Office for National Statistics

Statistical bulletin

# Health state life expectancies by national deprivation deciles, England: 2016 to 2018

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

## Notice

**27 March 2020**

Previously Health state life expectancies by national deprivation deciles for England and Wales has been published in one bulletin "Health state life expectancies by national deprivation deciles, England and Wales". From 27 March 2020 Health state life expectancies by national deprivation deciles for England and Wales will be published in two separate bulletins "Health state life expectancies by national deprivation deciles, England" and "Health state life expectancies by national deprivation deciles, Wales".

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# 1 . Main points

- The gap in life expectancy at birth between the least and most deprived areas in England was 9.5 years for males and 7.5 years for females; an increase in inequality for both sexes since 2013 to 2015.

- Males living in the most deprived areas of England can expect to live 18.9 years less in "Good" health compared with those in the least deprived; with the gap at 19.4 years for females.

- Females living in the most deprived areas of England saw a fall in life expectancy at birth in 2016 to 2018 compared with 2013 to 2015; in contrast females in the least deprived areas saw an increase in life expectancy.

- Males living in the most deprived areas of England saw no change in life expectancy at birth in 2016 to 2018 compared with 2013 to 2015; with those in the least deprived areas seeing an increase.

- Males aged 65 years living in the most deprived areas of England can expect to live five years less than those in the least deprived areas, with the difference being 4.6 years for females aged 65 years.

- Females aged 65 years living in the most deprived areas of England saw life expectancy decrease in 2016 to 2018 compared with 2013 to 2015; in contrast those in the least deprived areas saw life expectancy increasing.

- Males aged 65 years living in the most deprived areas of England saw no change in life expectancy in 2016 to 2018 compared with 2013 to 2015; whereas those in the least deprived areas saw an increase in life expectancy.

## Statistician's comment

"Today's release highlights the continuing inequality in life expectancy at birth across England. The gap between the most and least deprived areas in England has widened to almost a decade for males and 7.5 years for females since the period 2013 to 2015. In fact, women in the most deprived areas of England experienced a fall in life expectancy at birth, the only group to do so, while women in the least deprived areas saw an increase in life expectancy at birth.

"Additionally, those living in the most deprived areas can expect to spend almost two decades less in good health than their counterparts in the least deprived areas; with this gap remaining stable since 2013 to 2015."

Ben Humberstone, Head of Health Analysis and Life Events, Office for National Statistics

# 2 . Life expectancy and healthy life expectancy in England, by the Index of Multiple Deprivation

The Index of Multiple Deprivation 2019 (IMD 2019) is the official and most recent measure of area-based relative deprivation in England. Each Lower-layer Super Output Area (LSOA) in England is provided a score and rank based on relative deprivation, which is calculated using seven domains of life including education and health. Ranks are also used to split LSOAs into deciles of deprivation.

The scores are based on the area as a whole and not everyone within a given LSOA will necessarily experience 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. For example, an LSOA located at the higher end of a given decile is likely to experience a different level of deprivation to an LSOA located at the lower end.

Figure 1 allows you to explore life expectancy and healthy life expectancy estimates by age and postcode. The postcode look-up will highlight which decile your area falls into, what the average life expectancy is for the age selected, and how long an individual in that breakdown can expect to live in good and poorer states of health.

Life expectancy in this instance refers to period life expectancy, which 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.

Healthy life expectancy is an estimate of lifetime spent in "very good" or "good" health, based on how individuals perceive their general health, and is equivalent to the remaining years expected to live in good health.

## Figure 1: Life expectancy and healthy life expectancy by age, sex, and deprivation decile in England, 2016 to 2018

**Data downloads**

**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. 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.

## Males living in the most deprived areas were expected to live 73.9 years compared with those in the least deprived areas who could be expected to live 83.4 years; a difference of almost a decade

Life expectancy at birth for males living in the most deprived areas in England was 73.9 years, compared with 83.4 years for males in the least deprived areas, nearly a decade difference (Figure 2). Males living in the five least deprived areas could expect to live beyond 80 years, whilst those in the five most deprived areas could expect to live less than 80 years.

Females living in the most deprived 10% (or decile) of neighbourhoods could expect to live 78.6 years, whereas females in the least deprived 10% could expect to live 86.3 years (Figure 2), a difference of almost eight years. Data for all deciles can be explored further in our datasets.

