Office for National Statistics

Health state life expectancies, UK QMI: 2020 to 2022

Quality and methodology information for health state life expectancies, UK, detailing the strengths and limitations of the data, methods used and data uses and users.

Table of contents

1 . Output information

- National Statistic: yes

- Frequency: annual

- How compiled: administrative data, survey data

- Geographic coverage: UK (England, Northern Ireland, Scotland, Wales)

2 . About this QMI report

This quality and methodology report contains information on the quality characteristics of the data (including the European Statistical System five dimensions of quality) as well as the methods and data sources used to create it.

The information in this report will help you to:

- understand the strengths and limitations of the data

- learn about existing uses and users of the data

- understand the methods used to create the data

- help you to decide suitable uses for the data

- reduce the risk of misusing data

3 . Important points

- Life expectancy (LE) and health state life expectancies (HSLE) are important high-level measures of a population's health status.

- Period life expectancy at a given age for a population is the average number of years people would live, if they experienced the population's age-specific mortality rates for that time period throughout their lives.

- HSLE are summary measures of population health, adding a quality of life dimension to estimates of LE by partitioning expected lifespan into time spent in different states of health.

- Healthy life expectancy (HLE) estimates the average years lived in "very good" or "good" health, which is derived from a subjective assessment of a person's health status ranging from "very good" to "very bad"; general health can be interpreted as measuring health-related well-being.

- Disability-free life expectancy (DFLE) estimates lifetime free from a longstanding physical or mental health condition or illness, which restricts day-to-day activities; it is based upon a self-rated assessment of how much health conditions and illnesses are limiting an individual's ability to carry out day-to-day activities; limiting longstanding illness can be interpreted as a measure of functional health status.

4 . Quality summary

Health state life expectancies (HSLE) are summary measures of population health. They are important indicators of wider societal well-being, providing context to the effects of policy changes and interventions at both national and local levels.

HSLE are extensions of life expectancy (LE). By combining mortality data with both general and functional health status data, the average amount of life a person can expect to live in favourable states of health can be estimated. Healthy life expectancy (HLE) is the average amount of time across the life course a person can expect to live in "very good" or "good" general health. Disability-free life expectancy (DFLE) is the average amount of time across the life course a person can expect to live without a physical or mental health condition, which restricts the normal day-to-day activities.

This partitioning of length of life into periods spent in these dichotomised states of health provides a quality dimension to LE. These metrics provide an informative summary measure of the health status of the population, which provides further context to changing patterns in lifespan.

These publications cover the geographical and socioeconomic distributions of health state life expectancies by sex for males and females. The geographical coverage encompasses figures for UK and constituent countries, English regions and a range of local areas. The socioeconomic coverage encompasses deciles (tenths) of area deprivation for England and quintiles (fifths) of area deprivation for Wales using each country's contemporary index of multiple deprivation.

The figures presented are three-year rolling averages to ensure they are sufficiently robust at all geographic and socioeconomic levels.

Recent improvements

There have been two changes implemented in the latest releases to note, which are designed to improve the quality of these statistics.

Use of rebased mid-year population estimates

We use mid-year population estimates between 2012 and 2020, which have been rebased to the 2021 Census, to revise the historical time series between 2011 to 2013 and 2018 to 2020 [note 1][note 2]. These new populations are currently only available for England, Northern Ireland and Wales. After Scotland publishes their new population estimates rebased on their 2022 Census, the Office for National Statistics (ONS) will add a revised time series for Scotland.

Using rebased population estimates means the new LE and HSLE estimates are more accurate, especially for the periods just before the 2021 Census. For local areas in 2018 to 2020, most life expectancy estimates have had only minor revisions. However, some London boroughs have had substantial downward revisions of over 3.5 years for males and over 2 years for females. This is because populations in these areas were previously overestimated.

Interpolation of census health state prevalence in intercensal years

The HSLE calculation makes use of census information on general health and on disability in two respects:

- to impute health state prevalence for age groups that the Annual Population Survey (APS) does not cover (or in age groups where APS data are too sparse)

- to improve (smooth) the health state prevalence observed in APS data

Previously, we used 2011 Census data for those purposes in estimating health state life expectancies between 2011 to 2013 and 2018 to 2020. Now that Census 2021 data are available, we are able to improve the accuracy of adjustment factors and intercensal census prevalence used in imputing and fitting health state prevalence.

We use linear interpolation [note 3] between the health state prevalence observed at Census 2011 and at Census 2021 to create period-specific "census" estimates of health state prevalence for the intervening years 2012 to 2020.

Uses and users

LE provides users with an indicator of longevity, which can be used to inform policy needs and planning for services, and provide context for further research in both the public and private sectors in areas such as health, social care, population size, pensions and insurance.

