Quality and Methodology Information

General details

Title of output: Health expectancies at birth and at age 65 in the United Kingdom\(^1\)
Inequality in disability-free life expectancy by area deprivation: England\(^2\)
Disability-free life expectancy, sub-national estimates for England\(^3\)

Abbreviated title: Not applicable
Designation: National Statistics\(^1\), Official statistics undergoing National Statistics accreditation\(^2,3\)

Geographic coverage: UK and constituent countries\(^1\), Clusters of Lower Super Output areas in England\(^2\), English regions and local authority districts in England\(^3\)

Date of last SQR or QMI\(^\ast\): SQR\(^1\), February 2011, not applicable\(^2,3\)
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Executive summary

Health Expectancies (HE) are extensions of Period Life Expectancy (LE)\(^4\) which combine morbidity and mortality data to produce estimates of the span of life that a person can expect to live in very good or good health; Healthy Life Expectancy (HLE), or without a limiting long-standing illness or disability; Disability-Free Life Expectancy (DFLE). This partitioning of length of life into periods spent in various health states provide a quality dimension to LE. These metrics provide an informative summary measure of the health status of the population.

The reporting of HE estimates by ONS date back to 1980-82 for Great Britain\(^5\) and to 2000-2002 for the UK as a whole\(^6\). Sub-national HEs have in the past been calculated exclusively from census data. In response to stakeholder requests for more up to date figures we have developed a set of official statistics reporting DFLE at sub-national levels\(^2,3\). These statistics differ from the UK estimates by survey source and geographical coverage only, the underlying methodology remains consistent across ONS health expectancy outputs. Developments in reporting sub-national DFLE were reported in two separate articles, (Smith et al., 2010\(^7\); Smith et al., 2011\(^8\) in the ONS peer-review journal, Health Statistics Quarterly\(^9\).

This document contains the following sections:
- Output quality
- About the output
- How the output is created
- Validation and quality assurance
- Concepts and definitions
- Other information, relating to user needs, and
- Sources for further information or advice

Output quality

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

ONS has developed Guidelines for Measuring Statistical Quality; these are based upon the six European Statistical System (ESS) quality dimensions. This document addresses these quality dimensions and other important quality characteristics, which are:

\(*\) Quality and Methodology Information' (QMI) replaced 'Summary Quality Reports' (SQR) from 04/11
Relevance

The degree to which the statistical outputs meet users’ needs.

ONS health expectancy outputs are produced on an annual basis and cover the UK and constituent countries, English regions, local authority districts and clusters of Lower Super Output Areas (LSOAs) grouped according to their area deprivation quintile as measured by the Index of Multiple Deprivation (IMD)\(^{10}\).

UK and constituent country level data are available in rolling three-year aggregate periods dating back to 2000-2002. These estimates combine data from the General Lifestyle survey (GLF)\(^ {11}\) (formerly known as the General Household Survey (GHS)) for Great Britain and from the Continuous Household Survey (CHS)\(^ {12}\) for Northern Ireland (NI). Survey data are combined with interim life tables\(^ {13}\) and mid-year population estimates\(^ {14}\) to give a measure of the quality of remaining years of life by age-group, sex and area.

From 2010, survey data for NI will be captured from the Health Survey Northern Ireland (HSNI)\(^ {19}\).

The underlying methodology is consistent across all ONS health expectancy outputs. However, the underlying survey source data changes depending on the geographical area under analysis. For example, the national estimate of DFLE for England derived from Annual Population Survey (APS) data, used for benchmarking sub-national estimates, may be different from that calculated for the England estimates in the national time series.


In 2005 the GHS underwent a change in survey design, from a purely cross-sectional survey to one with a longitudinal rotating panel design, becoming the GLF. This change led to a substantial fall in the amount of cross sectional survey data available for analysis. There was a consequent loss of precision, and possibly accuracy, in ONS estimates of HLE and DFLE, evidenced by a widening in the 95 per cent Confidence Intervals (CI) surrounding each estimate. This loss of precision has important implications for detecting change over time as statistically significant changes can be determined by non-overlapping 95 per cent CIs, which can be used to test for health improvement or deterioration. This change, along with an improvement in the method to account for sample selection, was reported in Health Statistics Quarterly (HSQ)\(^ {15}\) (Smith et al., 2010a)\(^ {16}\).