**Life expectancy, England, 2016 to 2018**

## Figure 2: Males and females in the most deprived 10% of areas could expect to live less than 80 years

Life expectancy, England, 2016 to 2018
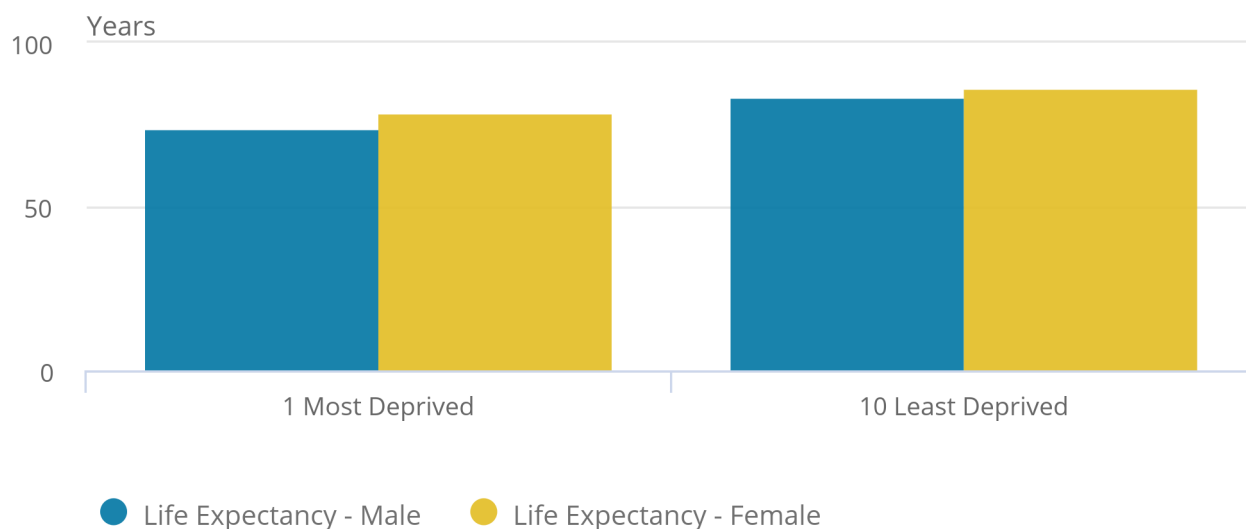


**Source: Office for National Statistics**

**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 per cent (or decile) of neighbourhoods in England and Decile 10 represents the least deprived 10 per cent (or decile) of neighbourhoods in England.

Although females nationally live longer than males, as level of deprivation decreases so does the gap between female and male life expectancy. For example, the gap in life expectancy between females living in the most deprived areas and males in the most deprived areas is 4.7 years. Whereas the gap in the least deprived areas is 2.9 years.
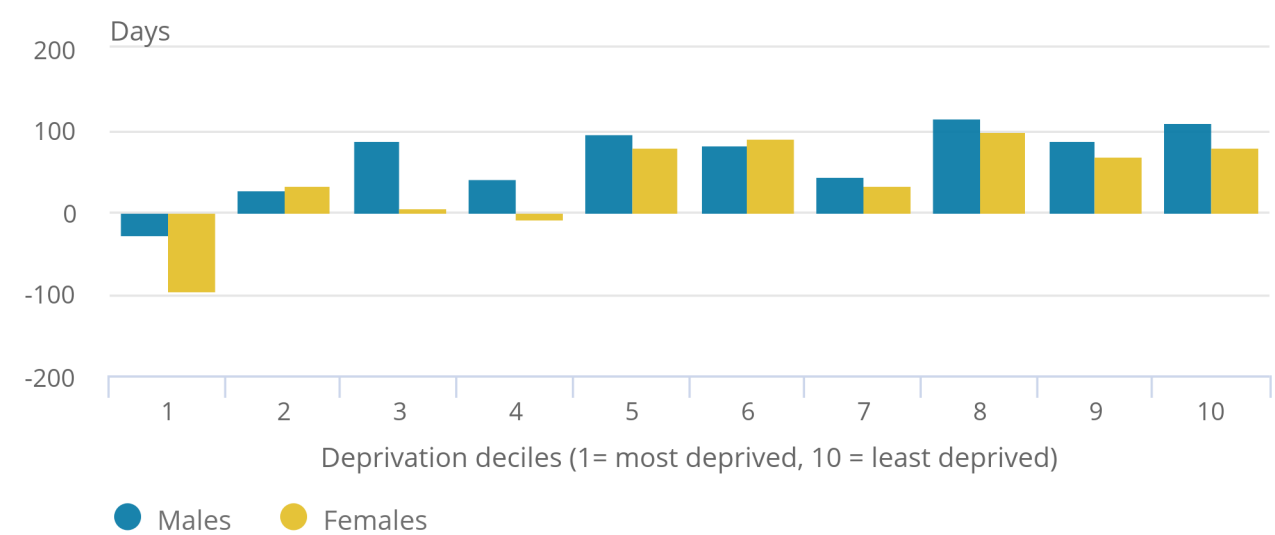
Also, males living in the least deprived areas can expect to outlive females living in the most deprived areas (Figure 2). Males in the least deprived 50% of areas in England (Deciles 6 to 10) could all expect to live longer than females in the most deprived 20% of areas (Deciles 1 and 2).

**Figure 3: Females living in the most deprived 10% of areas in England were the only group to show a decrease in life expectancy at birth of 95.3 days**

Life expectancy change in days, England, between 2013 to 2015 and 2016 to 2018

## Figure 3: Females living in the most deprived 10% of areas in England were the only group to show a decrease in life expectancy at birth of 95.3 days

Life expectancy change in days, England, between 2013 to 2015 and 2016 to 2018



**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 neighbourhoods in England and Decile 10 represents the least deprived 10% (or decile) of neighbourhoods in England.

Females in the most deprived areas experienced a fall in life expectancy of 95.3 days in 2016 to 2018 compared with 2013 to 2015. In contrast, females in the least deprived areas saw life expectancy improve by 80.1 days. Similarly, males in the least deprived areas saw an improvement in life expectancy of 111 days. The inequality gap is now 9.5 years in the life expectancy of males.

