

## Long live the Queen's subjects

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*Phil. Trans. R. Soc. Lond. B* 1997 **352**, 1919-1920  
doi: 10.1098/rstb.1997.0178

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# Long live the Queen's subjects

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## SUMMARY

In 1952, the Queen congratulated 255 people on their hundredth birthdays and 1135 couples on their sixtieth wedding anniversaries. By 1996, these numbers had risen to 5218 and 11 688, respectively. Semilogarithmic plots, normalized to constant numbers of births and marriages, show steady exponential rises in the number of centenarians with a doubling time of 11 years, and of diamond weddings with a doubling time of 19 years. An alternative plot of the numbers of those reaching a hundred between 1910 and 1990, based on registers of births and deaths and normalized to constant births, shows an annual rise of only 1% from 1910 to 1946, followed by a steady exponential rise with a doubling time of 12 years, closely matching that of 11 years derived from the Queen's figures.

The exponential rise in the number of those born from 1846 onwards living to a hundred precedes by many years the general rise in the expectation of life at birth and the general drop in mortality from infectious diseases, but it coincides with the beginning of a steady rise in real wages. Another important factor may be improved medical treatment at old age from 1946 onwards.

British monarchs traditionally congratulate their subjects on their hundredth birthday or their sixtieth wedding anniversary. These congratulations have multiplied spectacularly during the reign of Queen Elizabeth II.

Figure 1 shows the total number of marriages from 1892–1936 and of births from 1852–1896 in England, Wales, Scotland and Northern Ireland. From 1850–1875 the number of births increased, with a doubling time of about 60 years, but after this they have remained constant up to 1896; marriages rose steeply until 1900, and more gently after that, with a doubling time of 70 years. Underneath are plotted the numbers of 60th wedding anniversaries and 100th birthdays from 1952–1996, normalized for constant numbers of births as in 1863 and marriages as in 1913. The 100th birthdays fall on a straight line with an annual growth of 6.3% and a doubling time of 11 years, with a hint of levelling off after 1991. Up to 1960 the 60th wedding anniversaries fall on a parallel straight line, but after that they level off to a doubling time of 19 years.

The numbers for these plots were kindly supplied by Sir Robert Fellowes, the Queen's Private Secretary. They are based on notifications supplied by relatives or friends which are accompanied by birth or marriage certificates. In 1996 about one third came from Commonwealth countries and the rest from the UK. For the purpose of normalizing the numbers, it was assumed that most of the people concerned were born in the UK. This may have introduced slight errors, but would not have affected the general trend. I found the regular exponential growths so astonishing that I wondered how representative the numbers were.

As part of an enquiry into the maximum human life-span, Thatcher has published a table of the number of centenarians in England and Wales from 1910 to 1990, based on the Registrar General's Reports of Births, Deaths and Marriages (Thatcher 1992). Between 1946 and 1990, they fall on a straight line with an annual growth of 5.8% with a doubling time of 12 years. That fast growth began abruptly in 1946; before that it was hardly greater than 1% per annum (figure 2). The full circles on the growth curve in figure 1 are taken from figure 2; they almost coincide with it, which shows that the two curves are similar. The slightly faster growth rate of the Queen's numbers may be due to increasingly complete notifications, especially from the Commonwealth.

What was responsible for the steady exponential growth in these numbers? It does not coincide with the general expectation of life at birth, which began its steep rise much later. Had failure to take account of infant mortality affected the normalization of the data? In fact, mortality of infants under one year of age remained constant at  $155 \pm 7$  deaths per 1000 live births between 1850 and 1900, the later part of the period when the centenarians were born. Maternal mortality at childbirth remained at  $46 \pm 5$  deaths per 10 000 births from 1850 to 1930 and had dropped only slightly, to 35.8 deaths by 1940, which covers the period when the women centenarians would have been of childbearing age. From 1850 to 1950, deaths from tuberculosis diminished only very slowly from 250 to 100 per 100 000 per annum, which would have had only a small effect on the rise in centenarians.

I next turned to economic factors. Recent research on the industrial revolution has shown that the growth

