Office for National Statistics

Article

Life Expectancy releases and their different uses

The different life expectancy releases and their potential uses.

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Table of contents

1 . Introduction

We regularly release a range of publications that report estimates of life expectancy; the purpose of this explainer is to outline the following:

- what is life expectancy
- the range of life expectancy releases produced by Office for National Statistcs (ONS)
- the intended uses of each release
- the different methods deployed for each release

Section 8 is a question and answer section to guide users to the publication will be most relevant to their specific need.

2 . What is life expectancy and what are life tables?

Life expectancy is a population based statistical measure of the average number of years a person has before death. Life expectancies can be calculated for any age and give the further number of years a person can on average expect to live given the age they have attained.

Life expectancies are calculated using life tables. A life table is a demographic tool used to analyse death rates (also called mortality rates) and calculate life expectancies at various ages. We calculate life tables separately for males and females because of their different mortality patterns.

There are two main measures of life expectancy – period and cohort. A period life expectancy is defined as the average number of additional years a person can be expected to live for, if he or she experienced the age-specific mortality rates of the given area and time period for the rest of his or her life. Cohort life expectancy, in contrast, makes allowances for mortality improvements by combining observed and projected changes in mortality into future years. A cohort refers to a group of people with the same year of birth. For example, if someone is aged 18 years in 2018, they would have been born in 2000 and will therefore be part of the year 2000 birth cohort. Further details about the differences between period and cohort life expectancies can be found in the article Period and cohort life expectancy explained.

Life expectancy is an important indicator of the nation’s health and our life expectancy figures are used to assess and set a number of important health related policies and initiatives that impact on everyday life. Our projected life expectancies are used in the process for setting the State Pension Age whilst subnational life expectancies are used to assess inequality between different parts of country and different population groups.

Which Office for National Statistics (ONS) life expectancy release should I use?

- Current life expectancies at national level only – the National life Tables
- Future projections of life expectancy – the past and projected data from period and cohort life tables
- Life expectancies at regional or local authority level – Health State Life Expectancy: UK
- National life expectancies for comparison with subnational life expectancies – Health State Life Expectancy: UK
- A long time series of life expectancies for England and Wales – The English (decennial) Life Tables
- Socioeconomic inequality in life expectancy – Health state life expectancies by national deprivation deciles: England and Wales

3 . National life tables

We publish national life tables annually in September for the UK, Great Britain, England and Wales combined and the UK countries separately. The national life tables give period life expectancies and provide the official country level estimates of life expectancy for the UK and UK countries. They cover a consecutive three-year period to help reduce the effect of annual fluctuations in the number of deaths caused by seasonal events such as winter flu. The current published series goes back to 1980 to 1982.

The national life tables are calculated by single year of age (known as complete life tables) from age 0 up to age 100. Although people do live beyond age 100 years, life expectancies at these oldest ages are highly uncertain and so we do not publish them.

The methodology for calculating national life tables is described in our Guide to calculating national life tables. Queries relating to the National life tables can be sent to pop.info@ons.gov.uk.

4 . Past and projected period and cohort life tables

We publish past and projected data from period and cohort life tables biennially in December for the UK, Great Britain, England and Wales combined and the UK countries separately. These life tables are published on a period and cohort basis and are based on the assumptions for future mortality from the national population projections (NPP). These tables give historic and projected life expectancies to the NPP base year and then 50 years into the future. These are the figures to use if you are interested in how life expectancies might change into the future.

Like the national life tables, the period and cohort life tables are calculated by single year of age (known as complete life tables) from age 0 up to age 100. Again due to the uncertainty of life expectancies at the highest ages, we do not publish them above age 100 years.

We publish period and cohort measures of life expectancy (ex), probability of dying (qx) and numbers surviving (lx) from the period and cohort life tables. These are produced for the principal projection as well as a number of variant projections which are based on alternative assumptions about future mortality.

In contrast to the national life tables the past and projected period and cohort life tables are for single years rather than a three-year period. These datasets should be used for projected mortality data for future years. These tables contain estimates of observed (past) life expectancy for single years, however these should not be used as official national estimates of life expectancy as they are more prone to annual fluctuations in deaths.

The methodology for calculating the past and projected period and cohort life tables is the same as for the national life tables as described in our guide to calculating national life tables. In order to project mortality for future years we need to set assumptions, this article describes the method for producing our mortality assumption underlying the projections.

Queries relating to the past and projected period and cohort life tables can be sent to pop.info@ons.gov.uk.

5 . English (decennial) life tables

The English life tables (also referred to as the decennial life tables) are based on data for England and Wales and are published once every ten years. They provide period life expectancy by single year of age for the three-year period centred on a census. The series began in 1841 and can be used for looking at the increasing longevity of the population of England and Wales over a long period. They can be compared with the experience of other countries and other groups of people.

As well as the usual male and female life tables, a life table for persons is also published as part of the English life tables. This table is useful for both historical and international comparisons where there are no separate figures for males and females. This table cannot be used to derive mortality rates for persons which would have any general application, since they would only reflect the mortality of a population which at any particular age has the same ratio of males to females as underlies the “persons” table.

The differences in the life expectancy figures calculated in the English life tables and the national life tables for the same three-year period are small. The main difference in the method between the national life tables and the English life tables is that the mortality rates used in the English life tables are smoothed (also referred to as graduated). This reduces fluctuations in the progression of mortality rates by age so better reflects the underlying mortality rates in the population for the periods in question. The years around a census year are used as the population estimates produced around a census are generally thought to be the most accurate.

In the English life tables mortality rates are also modelled up to age 125 years. Mortality rates in the national life tables are only published up to age 100 years due to the uncertainty of mortality rates at very high ages. The decennial life tables provide a better progression of mortality rates at these ages and are the only officially published mortality rates by single year of age above age 99.