In fact, in the five least deprived deciles there were significant improvements in life expectancy in every decile except the seventh for both males and females; the largest improvement for both sexes occurred in Decile 8, of 99 days for females, and 114 days for males.

**Those living in the most deprived areas of England could expect to live the smallest proportion of their lives in "Good" health**

Healthy life expectancy at birth among males living in the most deprived areas was 52.3 years in 2016 to 2018, compared with 70.6 years among those living in the least deprived areas, showing almost an additional two decades of life in "Good" general health across their life course (Figure 4).
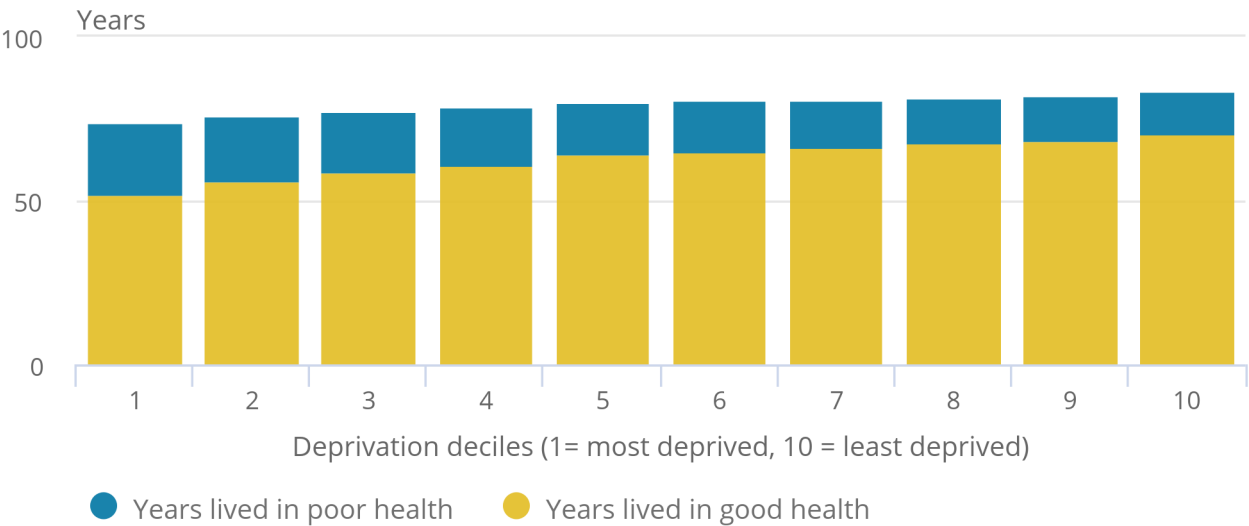
Only males living in the least deprived 40% of areas in England were expected to live more than 65 years of their life in "Good" health, while those in the most deprived 60% of areas were expected to live less than 65 years in "Good" health. Those in the most deprived 30% of areas were expected to live less than 60 years in good health.

**Figure 4: The largest gap in male healthy life expectancy between adjacent deciles was between Deciles 1 and 2 (most deprived)**

**Healthy life expectancy, England, 2016 to 2018**

Figure 4: The largest gap in male healthy life expectancy between adjacent deciles was between Deciles 1 and 2 (most deprived)

Healthy life expectancy, England, 2016 to 2018

Years

100

50

0

Deprivation deciles (1= most deprived, 10 = least deprived)

1   2   3   4   5   6   7   8   9   10

● Years lived in poor health        ● Years lived in good health

**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 gap between adjacent deciles was largest between Deciles 1 and 2; males in the latter were expected to live almost 3.6 years longer in "Good" health than males living in the most deprived areas. 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 level of deprivation exposure, with years spent in "Poorer" health mostly reducing in a progressive pattern from 21.6 years among males living in the most deprived areas to 12.8 years in the least deprived areas.
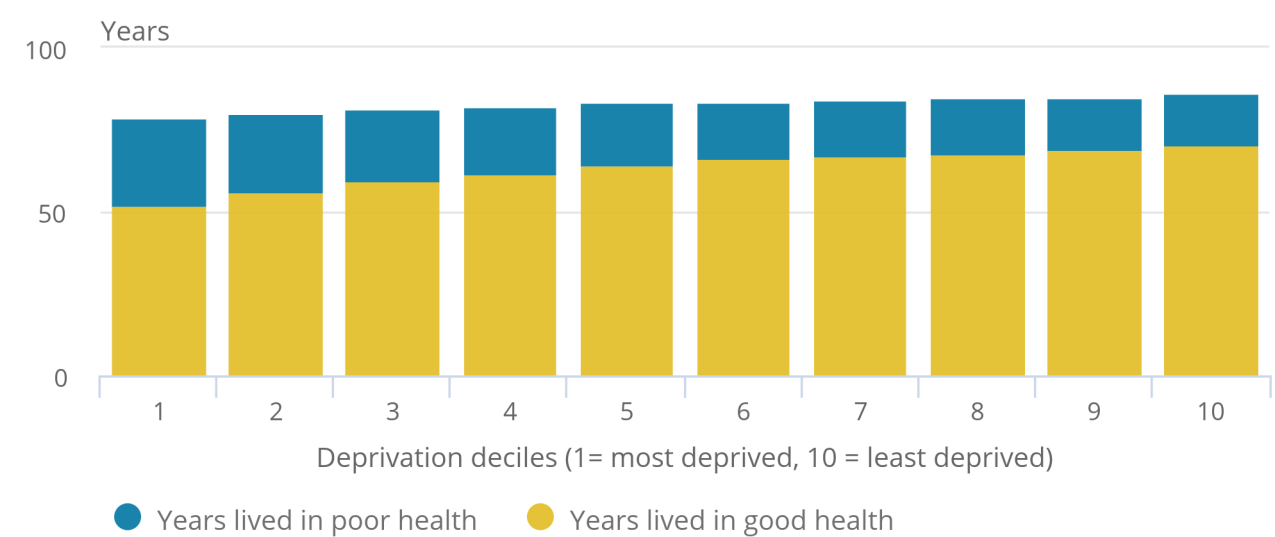
**Figure 5: Females living in the most deprived areas in England could expect to live 52.0 years in "Good" health, compared with 70.8 years for those living in the least deprived areas**

