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Future inequalities in life expectancy in England and Wales

Recent international trends in life expectancy tell a remarkable story of improvement.[1] In England, life expectancy from birth has doubled since 1840 and, from 1982 to 2012, has increased by about 8 years for men (from 71·3 years to 79·2 years) and 6 years for women (from 77·3 years to 83.0 years).[2] This most recent change equates to more than 6 h of life expectancy gained per day survived for men, and more than 4 h for women.

Historically, improvements in life expectancy were achieved through reductions in infant and child mortality,[1] whereas, from 1981 to 2012, life expectancy at 65 years improved by 41% for men and 24% for women in England; and even at 85 years, by 34% for men and 27% for women.[2] For men, 39% of deaths in the UK now occur at ages older than 85 years, and 52% occur at these ages in women, increased from 14% for men and 31% for women in 1981.[2] In low-mortality countries such as England, summary mortality statistics therefore mainly track changes in the common pathologies of old age.[3]

Life tables have been used since the 1840s to describe geographical inequalities in health. These life tables generally correlate strongly with area deprivation,[4] although migration has an effect.[5] Unfortunately, improvement in overall life expectancy has not led to commensurate reductions in levels of inequality. The range of life expectancy at birth in England across its districts increased for males, from 8·3 years in 2008 to 8·7 years in 2012, although it did fall for women from 7·3 years to 6·4 years.[6] At a regional level, inequalities have reduced for men, for whom the range between regions fell from 2·7 to 2·4 years, but no change occurred for women, for whom the equivalent range remained at 2·4 years. On a positive note, the gap between men and women at a national level has progressively narrowed from 5·9 years in 1982 to 3·8 years in 2012.

Statistics on period life expectancy combine age-specific mortality data into a single summary statistic that is meaningful to almost any audience. Pitfalls exist, however. No one actually experiences period life expectancy.[6] Just as the satellite navigation system in your car tells you how long the journey to an airport would take with present traffic conditions, but not with the ones that you will actually encounter, period life expectancy is a notional construct based on present age-specific mortality patterns. In reality, people contribute to death statistics as members of birth cohorts living through different periods at different ages.[7] Period life expectancy statistics therefore tell us a lot about present mortality experience, but rather little about future expectations.

Life expectancy at birth has been projected to 2062 for England,[8] but the uncertainty range is huge. At best, the life expectancy of men could be 92·6 years and 95·1 years for women, but, at worst, it could be 81·9 years for men and 85·5 years for women. The main estimate is in the middle and represents substantial flattening of present rates of improvement. In *The Lancet*, James Bennett and colleagues[9] have used elaborate Bayesian models to analyse present mortality patterns in England and Wales. They then forecasted life expectancy to 2030 for 375 districts. Their models take separate account of age, cohort, period, and geography; the one that performed best emphasised the effect of cohort. One of the many benefits of this approach is that it makes few, if any, assumptions about trends in mortality. It allows for non-linear trends of the sort that might be expected to follow known patterns of, for example, smoking in past decades.

The model output is more optimistic than official figures. By 2030, life expectancy is predicted to reach 85·7 years (95% credible interval 84·2–87·4) for men

and 87·6 years (86·7–88·9) for women. The sex gap would be reduced to just 1·9 years as mortality is likely to continue to improve more for middle-aged and old men than it will for women. At district level, the range between local areas in 2012 is already equivalent to the gap between the UK and countries like Sri Lanka or Nicaragua.[10] The model predicts increasing inequality within England and Wales, with the difference between the 1st and 99th percentiles rising from 6·1 years (5·9–6·4) to 8·3 years (6·8–9·7) for men, and from 5·6 years (5·3–6·0) to 8·3 years (7·1–9·4) for women.

These results raise important questions about what constitutes an adequate response to such worsening inequality in terms of both policy and service provision. Measures to control smoking remain important, but addressing so-called proximal risk factors (such as use of tobacco and alcohol, and diet) cannot be expected to achieve much unless the social and economic determinants of these behaviours change.[11] For health services, the issue is one of equity not equality—the health of the disadvantaged should not be further diminished by prevention and treatment services that are inadequately adapted to their various situations and needs.