Also in 2005, 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)\(^ {17}\) 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 HSQ (Smith and White, 2009)\(^ {18}\). A simulated time series of HLE was developed to provide users with a consistent synthetic series from 2000-2002 to 2004-2006 leading to the adoption of the harmonised measure of HLE in 2005-2007. ONS HLE is now broadly comparable with that of other EU member states, and has the added advantage of consistency with data available from the 2011 Census.

ONS National Health Expectancies statistical bulletins\(^ {1}\) are published online on the ONS website and present data for males and females at birth (0 to 4 years) and at age 65 (65 to 69 years). ONS also publishes data reference tables\(^ {20}\) in an Excel workbook which provides figures dating back to 2000-2002 and includes pivot tables for all age groups and a calculation template. Data in other formats are available on request from the ONS Disability and Health Measurement Team; hle@ons.gov.uk.
A review of ONS national health expectancy series in 2008 identified the need for more timely (i.e., inter-censal), releases of sub-national health expectancies and an exploration of the link between health and deprivation. In response, and in collaboration with the Department of Health, ONS developed two statistical outputs; Disability-free life expectancy sub-national estimates for England and Inequality in Disability-free life expectancy by area deprivation: England.

Further information about this review and a more recent assessment can be found in this report in the Other information, assessment of user needs and perceptions section.

Disability-free life expectancy, sub-national estimates for England are also based on rolling three-year aggregate periods and are produced on an annual basis. The current series, which includes an article documenting the development of this statistic (Smith et al., 2011) dates back to the period 2006-2008 and is based upon data from the Annual Population Survey (APS). Sub-national health expectancies based upon the 2001 census are also available. Estimates of sub-national HLE are not currently available for inter-censal periods as the APS did not carry a general health question until 2010. The statistical bulletin focuses on results for English regions and the top and bottom ten local authority district DFLE values for men and women at age 16. Local authority districts are defined according to the post-2009 administrative boundaries reorganisation. Data are not available for males and females at birth as the APS does not collect responses for children. Associated reference tables in the form of an Excel workbook are also published and include data for men and women at age 16 and at age 65 for English regions and all local authority districts. Data in other formats are available upon request; hle@ons.gov.uk.

Inequality in Disability-free life expectancy by area deprivation: England is based on rolling four-year aggregate periods using the GHS/GLF as the survey source. The current series, which includes an article documenting the development of this statistic (Smith et al., 2010b) covers non-overlapping periods dating back to 2001-2004. This series does not include estimates of HLE due to the change to the general health question in 2005. Estimates of HLE and DFLE by clusters of area deprivation and other area clusters based on the 2001 census are also available. The statistical bulletin provides data for males and females at birth and at age 65 and also gives estimates of the slope index of inequality (SII) and a modified relative ratio of inequality (RII) to provide indications of the scale of inequality across the clustered geographical areas. Associated reference tables provide these data in the form of an Excel workbook. Data in other formats are available on request; hle@ons.gov.uk.

ONS health expectancy statistics are reported in a number of other ONS publications such as National Well-Being - Health, Pension Trends and Focus on Older People.

Key external users of ONS health expectancy statistics include:

- Department of Health - Increases in HLE and reductions in the differences in HLE between communities are high level outcomes of the Public Health Outcomes Framework
- Department for Work and Pensions - Health expectancies inform policy around ageing in the UK
- Department for Environment, Food and Rural Affairs - Healthy life expectancy and disability-free life expectancy are headline indicators of sustainable development
- Academia, actuaries and the media

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.

Health expectancies at birth and at age 65 in the United Kingdom, Inequalities in DFLE by area deprivation: England and DFLE, sub-national estimates for England are produced annually. The latest year in each period lags behind the current date by approximately two years. For example, National health expectancies 2007-09 were published in August 2011. This delay is related to the reliance of the prior release of datasets required for analysis. Users understand and accept the methodological constraints that affect the timeliness of these outputs.

ONS health expectancy outputs are, on the whole, punctual in relation to the expected release date. However, changes of less than one month have been made to allow the output release to coincide with other related releases.

For more details on related releases, the UK National Statistics Publication Hub is available online and provides 12 months’ advance notice of release dates. 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 Official Statistics.

How the output is created

HLE and DFLE at a given age, for a given population and time period provide ‘snapshot’ estimates of population health. For example, HLE provides a measure of the average number of years that a person would expect to live in ‘Very good’ or ‘Good’ general health (HLE) if he or she experienced the particular area’s age and period specific mortality and general health rates throughout the rest of his or her life. These estimates are not, therefore, the number of years that a person will actually live in a given health state because mortality rates and general health status of the population are likely to change in the future. Also, many of those residing in an area are likely to live elsewhere for part of their lives.