Healthy life expectancy, England, 2016 to 2018

**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 in the five least deprived deciles were expected to live more than 65 years in "Good" health, while those in the three most deprived deciles were expected to live less than 60 years in "Good" health (Figure 5).

For females, the years spent in poorer health states were clearly linked with the level of exposure to area deprivation; it fell from 26.6 years among females living in the most deprived areas to 15.4 years among the least deprived areas (Figure 5).

The gap in healthy life expectancy between adjacent deciles was largest between Deciles 1 and 2 for females also; a pattern similar to that seen in the same deciles for males. Females in Decile 2 were expected to live 4.2 years longer in "Good" health than females in Decile 1.

**Figure 6: Males and females at 65 years of age living in the most deprived areas could expect to live 5.2 years and 5 years less than those in the least deprived areas respectively**

**Life expectancy, England, 2016 to 2018**

Figure 6: Males and females at 65 years of age living in the most deprived areas could expect to live 5.2 years and 5 years less than those in the least deprived areas respectively

Life expectancy, England, 2016 to 2018
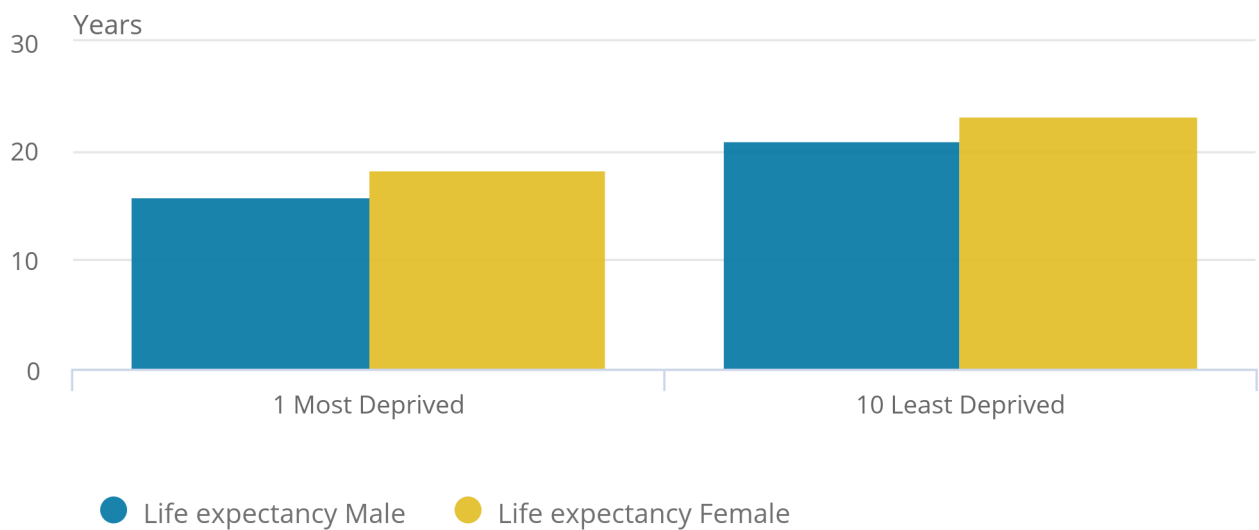


**Source: Office for National Statistics**

**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 area and Decile 10 represents the least deprived area.

As seen for life expectancy at birth, there are also large disparities in life expectancy at age 65 years across levels of deprivation exposure. Again as at birth, males at age 65 years living in the least deprived areas could expect to live 2.7 years longer than females living in the most deprived areas.

**Figure 7: Females aged 65 years living in the most deprived areas could expect to live 65.4 days less in 2016 to 2018, than in 2013 to 2015**

**Change in life expectancy (days), England, 2013 to 2015 and 2016 to 2018**

## Figure 7: Females aged 65 years living in the most deprived areas could expect to live 65.4 days less in 2016 to 2018, than in 2013 to 2015

