

Statistical bulletin

Health state life expectancies by national deprivation deciles, England: 2017 to 2019

Life expectancy and years expected to live in "Good" health and disability-free using national indices of deprivation to measure socioeconomic inequalities in England.



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1 . Main points

- In 2017 to 2019 the difference in life expectancy (LE) at birth between the least and most deprived areas in England, as measured by the Slope Index of Inequality (SII), was 9.4 years for males and 7.6 years for females; the gap has remained constant for males but a small increase was observed for females since 2014 to 2016.
- Females and males living in the least deprived areas of England saw a significant increase in life expectancy between 2014 to 2016 and 2017 to 2019; in the most deprived areas no significant changes were observed.
- The SII in healthy life expectancy (HLE) at birth was 19.0 years for males and 19.3 years for females, amounting to almost two decades less of life in good general health among those living in the most deprived areas of England compared with the least.
- There were significant decreases in female disability-free life expectancy (DFLE) at birth between 2014 to 2016 and 2017 to 2019; sizable reductions occurred in Decile 4 (2.1 years) and Decile 10 (1.8 years).
- The SII in DFLE at birth was 17.2 years for males and 16.3 years for females; the gaps in activity restrictions were somewhat narrower than in health-related well-being as measured by healthy life expectancy.

Please note health state life expectancy data currently goes up to 2019, which means coronavirus (COVID-19) deaths are not included. The inclusion of COVID-19 on these statistics will not be available until March 2022.

2 . Life expectancy at birth in England, by the Index of Multiple Deprivation

Males living in the most deprived areas were expected to live 74.1 years, which compares with 83.5 years in the least deprived areas – a difference of almost a decade of life

Males living in the most deprived areas could expect to live 74.1 years, compared with 83.5 years in the least deprived areas, nearly a decade difference in life years (Figure 1). The more advantaged half of the male population living in Deciles 6 to 10 could expect to live beyond 80 years, with those in Decile 5 expected to live to 80 years. Life expectancy for males in the more disadvantaged remaining deciles fell short of 80 years.

Females living in the most deprived areas could expect to live 78.7 years, whereas females in the least deprived areas could expect to live 86.4 years (Figure 1), a difference of almost eight years.

Data for all deciles can be explored further in our [datasets](#).

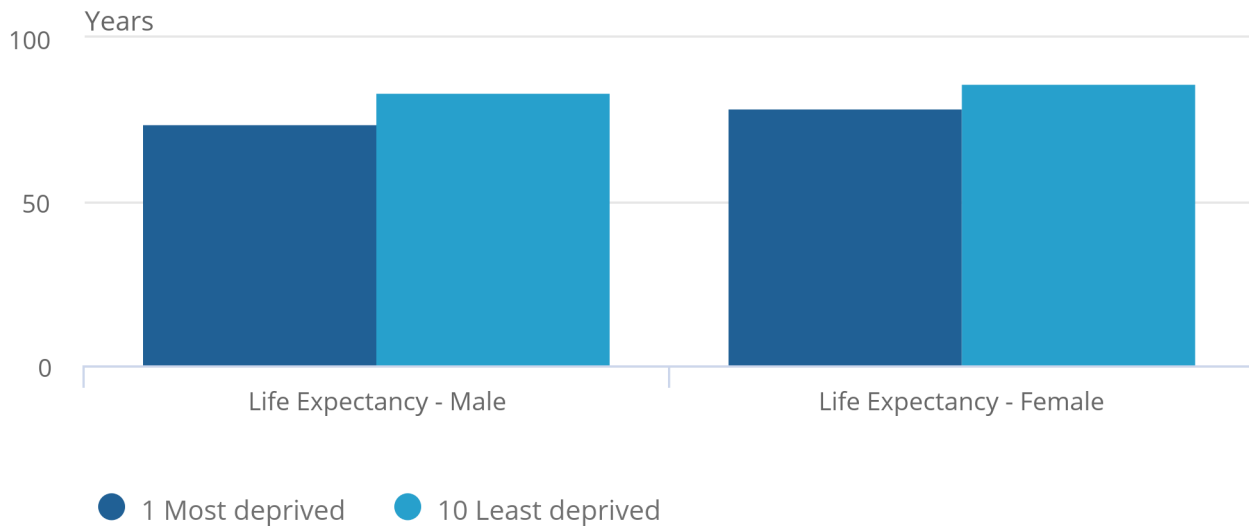
Please note differences stated throughout this release have been calculated based on figures from the [accompanying datasets](#), where details for all deciles are available.

Figure 1: Males living in the most deprived of areas could expect to live less than 75 years

Life expectancy, England, 2017 to 2019

Figure 1: Males living in the most deprived of areas could expect to live less than 75 years

Life expectancy, England, 2017 to 2019



Source: Office for National Statistics

Notes:

1. Life expectancy (LE) includes all usual residents.
2. Deprivation deciles are based on the Index of Multiple Deprivation 2019 (IMD 2019), which is the official measure of relative deprivation. Decile 1 represents the most deprived 10% (or decile) of small areas in England and Decile 10 represents the least deprived 10% (or decile) of small areas in England.

Although females nationally live longer than males, as the level of deprivation lessens so does the difference between female and male life expectancy (LE). For example, the difference in LE between females and males living in the most deprived areas is 4.6 years. This contracts to 2.9 years in the least deprived areas.

Also, males living in the least deprived areas can expect to outlive females living in the most deprived areas (Figure 1). In fact, males living in the more advantaged half of areas (Deciles 6 to 10) could all expect to live longer than females in the least advantaged fifth of areas (Deciles 1 and 2).