Clearly, many predictions of trends in life expectancy from the past century were substantially wrong.[1] In the 1970s, Omran's[12] view of the epidemiological transition was that mortality would stabilise once infectious diseases had been overcome and mortality was dominated by the effects of what he called "degenerative disease and man-made diseases",

such as cardiovascular disease and cancers. Many authorities at that time assumed an upper limit for life expectancy at birth of 75 years,[1] which now seems extraordinarily naive. The fact that life expectancy has continued its upward trajectory more or less unchecked is widely attributed to a profound and abrupt decline in mortality from cardiovascular diseases. Bongaarts[3] ascribed two-thirds of the recent fall in deaths in 15 low-mortality countries to a reduction in cardiovascular deaths. As a result, cancer is now twice as important as a cause of death in these countries as it was 50 years ago.

Sustained improvements in life expectancy have transformed the age profile of countries like England, with implications for health and care services, fiscal policy, the insurance market, and commerce generally. Old people of the future will need to be healthier and more independent than those using services nowadays, otherwise those services could be overwhelmed. Aggressive and timely management of disability, and a positive approach to promotion of health for old people, could still achieve the resilience and capability needed.

Reliable estimates of future life expectancy trends are therefore in great demand. Bennett and colleagues[9] have arguably developed to its limit the use of existing overall mortality data as a method for prediction of future mortality. The next stage is to model trends in cause-specific mortality for the common causes[3,13] and, even better, to add trends in causes attributable to important risk factors. Peto and colleagues[14] have developed a robust method for estimation of numbers of deaths attributable to smoking, which probably peaked in England for men in about 1980 and for women in 2010. Other attributable risks are technically more difficult to estimate but these will become increasingly important to estimate as the effect of smoking falls.

In the end, projections are derived from known data and remain susceptible to Hume's problem of induction. We implicitly assume that the future will be like the past in a predictable way, otherwise even the best model is of no value. Unfortunately, experience suggests that the future is often rather different from the past in really quite unpredictable ways. Extrapolation beyond the data remains a risky and uncertain business.

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The UK's strong contribution to health globally

The first mapping of the UK's activities in health globally across academia, commerce, government, and the not-for-profit sector is provided in *The UK's Contribution to Health Globally: Benefiting the Country and the World*,[1] a new report by the All-Party Parliamentary Group on Global Health (APPG) published on June 29, 2015. This analysis shows that the UK has enormous strengths in each of these areas, which could enable the UK to make an even greater contribution to improving health globally. There are, however, risks and threats to this position and choices to be made.

The APPG commissioned research from the London School of Hygiene & Tropical Medicine to examine the UK's contribution to health globally and assess the potential for achieving greater benefits. The brief was to map UK activities—rather than assess the more complex idea of impact—and to consider only activities that had improving health as their primary objective. The research was undertaken through interviews, data collection, and literature review with preliminary results discussed with stakeholders; the officers of the APPG and the researchers together agreed the report's conclusions and recommendations.

The report reveals strengths in each sector. In academia, the UK has three of the top five universities in the world for clinical, preclinical, and health sciences; two of the top five for life sciences; and the second largest share of the top 100 universities for both clinical and life sciences.[2] The UK ranks first or second among G7 countries for research quality by citation impact in health-related fields.[3] The UK has leading funders in the Medical Research Council and the Wellcome Trust; internationally recognised thinktanks in Chatham House and the Overseas Development Institute; and world-leading medical and bioscience journals in *The BMJ*, *The Lancet*, and *Nature*.

Different parts of government and the public sector have major roles in important areas of research, such as antimicrobial resistance, dementia, malaria, neglected tropical diseases, and, most recently, the response to Ebola. The National Health Service (NHS), National Institute for Health and Care Excellence, Public Health England, the Royal Colleges, and other parts of the UK health system are respected for their quality and expertise, have many international links, and provide volunteers to work in low-income and middle-income countries. Additionally, the UK Government's Department for International Development makes a substantial contribution to health as the second largest development agency, with the UK now spending 0·7% of gross national income on overseas aid.[4]

Commercially, the UK Government supports British health-care companies to work internationally and promote life sciences. There are 4800 companies generating more than £55 billion annually, with the largest biotech pipeline in Europe.[5] Meanwhile, the UK has one of the largest and most thriving non-governmental organisation sectors in the world, with