Change in life expectancy (days), England, 2013 to 2015 and 2016 to 2018
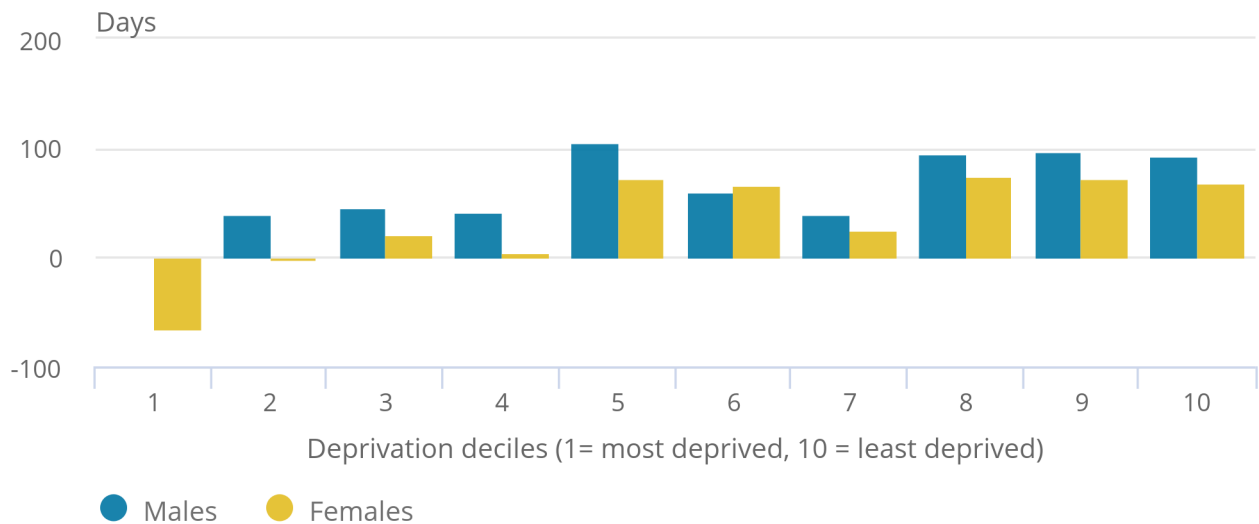


**Source: Office for National Statistics**

**Notes:**

1. Life expectancy (LE) includes all usual residents.

2. Deprivation deciles for 2013 - 2015 are based on the Index of Multiple Deprivation 2015 (IMD 2015) and deprivation deciles for 2016 – 2018 are based on the Index of Multiple Deprivation 2019 (IMD 2019). Decile 1 represents the most deprived and Decile 10 represents the least deprived.

The only significant decline in life expectancy at age 65 years for females in 2016 to 2018 compared with 2013 to 2015 was found in the most deprived areas. Life expectancy fell, from 18.5 years in 2013 to 2015, to 18.3 years in 2016 to 2018 (65.4 days).
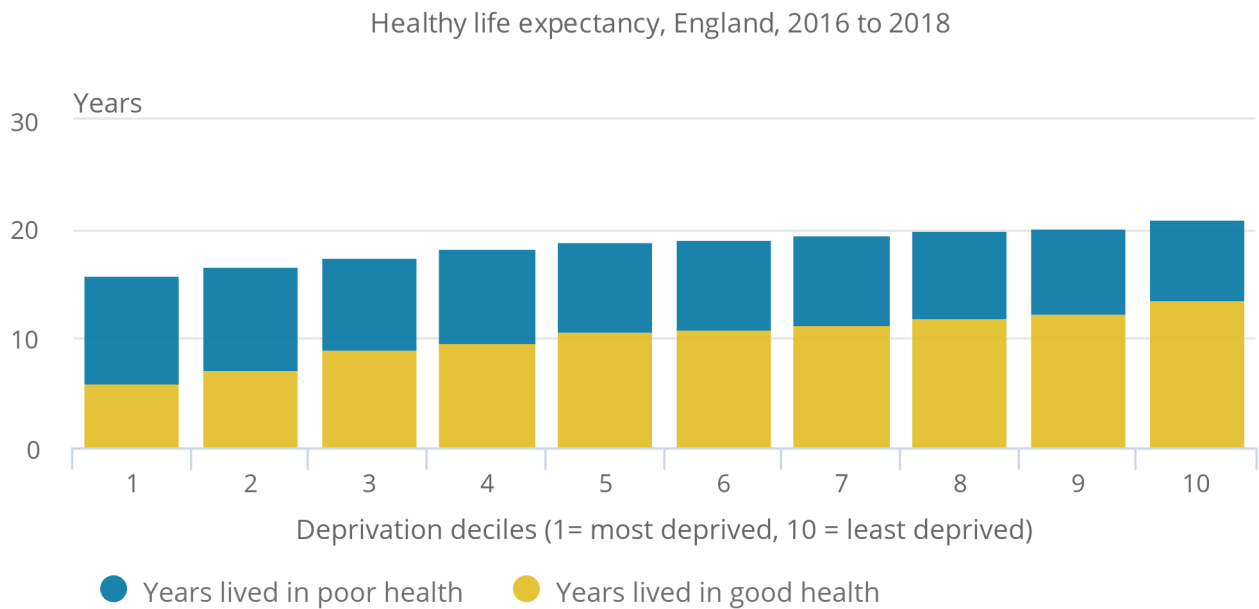
Females in Deciles 5, 6, 8, 9 and 10 all experienced significant increases in life expectancy at age 65 years in 2016 to 2018 compared with 2013 to 2015. The largest gain observed was in Decile 8; an improvement of 75.5 days (life expectancy improving from 21.9 years to 22.1 years).