The main users of LE data include:

- the Department of Health and Social Care (DHSC)

- Office for Health Improvement and Disparities (OHID)

- Public Health Wales

- NHS England

- National Records Scotland

- Northern Ireland Statistics and Research Agency

- Ministry of Housing, Communities and Local Government

- Department for Work and Pensions

- local public health departments

- local authorities

- combined authorities

- private pensions and insurance companies

- academic institutions such as the Institute for Health Equity and the Institute and Faculty of Actuaries

LE figures are used at regional and local levels to focus on health monitoring and planning in specific areas. They are also published as part of the Regional Health Profiles, which are produced by OHID. The profiles comprise a package of indicators, which are designed to support action by local governments and primary care trusts to tackle health inequalities through greater targeting of interventions to promote health improvement. LE figures are also presented for local authority areas in OHID's Public Health Outcomes Framework.

In the private sector, LE figures are used by pensions and insurance companies for planning their financial services.

Our HSLE statistics are reported in a number of our other publications such as National health and well-being. The main external users of our HSLE statistics include the following.

Department of Health and Social Care

For England, the Department of Health and Social Care (DHSC) has a responsibility to level-up the nation's health by reducing disparities. Healthy life expectancy (HLE) has been identified as an important outcome measure in assessing the extent to which health is improving and disparities are narrowing. Increases in HLE and reductions in the differences in HLE between communities are over-arching high-level outcome indicators of the Public Health Outcomes Framework, where they are used to monitor health improvement locally and health inequality nationally.

Department for Levelling Up, Housing and Communities

The Department for Levelling Up, Housing and Communities' (DLUHC) mission has identified HLE as an important indicator with an ambition to narrow the gap in HLE between local areas where it is highest and lowest by 2030, and by 2035 HLE will rise by five years.

Department for Work and Pensions

Health expectancies inform policy around ageing in the UK, fitness for work and extending working lives, and making judgements about fairness when setting the [State Pension age (PDF, 2.93MB)](#).

The Pensions Act 2014 introduced a requirement for the Secretary of State of the Department for Work and Pensions to periodically review the rules on State Pension age and report to Parliament. HSLE at subnational level and by measures of socioeconomic status were used in the most recent [review of the State Pension age in 2022 (PDF, 16.58MB)](#). With the State Pension age set to increase in future years, an assumption will be to extend working lives to higher State Pension ages. An important judgement to support such an assumption is fitness to work at older ages, and whether improvements in HSLE are keeping track with improvements in LE.

Other external users of HSLE statistics include academia, actuaries and the media.

Notes for Section 4: Quality summary

1. The HLE time series for Northern Ireland has been revised from 2013 to 2015 as health state prevalence data for Northern Ireland local government districts are only available from 2013.

2. A time series is a series of estimates ordered chronologically.

3. Linear interpolation estimates the value of function between two known values; in this case the prevalence observed at the 2011 Census and 2021 Census. Further details are presented in the sections used to produce the data.

5 . Quality characteristics of the data

This report provides a range of information that describes the quality of the data and details any points that should be noted when using the output.

We have developed [Guidelines for Measuring Statistical Quality](#); these are based upon the five European Statistical System (ESS) Quality Dimensions. This report addresses these quality dimensions and other important quality characteristics, which are:

- concepts and definitions

- relevance

- accuracy and reliability

- coherence and comparability

- accessibility and clarity

- timeliness and punctuality

- output quality

- assessment of user needs and perceptions

- why you can trust our data

More information is provided about these quality dimensions in the following sections.

Concepts and definitions

(Concepts and definitions describe the legislation governing the output and a description of the classifications used in the output.)

Expectations of life can be calculated using either period (as used in this publication) or cohort life tables.

Period expectation of life at a given age for an area in a given time period is an estimate of the average number of years a person of that age would survive if they experienced the particular area's age-specific mortality rates for that time period throughout the rest of their life. The figure reflects mortality among those living in the area in each time period, rather than mortality among those born in each area. It is not therefore the number of years a person in the area in each time period will be expected to actually live, both because the death rates of the area are likely to change in the future and because many of those in the area may live elsewhere for at least some part of their lives. The measure reflects the mortality rates prevailing at the time and therefore gives a measure with which to compare different populations both spatially and temporally.

Cohort life expectancies are calculated using age-specific mortality rates for the series of years in which that cohort reaches each succeeding age. This allows for known or projected changes in mortality in later years. Cohort life expectancies are therefore regarded as a more realistic measure of how long a person of a given age would be expected to live, on average, than period life expectancy.

To illustrate, period life expectancy at age 65 years in 2000 would be estimated using the mortality rate for someone aged 65 years in 2000, aged 66 years in 2000, aged 67 years in 2000, and so on. Cohort life expectancy at age 65 years in 2000 would be worked out using the mortality rate for someone aged 65 years in 2000, aged 66 years in 2001, aged 67 years in 2002, and so on.

Period life expectancies are a useful summary measure 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 areas of within a country and with other countries. Official life tables in the UK and in other countries, which relate to past years, are generally period life tables for these reasons. Cohort life expectancies, even for past years, usually require projected mortality rates based on a set of assumptions for their calculation and so, in such cases, involve an element of uncertainty regarding the accuracy of mortality projections. More information on the differences between period and cohort life expectancies is available on the ONS website.