There were significant improvements in male and female life expectancy at birth compared with 2014 to 2016 in most deciles

Females living in the most deprived areas saw their LE at birth fall by 4.2 weeks in 2017 to 2019 compared with 2014 to 2016, but this was not statistically significant (Figure 2). In contrast, there was a statistically significant improvement in LE of 11 weeks among females living in the least deprived areas. Similarly, males in the least deprived areas saw a statistically significant improvement in LE of 12.5 weeks compared with 2014 to 2016, whereas a smaller non-significant gain of 7.3 weeks was observed among males living in the most deprived areas.

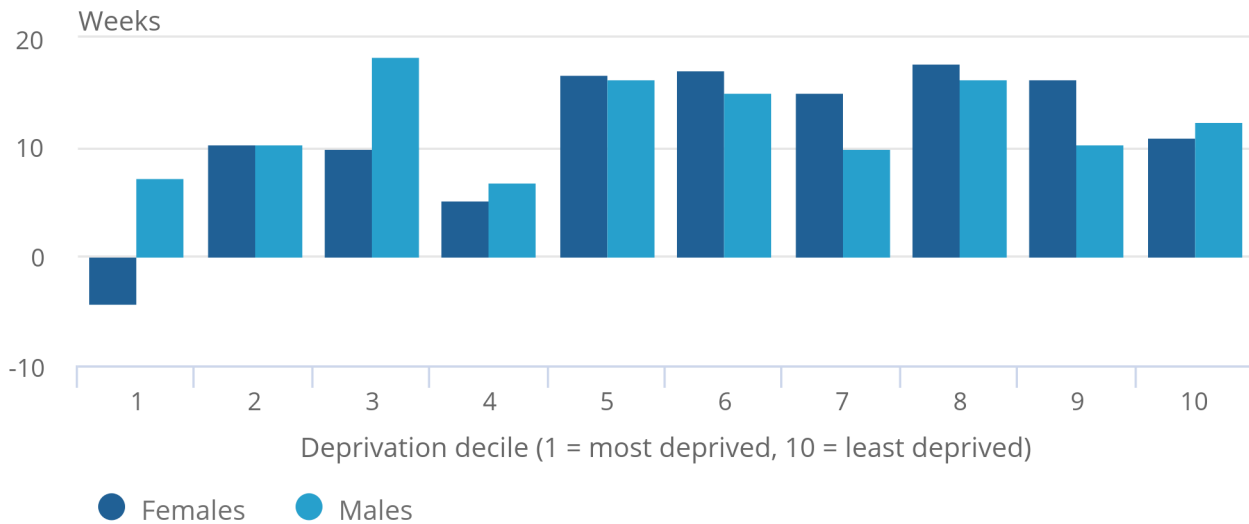
There were significant improvements in male and female LE at birth compared with 2014 to 2016 in most deciles, with the exception of Decile 1 (most deprived) and Decile 4, which showed no significant change. The largest improvement for males occurred in Decile 3, amounting to 18.3 weeks. For females, the largest improvement was observed in Decile 8, growing by 17.7 weeks.

Figure 2: Males in Decile 3 saw the largest increase in life expectancy of 18.3 weeks

Change in life expectancy at birth in weeks between 2014 to 2016 and 2017 to 2019

Figure 2: Males in Decile 3 saw the largest increase in life expectancy of 18.3 weeks

Change in life expectancy at birth in weeks between 2014 to 2016 and 2017 to 2019



Source: Office for National Statistics

Notes:

1. Life expectancy (LE) includes all usual residents.
2. Deprivation deciles are based on the Index of Multiple Deprivation (IMD), which is the official measure of relative deprivation. Deprivation deciles for periods 2011 to 2013 and 2015 to 2017 IMD 2015 was used and for periods 2016 to 2018 and 2017 to 2019 IMD 2019 was used.
3. Decile 1 represents the most deprived and Decile 10 represents the least deprived.

3 . Healthy life expectancy at birth in England, by the Index of Multiple Deprivation

Those living in the most deprived areas could expect to live the smallest proportion of their lives in “Good” health

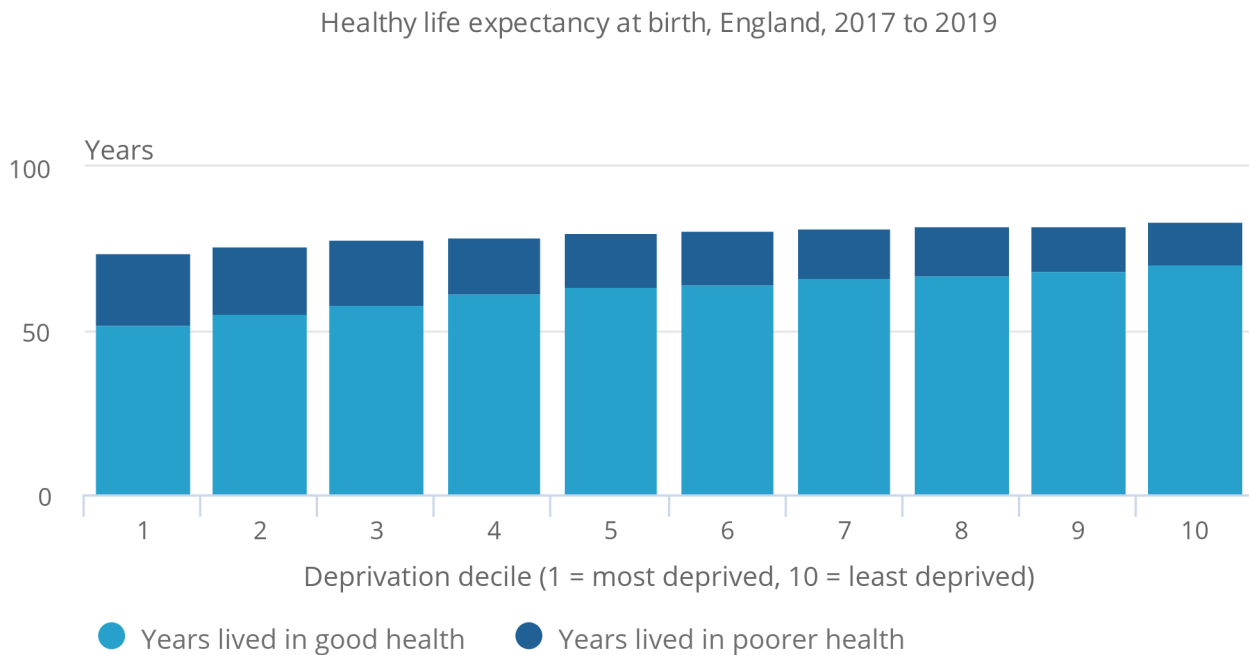
Healthy life expectancy (HLE) at birth among males living in the most deprived areas was 52.3 years in 2017 to 2019, compared with 70.7 years among those living in the least deprived areas. This amounts to a difference of 18.4 years (almost two decades) in “Good” general health between these populations across their life course (Figure 3).

