.88	83.20	83.49	83.76	84.02	84.28	84.54	84.77	85.04	85.28	85.54	85.79	86.05
Lower 95th percentile	80.48	80.44	80.44	80.48	80.53	80.61	80.70	80.78	80.85	80.95	81.08	81.16	81.28	81.38	81.49	81.59	81.70
Actual trend	80.80	81.04	81.34	81.03	81.08	81.16	81.01										
Wales males																	
Median projection	78.34	78.60	78.85	79.10	79.36	79.60	79.85	80.09	80.35	80.61	80.86	81.11	81.37	81.62	81.87	82.12	82.35
Upper 95th percentile	78.96	79.48	79.91	80.35	80.72	81.13	81.51	81.87	82.21	82.55	82.90	83.22	83.57	83.89	84.24	84.57	84.91
Lower 95th percentile	77.72	77.72	77.75	77.83	77.94	78.07	78.21	78.34	78.46	78.62	78.81	78.94	79.12	79.28	79.45	79.60	79.76
Actual trend	78.23	78.16	78.79	78.27	78.23	78.45	78.23										
Wales females																	
Median projection	82.52	82.72	82.92	83.11	83.30	83.48	83.68	83.86	84.06	84.26	84.45	84.65	84.84	85.04	85.23	85.42	85.60
Upper 95th percentile	83.11	83.56	83.92	84.29	84.59	84.94	85.25	85.55	85.82	86.10	86.39	86.64	86.93	87.19	87.47	87.74	88.02
Lower 95th percentile	81.94	81.89	81.88	81.90	81.96	82.04	82.13	82.20	82.27	82.37	82.51	82.59	82.71	82.82	82.94	83.04	83.14
Actual trend	82.09	82.13	82.61	82.03	82.42	82.39	82.19										
UK males																	
Median projection	79.04	79.30	79.57	79.83	80.10	80.36	80.63	80.89	81.16	81.42	81.69	81.96	82.22	82.49	82.76	83.02	83.28
Upper 95th percentile	79.34	79.73	80.09	80.44	80.76	81.11	81.43	81.75	82.06	82.37	82.68	82.98	83.29	83.59	83.90	84.21	84.52
Lower 95th percentile	78.74	78.88	79.04	79.22	79.41	79.62	79.83	80.04	80.24	80.46	80.70	80.90	81.13	81.36	81.58	81.80	82.02
Actual trend	78.95	78.98	79.25	79.04	79.21	79.28	79.24										
UK females																	
Median projection	82.91	83.11	83.31	83.50	83.70	83.89	84.09	84.28	84.48	84.68	84.88	85.08	85.28	85.48	85.67	85.87	86.06
Upper 95th percentile	83.28	83.64	83.94	84.25	84.52	84.81	85.09	85.35	85.60	85.85	86.10	86.34	86.60	86.84	87.09	87.34	87.59
Lower 95th percentile	82.54	82.58	82.65	82.74	82.85	82.98	83.11	83.23	83.35	83.49	83.66	83.78	83.93	84.08	84.22	84.36	84.51
Actual trend	82.66	82.74	82.99	82.71	82.87	82.98	82.93										

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Table 2 Trends in life expectancy at birth for England, Northern Ireland, Scotland, Wales and the UK, 2012–2018, compared with projected trends based on 1990–2011, with projections to 2028