Health state life expectancies (HSLE) add a quality of life dimension to estimates of life expectancy (LE) by dividing expected lifespan into time spent in different states of health or disability.

The first is healthy life expectancy (HLE), which estimates average lifetime spent in "very good" or "good" health, based on how individuals perceive their general health.

The second is disability-free life expectancy (DFLE), which estimates lifetime free from a long-standing illness which limits daily activities. This is based upon a self-rated assessment of activity limitation associated with physical and or mental health conditions the person has.

We use the following definitions of health to calculate both HLE and DFLE.

HLE is defined as the number of remaining years that an individual can expect to live in "very good" or "good" general health. Rates of "very good" and "good" general health by sex and five-year age band are captured from the following survey general health question on the Annual Population Survey (APS) and in the Census 2011 and Census 2021:

How is your health in general; would you say it was:

- very good?

- good?

- fair?

- bad?

- very bad?

DFLE is defined as the number of remaining years that an individual can expect to live without an activity restriction in carrying out normal day-to-day activities associated with a long-standing physical or mental health condition or illness. Rates of activity restriction by sex and five-year age band are captured from the following survey questions asked in the Annual Population Survey (APS), following the primary harmonised standards introduced in April 2013:

Do you have any physical or mental health conditions or illnesses that have lasted or are expected to last 12 months or more?

Response: Yes or No

If "Yes" the respondent is then asked:

Does your condition or illness/any of your conditions or illnesses reduce your ability to carry out normal day to day activities?

1. Yes, a lot

2. Yes, a little

3. Not at all

A similar question specification was also asked in the 2021 Census in England and Wales, although the 2011 Census had a different wording.

Relevance

(The degree to which statistical outputs meet users' needs.)

Our health state life expectancies (HSLE) output has two components, each of which has a different population coverage. The two components are:

- estimates of period life expectancy

- estimates of HSLE

Estimates of period life expectancy cover the UK and constituent countries. In addition, for England they cover regions, counties, metropolitan counties, combined authorities and local authority districts and for national deprivation deciles in England and Wales as measured by the Index of Multiple Deprivation (IMD) and the Welsh Index of Multiple Deprivation (WIMD).

Estimates of HSLE cover the UK and constituent countries, and:

- for England, they cover regions, metropolitan counties, combined authorities and upper-tier local authorities; and clusters of Lower-layer Super Output Areas (LSOAs) grouped according to their area deprivation decile as measured by the IMD

- for Wales, they cover unitary authorities and Welsh health boards, and clusters of LSOAs grouped according to their area deprivation quintile as measured by the WIMD

- for Scotland, they cover council areas

- for Northern Ireland they cover local government districts

Figures are not calculated for City of London or Isles of Scilly because the numbers of deaths are too small to produce statistically robust estimates.

The harmonised standards now included on the APS for defining disability and producing statistical measures of disability improves relevance as it is more likely to capture mental health conditions by explicitly mentioning mental health conditions in the body of the question.

HSLE measures are estimates of years lived in favourable states of health, such as years spent in good general health and years lived free from disabling health conditions. They provide an overview of the health of a population and enable sub-groups of the population to be compared spatially and socioeconomically. The coverage of current estimates includes all local areas of the UK and sub-groups of the population of England and Wales exposed to greater and lesser amounts of deprivation.

Accuracy

(The degree of closeness between an estimate and the true value.)

Subnational life expectancy

The subnational life expectancy calculations use abridged life tables (based on grouping ages) rather than complete ones (based on single year of age). Through procedures that have been extensively tested, these abridged tables are more suitable than complete life tables (based on single year of age) for calculating subnational life expectancy due to small numbers of deaths by single year of age, particularly among younger ages and in smaller local authorities. They are created using numbers of deaths registered in calendar years and mid-year population estimates.

Life expectancy (LE) figures are calculated as three-year rolling averages to provide large enough numbers to ensure that the results are sufficiently precise. However, we have started to produce estimates for single years in response to demand for more timely updates demanded by stakeholders for pandemic monitoring purposes. These estimates based on a single year of mortality data are not considered as robust as those based on aggregated three-year periods, but are now included in the data tables accompanying the release.

A template which shows how abridged life tables are calculated, is available.

Before the annual release, LE figures for local and unitary authorities are calculated as part of the process for quality assuring mid-year population estimates for England and Wales. The analyses highlight potential outliers in the distribution of new LE estimates and compare results with those calculated for the previous period.

For information about the underlying mortality and population data used for LE calculations, please see the following links:

- Deaths registered in England and Wales

- Deaths registered in Scotland

- Deaths registered in Northern Ireland

- Mid-year population estimates

Health state life expectancies

Health state life expectancies (HSLE) are secondary analyses of published survey, mortality and mid-year population estimates. As such, the data have already been subject to rigorous quality control procedures. Our HSLE are calculated subject to a rigorous documented quality control procedure. Calculations are performed using a Reproducible Analytical Pipeline (RAP) programmed in R open source software, which includes unit testing to ensure each programme function works as intended. The RAP minimises manual intervention when producing new estimates, and therefore reduces the risk of error. In future, R code to produce the data tables will be made available on Github.