Only males living in the more advantaged areas (Deciles 7 to 10) in England were expected to live more than 65 years of their life in “Good” health, while the remainder were expected to live fewer than 65 years in “Good” health. In addition, those living in the more disadvantaged areas (Deciles 1 to 3) were expected to live fewer than 60 years in good health.

Figure 3: Deciles 1 and 2 and Deciles 3 and 4 had the largest adjacent decile gap of 3.5 years in male healthy life expectancy at birth

Healthy life expectancy at birth, England, 2017 to 2019

Figure 3: Deciles 1 and 2 and Deciles 3 and 4 had the largest adjacent decile gap of 3.5 years in male healthy life expectancy at birth



Source: Office for National Statistics - Annual Population Survey, 2011 Census

Notes:

1. Life expectancy (LE) includes all usual residents.
2. The health state prevalence estimates used to estimate healthy life expectancy (HLE) are sourced from Annual Population Survey (APS) data and data from the 2011 Census. The APS excludes residents of communal establishments except NHS housing and students in halls of residence where inclusion takes place at their parents' address.
3. Deprivation deciles are based on the Index of Multiple Deprivation 2019 (IMD 2019), which is the official measure of relative deprivation. Decile 1 represents the most deprived and Decile 10 represents the least deprived.

The adjacent deciles differences were largest between Deciles 1 and 2 and Deciles 3 and 4; males living in Deciles 1 and 3 were expected to live 3.5 years fewer in “Good” health than males living in Deciles 2 and 4 respectively. This illustrates the contrasting health outcomes between relatively deprived populations, as was also found for life expectancy.

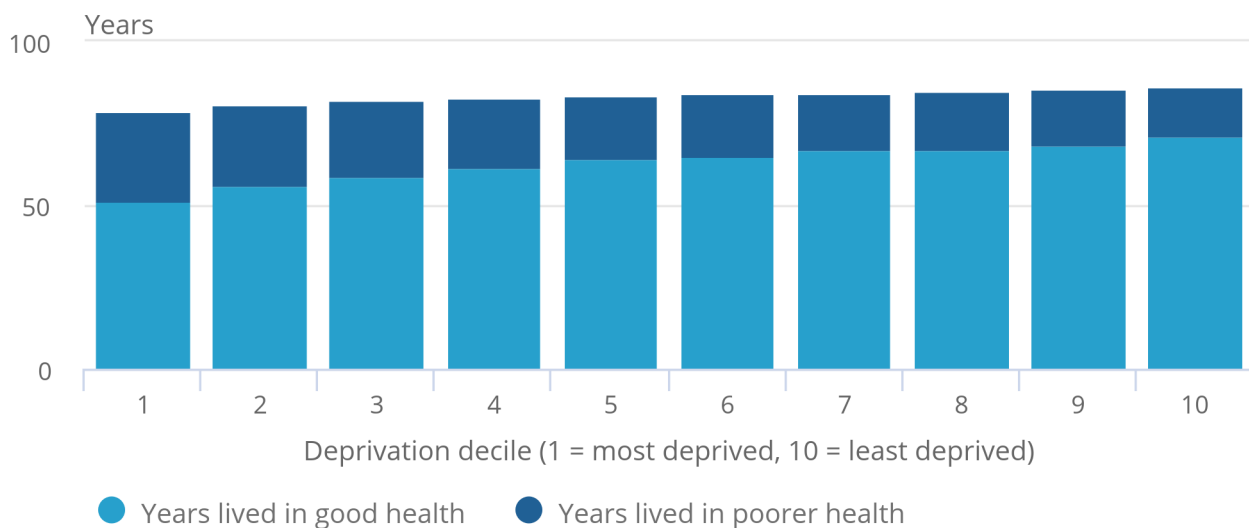
The years spent in a poorer state of health for males were linked to the level of deprivation exposure, reducing in a progressive pattern from 21.8 years among males living in the most deprived areas to 12.8 years in the least deprived areas.

Figure 4: Females in the most deprived areas could expect to live 51.4 years in “Good” health compared with 71.2 years in the least deprived areas

Healthy life expectancy at birth, England, 2017 to 2019

Figure 4: Females in the most deprived areas could expect to live 51.4 years in “Good” health compared with 71.2 years in the least deprived areas

Healthy life expectancy at birth, England, 2017 to 2019



Source: Office for National Statistics - Annual Population Survey, 2011 Census

Notes:

1. Life expectancy (LE) includes all usual residents.
2. The health state prevalence estimates used to estimate healthy life expectancy (HLE) are sourced from Annual Population Survey (APS) data and data from the 2011 Census. The APS excludes residents of communal establishments except NHS housing and students in halls of residence where inclusion takes place at their parents’ address.
3. Deprivation deciles are based on the Index of Multiple Deprivation 2019 (IMD 2019), which is the official measure of relative deprivation. Decile 1 represents the most deprived and Decile 10 represents the least deprived.

