Office for National Statistics

Article

Quarterly mortality report, England: October to December 2017 and year-end review

Provisional death registration and death occurrence data for England broken down by sex, age and underlying cause.

Table of contents

1 . Main points

- Provisionally there were 498,285 deaths registered in England in 2017, more than in each of the last five years and the highest since 2003.

- The provisional age-standardised mortality rate for 2017 was 1,105 deaths per 100,000 males and 828 per 100,000 females; these are similar to 2016 but are lower than 2015.

- For both males and females, provisional estimates of life expectancy at birth show a small increase of 0.1 years between 2016 and 2017.

- The provisional age-standardised mortality rate for deaths with an underlying cause of dementia or Alzheimer's disease was significantly higher in 2017 than in 2016 for both males and females.

- Provisionally there were 125,112 deaths registered in Quarter 4 (Oct to Dec) 2017, higher than the same period in 2015, 2016 and the five-year average.

- Of the deaths that occurred each day during Quarter 4 (Oct to Dec) 2017 86% were above the five-year average.

2 . Things you need to know about this release

The purpose of this report is to provide timely surveillance of mortality in England. This report serves as a snapshot of deaths that were registered within the most recent quarter using the best available data. Through comparative analyses with previous quarters and with the use of rolling four-quarter totals, it aims to inform patterns of change in mortality; specifically, whether mortality has increased, remained stable or decreased.

This report includes data up to and including Quarter 4 2017, which covers the period 1 October to 31 December 2017. In addition to reporting on deaths that were registered in Quarter 4 we also report quarterly rolling four-quarter death counts and mortality rates that encompass all quarters of the year. The most recent rolling four-quarter period is Quarter 1 2017 to Quarter 4 2017 (January 2017 to December 2017).

In keeping with previous editions of this report, this edition will be based primarily on death registrations with a section on death occurrences. Death occurrences report the number of deaths that occurred within a reference period to allow period-specific comparisons and thereby aim to enable timely judgements on the direction and magnitude of change. We can only know when a death occurred once it has been registered. However, due to registration delays, death occurrences data can often be incomplete, especially towards the end of the quarter.

Death registrations data for 2017 are provisional; however, we would expect only very small changes to total death registration counts once data are made final. Breakdowns by cause of death may also change as some deaths may be registered but not yet coded for cause of death. A provisional extract of death registrations and death occurrences data for Quarter 4 (1 October to 31 December) 2017 was created on 29 January 2018, roughly four weeks after the end of the reporting period.

The quarterly populations used in the rate calculations here are adjusted using mid-year population estimates or a combination of mid-year population estimates (2001 to 2016) and population projections (2017) to estimate what the likely population would have been at the mid-point of the quarter. More detail is provided in the technical notes at the end of this report.
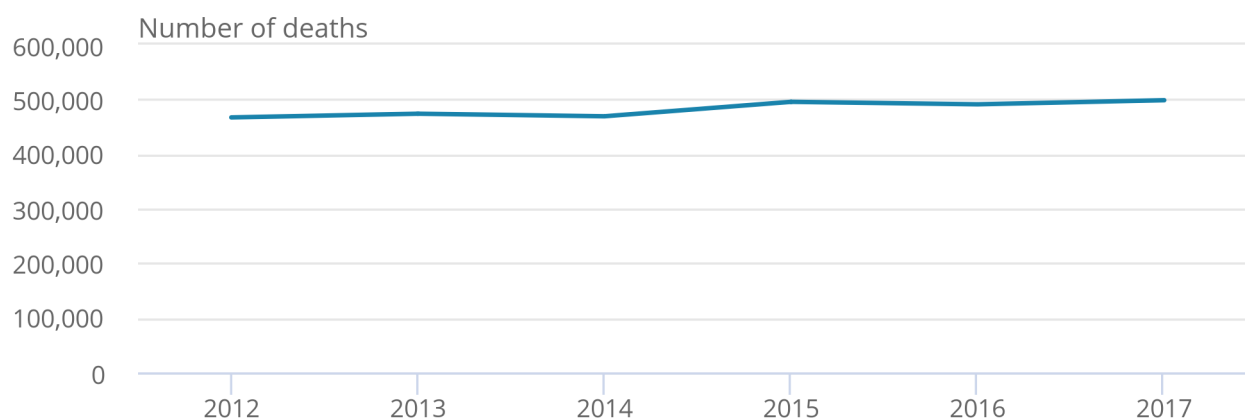
The statistics reported here are Experimental Statistics and allow us to demonstrate to users some of the analyses possible in the future and to seek feedback to inform the future presentation of timely mortality data. We welcome feedback from users on this report at mortality@ons.gov.uk

This publication was produced with support from Public Health England and Department of Health.