Males living in Deciles 5, 6, 8, 9 and 10 all experienced improvements in life expectancy at age 65 years in 2016 to 2018 compared with males aged 65 years in 2013 to 2015. The largest gain in life expectancy was in Decile 5 with an improvement of 105.9 days (life expectancy increasing from 18.5 years to 18.8 years).

**Figure 8: Males living in the least deprived areas of England could expect 13.5 years of "Good" health from 65 years of age, however those in the most deprived areas could only expect 6.0 years**

**Healthy life expectancy, England, 2016 to 2018**

## Figure 8: Males living in the least deprived areas of England could expect 13.5 years of "Good" health from 65 years of age, however those in the most deprived areas could only expect 6.0 years

Healthy life expectancy, England, 2016 to 2018



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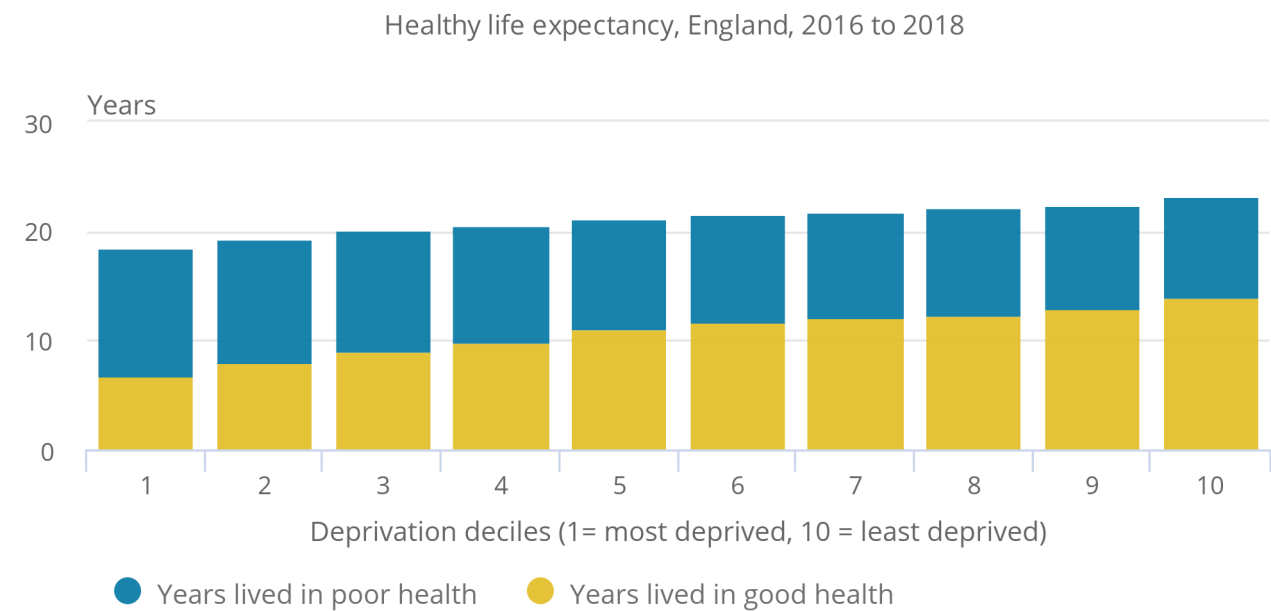
**Notes:**

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.

Healthy life expectancy at 65 years of age varied markedly by level of exposure to deprivation. Males living in Decile 1 and Decile 2 areas could expect to live less than half their remaining life in good health, whereas in all other deciles it exceeded half their remaining life; in Decile 10 this reached almost two-thirds of remaining life, discernable from Figure 8. The contrast across adjacent deciles was largest between Decile 2 and Decile 3 with a gap of 1.9 years.

**Figure 9: Females aged 65 years living in the least deprived areas were expected to spend a further 13.9 years of their remaining life in "Good" health, but this was only 6.8 years for females living in the most deprived areas**

Healthy life expectancy, England, 2016 to 2018

## Figure 9: Females aged 65 years living in the least deprived areas were expected to spend a further 13.9 years of their remaining life in "Good" health, but this was only 6.8 years for females living in the most deprived areas

Healthy life expectancy, England, 2016 to 2018



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 most deprived 40% of areas were spending less than half of their remaining life from age 65 years in good health, reducing to slightly more than a third in Decile 1. This compares with almost three-fifths of remaining life in good health in the least deprived areas.

# 3 . Slope Index of Inequality for life expectancy and healthy life expectancy in England

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

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.

## Gaps in life expectancy and healthy life expectancy remained substantial for both males and females at birth and at age 65 years in 2016 to 2018

In 2016 to 2018, the inequality in life expectancy in England for males at birth, as measured by the SII, stood at 9.5 years compared with 7.5 years for females.

The SII for healthy life expectancy at birth was larger than for life expectancy, standing at 18.9 years for males and 19.4 years for females (Figures 10 and 11).

### Figure 10: Slope index of inequality in male healthy life expectancy at birth: England, 2016 to 2018

Data download

**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.

### Figure 11: Slope index of inequality in female healthy life expectancy at birth: England, 2016-2018

**Data download**

**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.

At 65 years of age, the SII in life expectancy for males was 5.0 years compared with 4.6 years for females, suggesting sizeable socioeconomic inequalities persist at age 65 years. The inequality in healthy life expectancy at age 65 years for males was 6.9 years and for females 7.0 years.