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
England males																	
Median projection	79.37	79.66	79.94	80.23	80.51	80.79	81.07	81.35	81.64	81.93	82.21	82.49	82.78	83.06	83.35	83.63	83.91
Upper 95th percentile	79.68	80.09	80.46	80.83	81.17	81.54	81.88	82.22	82.54	82.87	83.20	83.51	83.85	84.16	84.49	84.82	85.15
Lower 95th percentile	79.07	79.23	79.41	79.61	79.83	80.05	80.28	80.50	80.73	80.96	81.22	81.44	81.69	81.93	82.17	82.41	82.65
Actual trend	79.26	79.27	79.51	79.34	79.52	79.59	79.55										
England females																	
Median projection	83.17	83.38	83.59	83.80	84.01	84.22	84.42	84.63	84.84	85.06	85.27	85.48	85.69	85.90	86.11	86.31	86.51
Upper 95th percentile	83.55	83.92	84.23	84.55	84.84	85.14	85.43	85.70	85.96	86.23	86.50	86.74	87.02	87.27	87.53	87.79	88.06
Lower 95th percentile	82.80	82.85	82.93	83.04	83.16	83.30	83.44	83.57	83.71	83.86	84.03	84.17	84.33	84.49	84.65	84.80	84.95
Actual trend	82.92	82.99	83.23	82.96	83.11	83.23	83.20										
Northern Ireland males																	
Median projection	78.13	78.41	78.69	78.97	79.25	79.51	79.79	80.06	80.34	80.63	80.91	81.18	81.47	81.74	82.02	82.29	82.56
Upper 95th percentile	78.67	79.18	79.62	80.05	80.44	80.86	81.24	81.61	81.97	82.33	82.69	83.02	83.39	83.72	84.09	84.44	84.79
Lower 95th percentile	77.59	77.64	77.73	77.86	78.01	78.18	78.36	78.53	78.70	78.89	79.12	79.29	79.50	79.70	79.91	80.10	80.30
Actual trend	78.05	78.07	78.61	78.17	78.75	78.38	78.84										
Northern Ireland females																	
Median projection	82.61	82.83	83.04	83.25	83.47	83.67	83.88	84.08	84.30	84.52	84.73	84.94	85.16	85.37	85.58	85.79	85.99
Upper 95th percentile	83.28	83.77	84.18	84.58	84.92	85.31	85.65	85.98	86.28	86.59	86.91	87.19	87.51	87.79	88.11	88.41	88.71
Lower 95th percentile	81.95	81.89	81.87	81.90	81.96	82.04	82.14	82.21	82.29	82.40	82.55	82.63	82.76	82.88	83.00	83.11	83.23
Actual trend	82.26	82.22	82.38	82.22	82.27	82.43	82.44										
Scotland males																	
Median projection	76.76	77.03	77.30	77.57	77.83	78.09	78.35	78.61	78.88	79.15	79.42	79.69	79.96	80.22	80.49	80.75	81.00
Upper 95th percentile	77.25	77.73	78.13	78.54	78.90	79.29	79.65	80.00	80.34	80.68	81.02	81.33	81.68	81.99	82.34	82.67	83.00
Lower 95th percentile	76.28	76.35	76.44	76.57	76.73	76.90	77.08	77.25	77.41	77.60	77.82	77.99	78.20	78.39	78.60	78.79	78.98
Actual trend	76.79	77.02	77.32	76.95	76.96	77.13	77.05										
Scotland females																	
Median projection	81.03	81.25	81.46	81.67	81.88	82.09	82.30	82.50	82.72	82.93	83.15	83.36	83.57	83.78	84.00	84.20	84.40
Upper 95th percentile	81.52	81.94	82.30	82.65	82.96	83.29	83.60	83.90	84.18	84.47	84.75	85.01	85.31	85.57	85.86	86.13	86.41
Lower 95th percentile	80.54	80.56	80.60	80.67	80.77	80.89	81.01	81.12	81.23	81.37	81.53	81.65	81.80	81.94	82.09	82.23	82.37
Actual trend	80.80	81.04	81.34	81.03	81.08	81.16	81.01										
Wales males																	
Median projection	78.34	78.60	78.86	79.11	79.36	79.61	79.86	80.10	80.36	80.62	80.88	81.13	81.39	81.64	81.89	82.14	82.38
Upper 95th percentile	78.97	79.50	79.93	80.37	80.74	81.16	81.54	81.90	82.24	82.59	82.94	83.26	83.62	83.93	84.29	84.62	84.96
Lower 95th percentile	77.72	77.71	77.75	77.83	77.93	78.07	78.21	78.33	78.46	78.61	78.81	78.94	79.12	79.28	79.45	79.60	79.76
Actual trend	78.23	78.16	78.79	78.27	78.23	78.45	78.23										
Wales females																	
Median projection	82.53	82.73	82.93	83.13	83.33	83.52	83.72	83.91	84.12	84.32	84.52	84.72	84.92	85.12	85.32	85.52	85.70
Upper 95th percentile	83.09	83.54	83.90	84.26	84.57	84.92	85.23	85.53	85.81	86.09	86.37	86.63	86.93	87.18	87.47	87.75	88.02
Lower 95th percentile	81.97	81.94	81.94	81.98	82.05	82.14	82.24	82.32	82.40	82.51	82.66	82.75	82.88	83.00	83.12	83.23	83.35
Actual trend	82.09	82.13	82.61	82.03	82.42	82.39	82.19										
UK males																	
Median projection	79.05	79.33	79.61	79.89	80.17	80.45	80.73	81.00	81.29	81.57	81.85	82.13	82.41	82.69	82.97	83.25	83.52
Upper 95th percentile	79.36	79.77	80.14	80.51	80.85	81.21	81.55	81.88	82.20	82.53	82.86	83.17	83.50	83.81	84.14	84.46	84.79
Lower 95th percentile	78.74	78.90	79.07	79.27	79.47	79.70	79.92	80.14	80.36	80.59	80.84	81.06	81.30	81.54	81.78	82.01	82.25
Actual trend	78.95	78.98	79.25	79.04	79.21	79.28	79.24										
UK females																	
Median projection	82.92	83.13	83.34	83.55	83.76	83.97	84.17	84.38	84.59	84.81	85.02	85.23	85.44	85.65	85.86	86.06	86.26
Upper 95th percentile	83.31	83.68	84.00	84.32	84.61	84.92	85.20	85.48	85.74	86.01	86.28	86.53	86.81	87.05	87.32	87.58	87.85
Lower 95th percentile	82.54	82.59	82.66	82.77	82.88	83.02	83.16	83.29	83.42	83.57	83.75	83.88	84.04	84.20	84.36	84.51	84.66
Actual trend	82.66	82.74	82.99	82.71	82.87	82.98	82.93										