3 . Provisional total number of deaths registered in 2017 exceeds that of 2015, 2016 and the five-year average

To assess how the number of deaths registered in 2017 compares with recent years, Figure 1 shows the number of deaths that have been registered in each year from 2012 to 2017. The number of deaths registered in 2017 was 498,285; this is higher than each of the last five years and is a 2% increase from 2016 and a 4% increase from the five-year average. However, the age-standardised mortality rates remain at a similar level (see Section 4).

Figure 1: Number of deaths registered in the period January to December, England, 2012 to 2017

Figure 1: Number of deaths registered in the period January to December, England, 2012 to 2017

Source: Office for National Statistics

Notes:

1. Data for 2017 are provisional.

2. Figures for England exclude deaths of non-residents.

3. [Information on registration delays for a range of causes](#).

Table 1a presents the number of deaths registered in 2015, 2016, 2017 and the five-year average and compares the number of deaths registered in 2017 with each of these periods. There were more deaths registered in 2017 than in both 2015 and 2016 and 19,224 more deaths registered in 2017 than the five-year average.

Table 1a: Number of deaths observed year-to-date 2015 to 2017 and 2012 to 2016 average

	2012 to 2016 average	2015	2016	2017
Number of deaths	479,061	495,309	490,791	498,285
Excess deaths in 2017 compared with previous years	19,224	2,976	7,494	0

Source: Office for National Statistics

Notes:

1. Data for 2017 are provisional.

An expected number of deaths in 2017 can be calculated by applying the mortality rate for earlier periods to the 2017 population (Table 1b). Despite the relatively high number of observed deaths, there were fewer deaths registered in 2017 than we would have expected given the mortality rates observed in previous years. For example, there were 14,956 fewer deaths than would be expected in 2017 based on the 2015 mortality rate.

Table 1b: Number of deaths expected year-to-date 2015 to 2017 and 2012 to 2016 average

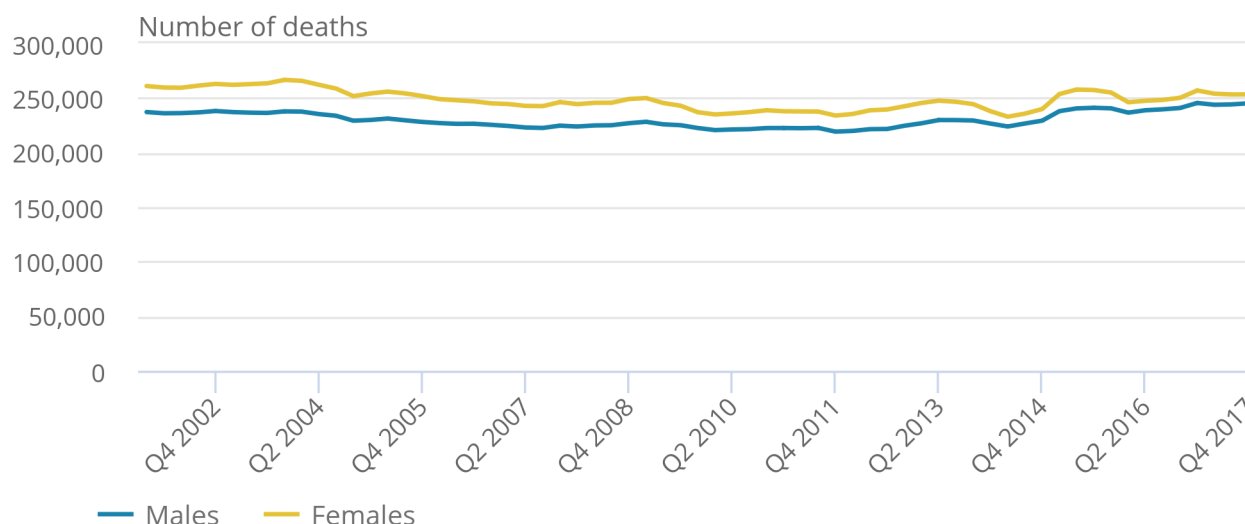|	Using 2012 to 2016 average rate	Using 2015 rate	Using 2016 rate	Observed deaths in 2017
Expected deaths	505,902	513,241	498,872	498,285
Excess deaths in 2017 compared with expected deaths for 2017 using previous year's rates	-7,617	-14,956	-587	0

Source: Office for National Statistics

Notes:

1. Data for 2017 are provisional.

4 . 498,285 deaths were registered in England between January 2017 and December 2017 (the latest rolling four-quarter period)

Figure 2a shows the number of deaths registered in rolling four-quarter periods since 2001. The number of deaths registered is consistently higher in females than in males, this is likely related to there being more females in the population. For males, the number of deaths registered in the latest four-quarter period is higher than those registered in the four-quarter period ending Quarter 4 (Oct to Dec) 2001. Whereas for females, the number of deaths in the latest four-quarter period is lower than that observed in the period ending Quarter 4 2001.