Inconsistency and missing data checks are initially performed on the survey data. An example of an inconsistency would be where a person is reported not to have a long-standing illness but at the same time is recorded as having activity restriction resulting from a long-standing illness. Missing data and inconsistencies are deleted from the final survey dataset.

Uncertainty estimates of subnational life expectancies and health state life expectancies

LE and HSLE estimates are published with 95% confidence intervals (CIs) to allow the user to judge their precision and identify a plausible range of uncertainty in the estimate, which can be used to compare ages, sex, areas and deprivation strata. HSLE CI calculations are calculated from weighted prevalence and unweighted survey counts, outlined by the Sullivan method (PDF) and include an adjustment to improve the accuracy of the standard error by accounting for the multi-stage sampling design effects of the survey sources.

Subnational reporting in the latest release, which covers 2019 to 2021 and 2020 to 2022, is restricted to English regions; other local area types are not included because of quality concerns. The coronavirus (COVID-19) pandemic had a significant impact on the data collection for the Annual Population Survey (APS). Because of the reduced sample size, subnational estimates cannot be provided at geographies smaller than regions. We are prioritising the development of an updated methodology to calculate subnational estimates on health state life expectancies for future publications.

Coherence and comparability

(Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain, for example, geographic level.)

Life expectancy (LE) and health state life expectancies (HSLE) are indicators of mortality and population health, which is independent of any differences in the age structures of populations. Results for local areas and area deprivation strata can therefore be meaningfully compared, as can results for males and females.

LE and HSLE estimates at subnational level used to be calculated using an abridged life table closed at age 85 years and over. These are available for:

- estimates of life expectancy for local areas in the UK between 1991 to 1993 and 2010 to 2012

- estimates of life expectancy for local areas in England and Wales between 1991 to 1993 and 2012 to 2014

- healthy life expectancy and disability-free life expectancy for Great Britain between 1981 and 2001 (XLS, 55KB)

- healthy life expectancy and disability-free life expectancy for the UK between 2000 to 2002 and 2009 to 2011 (XLS, 2.89MB)

However, because of increases in the older population, an abridged life table closed at age 90 years and over was introduced for the release Health state life expectancies for local areas in the UK: 2013 to 2015 and a data back series was produced from 2001 to 2003 for LE and from 2011 to 2013 for HSLE. This means that LE estimates are comparable for local areas back to 2001 to 2003 using a life table closed at age 90 years and over, and for HSLE from 2011 to 2013 (XLS, 30.7MB). The impact of closing the life table at age 90 years and over has been reported on by the Office for National Statistics (ONS) in the publication Method changes to life and health state expectancies.

Individual deaths are assigned to geographical areas by linking the postcode of usual residence of the deceased to the latest version of the National Statistics Postcode Directory (NSPD). This means that figures for each three-year period may be based on slightly different boundaries, where, for example, postcodes are re-allocated from one area into another. The impact on life expectancy results is minimal and comparability over time is not therefore affected.

Deaths of non-residents are excluded from local area LE estimates, since they cannot be assigned to a geographical area. However, when LE estimates are calculated for England and Wales as a whole, non-residents are included as they do not need to be assigned to a specific geographical area.

The national life tables provide the gold standard period LE estimates for the UK and constituent countries. These are calculated using complete life tables (based on single year of age) and should be used when comparing results with other countries.

To provide comparisons for regional and local area figures, LE estimates for constituent countries are also produced within this output using the same method as the subnational results, with abridged life tables in which death and population data are aggregated into age groups. Therefore, the two sets of national figures may differ very slightly (usually by less than 0.1 years).

Scotland produces estimates of healthy life expectancy (HLE), Scottish healthy life expectancy (SHLE), that differ slightly from our estimates of HLE. This is because different survey sources are used; SHLE is based on the Scottish Health Survey.

There are a number of issues that arise when trying to compare HSLE derived from different sources or methods. In general, HSLE are sensitive to:

- measurement instruments used to collect the prevalence of health status, as the concept or definition of health may vary by survey or country

- the survey mode, for example, face-to-face interview, telephone interviews or postal or online surveys; between March 2020 and October 2023 the survey mode of Labour Force Survey and Annual Population Survey changed from face-to-face to telephone as a response to the coronavirus (COVID-19) pandemic

- exclusion or inclusion of institutionalised persons

Differences between HSLEs for different countries can often be explained by differences in these issues. It is therefore important that they are considered before attempting comparisons between countries, as also highlighted in a comprehensive review Policy Applications of Health Expectancy (Bone and others, 1995).

HSLE have previously been available for the UK and constituent countries back to 2000 to 2002. These estimates combine data from the General Lifestyle Survey (GLF) (formerly known as the General Household Survey (GHS)) for Great Britain and from the Continuous Household Survey (CHS) for Northern Ireland and Health Survey Northern Ireland (HSNI) from 2010.