Females living in the more advantaged areas (Deciles 7 to 10) were expected to live more than 65 years in “Good” health, while those living in Deciles 1 to 3 were expected to live fewer than 60 years in “Good” health (Figure 4).

For females, the years spent in poorer health states were clearly linked to the level of exposure to area deprivation; it fell from 27.3 years among females living in the most deprived areas to 15.3 years among the least deprived areas (Figure 4). As a result, not only do females living in the most deprived areas have the shortest life span overall, they also live a larger number of years in poorer states of health.

The adjacent decile comparison in HLE was similar to that reported for males, with the largest gap observed between Decile 1 and Decile 2. Females in Decile 2 were expected to live 4.7 years longer in “Good” health than females in Decile 1.

4 . Disability-free life expectancy in England, by the Index of Multiple Deprivation

Disability-free life expectancy (DFLE) at birth for females saw significant reductions between 2014 to 2016 and 2017 to 2019, with the largest reductions occurring in Decile 4 (2.1 years) and Decile 10 (1.8 years)

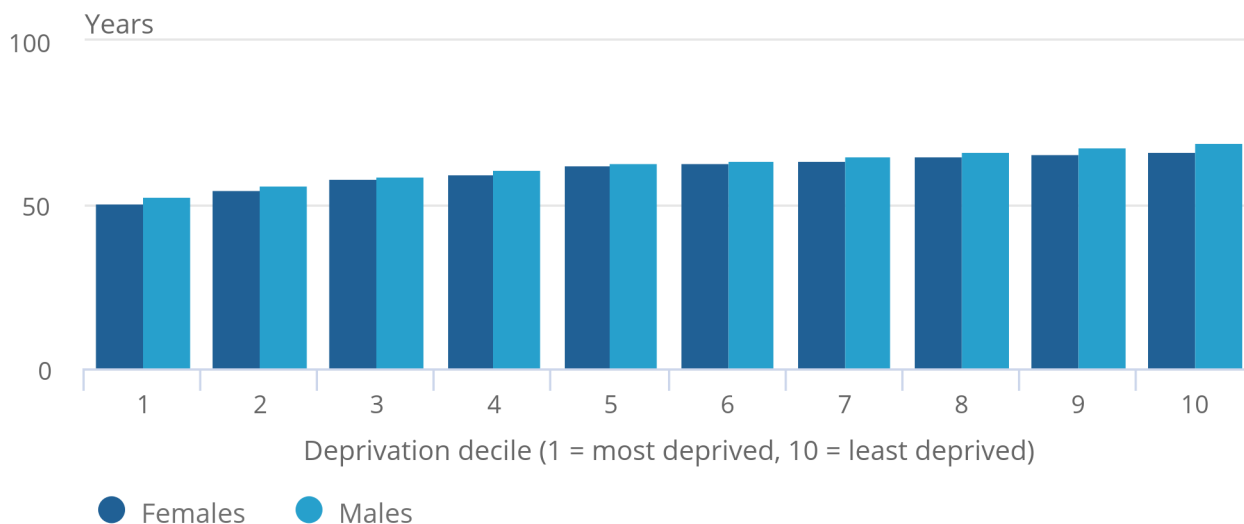
DFLE at birth for females was 50.7 years in the most deprived areas in 2017 to 2019 compared with 66.5 years in the least deprived areas. DFLE at birth among males living in the most deprived areas in 2017 to 2019 was 52.6 years, compared with 69.4 years in the least deprived areas.

Figure 5: Males in Decile 10 can expect to live 2.9 years longer disability-free than females in the same decile

Disability-free life expectancy, England, 2017 to 2019

Figure 5: Males in Decile 10 can expect to live 2.9 years longer disability-free than females in the same decile

Disability-free life expectancy, England, 2017 to 2019



Source: Office for National Statistics - Annual Population Survey, 2011 Census

Notes:

1. Deprivation deciles are based on the Index of Multiple Deprivation 2019 (IMD19), which is the official measure of relative deprivation. Decile 1 represents the most deprived 10% (or decile) of small areas in England and Decile 10 represents the least deprived 10% (or decile) of small areas in England.
2. The health state prevalence estimates used to estimate disability-free life expectancy (DFLE) are sourced from Annual Population Survey (APS) data and data from the 2011 Census. The APS excludes residents of communal establishments except NHS housing and students in halls of residence where inclusion takes place at their parents' address.

Since 2014 to 2016, there has been a widening of the gap in DFLE at birth between males and females, because of larger decreases in DFLE for females. The largest difference between males and females occurred in the least deprived areas, where men can expect to live an additional 2.9 years disability-free than females (Figure 5).

Females in the least deprived areas saw a statistically significant fall of 1.8 years (96.0 weeks) in DFLE at birth since 2014 to 2016, while females in the most deprived areas saw no significant change. However, the largest significant reduction in DFLE was observed in decile 4 of 2.1 years (110.1 weeks). These decile specific trajectories caused the difference between the least and most deprived deciles to reduce by 1.4 years (72.0 weeks) in 2017 to 2019.