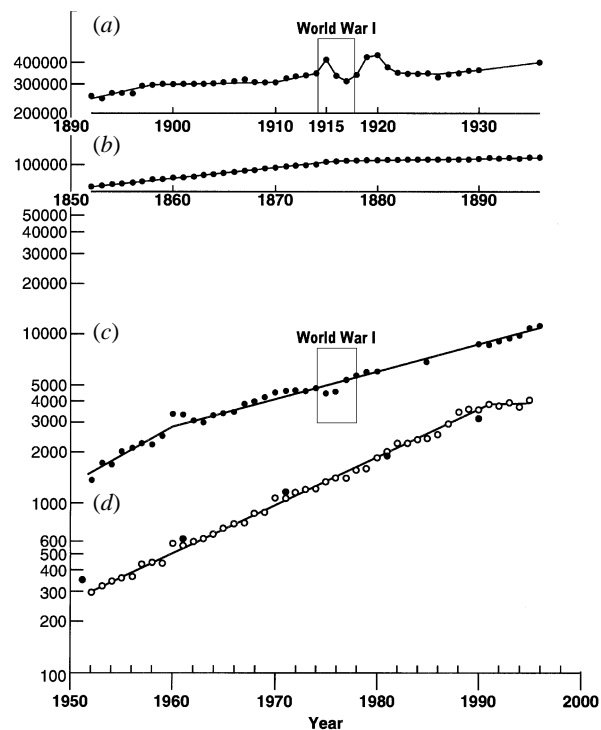


Figure 1. Semilogarithmic plot of (a) the number of marriages between 1852 and 1896 for England, Wales, Scotland and Northern Ireland, taken from the Registrar General's Annual Reports to Parliament, together with (c) diamond wedding anniversaries and (d) the number of hundredth birthdays between 1952 and 1956 notified to the Queen. The number of hundredth birthdays and wedding anniversaries have been normalized for constant numbers of births and marriages. The full circles represent Thatcher's estimates of centenarians from death registrations from 1951–1986 and number of pensioners in 1990, and are taken from figure 2.

in Gross National Product (GNP) after 1850 was much faster than before 1820; economic trends between 1825 and 1850 are still under debate. Feinstein's (1996) careful study of wages in the last century shows a very slow growth until 1845, when there began a continuous steep rise (figure 3). The remarkable coincidence between the date of this rise and that of the rise in the number of centenarians suggests that longevity followed wealth, or at least less poverty, because pregnant mothers' and infants' nutrition are crucial for adult longevity. After 1945 the advent of antibiotics must have helped to prolong the lives of those who were born strong enough to have survived earlier infections without them. Sir Richard Doll pointed out that the annual death rate per 1000 persons aged 85 and over has dropped by 36% since the 1950s, from 263.4 in 1936–40 to 169.6 in 1986–90, and he attributes this primarily to improved medical treatment at old ages.

Overall, the chance of living to a hundred has increased 12-fold, from about 1 in 3800 for those born in 1852 to 1 in 310 for those born in 1896. The numbers of hundredth birthdays do not separate the sexes; Thatcher's tables show that women centenarians outnumber men by seven to one. This means that for those born in 1896 the chances of surviving to a hundred were 1 in 178 for women, but only 1 in 1225 for men.

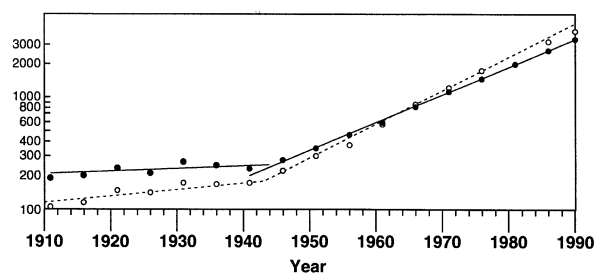


Figure 2. Semilogarithmic plot of the number of hundredth birthdays drawn from the data of Thatcher (1992) and normalized for births in 1863.

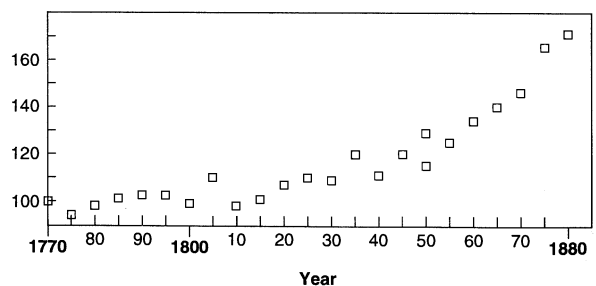


Figure 3. Real wages in Great Britain between 1770 and 1880.

As expected on statistical grounds, the chance for a couple to see their 60th wedding anniversary has increased only about half as much, 6.6-fold, from 1 in 234 for those married in 1892 to 1 in 35.5 to those married in 1936. Sixtieth wedding anniversaries show a marked hump in 1960, which remains unexplained, and a dip in 1976, reflecting the many young husbands who lost their lives in the First World War. The annual number of marriages increased from 335 000 in 1913 to 421 000 in 1915, as couples got married before the men went off to war. It then dropped to 302 000 in 1917, when men were called up aged eighteen; it rose again to 413 000 in 1919 and 444 000 in 1920 as the survivors returned. The difference between the number of 60th wedding anniversaries expected from the general trend and those recorded between the years 1973 and 1978 suggests that over 6500 men were killed who might have lived to celebrate their sixtieth wedding anniversaries. It will be interesting to see if the levelling off of the hundredth birthday line (figure 1d) continues.

I thank Miss Annabel Freeman and Mrs Pauline Penfold in the Queen's Private Secretary's Office for kindly looking up the figures for hundredth birthdays and diamond weddings and the Queen for allowing me to publish them. I also thank Dr Peter Laslett and Dr S. N. Solomou for directing me to the right sources and for much helpful advice.

## REFERENCES

- Feinstein, C. 1996 Conjectures and contrivances: economic growth and the standard of living in Britain during the industrial revolution. *Discussion papers in economic and social history, University of Oxford* **9**, 1–55.
- Thatcher, A. R. 1992 Trends in numbers and mortality at high ages in England and Wales. *Popul. Studies* **46**, 411–426.