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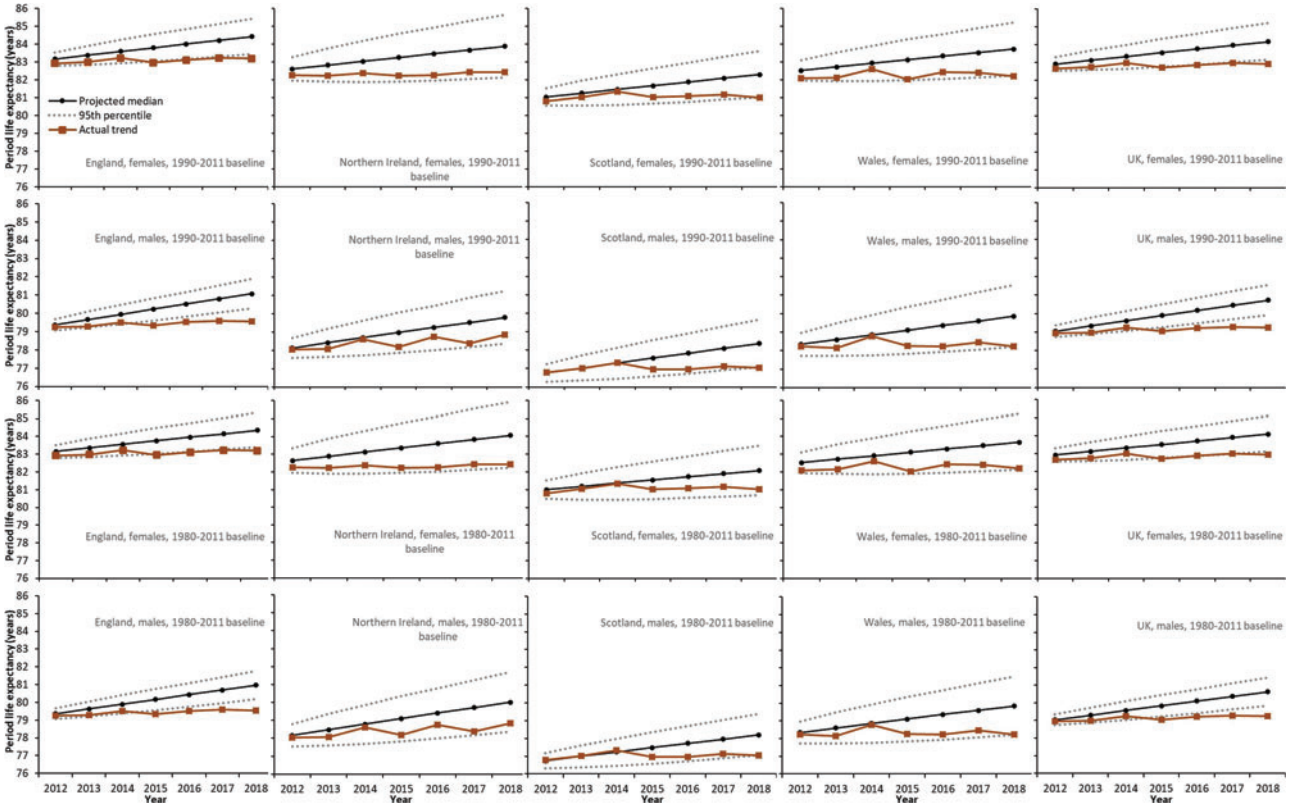