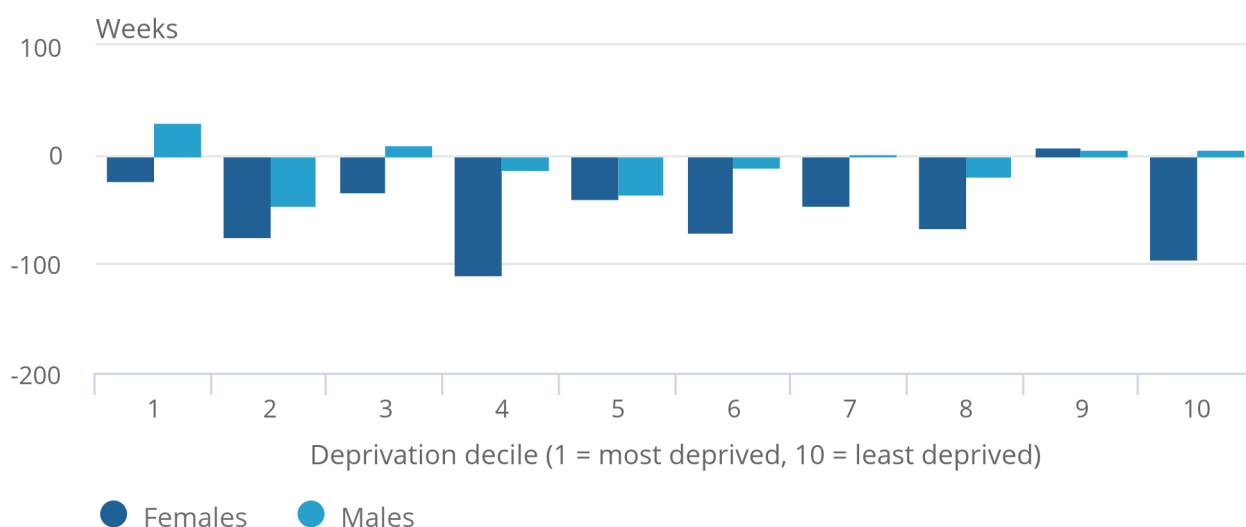
Unlike females, there was no significant change in DFLE in any decile for males at birth between 2014 to 2016 and 2017 to 2019. The trajectories across deciles caused the difference between the least and most deprived areas to reduce by 24 weeks.

Figure 6: Disability-free life expectancy at birth for females showed a statistically significant reduction of 96 weeks in the least deprived areas

The change in disability-free life expectancy in weeks, England, 2014 to 2016 to 2017 to 2019

Figure 6: Disability-free life expectancy at birth for females showed a statistically significant reduction of 96 weeks in the least deprived areas

The change in disability-free life expectancy in weeks, England, 2014 to 2016 to 2017 to 2019



Source: Office for National Statistics - Annual Population Survey, 2011 Census

Notes:

1. Deprivation deciles are based on the Index of Multiple Deprivation (IMD), which is the official measure of relative deprivation. Deprivation deciles for periods from 2011 to 2013 to 2015 to 2017 IMD 2015 was used and for periods 2016 to 2018 and 2017 to 2019 IMD 2019 was used.
2. Decile 1 represents the most deprived and Decile 10 represents the least deprived.
3. The health state prevalence estimates used to estimate disability-free life expectancy (DFLE) are sourced from Annual Population Survey (APS) data and data from the 2011 Census. The APS excludes residents of communal establishments except NHS housing and students in halls of residence where inclusion takes place at their parents' address.

5 . Slope Index of Inequality in health state life expectancy

The Slope Index of Inequality (SII) is used to assess the absolute inequality in life expectancy (LE) and each health state life expectancy (HSLE), both healthy life expectancy (HLE) and disability-free life expectancy (DFLE).

The SII is an absolute measure and can be interpreted in the same way as the range between the least and most deprived areas but also 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.

Socioeconomic gaps in life expectancy and healthy life expectancy at birth remained substantial for both males and females in 2017 to 2019

In 2017 to 2019, the inequality in male LE at birth in England, as measured by the SII, stood at 9.4 years compared with 7.6 years for females. The SII for HLE at birth was considerably larger, standing at 19.0 years for males and 19.3 years for females. The SII for DFLE at birth was also larger than LE with a gap of 17.2 years for males and 16.3 years for females.

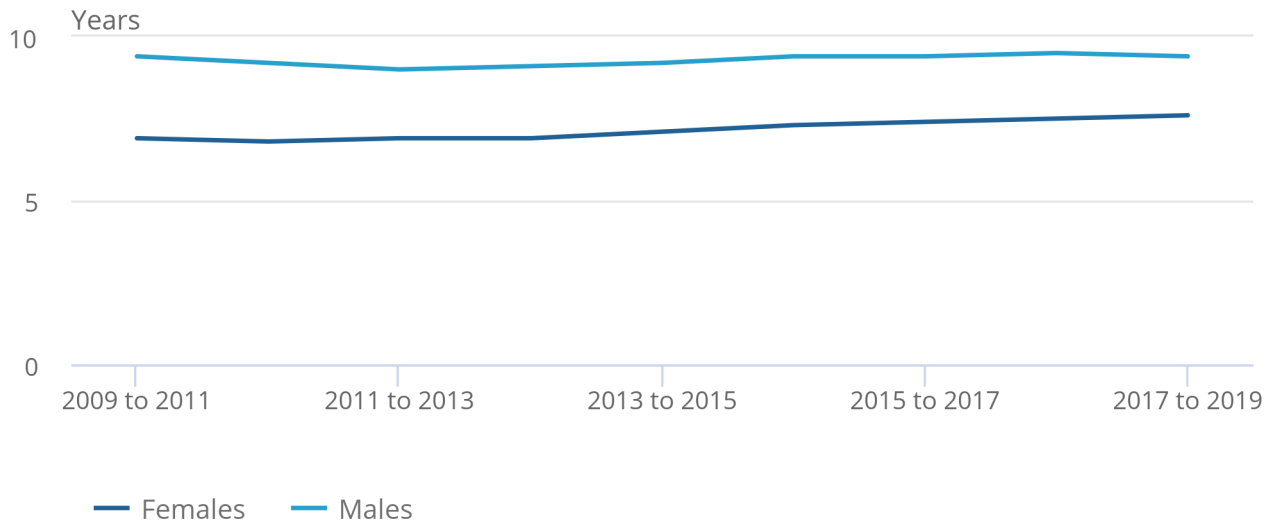
Figures 7 and 8 show the trend for the SII for LE and HLE at birth from 2009 to 2011 to 2017 to 2019.