While the range and SII for life expectancy and healthy life expectancy are important for estimating the scale of inequality at a given time point, the change from the most recent non-overlapping period (2013 to 2018) 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 life expectancy and healthy life expectancy for the periods 2013 to 2015 and 2016 to 2018.

Table 1: Comparison of the Slope Index of Inequality and range in life expectancy and healthy life expectancy at birth and at age 65 years by sex
England, between 2013 to 2015 and 2016 to 2018

| | 2013 to 2015 | | 2016 to 2018 | | | |
| | SII (Years) | Range (Years) | SII (Years) | Range (Years) | SII Difference | Range Difference |
|---|---|---|---|---|---|---|
| **Males at Birth** | | | | | | |
| **LE** | 9.2 | 9.2 | 9.5 | 9.5 | 0.3 | 0.3 |
| **HLE** | 18.9 | 18.7 | 18.9 | 18.3 | 0 | -0.4 |
| **Males at age 65** | | | | | | |
| **LE** | 4.7 | 5 | 5 | 5.2 | 0.3 | 0.2 |
| **HLE** | 6.8 | 7.1 | 6.9 | 7.6 | 0.1 | 0.5 |
| **Females at Birth** | | | | | | |
| **LE** | 7.1 | 7.2 | 7.5 | 7.7 | 0.4 | 0.5 |
| **HLE** | 19.6 | 19.1 | 19.4 | 18.9 | -0.2 | -0.2 |
| **Females at age 65** | | | | | | |
| **LE** | 4.3 | 4.6 | 4.6 | 5 | 0.3 | 0.4 |
| **HLE** | 7.3 | 7.4 | 7 | 7.1 | -0.3 | -0.3 |

Source: Office for National Statistics

Notes

1. Life expectancy includes all usual residents. Back to table

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. Back to table

3. SII is calculated by taking the difference between the extremes of a population weighted regression line of best fit. Back to table

4. Range is calculated by taking the difference between Decile 1 and Decile 10. Back to table

5. Figures may not sum because of rounding. Back to table

There was an increase in the inequality in male life expectancy at birth of 0.3 years, with the SII increasing from 9.2 years in 2013 to 2015 to 9.5 years in 2016 to 2018 (Table 1).

There was an increase in the inequality in female life expectancy at birth of 0.4 years, exceeding the increase experienced by males and thereby contracting the difference in the scale of the inequality between males and females. In the 2013 to 2015 period, the SII in female life expectancy at birth was 7.1 years but this grew to 7.5 years in 2016 to 2018.

# 4 . Changes to IMD 2019 (from IMD 2015) on life expectancy and healthy life expectancy at birth and aged 65 years

## In general, life expectancy follows a similar course across deciles when using either IMD 2015 or IMD 2019

In 2019, the English Indices of Deprivation were updated, with the Index of Multiple Deprivation: IMD 2019 replacing the IMD 2015. The IMD 2019 uses the same methodology as the IMD 2015, however, it has been updated to take account for changes in the Lower-layer Super Output Areas.

Figures 12 and 13 illustrate how life expectancy estimates across the IMD deciles follow a similar trajectory when using either version of the IMD (IMD 2015 and IMD 2019).

**Figure 12: Male life expectancy at birth in, follows a similar course across deciles when calculated using both IMD 2015 and IMD 2019**

**Life expectancy, England, 2016 to 2018**

**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 2015 (IMD 2015) and 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 neighbourhoods in England and Decile 10 represents the least deprived 10% (or decile) of neighbourhoods in England.

**Figure 13: Female life expectancy at birth, follows a similar course across deciles when calculated using both IMD 2015 and IMD 2019**

**Life expectancy, England, 2016 to 2018**

Figure 13: Female life expectancy at birth, follows a similar course across deciles when calculated using both IMD 2015 and IMD 2019