Figure 2a: Number of death registrations, England, rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

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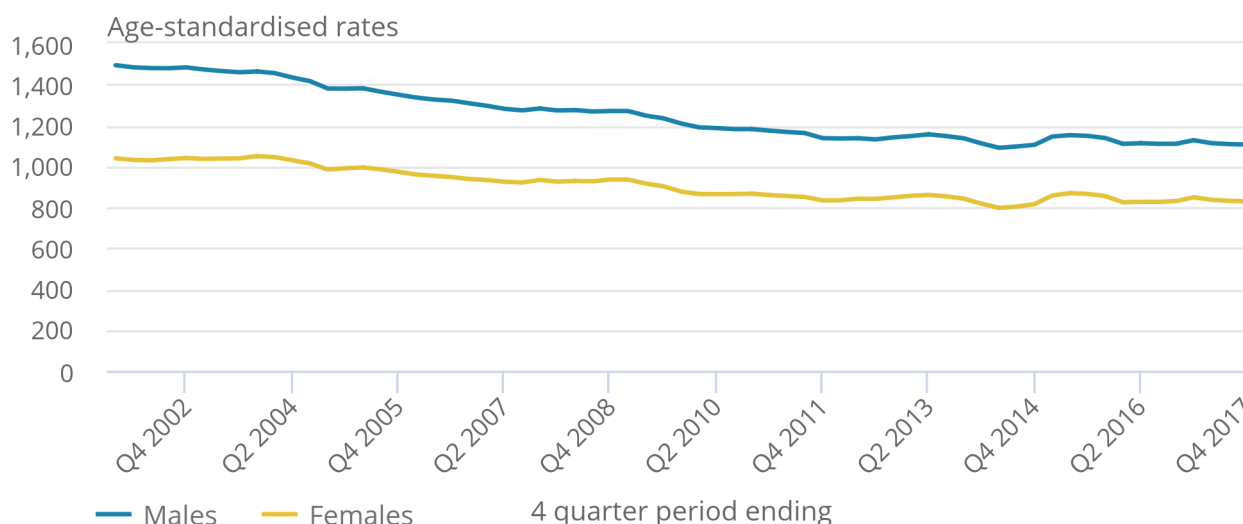

Source: Office for National Statistics

Notes:

1. Data for 2017 are provisional, therefore the sum of male and female death counts may not equal the total reported elsewhere as some death registrations are not yet fully coded.

2. Population data for 2017 are projected.

3. Q1 refers to year ending Quarter 1 (Apr to Mar), Q2 refers to year ending Quarter 2 (Jul to Jun), Q3 refers to year ending Quarter 3 (Oct to Sep) and Q4 refers to year ending Quarter 4 (Jan to Dec).

Although numbers of deaths have increased over recent years, Figure 2b shows that the age-standardised mortality rate for males is at a similar level to the same period in 2014 and 2016. Despite having higher numbers of deaths than males, females consistently have lower age-standardised mortality rates. The mortality rate for females remains at a similar level to the equivalent period in 2016 but is not as low as for the equivalent period in 2014. The increase in the number of deaths registered for each rolling four-quarter period is influenced strongly by the increasing size and age of the population.

Figure 2b: Age-standardised mortality rate, England, rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

Figure 2b: Age-standardised mortality rate, England, rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

Notes:

1. Data for 2017 are provisional, therefore the sum of male and female death counts may not equal the total reported elsewhere as some death registrations are not yet fully coded.

