Health state life expectancies, UK QMI: 2021 to 2023

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.

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Notice

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This quality and methodology information has been superseded by our Healthy life expectancy quality and methods guide and our Life expectancy for UK local areas quality and methods guide.

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1 . Output information

- 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 and health state life expectancies are important high-level measures of a population's health status.
- Period life expectancy (LE) 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.
- Health state life expectancies are summary measures of population health, adding a quality of life dimension to estimates of life expectancy (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 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.

Health state life expectancies (HSLEs) 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 normally 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.

The comparability of DFLE estimates across countries and over time is affected by differences in question wording in the census. Comparisons between DFLE estimates in the March 2024 release can be made over time for Northern Ireland but not for England and Wales; comparisons can also be made across England (and English regions) and Wales, but not with Northern Ireland. Further releases of DFLE estimates will not be produced until a suitable method to align estimates based on the different census questions has been developed. See Section 5: Quality characteristics of the data for more detail.

Recent improvements

Change in method to estimate good health prevalence

Because of decreasing sample sizes of the main data source, our Annual Population Survey (APS), releases from December 2024 onwards are classed as official statistics in development. It also uses a new, interim methodology to estimate prevalence of "good" health using logistic regression modelling to mitigate the extent of measurement error observed following decreases in sample size. More information can be found in this Estimating good health prevalence for use in healthy life expectancy outputs article.

Improved variance estimation

In releases published from December 2024 onwards, the variance of the HSLE estimates has been amended to better reflect the uncertainty in the proportionality of health state prevalence between imputed age groups and other age groups instead of treating them as independent. Imputed age groups are those for which the APS either excludes from its sample (ages under 16 years) or samples are inadequate for local area estimation (ages over 84 years).

Use of rebased mid-year population estimates

All releases published from January 2024 onwards use mid-year population estimates from 2012 to 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]. These new populations are currently only available for England, Northern Ireland and Wales. Once Scotland publishes their new population estimates rebased on their 2022 Census, 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 Census 2021. 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 APS does not cover (or in age groups where APS data are too sparse)
- to adjust (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 2] 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. From year 2022 onwards we use the Census 2021 value.

The July 2025 release of Healthy life expectancy by national area deprivation in England and Wales: between 2013 to 2015 and 2020 to 2022 is the first release by national area deprivation to apply these methodological improvements.

Uses and users

Life expectancy 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 life expectancy 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 and academic institutions such as the Institute for Health Equity and the Institute and Faculty of Actuaries

Life expectancy 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. Life expectancy figures are also presented for local authority areas in OHID's Public Health Outcomes Framework.

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

Our health state life expectancies (HSLEs) 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, DHSC have a responsibility to level-up the nation's health by reducing disparities. Healthy life expectancy (HLE) has been identified as a key 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 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. 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. Health state life expectancy at subnational level and by measures of socioeconomic status were used in the most recent review in 2022. 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 health state life expectancy are keeping track with improvements in life expectancy.

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

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[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] Linear interpolation is a mathematical function that estimates unknown values between two or more known values, allowing gaps in data to be populated; 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 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 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 healthy life expectancy (HLE) and disability-free life expectancy (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 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 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. The 2011 Census in England and Wales, the 2021 Census in Northern Ireland and the 2022 Census in Scotland had a different wording. They do not have a two-stage question, rather they ask directly "Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months?" and they had the instruction "Include problems related to old age".

A report on question changes found they were broadly comparable, and based on this were found suitable to use in interpolated census health prevalence. However, removing the instruction "Include problems related to old age" leads to substantially lower proportions of older people responding that they are limited in their activities. Therefore, DFLE estimates in the March 2024 release cannot be fully compared over time, and for the more recent periods estimates from England and Wales cannot be compared with estimates from Northern Ireland.

Further investigation of different wording and underlying conceptual definitions will be necessary to quantify their effects and correct for the differences observed, before DFLE will be included in the releases again.

Relevance

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

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

- estimates of period life expectancy
- estimates of health state life expectancy

Estimates of period life expectancy (LE) 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 and the Welsh Index of Multiple Deprivation.

Estimates of health state life expectancy 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 Index of Multiple Deprivation (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 Welsh Index of Multiple Deprivation (IMD)
- 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.

Health state life expectancy 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 subgroups of the population to be compared spatially and socioeconomically.

The coverage of estimates usually includes all local areas of the UK and subgroups of the population of England and Wales exposed to greater and lesser amounts of deprivation. The latest release only covers local areas England and Wales and English regions; Scotland and Northern Ireland local areas, as well as combined authorities and integrated care boards in England will be added once the necessary complementary data is available.

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 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 datasets accompanying the release.