ONS health expectancy outputs all use the same core methodology, the Sullivan Method. Briefly, this method combines survey data, for example the GLF and mortality data and mid-year population estimates to calculate the number of remaining years, at a particular age, in which an individual can expect to live in a given state of health. ONS uses 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:

- How is your health in general? Is it...
  - Very Good?
  - Good?
  - Fair?
  - Bad?
  - Very bad?

DFLE is defined as the number of remaining years that an individual can expect to live without a limiting long-standing illness. Rates of limiting long-standing illness by sex and five-year age band are captured from the following survey questions in the GLF and the CHS and the HSNI:

- Do you have any long-standing illness, disability or infirmity – by long-standing I mean anything that has troubled you over a period of time or that is likely to affect you over a period of time?
  - Yes/No

If ‘Yes’ the respondent is then asked:

- Does this illness or disability (Do any of these illnesses or disabilities) limit your activities in any way?
  - Yes/No

Respondents answering ‘Yes’ to both questions are considered to have a limiting long-standing illness.

Slightly different questions are asked in the APS:

- Do you have any health problems or disabilities that you expect will last for a year or more?
  - Yes/No

If ‘Yes’ the respondent is then asked:

- Do these health problems or disabilities, when taken singly or together, substantially limit your ability to carry out normal day to day activities? If you are receiving medication or treatment, please consider what the situation would be without the medication or treatment.
  - Yes/No

Survey data are weighted to match with mid-year population estimates to allow tables showing population estimates to be produced and to compensate for differential non-response among different sub-groups in the population. For the CHS and HSNI data are weighted simply by age and sex. Data for the GLF and APS are also adjusted to account for sample selection and multi-household addresses. The cross-sectional elements of the GLF and APS are further weighted for non-response while the longitudinal elements of these surveys are weighted for attrition after first interview. Further information on survey data weighting is given in the Integrated Household Survey User Guide.
The GLF\textsuperscript{11} achieves a sample of approximately 9,000 households from a sample of 13,000 addresses in each year and aims to interview all adults aged 16 or over, face-to-face, using trained interviewers and by proxy interview for those aged under 16 years. From 2008, students who are living in halls of residence are also included as residents of the household sampled even if they are not in situ at the time of the interview. The survey uses a probability, stratified two-stage sample design\textsuperscript{15}. The Primary Sampling Units (PSUs) are postcode sectors, which are similar in size to electoral wards and the secondary sampling units are addresses within those sectors. The stratification procedure ensures a representative sample will be drawn with respect to each stratifier used (i.e. the proportion of units sampled from any particular stratum will equal the proportion in the population with that characteristic) and improves precision.

The APS\textsuperscript{23} is a continuous survey of households in the United Kingdom, which is produced quarterly and contains annual data. Each data set (known as a quarterly rolling annual dataset) consists of wave one and five of the quarterly 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. Each APS dataset contains approximately 170,000 households and 320,000 individuals. The primary purpose of the APS is to provide estimates for labour market and socio-economic analyses at sub-national level, and the APS is the recommended source of statistical information for analysis at unitary authority and local authority district level.

Although the design of the APS has a longitudinal element, the aggregated three-year period used in the sub-national analyses of DFLE at age 16 ensures the study population used excludes duplicate survey responders. The APS is intended to be representative of sub-national populations including regions, upper and lower tier local authorities. The following chart shows how the study population for the sub-national DFLE estimates is constructed from distinct waves of the LFS and APS boost.

For National Health Expectancy estimates\textsuperscript{1}, survey data are collected from the GLF\textsuperscript{11} for Great Britain, England, Wales and Scotland and from the CHS\textsuperscript{12} and the HSNI\textsuperscript{19} for NI. Survey data are combined to calculate rates for the UK. Since these survey data only capture prevalence rates in the private household population, an adjustment is made to survey prevalence rates to account for residents of medical and care communal establishments based on data from the Census 2001. These figures will be updated to reflect the findings of the 2011 Census as these data become available. Further information regarding the methodology behind these estimates are published on the ONS website (Smith et al., 2010a)\textsuperscript{16}.