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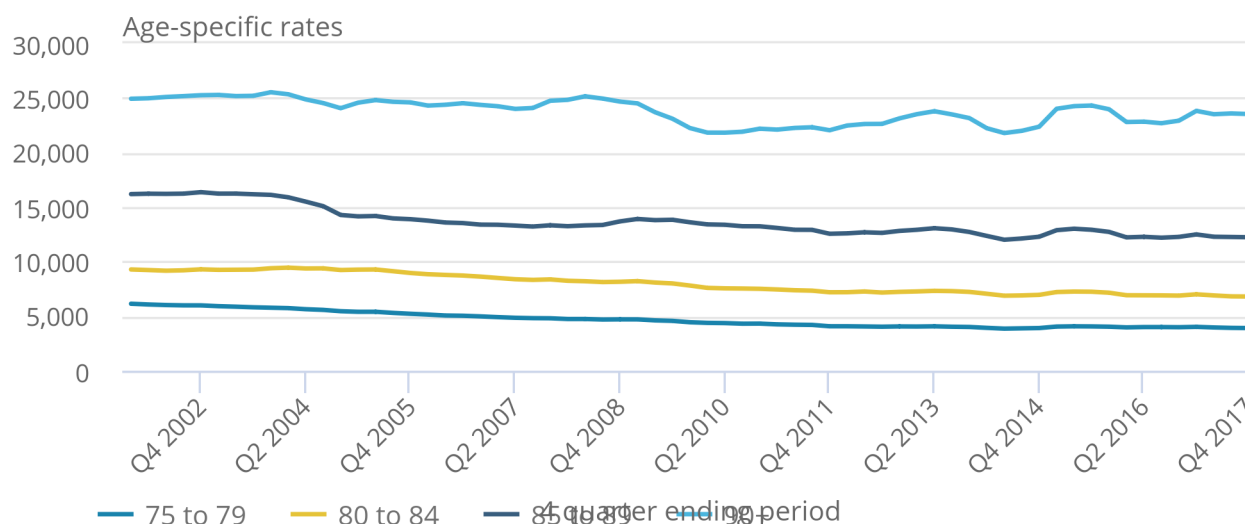
5 . Mortality rates most volatile among females aged 90 years and over

There is little change in the age-specific mortality rates in the older age groups for the latest rolling four-quarter period compared with the previous three rolling four-quarter periods.

In both males and females, the highest age-specific mortality rates were observed in the 90 and over age group. Age-specific mortality rates in females aged 90 and over are more volatile than those of males in the same age group. Since the period ending Quarter 2 (April to June) 2010 age-specific mortality rates for males aged 90 and over have increased by 7.8% and for females age-specific mortality rates for those aged 90 and over have increased by 8.4%. However, care must be taken when interpreting the age-specific rates for the 90 and over age group as this includes deaths of all individuals aged 90 and over so will have the largest range of ages.

Figure 3a: Age-specific mortality rates, males, England, rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

Figure 3a: Age-specific mortality rates, males, England, rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

Source: Office for National Statistics

Notes:

1. Death registrations data for 2017 are provisional.

2. Population data for 2017 are projected.

3. Q1 refers to year ending Quarter 1 (Apr to Mar), Q2 refers to year ending Quarter 2 (Jul to Jun), Q3 refers to year ending Quarter 3 (Oct to Sep) and Q4 refers to year ending Quarter 4 (Jan to Dec).

Figure 3b: Age-specific mortality rates, females, England, rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

Figure 3b: Age-specific mortality rates, females, England, rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017
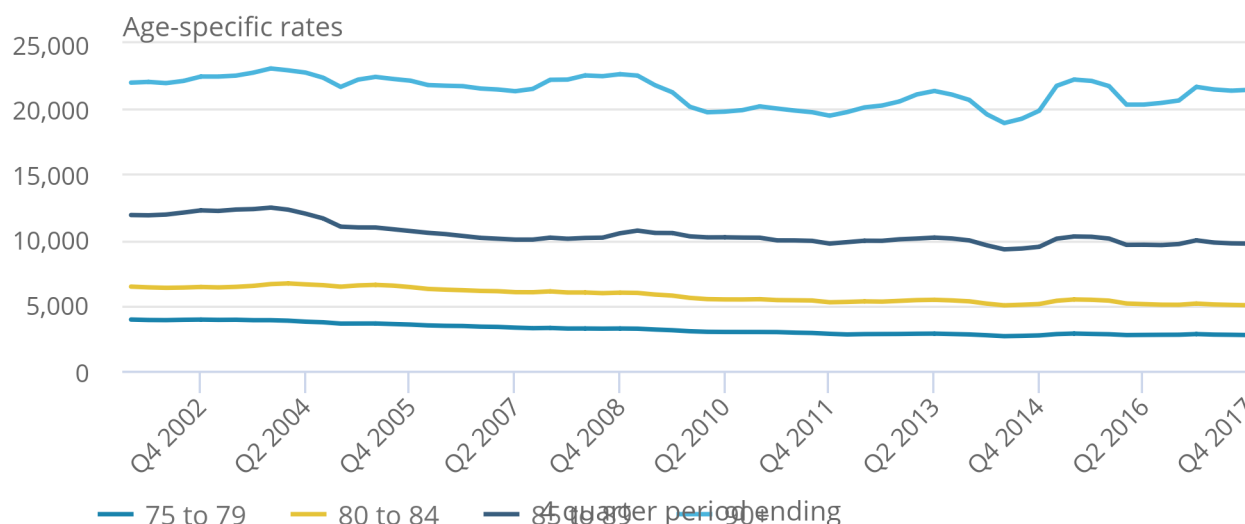