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

Before the annual release, life expectancy 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 life expectancy estimates and compare results with those calculated for the previous period.

For information about the underlying mortality and population data used for life expectancy 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 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 health state life expectancies 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

Life and health state life expectancy 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. Health state life expectancy (HSLE) CI calculations are calculated from weighted prevalence and unweighted survey counts, outlined by the Sullivan method 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. In the December 2024 release, the variance estimation for HSLE estimates was improved to better reflect the uncertainty in the proportionality of health state prevalence between imputed age groups (less than1, 1 to 4, 5 to 9, 10 to 14, 85 to 89, 90 years and over) and other age groups instead of treating them as independent: imputed age groups are those for which the Annual Population Survey either excludes from its sample (ages under 16 years) or samples are inadequate for local area estimation (ages over 84 years).

Previously, the variance was estimated using the following equation:

$$\widehat{Var}\left(HLE_x\right) = \frac{1}{l_x^2}\sum_{i=x}^{\omega}\widehat{Var}\left(\pi_i\right)L_i^2.$$

Where:

l_x is the number of people alive at the start of a given age group.

x is an age interval such as 20 to 24 years.

Varsubscript hat($_i$) is the standard variance calculation for a survey proportion ($_i$*(1- $_i$)/N/design effect).

L_i is the person years lived in age intervals.

We impute health state prevalence for ages less than 1, 1 to 4, 5 to 9, 10 to 14, 85 to 89, 90 years and over using the census adjustment factors they are directly proportional to the age groups 16 to 19 years and 80 to 84 years, respectively. The variance calculation above ignores the probability associated with this proportionality and treats them as independent.

Our new approach to calculating the variance reflects the correlation that is a result of the proportional relationships between health state prevalence in imputed age groups instead of assuming independence. To account for this direct proportionality, while retaining the regression-adjusted values for the proportions
$\hat{\pi}_x$
we define the ratios
$\varrho_x = \hat{\pi}_x^R/\hat{\pi}_5^R, x = 1,\ldots,5$
and
$\varrho_x = \hat{\pi}_x^R\hat{\pi}_{18}^R, x = 18,\ldots,20$
so that algebraically we have the modified variance:

$$\widehat{Var}\left(HLE_0\right) = \frac{1}{l_0^2}\left[\left(\sum_{i=1}^{5}\varrho_i L_i\right)^2\frac{\hat{\pi}_5^R\left(1-\hat{\pi}_5^R\right)}{N_5/D_{eff,5}} + \sum_{i=6}^{17}\frac{L_i^2\hat{\pi}_i^R\left(1-\hat{\pi}_i^R\right)}{N_i/D_{eff,i}} + \left(\sum_{i=18}^{20}\varrho_i L_i\right)^2\frac{\hat{\pi}_{18}^R\left(1-\hat{\pi}_{18}^R\right)}{N_{18}/D_{eff,18}}\right].$$

Where:

Q_i are the derived ratios from the predicted prevalence using the fitted values from the model for the age groups involved in the imputation.
$\widehat{Var}\left(HLE_0\right)$
is the variance of HLE at birth.

l_0 the cohort alive from birth.
$\hat{\pi}_x^R$
= the new derived ratios from the predicted prevalence using the fitted values from the model for the age groups not imputed.

L_i Person-years lived in age interval i.

D_{eff} = Design effect, set to 1.

N_i = survey base for age group i.

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 and health state life expectancies 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.

Life expectancy 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 back series was produced from 2001 to 2003 for life expectancy and from 2011 to 2013 for HSLE. This means that life expectancy 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 life expectancy estimates, since they cannot be assigned to a geographical area. However, when life expectancy 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 life expectancy 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.

There are a number of issues that arise when trying to compare health state life expectancies (HSLEs) derived from different sources or methods. In general, HSLEs 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 LFS/APS changed from face-to-face to telephone as a response to the 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 (Bone and others, 1995).

Health state life expectancies 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 Health Statistics Quarterly number 45 (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, 275.3KB).

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 definition of general health was introduced from 2005 to 2007. The HLE estimates are now broadly comparable with that of EU member states and the UK's 2011 and 2021 Censuses.

From 2016, a new UK HLE and DFLE time series was published. HLE has estimates from 2009 to 2011 and DFLE from 2014 to 2016 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. HLE for Scotland and Northern Ireland local areas is available from 2014 to 2016, for England local areas it is available from 2009 to 2011 and for Wales from 2011 to 2013. DFLE is available from 2014 to 2016 for local areas of the UK.

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 Data sources and quality 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 (9 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. If there are delays in the required data for a constituent country of the UK, figures for this country 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 life expectancy 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 2024 publications.