Data for Great Britain and England are available dating back to 1980 to 1982, although there are gaps for the years 1995 to 1997, 1997 to 1999 and 1999 to 2001 because of suspension of the GHS in 1997 and 1999.

In 2005, the GHS underwent two changes. The first was a change from a cross-sectional survey to one with a longitudinal rotating panel design, becoming the GLF. This resulted in a loss of precision, and possibly accuracy in our estimates of healthy life expectancy (HLE) and disability-free life expectancy (DFLE). This change, along with an improvement in the method to account for sample selection, was reported in Update to the methodology used to calculate health expectancies for the UK and constituent countries (PDF, 611KB).

The second change was that the general health survey question used in the calculation of HLE was harmonised to the European Union Statistics on Income and Living Conditions (EU-SILC) Minimum European Health Module question containing five health state categories. This change in the data input and the derived definition of "good" general health led to a substantial fall in the absolute value of HLE, which was reported in Health Statistics Quarterly (An investigation into the impact of question change on estimates of General Health Status and Healthy Life Expectancy (PDF, 275KB).

A simulated time series of HLE was developed to provide users with a consistent synthetic series between 2000 to 2002 and 2004 to 2006, leading to the adoption of the harmonised measure of HLE in 2005 to 2007. The HLE estimates are now broadly comparable with that of EU member states and are also consistent with used in the 2011 and 2021 Census.

From 2016, a new UK HLE and DFLE time series was published, which has estimates from 2009 to 2011 based on the Annual Population Survey (APS). This is not comparable with previous estimates and encompasses local areas in the four constituent countries, together with combined authorities and Welsh Health Boards, although the time series start for local areas is different for the UK constituent countries. For Wales, Scotland and Northern Ireland local areas it is available from 2013 to 2015; for England local areas it is available from 2009 to 2011.

Accessibility and clarity

(Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the release details, illustrations and accompanying advice.)

For accessible content we use a combination of HTML web pages for narrative, charts and graphs, with data being provided in usable formats such as CSV and Excel. Our website also offers users the option to download the narrative in PDF format. For further information please refer to the contact details at the beginning of this report.

For information regarding conditions of access to data, please refer to the following links:

- [Terms and conditions (for data on the website)](#)

- [Accessibility](#)

In addition to this Quality and Methodology Information, basic quality information relevant to each release is available in the quality and methodology section of the relevant statistical bulletin.

Timeliness and punctuality

(Timeliness refers to the lapse of time between publication and the period to which the data refer. Punctuality refers to the gap between planned and actual publication dates.)

The annual release of health state life expectancy for local areas of the UK figures is announced on the [GOV.UK release calendar](#) 12 months in advance. If there are any changes to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change will be explained fully at the same time, as set out in the [Code of Practice for Statistics](#).

Life expectancy estimates for local areas of the UK are usually published alongside the National life tables release in September (nine months after the end of the reference period), following the release of annual death registrations data and subnational mid-year population estimates for the previous year in each country by July. However, there has been a delay to the Scotland estimates because of Scotland delaying their decennial census to 2022 meaning the rebased populations were not available for use in the January 2024 release. Figures for Scotland will be added to the release the next time the publication is updated.

Life expectancy estimates are produced on a three-year rolling average basis to provide large enough numbers to ensure that the figures are sufficiently robust. However, we also produce estimates for single years following user demand for more timely estimates during the pandemic period. Single year estimates are not as precise or stable as the three-year rolling average estimates.

HSLE for local areas are usually published in December each year (12 months after the end of the reference period). These estimates are also produced on a three-year rolling average basis, to provide large enough numbers to ensure that the figures are sufficiently robust. Both LE and HSLE figures have been mostly punctual with the exception of releases during the pandemic period or when there was a need to wait for rebased mid-year population estimates. In addition, there has been a delay to the revised time series for Scotland and its council areas because of the delay to the decennial census in Scotland, which delayed the availability of their rebased mid-year population estimates. For this reason, a UK figure for HSLE is also delayed and not available for the March 2024 publication.

The annual release of Health state life expectancies by national deprivation deciles in England and national deprivation quintiles in Wales is also announced on the [GOV.UK release calendar](#) 12 months in advance. Results are usually published in March each year, following the release of the [Lower-layer Super Output Area mid-year population estimates](#) in September each year, required for its calculation.

The design and frequency of the Health state life expectancies releases was subject to review as part of the [Consultation on health and social care statistical outputs](#) that closed on 5 March 2024. Recommendations are expected in June 2024. Currently, we produce the following LE and HSLE publications annually:

- [Life expectancy for local areas and constituent countries of the UK](#)

- [Health state life expectancies by national deprivation deciles, England](#)

- [Health state life expectancies by national deprivation quintiles, Wales](#)

- [Health state life expectancies, UK](#), constituent countries and local areas

The proposal put forward in the consultation is to merge all current annual publications into one biennial life expectancy and health state expectancy publication.

Output quality trade-offs

(Trade-offs are the extent to which different dimensions of quality are balanced against each other.)