Source: Office for National Statistics

Notes:

1. Death registrations data for 2017 are provisional.

2. Population data for 2017 are projected.

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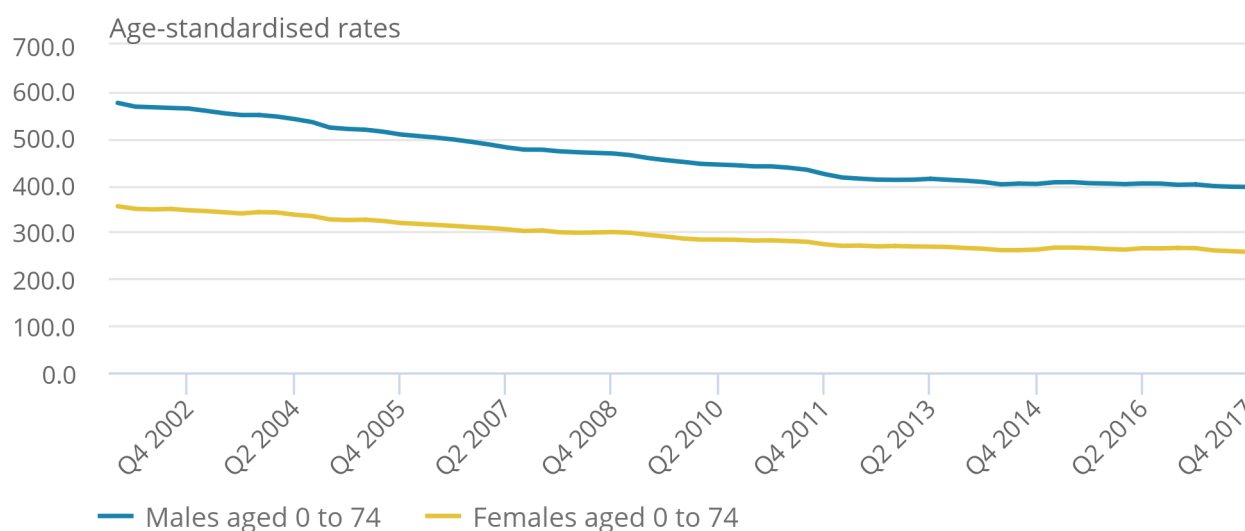
For both males and females, age-standardised mortality rates in those aged 0 to 74 years have seen no substantial rolling change since the period ending Quarter 1 (Jan to Mar) 2012 (see Figure 3c).

Figure 3c: Age-standardised mortality rates, by sex, ages 0 to 74 years, England,

Rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

Figure 3c: Age-standardised mortality rates, by sex, ages 0 to 74 years, England,

Rolling four-quarter periods from period ending Quarter 4 (Oct to Dec) 2001 to period ending Quarter 4 2017

Age-standardised rates

Source: Office for National Statistics

Notes:

1. Death registrations data for 2017 are provisional.

2. Population data for 2017 are projected.

3. Q1 refers to year ending Quarter 1 (Apr to Mar), Q2 refers to year ending Quarter 2 (Jul to Jun), Q3 refers to year ending Quarter 3 (Oct to Sep) and Q4 refers to year ending Quarter 4 (Jan to Dec).

Single year of age mortality rates for deaths registered in Quarter 4 (Oct to Dec) for those aged 75 years and over can be found in the accompanying datasets. Caution must be used when interpreting these rates given birth cohort effects following the First World War.

All mortality rates and 95% confidence intervals can be found in the dataset accompanying this release.