Inequality in DFLE by area deprivation, England\textsuperscript{2} estimates are based solely on the GHS/GLF\textsuperscript{11} and
provide figures for the private household population alone. Estimates are based on quintile clusters of LSOAs grouped according to IMD rank. Residents of Medical and Care Communal Establishments are excluded in these analyses due to the complexity of accounting for this population at LSOA level. This statistical output also includes estimates of the slope index of inequality (SII) and modified relative index of inequality (RII) (Mackenbach and Kunst 1997)\(^3\), which provide an indication of the scale of inequality across all deprivation clusters. The SII is calculated using weighted least squares linear regression and gives a predicted value for each population subset and measures the absolute difference in DFLE, in years, between the least and most deprived areas taking into account the proportion of the population and relative deprivation across all area clusters. The modified RII provides a relative measure of inequality derived from the SII. It is calculated through a linear regression prediction of DFLE for the least deprived area and divides this figure by the SII to give the ratio of DFLE between the most and least deprived areas. Further information regarding the methodology behind these estimates are published on the ONS website (Smith et al., 2010b\(^2\)).

**DFLE, sub-national estimates for England**\(^3\) are based solely on the APS\(^23\) and include residents of private households, NHS housing and students in halls of residence when interviewed at their parents address. As this survey does not collect data from children, estimates are provided for men and women at age 16 and at age 65 for English regions and local authorities. Further information regarding the methodology behind these estimates are published on the ONS website (Smith et al., 2011\(^22\)).

**Validation and quality assurance**

**Accuracy**

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

ONS health expectancies are secondary analyses of published survey, mortality and mid-year population estimates. As such the data has already been subject to rigorous quality control procedures. ONS health expectancies are calculated subject to a rigorous documented quality control procedure. Calculations are performed independently by two members of ONS disability and health measurement team using STATA\(^2\) and Excel. 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 a limitation resulting from a long-standing illness. Missing data and inconsistencies are deleted from the final survey dataset. Cross validation checks are carried out at each step of the calculation procedure and the final results are checked for face-validity and against recent trends by a third member of the team.

Health expectancy estimates are published with 95 per cent CIs to allow the user to judge their precision and identify significant differences (on the basis of non-overlapping CIs) between data points (area, sex, age and time period). CI calculations are calculated from unweighted survey data and (with the exception of the CHS\(^12\) and the HSNI\(^19\), which have a simple randomised sample design), include an adjustment to improve the accuracy of the standard error of health expectancies by accounting for the multi-stage sampling design effects of the survey sources. While more formalised and accurate methods of significance testing are available, the non-overlapping CI method is used because it is both simple to calculate and easily understood.

Certain assumptions are made when calculating the health status prevalence rates of residents of medical and care communal establishments. For instance, the proportions of people by age and sex and health status as reported in Census 2001 are only adjusted in line with the Mid-year Population Estimates. No assumptions are made regarding growth or contraction or health status changes in this population over time, for example in relation to policy changes. Undetermined, latent year on year variation in this population can lead to bias in health expectancies. This issue is widely recognised and not easily resolved. However, it is accepted that the impact of this potential bias is small in terms of the national population and unlikely to affect the outcome of subsequent analyses.

The health status prevalence rates by age and sex for the resident medical and care communal establishment population will be updated when Census 2011 data becomes available. ONS also intends to test the underlying assumption of no change in these rates by comparing Census 2001 and 2011 data. If there is a significant change, ONS will assess the impact on estimates of HLE and DFLE between 2000-02 and 2008-10 and publish revisions to the estimates backdated as appropriate.

ONS is evaluating the potential of the Integrated Household Survey (IHS)\(^39\) as the primary survey
source for health expectancies at national and sub-national levels and for analyses of clusters of deprivation. The significant sample size (355,000 respondents annually from 2011-12) of this survey will lead to improved accuracy and greater comparability across areas of analysis. However, the mixed mode sampling design of the IHS could lead to significant discontinuities in the health expectancy series. ONS is currently undertaking a thorough evaluation of the likely effects of adopting the IHS and will publish findings in 2012.

**Comparability and coherence**

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

ONS health expectancies are indicators of population health that take into account differences in the age structure of the population. Within each output\(^1,2,3\) results are comparable by age, sex and between areas.

National estimates of DFLE for GB and England between 1980-1982 and the latest period (2008-2010) are broadly comparable, as are figures for the UK, Wales, Scotland and NI between 2000-2002 and the latest period. From 2005-2007 ONS estimates of HLE were based upon the EU-SILC general health question and so estimates after this date are not directly comparable with estimates prior to this date. A synthetic time series between 2000-2002 and 2004-2006 showing revised estimates of HLE for the UK and constituent countries based on the EU-SILC general health question are included in the associated national reference tables\(^26\).