Queries relating to the English life tables can be sent to pop.info@ons.gov.uk.

6 . Sub-national life expectancies

Subnational life expectancies are published annually in December. The life expectancy estimates reported in the Health State Life Expectancies: UK are period-based life expectancies. Unlike the other life expectancy publications, the subnational life expectancy estimates use an abridged life table method. Abridged life tables are based on deaths and population data by age groups (usually five-year age groups, with an open-ended final age interval, currently set at 90 years and above). An explanation of why 90 years and over is selected as the final age band is given in the article Method changes to life and health state expectancies.

Abridged life tables assume that deaths are evenly distributed within age groups, so that the probability of dying is the same for all individuals within an age group regardless of their age. However, this assumption becomes increasingly less accurate as the width of age groups increase, as is the case with the open-ended final age interval, such as 90 years and above. Due to improvements in survival rates, particularly for the over-65 years, there has been a rapid increase in the number of people living to very old ages. For this reason, abridged life tables are closed at 90 years and above for estimating life expectancy at sub-national level.

Abridged life tables use the age-specific mortality rates for an area aggregated over three years, for example 2015 to 2017, which is based on the age-group death count divided by the age-group population count. A template is available, which shows how the abridged life table is deployed to derive life expectancy estimates.

Abridged life tables are used in preference to complete life tables for smaller populations, such as local authorities, because death counts can be too sparse for examining mortality for single years of age, and mid-year population estimates are not available or sufficiently reliable to produce these by single year of age.

It is important for local authorities to benchmark their specific life expectancy with national estimates and to track health improvement over time. Consequently, the health state life expectancy release includes life expectancy estimates for regions, constituent countries and for the UK as a whole to ensure all units of analysis have estimates based on an abridged life table methodology so that they can be used validly for comparison.

7 . Comparisons of life expectancy estimates

The abridged life table in the subnational publication provides estimates of life expectancy for the UK and constituent countries that are a close approximation to those based on complete life tables published as part of the national life tables release (see Table 1). Consequently, abridged life table based estimates are a valid means to enable sub-national populations to compare themselves with national norms.

Table 1: Life expectancy at birth and age 65 by sex using complete and abridged life table method for selected countries 2015 to 2017

Country	Abridged life table method	Complete life table method
At birth - Males		
UK	79.2	79.2
England	79.6	79.5
Scotland	77	77
Wales	78.3	78.3
Northern Ireland	78.5	78.4
At birth- Females		
UK	82.9	82.9
England	83.1	83.1
Scotland	81.1	81.1
Wales	82.2	82.3
Northern Ireland	82.3	82.3
At age 65 years - Males		
UK	18.6	18.6
England	18.8	18.7
Scotland	17.4	17.4
Wales	18.2	18.2
Northern Ireland	18.2	18.2
At age 65 years - Females		
UK	20.9	20.9
England	21.1	21.1
Scotland	19.7	19.7
Wales	20.5	20.6
Northern Ireland	20.6	20.6

We also include two alternative measures of life expectancy in our release. These are the median and modal ages at death. The median age at death is an estimate of the age at which half of a hypothetical cohort would have died and half would still be alive. The modal age at death identifies the age at which the highest number of deaths occur over the life course. This focuses on deaths occurring at older ages in the life table in its calculation.

We also produce estimates of life expectancy for national deprivation deciles to enable the socioeconomic inequality in life expectancy to be determined. These estimates are also based on an abridged life table methodology. This release should be used for assessing health improvement among populations exposed to greater or lesser amounts of deprivation and for tracking changes in the inequality. They have value for assessing the fairness of state pension age changes and for monitoring the effectiveness of policies designed to reduce socioeconomic health gaps.

We will soon be publishing life tables for deprivation quintiles within England. These are used exclusively for cancer survival statistics and should not be used for regional comparisons of life expectancy. Further details will be provided when published in January.

Further information on sub-national life expectancy and abridged life table methodology can be obtained by emailing hle@ons.gov.uk.

8 . Selected questions and answers

This section contains answers to common questions users might have concerning the appropriateness of each release for their specific needs.

Question: “Which release should I use if I want to compare England with other countries in the UK for the latest period or over time?”

Answer: You should use the national life tables, published in September each year.

Question: Which release should I use if I want to compare the life expectancy of a man and woman in the England and Scotland of a specific age, such as age 18 years?”

Answer: You should use the national life tables, published in September each year.

Question: “Which release should I use if I want to know the life expectancy of someone who is aged 18 years now and when they are aged 28 years in ten years time?”

Answer: You should use the past and projected data from period and cohort life tables release published biennially in December.

Question: “Which release should I use if I want to compare the male life expectancy at birth in Watford and the UK?”

Answer: You should use the Health state life expectancies, UK release, published annually in December.

Question: “Which release should I use if I want to compare the change in male life expectancy at age 65 years in Blackpool and Wokingham between 2001 to 2003 and 2015 to 2017?”

Answer: You should use the Health state life expectancies, UK release, published annually in December.

Question: “Which release should I use if I want to compare the female life expectancy at birth in more and less deprived areas?”

Answer: You should use the Health state life expectancies by national deprivation deciles: England and Wales release, published annually in March.

Question: “Which release should I use if I want to quantify the socioeconomic inequality in female life expectancy at birth between the least and most deprived areas?”

Answer: You should use the Health state life expectancies by national deprivation deciles: England and Wales release, published annually in March.

Question: “Which release should I use if I want to assess change overtime in life expectancy?”

Answer: It depends. If you want to compare countries of the UK, you should use the national life tables published in September each year. However, if you want to compare London with the UK, or Manchester with England, you should use the Health state life expectancies, UK release, published in December each year.