Figure 7: Slope Index of Inequality in life expectancy at birth increased from 6.9 years in 2009 to 2011 to 7.6 years in 2017 to 2019 for females

Slope index of inequality in life expectancy at birth, England, between 2009 to 2011 to and 2017 to 2019

Figure 7: Slope Index of Inequality in life expectancy at birth increased from 6.9 years in 2009 to 2011 to 7.6 years in 2017 to 2019 for females

Slope index of inequality in life expectancy at birth, England, between 2009 to 2011 to and 2017 to 2019



Source: Office for National Statistics - Annual Population Survey, 2011 Census

Notes:

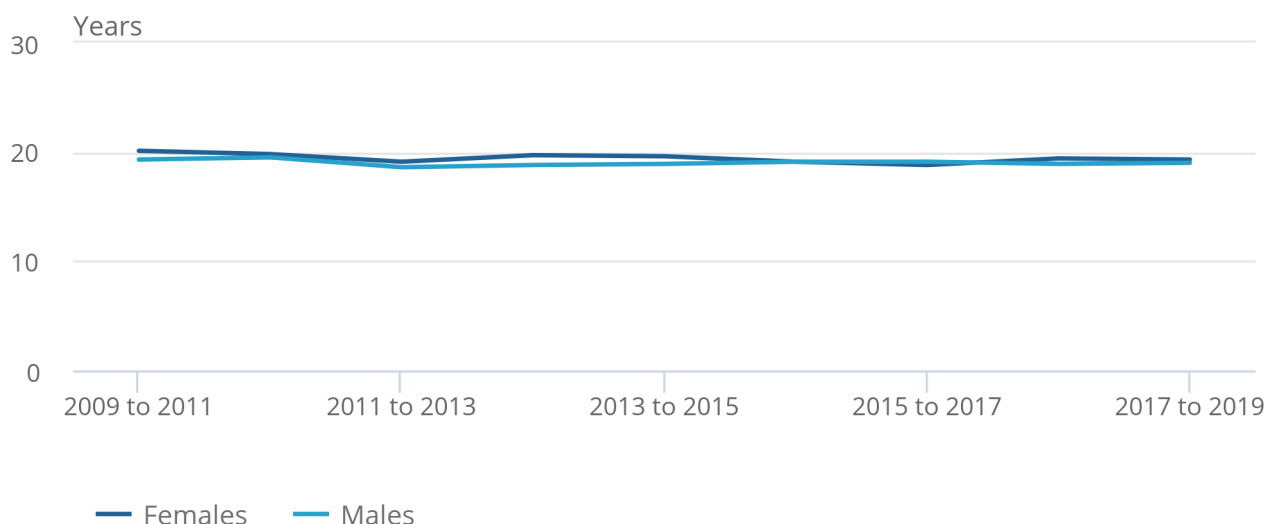
1. Slope Index of Inequality (SII) is calculated by taking the difference between the extremes of a population weighted regression line of best fit.
2. Deprivation deciles are based on the Index of Multiple Deprivation (IMD), which is the official measure of relative deprivation. Deprivation deciles for periods 2009 to 2011 and 2010 to 2012 are based on IMD 2010, for periods from 2011 to 2013 to 2015 to 2017 IMD 2015 was used and for periods 2016 to 2018 and 2017 to 2019 IMD 2019 was used.
3. Decile 1 represents the most deprived and Decile 10 represents the least deprived.

Figure 8: Slope Index of Inequality in healthy life expectancy at birth has narrowed for males and females

Slope index of inequality in healthy life expectancy at birth, England, between 2009 to 2011 to and 2017 to 2019

Figure 8: Slope Index of Inequality in healthy life expectancy at birth has narrowed for males and females

Slope index of inequality in healthy life expectancy at birth, England, between 2009 to 2011 to and 2017 to 2019



Source: Office for National Statistics - Annual Population Survey, 2011 Census

Notes:

1. The health state prevalence estimates used to estimate Healthy Life Expectancy (HLE) are sourced from Annual Population Survey (APS) data and data from the 2011 Census. The APS excludes residents of communal establishments except NHS housing and students in halls of residence where inclusion takes place at their parents' address.
2. Slope Index of Inequality (SII) is calculated by taking the difference between the extremes of a population weighted regression line of best fit.
3. Deprivation deciles are based on the Index of Multiple Deprivation (IMD), which is the official measure of relative deprivation. Deprivation deciles for periods 2009 to 2011 and 2010 to 2012 are based on IMD 2010, for periods from 2011 to 2013 to 2015 to 2017 IMD 2015 was used and for periods 2016 to 2018 and 2017 to 2019 IMD 2019 was used.
4. Decile 1 represents the most deprived and Decile 10 represents the least deprived.

While the range and SII for LE, HLE and DFLE are important for estimating the scale of inequality at a given time point, the change from the most recent non-overlapping period (2014 to 2016) is also important to consider, as it provides an opportunity to assess progress in narrowing the gap. Table 1 contains the SII in England for LE, HLE and DFLE for the periods 2014 to 2016 and 2017 to 2019.