Life expectancy figures are not routinely calculated by us for areas smaller than local authorities because of small numbers of deaths and populations. More information can be found in our report Life expectancy at birth: methodological options for small populations (PDF, 289KB). However, for five-year periods centred on the census year, we have produced health state life expectancies for Middle-layer Super Output Areas (MSOAs) and Census 2011 Wards. Estimates of life expectancy by MSOA are also available on the OHID fingertips tool.

We pool three years' worth of mortality and health state prevalence data to improve precision of estimates, but this constrains the timeliness of releases and prompt assessment of progress on health improvement on these metrics.

Why you can trust our data

The Office for National Statistics (ONS) is the UK's largest independent producer of statistics and is the country's national statistical institute. The Data Policies and Information Charter, available on the ONS website, details how data are collected, secured and used in the publication of statistics. We treat the data that we hold with respect, keeping it secure and confidential, and we use statistical methods that are professional, ethical and transparent.

6 . Methods used to produce the data

Life expectancy (LE) is calculated using the standard Chiang II (PDF, 5.2MB) abridged life table method. However, a minor modification has been added to the Chiang II life table calculations. This was to enable the calculation of a confidence interval at the final age group, 90 years and over. For this, a method developed by Silcocks and others (2001) has been used and its impact has been published in a methods paper Method changes to life and health state expectancies in 2016.

Our statistics on health state life expectancies (HSLE), healthy life expectancy (HLE) and disability-free life expectancy (DFLE), all use the same core methodology, the Sullivan method (PDF). This method combines survey data, self-assessed general health and activity restriction from the Annual Population Survey (APS), with life expectancy to calculate the average number of years lived in a given state of health from a given age.

Using the Annual Population Survey for health state information

Prevalence of good health is estimated using the APS, a continuous survey of households in the UK. We always use the latest version of the APS data available. Each quarterly rolling annual dataset consists of wave 1 and 5 of the quarterly Labour Force Survey (LFS) and additional boost cases in England, Wales and Scotland, which are added to ensure that a sufficient number of interviews are conducted with economically active people in each local education authority area.

The APS is the recommended source of statistical information for analysis at unitary authority and local authority district level. The APS three-year pooled dataset is designed to allow more robust analysis at lower-level geographies, if the sample size of the single year APS dataset is not sufficient.

The three-year pooled dataset contains around 530,000 respondents and largely only includes variables that appear in all of the three years it covers.

Although the design of the APS has a longitudinal element, the aggregated three-year period used in the subnational analyses of DFLE and HLE ensures the study population used excludes duplicate survey responders. This is done by selecting wave 5 LFS from year 1, waves 1 and 5 LFS from year 2, wave 1 LFS from year 3, and waves 1 and 4 APS boost from all waves. Survey data are weighted to match age, sex and regional profiles with mid-year population estimates. This calibration process ensures consistency between survey and population estimates and, additionally, compensates for potential bias that might arise from differential non-response among different subgroups in the sample selected for the survey.

The APS excludes residents of communal establishments such as care homes, but does include NHS housing and students in halls of residence where inclusion takes place at their parents address (See Volume 1 of the LFS user guide (PDF, 1.17MB)).

Further information on survey data weighting is given in the Labour Force Survey User Guide Volume 6: Annual Population Survey (Local Area Database) User Guide (PDF, 858KB).

Estimating subnational health state prevalence

To prepare the survey data for the Sullivan method, a set of adjustments are applied to the three years APS pooled dataset. Firstly, health state prevalence is fitted to better represent the known exponential relationship between age and health status, which aims to mitigate the sizeable random fluctuations observed in subnational survey data on health state prevalence.

Secondly, to impute a plausible health prevalence at both younger and very old ages greater than 84 years. Both adjustments use the Census 2011 and Census 2021 health data as they are considered a robust estimate of self-reported health at a point in time and cover the entire UK population.

The fitting of health state prevalence is achieved using a least squares regression model that includes a quadratic explanatory age variable and the interpolated health state prevalence derived from 2011 and 2021 Census data. This model is estimated separately for males and females for each area.

A set of adjustment factors are calculated based on the proportional difference found in census data to impute health state prevalence for age groups that the APS either does not cover or where APS data is too sparse. These are the age groups under 16 years (under 1, 1 to 4, 5 to 9, 10 to 14, 15 years) as the APS sample does not cover under 16-year-olds, and the age groups over age 84 years (85 to 89, 90 years and over), where for many local areas the APS data are too sparse. The age group 15 to 19 years is used as a proxy for age group 16 to 19 years captured in APS data and therefore the proportional difference between ages 15 to 19 years and 10 to 14 years found in interpolated estimates is applied to the age group 16 to 19 years captured in APS data.