Figure 1 Trends in life expectancy at birth for England, Northern Ireland, Scotland, Wales and the UK, 2012–2018, compared with projected trends based on 1990–2011 (upper two rows) and 1980–2011 (lower two rows).

Strengths and limitations

Our approach to projecting life expectancy follows common practice and reflects the variance between years for the baseline period. This also provides a cone of uncertainty based on this variance to guide judgement on how likely or otherwise the observed trends are. The cones of uncertainty are wider in Northern Ireland, Scotland and Wales reflecting the smaller population sizes and consequent greater year-to-year variation in the life expectancy figures during the baseline periods. Varying the length of the baseline period slightly changes the median projection, reflecting some, limited, uncertainty in what can be considered the counterfactual expected life expectancy. It is also possible that using a different year for ending the baseline period and conducting the projection would change the results slightly.

We do not consider the projections given here as 'ideal' or 'aspirational' targets, given that they do not consider the need for 'catch-up' for those nations which already experience lower life expectancy such as Scotland, Northern Ireland and Wales. We also do not examine in this paper inequalities in mortality, something that is known to be increasing across Scotland, England and Wales but not Northern Ireland.[19–21] Narrowing inequalities in mortality is important in its own right, but is therefore also important if the population life expectancy is to be increased rapidly.

How this fits with the existing literature

Much of the current literature and debate in this area focuses on short-term variations in life expectancy and mortality, and the extent to which it might be explicable by deaths in 2015, rather than the extent to which the recent data have diverged from the previous trends.[8 11] In this paper, we reframe the life expectancy challenge as one of the deviations from a previously improving trend. This is clearly not a single-year problem relating to particularly high mortality over a single winter but instead is a gradual but consistent deviation from previous trends.[22 23] Catching up the lost progress on life expectancy is possible, not least because of the large contribution due to higher mortality among middle-aged adults from clearly avoidable causes of death.[8 24] Furthermore, rapid improvements, similar to those required here to achieve catch-up, have been seen in life expectancy in other contexts previously.[2]

The ONS uses a different approach to projecting life expectancy than we used here. This includes the use of trends for age-specific rather than the summary statistic, life expectancy, and also an assumption that age-specific mortality trends will converge over time. Despite this, the projected trends are very similar and it therefore unlikely that the results would change substantially if these alternative methods were adopted.[25]

What are the implications?

Debate about whether life expectancy in a particular population has increased or declined over a short period of time across the UK misses the important divergence of the trends since 2012, which means that life expectancy is now substantially below the pre-2012 trends. Policy focus and academic commentary should move away from unhelpful debates about the extent to which life expectancy is increasing or decreasing at any particular point of time, and instead focus on the growing divergence of current life expectancy from what should be expected given previous trends. Governments must now prioritise addressing this public health challenge across policy areas to ensure that population well-being is maximised. The need for action to reduce poverty, to protect

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incomes through a generous social security system and to reverse the reductions in the budgets for public services in order to reverse these trends remains stark.[26]

CONCLUSIONS

Life expectancy trends for the UK and each of its nations have deviated from their previous trends such that life expectancy is now substantially lower than expected. The gap between observed and projected life expectancy has steadily grown after 2011. Policy and academic focus should move away from year-to-year variation and instead aim to change the trajectory to get back to the previous trends.

What is already known on this subject

- Life expectancy and mortality trends across many high-income countries have changed since around 2011. Substantial debate has centred on whether the year-on-year changes represent a rise or fall in the figures in each country.

What this study adds

- Examining the trends with annual data for the UK overall and separately for England, Northern Ireland, Scotland and Wales shows that the life expectancy trends are now markedly deviating from the trends up to 2011. The debate on whether or not there is a year-on-year increase or decrease diverts attention from the more substantive problem of the longer-term stalling in trends.

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