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 LSOA 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 in March 2024.. Currently, we produce the following life expectancy health state expectancies 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

These will gradually be merged into one life expectancy and health state expectancy publication. We expect annual reporting to continue.

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 due to small numbers of deaths and populations. More information can be found in a report titled Life expectancy at birth: methodological options for small populations. 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 statistics institute. The Data Policies and Information Charter, available on the ONS website, detail 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. More information about our data policies is available.

6 . Methods used to produce the data

Life expectancy is calculated using the standard Chiang II 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 in 2016.

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

Using Annual Population Survey (APS) for health state information

Health state prevalence is estimated using the Annual Population Survey (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, wave 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).

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.

Because of decreasing sample sizes of the APS, releases using APS data are currently classed as official statistics in development.

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. First, the probability of reporting "good" general health is calculated. The probability is predicted for single years of age using logistic regression modelling (the model uses age interacted with sex and region (England) or country (Scotland, Wales and Northern Ireland) of residence, with local authority as a main effect). A weighted average is then taken to produce a predicted prevalence for each five-year age group-sex-geography grouping. This method was introduced for the December 2024 release to mitigate the recent decline in APS sample sizes and replaces the previous direct estimation of health state prevalence as survey proportion using the R glinjack package and is also applied to the estimation of HLE by national area deprivation.

Next, a plausible health prevalence at both younger and very old ages is imputed. 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 (ages under 16 years), or where APS data are too sparse (ages over 84 years). The age group 15 to 19 years is used as a proxy for age group 16 to 19 years captured in APS data, 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.

For 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 is shown in Table 1.

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'.

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 2021 to 2023. This assumes the trajectory in health state prevalence between 2011 and 2021 was linear.

Finally, health state prevalence is fitted using a least squares regression model including a quadratic explanatory age variable and the interpolated health state prevalence derived from 2011 and 2021 Census data. This model was designed to better represent the known exponential relationship between age and health status, mitigating the sizeable random fluctuations observed in subnational survey data on health state prevalence, and also to account for the different levels of health in care home populations that are not covered by APS data. Prior to the recent decline in APS sample size it largely eliminated the sharp irregular deviations between adjacent age groupings found in some areas using observed APS data.

Prevalence of living without a longstanding physical or mental health condition or illness which restricts day-to-day activities (being disability-free) is fitted in the same way, using the APS data, but the question items were changed in April 2013, therefore the disability-free life expectancy time series starts 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 does 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 expectancy by area deprivation

Healthy life expectancy by national area deprivation, England and Wales is 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. 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.

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.

As analysis for England and Wales split the population into different quantiles, and are based on different indices of multiple deprivation, results are not comparable across countries.

The national deprivation groupings are scores based on the area as a whole and not everyone within a Lower layer Super Output Area (LSOA) necessarily experiences 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.

For both England and Wales, the Index of Multiple Deprivation (IMD) versions required for this analysis are based on lower layer Super Output Area (LSOA) 2011. To use these indices with data based on 2021 LSOA, for England, we use the adjusted IMD scores for IMD2015 and IMD2019 published by OHID. For Wales, we follow the procedure used by Welsh Government in their Analysis of population characteristics by area deprivation (Census 2021) to use the Welsh Indices of Multiple Deprivation WIMD2014 and WIMD2019.

Analysis of APS, population and deaths data for England uses IMD2015 scores for periods between 2011 to 2013 and 2015 to 2017. For periods from 2016 to 2018 onwards, adjusted IMD2019 is used. Analysis of the same data for Wales uses WIMD2014 for periods up to 2015 to 2017 and WIMD2019 from 2016 to 2018 onwards.

For the creation of interpolated census "good" health prevalences, we use Census 2011 with adjusted IMD2015 and WIMD2014, respectively, and Census 2021 with adjusted IMD2019 and WIMD2019. For the two end points, Census 2011 and Census 2021, this represents the most appropriate derivation; unavoidably, for the 3-year interpolated periods it results in mix of IMD versions.

Slope Index of Inequality

The socioeconomic inequality in life expectancy 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 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 we order quantiles 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 as:

$$x = c_{j-1} + (0.5f)$$

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 Population Health Monitoring 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 using the email address provided.

8 . Related links

- National Life tables
- Past and projected period and cohort life expectancy
- Inequalities in life expectancy and healthy life expectancy in Wales
- Life expectancy figures for Scotland
- Life Expectancy in Northern Ireland
- Public Health Outcomes Framework
- Health state life expectancy by 2011 Census wards
- Granular health state life expectancy for local areas of UK
- Small area health state life expectancy by middle layer super output area
- Slope index of inequality in healthy life expectancy in upper tier local authorities in England
- English Life Tables No.17

9 . Cite this methodology

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