Table 1: Example of adjustment factors used for health state prevalence for age groups under 15 and over 84 years, England, females, Census 2011 and Census 2021

Age group	Proportion in Very Good or Good health (%) Census 2011	Adjustment factor 2011	Proportion in Very Good or Good health (%) Census 2021	Adjustment factor 2021
<1	97.84	1.0017	98.54	1.0027
01 to 04	97.67	1.0003	98.27	1.0038
05 to 09	97.64	1.0033	97.90	1.0095
10 to 14	97.31	1.0202	96.98	1.0361
15 to 19	95.39	[z]	93.59	[z]
80 to 84	35.26	[z]	47.22	[z]
85 to 89	27.36	0.7760	36.16	0.7658
90+	22.19	0.8110	27.60	0.7633

Source: Office for National Statistics

Notes

1. [z] = 'not applicable'.

For each of the age groups not covered by the APS, the adjustment factors give the ratio of health state prevalence between the two adjacent age groups in the interpolated census estimates. An example of the adjustment factors for females in England at the 2011 and 2021 Census follows:

The introduction of interpolated health state prevalence estimates in the periods between 2011 and 2021 Censuses means we now have distinct adjustment factors for each period from 2011 to 2013 and 2020 to 2022. This assumes the trajectory in health state prevalence between 2011 and 2021 was linear.

The interpolated census health state prevalence estimates are also used in the fitting of health and disability-free state prevalence (previously Census 2011 prevalence was used for all periods). This is the take account of the trajectory in health state prevalence observed at census between 2011 and 2021. While the questions used to estimate activity restricting health conditions and illness are different at the 2011 and 2021 Census in England and Wales, and Scotland and Northern Ireland used the same question in 2011 and 2021, it is believed they are sufficiently comparable to apply linear interpolation. See our report on question changes and comparability.

The MS Excel template provides a detailed description of the standard methods and notation associated with the calculation of health state life expectancies.

Prevalence of living without a longstanding physical or mental health condition or illness which restricts day-to-day activities (being disability-free) is also fitted using the APS data, but the data items used to derive statistical measures of disability were changed in April 2013. For this reason, disability-free life expectancy (DFLE) has only been introduced from 2014 to 2016.

Geographical boundaries

Each publication uses the most recent available administrative boundaries at the time of creating the estimates and applies these boundaries to the whole time series. This ensures that estimates over time always relate to the same geographical area and valid comparisons can be made. This also means that estimates published at different times for the same administrative area do not always relate to the same geographical area. For example, the county of Dorset reported in previous periods has now been replaced by the Unitary Authority of Dorset, which has a different geographical boundary and population.

Method for health state life expectancies by area deprivation

Health state life expectancies by national deprivation deciles, England and Health state life expectancies by national deprivation quintiles, Wales are also produced using the APS health data. These outputs compare deprivation quantiles (decile or quintile, respectively) and quantify the socioeconomic gap between the least and most deprived populations, using the Slope Index of Inequality.

The prevalence of "good" and "not good" general health is computed for each quantile in each country using APS data starting with the period 2009 to 2011 in England and 2011 to 2013 in Wales. These data are combined with mortality data to compute expectation of life for each quantile in "good" general health. Prevalence of "good" health is fitted in the same way as in the local areas of the UK release. The release has been extended to include DFLE from 2014 to 2016 onwards.

National quantiles of area deprivation are grouped small geographical populations known as Lower-layer Super Output Areas (LSOAs) on the basis of the extent to which their local populations are deprived across a number of dimensions of deprivation. This is achieved by ranking according to deprivation score and grouping them into 10 divisions in England and five divisions in Wales. For example, for England each decile represents approximately 10% of the national population, with decile one containing the 10% most deprived LSOAs and decile 10 the 10% least deprived.

For England, the deciles are based on the Index of Multiple Deprivation (IMD). In 2019 the IMD was updated (IMD 2019) so for the period 2016 to 2018 IMD 2019 is used, prior to that IMD 2015 is used.

For Wales the quintiles are based on the Welsh Index of Multiple Deprivation. In 2019 the WIMD was updated (WIMD 2019) so for the period 2016 to 2018 WIMD 2019 is used, prior to that WIMD 2014 is used.

The national deprivation groupings are scores based on the area as a whole and not everyone within a LSOA is necessarily experiencing the same level or type of deprivation (not everyone living in a "deprived" area is deprived and not all deprived people live in deprived areas). For example, some unemployed individuals live in less deprived LSOAs, while some higher-income individuals live in more deprived LSOAs. Similarly, quantiles are a broad grouping and the levels of deprivation and the underlying factors determining the LSOA-level deprivation score will vary within the quantile.

Slope Index of Inequality

The socioeconomic inequality in LE and HSLE is estimated using the Slope Index of Inequality (SII), a measure of the absolute gap in years of life lived in total, and additionally lived in "good" general health and disability-free. In addition, the ranges in these statistical measures of health are also provided as absolute measures of inequality, taking the simple difference between the least and most deprived quantile.

The SII can be interpreted in the same way as the range but takes into account inequality across the whole distribution, as well as giving greater weight to larger populations and less weight to smaller populations. This means that the higher the SII, the more unequal the population is with regard to the outcome of interest.