Life expectancy, England, 2016 to 2018



**Source: Office for National Statistics**
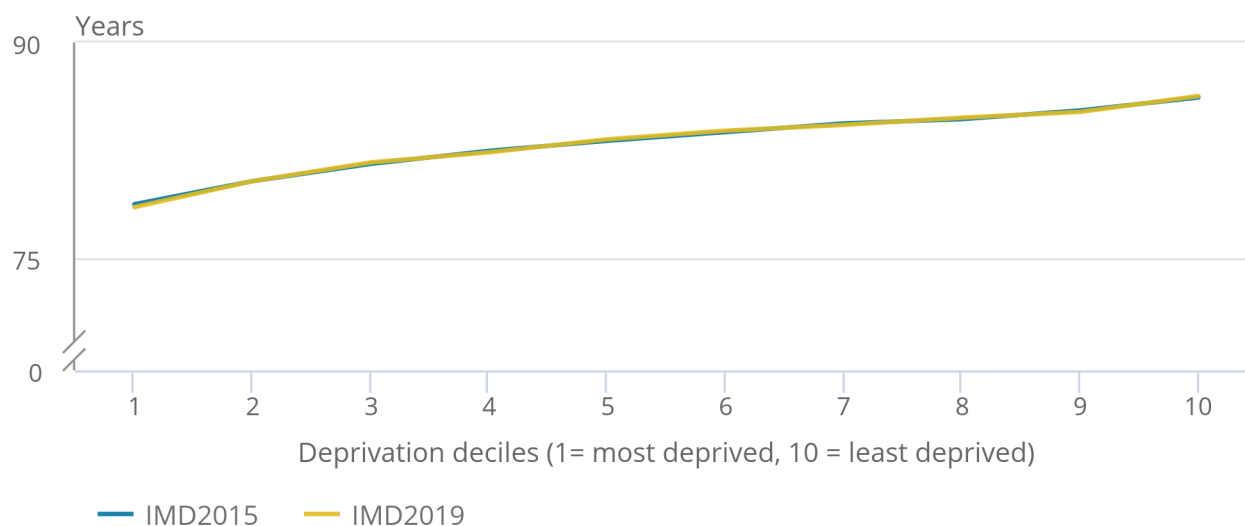
**Notes:**

1. Life expectancy (LE)includes all usual residents.

2. Deprivation deciles are based on the Index of Multiple Deprivation 2015 (IMD 2015) and 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 neighbourhoods in England and Decile 10 represents the least deprived 10% (or decile) of neighbourhoods in England.

## There are some differences between life expectancy estimates for 2016 to 2018 when calculated with either IMD 2015 or IMD 2019

In general, the direction of change between 2013 to 2015 and 2016 to 2018 was the same when using either IMD 2015 or IMD 2019 to calculate life expectancy estimates. However, there were some differences for specific deciles.

Between 2013 to 2015 and 2016 to 2018, life expectancy for females at birth in decile 1 decreased by 16.4 days when calculated using IMD 2015. However, when calculated with IMD 2019 life expectancy at birth fell by 95.3 days. This change was only significant when using IMD 2019.

Similarly life expectancy at age 65 years reduced for females in Decile 1, from 18.5 years in 2013 to 2015, to 18.4 years in 2016 to 2018 using IMD 2015 and 18.3 years using IMD 2019; the change again was significant when using IMD 2019 but not IMD 2015.

There was no significant difference in healthy life expectancy estimates for 2016 to 2018 at birth and aged 65 years when calculated with either IMD 2015 or IMD 2019. Moreover, there were no significant changes in healthy life expectancy compared with the last non-overlapping time period (2013 to 2015) irrespective of whether healthy life expectancy was calculated based on IMD 2015 or IMD 2019.

# 5 . Health state life expectancies data

Health state life expectancies by Index of Multiple Deprivation (IMD): England, all ages
Dataset | Released on 27 March 2020
Life expectancy (LE), healthy life expectancy (HLE), disability-free life expectancy (DFLE) by national deprivation deciles (IMD 2015 and IMD 2019), England: 2011 to 2018.

Health state life expectancies by Index of Multiple Deprivation (IMD 2019), England, at birth and age 65 years
Dataset | Released on 27 March 2020
Life expectancy (LE), healthy life expectancy (HLE), disability-free life expectancy (DFLE), Sslope Index of Inequality (SII) and range at birth and age 65 years by national deprivation deciles (IMD 2019), England: 2011 to 2018.

Health state life expectancies by Index of Multiple Deprivation (IMD): England, all ages
Dataset | Released on 27 March 2020
Life expectancy (LE), healthy life expectancy (HLE), disability-free life expectancy (DFLE) by national deprivation deciles (IMD 2015), England: 2016 to 2018.

# 6 . Glossary

## Period life expectancy

The life expectancy estimates reported in this bulletin are period-based. Period life expectancy 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 life expectancy by dividing expected lifespan into time spent in different states of health. In this release health state life expectancy 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 Index 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 Slope Index of Inequality (SII) was used to assess the absolute inequality in life expectancy and each health state life expectancy 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.

# 7 . Measuring the data

This statistical bulletin presents estimates of life expectancy, healthy life expectancy and disability-free life expectancy 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 The Health state life expectancies, UK QMI.

## Data sources

Life expectancy uses death registrations data held by the Office for National Statistics, 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, health state life expectancies use data collected as part of the Annual Population Survey (APS) and Census 2011 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 healthy life expectancy and disability-free life expectancy calculations.

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

## Method for estimating life expectancy

The life expectancy estimates reported in this bulletin are period-based life expectancies. Unlike the other life expectancy publications, the subnational life expectancy 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 life expectancies 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 template is available, which shows how the abridged life table is deployed to derive life expectancy estimates.

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

## Method for estimating health state life expectancies

Health state life expectancies 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 amongst the very old.

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

The Sullivan health state life expectancies 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:

$$X =^{cj} + (0.5f)$$

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

Using a random number-generating algorithm, a random value is taken from each decile life expectancy and healthy life expectancy 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 life expectancy 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.

# 8 . Strengths and limitations

The strengths of the Health state life expectancies by national deprivation deciles release are:

- health state life expectancies 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 health state life expectancy 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 Health state life expectancies 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

- Census 2011-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

# 9 . 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: 2016 to 2018
Bulletin | Released 12 December 2018
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 and Wales: 2015 to 2017
Bulletin | Released 27 March 2018
Life expectancy and years expected to live in "Good" health using national indices of deprivation to measure socioeconomic inequalities in England and Wales.

National life tables, UK: 2016 to 2018
Bulletin | Released 25 September 2019
Trends in the average number of years people will live beyond their current age measured by period life expectancy, analysed by age and sex for the UK and its constituent countries.