Table 1: Comparison of the Slope Index of Inequality and range in life expectancy and healthy life expectancy at birth for males and females

England, between 2014 to 2016 and 2017 to 2019

	2014 to 2016		2017 to 2019		SII Difference Range Difference	
	SII (Years)	Range (Years)	SII (Years)	Range (Years)	SII Difference	Range Difference
Males at birth						
LE	9.4	9.3	9.4	9.4	0.0	0.1
HLE	19.1	18.5	19.0	18.4	-0.1	-0.1
DFLE	17.2	17.3	17.2	16.8	0.0	-0.5
Females at birth						
LE	7.3	7.4	7.6	7.7	0.3	0.3
HLE	19.1	18.9	19.3	19.7	0.2	0.8
DFLE	16.4	17.2	16.3	15.8	-0.1	-1.4

Source: Office for National Statistics - Annual Population Survey, 2011 Census

Notes

1. Life expectancy includes all usual residents. The health state prevalence estimates used to estimate healthy life expectancy (HLE) are sourced from Annual Population Survey (APS) data and data from the 2011 Census. The APS excludes residents of communal establishments except NHS housing and students in halls of residence where inclusion takes place at their parents' address.
2. SII is calculated by taking the difference between the extremes of a population weighted regression line of best fit.
3. Range is calculated by taking the difference between Decile 1 and Decile 10.
4. Figures may not sum because of rounding.
5. Deprivation deciles are based on the Index of Multiple Deprivation (IMD), which is the official measure of relative deprivation. Deprivation deciles for periods 2011 to 2013 to 2015 to 2017 IMD 2015 was used and for periods 2016 to 2018 and 2017 to 2019 IMD 2019 was used.
6. Decile 1 represents the most deprived and Decile 10 represents the least deprived.

There was no change in the size of the inequality in male LE at birth, with the SII remaining constant at 9.4 years from 2014 to 2016 to 2017 to 2019 (Table 1).

There was a significant increase in the inequality in female LE at birth of 0.3 years, growing from 7.3 years in 2014 to 2016 to 7.6 years in 2017 to 2019. This contrast with males, caused a contraction in the difference in the scale of the inequality observed among males and females.

Between 2014 to 2016 and 2017 to 2019, DFLE for males saw no change in the SII, while the gap for females reduced slightly by 0.1 years, although this was not significant.

6 . Health state life expectancies data

[Health state life expectancies by Index of Multiple Deprivation \(IMD\): England, all ages](#)

Dataset | Released 23 March 2021

Life expectancy (LE), healthy life expectancy (HLE), disability-free life expectancy (DFLE) by national deprivation deciles (IMD 2015 and IMD 2019), England: 2011 to 2019.

[Health state life expectancies by Index of Multiple Deprivation \(IMD 2019\), England, at birth and age 65 years](#)

Dataset | Released 23 March 2021

Life expectancy (LE), healthy life expectancy (HLE), disability-free life expectancy (DFLE), Slope Index of Inequality (SII) and range at birth and age 65 years by national deprivation deciles (IMD 2019), England: 2011 to 2019.

[Health state life expectancies by Index of Multiple Deprivation \(IMD\): England, all ages](#)

Dataset | Released 23 March 2021

Life expectancy (LE), healthy life expectancy (HLE), disability-free life expectancy (DFLE) by national deprivation deciles (IMD 2015), England: 2016 to 2019.

7 . Glossary

Period life expectancy

The life expectancy (LE) estimates reported in this bulletin are period based. Period LE at a given age for an area is the average number of years a person would live, if he or she experienced the particular area's age-specific mortality rates for that time period throughout his or her life.

Health state life expectancy

A generic term for summary measures of health that add a quality dimension to estimates of LE by dividing expected lifespan into time spent in different states of health. In this release, health state life expectancy (HSLE) encompasses measures based on health-related well-being (healthy life expectancy) and functional health status (disability-free life expectancy).

Healthy life expectancy

An estimate of lifetime spent in "Very good" or "Good" health, based on how individuals perceive their general health.

Disability-free life expectancy

An estimate of lifetime free from a limiting persistent illness, which limits day-to-day activities: it is based upon a self-rated assessment of how health conditions and illnesses reduce an individual's ability to carry out day-to-day activities, such as washing and cleaning or shopping for essentials.

Confidence intervals

A measure of the uncertainty around a specific estimate. It is expected that the interval will contain the true value on 95 occasions if repeated 100 times. As intervals around estimates widen, the level of uncertainty about where the true value lies increases. The confidence intervals for the Slope Index of Inequality (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.

Statistical significance

The term “significant” refers to statistically significant changes or differences. Significance has been determined using the 95% confidence intervals, where instances of non-overlapping confidence intervals between estimates indicate the difference is unlikely to have arisen from random fluctuation.

Indices of Multiple Deprivation

The [Indices of Multiple Deprivation 2019 \(IMD 2019\)](#) are a score 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.

For example, some unemployed individuals live in less deprived LSOAs, while some higher-income individuals live in more deprived LSOAs. Similarly, deciles are a broad grouping and the levels of deprivation and the underlying factors determining the LSOA-level deprivation score will vary within the decile. Those LSOAs at the higher and lower end of each specific decile may vary considerably from each other.

Deciles are calculated by ranking the LSOAs from most deprived to least deprived and dividing them into 10 equal groups. These range from the most deprived 10% (Decile 1) of small areas nationally to the least deprived 10% (Decile 10) of small areas nationally.

Slope Index of Inequality

The SII was used to assess the absolute inequality in LE and each HSLE between the least and most deprived deciles. This indicator measures the gaps by taking account of the inequality across all adjacent deciles of relative deprivation, rather than focusing only on the differencing of the two extremes.

8 . Measuring the data

This statistical bulletin presents estimates of life expectancy (LE), healthy life expectancy (HLE) and disability-free life expectancy (DFLE) for the England by deprivation deciles.

More quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in the [Health state life expectancies, UK QMI](#).

Data sources

LE uses death registrations data held by the Office for National Statistics (ONS), which are compiled from information supplied when deaths are certified and registered as part of civil registration. Mid-year population estimates by age, sex and geographical area are used in combination with death registrations to calculate age-specific mortality rates used in life tables.

In addition, HSEs use data collected as part of the [Annual Population Survey \(APS\)](#) and 2011 Census data. The APS is a continuous survey of households in the UK, containing annual data. Each three-year pooled 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 subnational level and the APS is the recommended source of statistical information for analysis at unitary authority and local authority district level.

Health state prevalence rates are obtained from the three-year reweighted APS data set used in HLE and DFLE calculations.

As the method requires imputation and modelling, 2011 Census data are used to produce imputation adjustment factors and census-based health state prevalence.

Method for estimating life expectancy

The LE estimates reported in this bulletin are period-based LEs. Unlike the other LE publications, the subnational LE estimates use an abridged life table method. A life table is a demographic tool used to analyse death rates (also called mortality rates) and calculate LEs at various ages.

Abridged life tables use the age-specific mortality rates for an area aggregated over three years, for example 2016 to 2018, which is based on the age-group death count divided by the age-group population count. A [Health state life expectancy estimates template](#) is available, which shows how the abridged life table is deployed to derive LE estimates.

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

Method for estimating health state life expectancies

HSLEs are calculated using the Sullivan life table method. The data required are age- and sex-specific prevalence of the population in “Good” health (healthy) and “Free from activity restriction” (disability-free) obtained from the APS, and age-specific mortality rates from the abridged period life table.

Health state prevalence rates are obtained from a specially created three-year reweighted APS data set. Prevalence rates are imputed for those aged less than 1, 1 to 4, 5 to 9, 10 to 14, 85 to 89 and 90 years and above. A census adjustment is applied to these ages, which applies the proportional difference in younger ages found at the 2011 Census to the rate observed in the APS for those aged 16 to 19 years, and to older ages to that observed in the age group 80 to 84 years. This is because the survey does not cover younger age groups and only sparsely among the very old.

The resulting age, sex and area specific prevalence estimates are then adjusted using linear regression to produce fitted age, sex and area specific prevalence rates to use in the Sullivan life table.

The Sullivan HSLE reflects the current health of a real population adjusted for mortality levels and independent of age structure. It represents the number of remaining years, at a particular age, which an individual can expect to live in a healthy or disability-free state.

Method for calculating the Slope Index of Inequality

Deciles were ordered by decreasing area deprivation, that is, from the most to the least deprived. The fraction of the total population in each decile (f) was calculated. The cumulative frequency (ci), that is, the cumulative sum of the population in successively less deprived deciles, was also obtained and the relative deprivation rank (x) for each decile was calculated as:

This formula calculates the relative deprivation rank for use in the Slope Index of Inequality (SII) calculation. The SII (a line of best fit) was then estimated by regressing the outcome measures (LE, HLE and DFLE) separately against the relative deprivation rank (x), weighted by the population in each decile.

Method for calculating 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 decile, LE, HLE and DFLE have been calculated along with its standard error (SE). These SEs give information about the degree of uncertainty around each of the HSLE values: essentially it describes a statistical distribution for each decile.

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

9 . Strengths and limitations

The strengths of the health state life expectancies (HSLE) by national deprivation deciles release are:

- HSLEs are estimated using the same sources of data, namely the Annual Population Survey (APS) and the 2011 Census
- estimates based on abridged life tables have been shown to closely align with those based on complete life tables
- the mortality data used give complete population coverage and ensure the estimates are of high precision, and representative of the underlying population at risk
- the provision of HSLE summary measures provide a quality of life dimension to length of life, which is useful for assessing health and social care needs and fitness for work to changing State Pension ages

The limitations of the HSLE by national deprivation deciles release are:

- the APS sample sizes for some local authority populations are small, leading to volatility in estimates and wide confidence intervals
- survey data are not routinely collected for those aged under 16 years and only sparsely for those aged 85 years and above, requiring imputation of prevalence for these age groups
- 2011 Census-based imputation adjustments and prevalence used in the modelling are temporal and therefore prone to change as they are applied further away from the census
- the measures of health status are subjective self-reports and may be affected in their perception by demographic, cultural and socioeconomic factors

10 . Related links

[The English Indices of Deprivation \(PDF, 2.18MB\)](#)

Bulletin | Released 26 September 2019

Findings from the 2019 Index of Multiple Deprivation focusing on national and subnational patterns of multiple deprivation, patterns of income and employment deprivation.

[Method changes to life and health state expectancies](#)

Methodology | Released 26 November 2016

Report outlining the changes to life expectancy, healthy life expectancy and disability-free life expectancy.

[Proposed method changes to UK health state life expectancies](#)

Methodology | Published 7 December 2017

This report assesses three methods for future estimation of health state life expectancies and is consulting on these methods.

[Health state life expectancies: UK, 2017 to 2019](#)

Bulletin | Released 25 January 2021

The number of years people are expected to spend in different health states among local authority areas in the UK.

[Health state life expectancies by national deprivation deciles, England: 2016 to 2018](#)

Bulletin | Released 27 March 2020

Life expectancy and years expected to live in "Good" health using national indices of deprivation to measure socioeconomic inequalities in England.

[National life tables – life expectancy in the UK: 2017 to 2019](#)

Bulletin | Released 24 September 2020

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.

[Life expectancy for local areas of the UK: between 2001 to 2003 and 2017 to 2019](#)

Bulletin | Released 24 September 2020

Subnational trends in the average number of years people will live beyond their current age measured by "period life expectancy".