It is worth noting that the Office for Health Improvement and Disparities (OHID) also calculate the SII in life expectancy within lower tier local authorities, which is published in the Public Health Outcomes Framework (PHOF) back to 2010 to 2012.

To calculate the SII the following method is used.

Quantiles are ordered by decreasing area deprivation, that is, from the most to the least deprived. A social median rank is calculated as the explanatory variable in the weighted regression model. Firstly, the fraction of the total population in each quantile (f) is determined. Secondly, the cumulative frequency (ci), that is, the cumulative sum of the population in successively less deprived quantiles, was also obtained and the relative deprivation rank (x) for each quantile was calculated. This is formulated:
$$x = c_{j-1} + (0.5f)$$

The formula calculates the relative deprivation rank for use in the SII calculation. The HSLE for each quantile are then regressed by the relative deprivation rank and weighted by quantile-specific fraction of the total population to produce a line of best fit extending from the most- to least-deprived hypothetical population.

Confidence interval details for SII indicators

The confidence intervals for the SII are calculated using a simulation program. Simulation is a method used to estimate the degree of uncertainty for measures where the statistical distributions underpinning the measure are too complex to analyse mathematically.

For each quantile, the life expectancy (LE), healthy life expectancy (HLE) and disability-free life expectancy (DFLE) have been calculated along with its standard error (SE). These SEs give information about the degree of uncertainty around each of the health state life expectancy values: essentially, it describes a statistical distribution for each quantile.

Using a random-number-generating algorithm, a random value is taken from each quantile LE and HLE distribution and the SII recalculated. This is repeated many times (for example, 1,000,000), to build up a distribution of SII values based on random sampling from the quantile distributions. The 2.5% and 97.5% values from this distribution of SII values are then reported as the 95% confidence interval for the SII, rather than that based on 10 or 5 observations representing the quantiles.

7 . Other information

Assessment of user needs and perceptions

(The processes for finding out about use and users, and their views on the statistical products. are maintained with a range of users including those from government and academics.)

Understanding user needs is important to us, and we invite feedback from users regarding both the statistical bulletin and this Quality and Methodology Information report. Face-to-face meetings and email and telephone correspondence is maintained with a range of users including government users, academics, students and interested individuals.

A user consultation was held in 2017 to review the proposed method changes to UK health state life expectancies. Users were also consulted as part of the UK Statistics Authority assessment of compliance with the Code of Practice for Statistics.

The Ageing, Disability and Social Care Team maintains a list of known users including which statistical outputs they use and how they use them. All known users will be invited to participate in any future consultation.

Feedback is also received through our regular attendance at Royal Statistical Society Health Statistics User Group meetings and academic conferences.

We welcome your feedback. If you have any comments or questions about the statistical bulletin or this Quality and Methodology Information, please get in touch at ageing.disability.socialcare@ons.gov.uk.

8 . Related links

National life tables – life expectancy in the UK: 2020 to 2022
Bulletin | Released 11 January 2024
Trends in period life expectancy, a measure of the average number of years people will live beyond their current age, analysed by age and sex for the UK and its constituent countries.

Past and projected period and cohort life tables: 2020-based, UK, 1981 to 2070
Bulletin | Released 12 January 2022
Life expectancy (e), probability of dying (q) and number of persons surviving (l) from the period and cohort life tables, using past and projected mortality data from the 2020-based interim national population projections (NPPs), for the UK and constituent countries.

Inequalities in life expectancy and healthy life expectancy in Wales
NHS Wales web page | Last updated 9 June 2022

Life expectancy figures for Scotland
National Records of Scotland web page

Healthy Life Expectancy in Scotland
National Records of Scotland web page

Life Expectancy in Northern Ireland
Department of Health Northern Ireland web page

Public Health Outcomes Framework
Office for Health Improvement and Disparities web page

Health state life expectancy by 2011 Census wards, England and Wales: 2009 to 2013
Article | Released 7 March 2018
Estimates of health state life expectancy for small area populations for males and females at birth and age 65 years. The differences between small areas allows the scale of inequality to be determined.

Health expectancies at birth and at age 65 in the UK, based on 2011 Census health and disability prevalence data: 2010 to 2012
Article | Released 11 October 2016
Estimates of health state life expectancies for the UK, its constituent countries and their subnational areas using 2011 Census health and disability prevalence data.

Health Expectancies at Birth for Middle Layer Super Output Areas (MSOAs), England: 2009 to 2013
Article | Released 25 September 2015
Estimates of health expectancy for small area populations based on self-assessed health and self-assessed activity limitation.

Inequality in Health and Life Expectancies within Upper Tier Local Authorities: 2009 to 2013 Bulletin | Released 20 November 2015 Absolute difference of years spent in favourable health states between the least and most deprived areas, based on the Slope Index of Inequality.

Life tables ONS web page Graduated life tables which give statistics on national life expectancy for England and Wales. Published once every 10 years.

9 . Cite this methodology

Office for National Statistics (ONS), released 26 March 2024, ONS website, quality and methodology information report, Health state life expectancies, UK QMI