Scotland produces estimates of HLE (SHLE) that differ slightly from ONS estimates of HLE. This is because different survey sources are used; SHLE is based on the [Scottish Health Survey]\(^40\).

There are a number of issues that arise when trying to compare Health Expectancies derived from different sources or methods. In general Health Expectancies 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 surveys
- exclusion or inclusion of institutionalised persons

Differences between Health Expectancies for different countries can often be explained by differences in the points above. It is therefore important that they are taken into account before attempting comparisons between countries.

Health expectancies are calculated in other [European member states]\(^41\) and the issues highlighted above have been highlighted in a comprehensive review (Bone et al., 1995)\(^42\).

**Concepts and definitions**

*Concepts and definitions describe the legislation governing the output, and a description of the classifications used in the output.*

Definitions used.

- **Healthy life expectancy** - The period of time that an individual can expect to live in ‘Very good’ or ‘Good’ health. This self-reported health state is taken from survey data in response to a general health question. See the How the output is created section above. This definition is consistent across EU member states

- **Disability-free life expectancy** - The period of time that an individual can expect to live without a limiting long-standing illness or disability. This self-reported health state is taken from survey data in response to questions relating to limiting long-standing illness and activity limitation. See the ‘How the output is created’ section above. This definition is conceptually consistent across EU member states

There is no legislation relating specifically to health expectancies, although there is legislation relating to provisions for the registration, processing, reporting and analysis of mortality and population data that underpin health expectancies. These provisions appear in different pieces of legislation that reflect the distinct and separate roles of the Registrar General for England and Wales, Scotland and Northern Ireland. Legislation relating to England and Wales can be found on the ONS website: [Quality Methodology Information for Mortality Statistics in England and Wales]\(^43\).
Other information
Assessment of user needs and perceptions
The processes for finding out about users and uses, and their views on the statistical products.

A user consultation to review health expectancy statistics produced by ONS took place in 2008 and the response to the review is available on the ONS website.21

Users were also consulted as part of the UK Statistics Authority assessment of compliance with the Code of Practice for Official Statistics.44

All Health and Life events Division (HLED) statistical bulletins seek feedback from users with the inclusion of a standard statement within the background notes. The Health and Life Events User Engagement Strategy is available on the ONS website.45

The Health and Life Events Division 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 ONS’ regular attendance at Royal Statistical Society Health Statistics User Group meetings and academic conferences.

Sources for further information or advice
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.

ONS’s recommended format for accessible content is a combination of HTML web pages for narrative, charts and graphs, with data being provided in usable formats such as CSV and Excel. The ONS website also offers users the option to download the narrative in PDF format. In some instances other software may be used, or may be available on request. Available formats for content published on the ONS website but not produced by the ONS, or referenced on the ONS website but stored elsewhere, may vary. For further information please refer to the contact details at the beginning of this document.

For information regarding conditions of access to data, please refer to the links below:
- Terms and conditions (for data on the website)
- Copyright and reuse of published data
- Pre-release access (including conditions of access)
- Access to unpublished data
- Access to microdata via the Virtual Microdata Laboratory
- Accessibility

In addition to this Quality and Methodology Information, Basic Quality Information relevant to each release is available in the background notes of the relevant Statistical Bulletins.1,2,3

The latest statistical bulletins and figures (reference tables) can be found via the following links:
- Health expectancies at Birth and at age 65 in the UK, 2007-09 Reference tables
- Inequalities in Disability-free life expectancy: England, 2002-05 and 2006-09 Reference tables
- Disability-free life expectancy, sub-national estimates for England, 2007-09 Reference tables

Useful links
Interactive maps of sub-national estimates of Disability-free life expectancy are available via the ONS website.
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<td>31.</td>
<td>ONS Focus on Older People</td>
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<td>40. Scottish Health Survey</td>
<td><a href="http://www.scotland.gov.uk/Topics/Statistics/Browse/Health/scottish-health-survey">http://www.scotland.gov.uk/Topics/Statistics/Browse/Health/scottish-health-survey</a></td>
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<td>41. European Health Expectancies</td>
<td><a href="http://www.eurohex.eu/">http://www.eurohex.eu/</a></td>
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<td>46. Interactive maps of sub-national Disability-free life expectancy</td>
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