6 . Small increases in life expectancy at birth for both males and females from 2016 to 2017

For both males and females, provisional estimates of life expectancy at birth show a small increase of 0.1 years between 2016 and 2017. For males, life expectancy at birth in 2017 was 79.6 years, the highest it has ever been. For females, life expectancy at birth in 2017 was 83.2 years, the same as the historically high value in 2014. This small increase is consistent with recent reports indicating that the rate of increase in life expectancy has slowed in recent years.

The accompanying datasets show life expectancy at birth, age 65, 75, 85 and 95 years, by sex.

7 . Significant increase in deaths with an underlying cause of dementia or Alzheimer's disease for both males and females

Changes to the coding of underlying cause of death can have an impact on the number of deaths recorded with a specific underlying cause. Two major coding changes occurred in 2011 and 2014. Comparability ratios have been applied to the number of deaths to account for this impact to allow for a more consistent time trend. These ratios can be found in the "Comparability ratios" tab in the accompanying datasets. For more information, see Quality and methodology (Section 11).

For most underlying causes of death there have been no significant changes in age-standardised mortality rates for those aged 75 years and over from 2016 to 2017. This is except for dementia and Alzheimer's disease, which saw a significant increase for both males and females, and respiratory diseases other than influenza or pneumonia, which saw a significant increase from 2016 to 2017 for females.

For both males and females, age-standardised mortality rates for deaths from circulatory diseases in those aged 75 years and over have decreased over time since 2001, with mortality rates in 2017 being significantly lower than in 2015 (see Figures 4a and 4b).
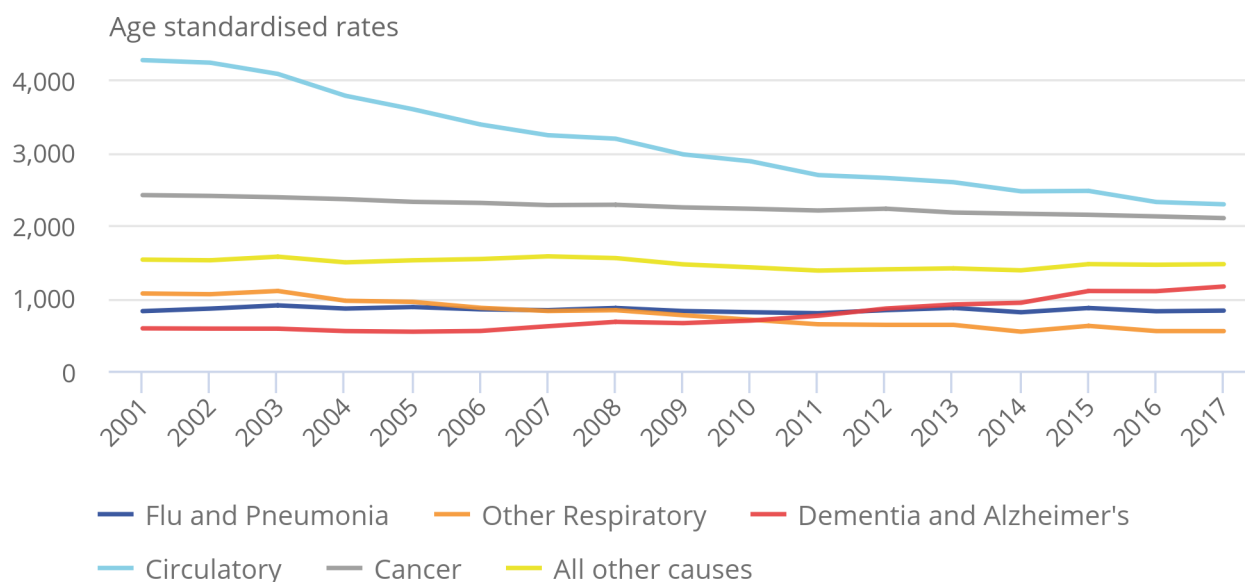
For both males and females, there have been continued rises in death rates from dementia and Alzheimer's disease, with significant increases from 2016 to 2017. For females aged 75 years and over, according to our provisional estimates, death rates from dementia and Alzheimer's disease in 2017 were significantly higher than those from cancer for the first time.

Of the additional 7,813 deaths registered in 2017 compared with 2016, there were 55% (4,264 out of 7,813) with an underlying cause of dementia and Alzheimer's disease. The proportion of all deaths with an underlying cause of dementia and Alzheimer's disease had the largest increase (0.9%) between 2016 and 2017 compared with any other cause group.

The reasons for the increase in death rates from dementia and Alzheimer's disease may be related partly to attempts across the health system to improve the diagnosis of people with dementia. For example, in 2013 to 2014, incentives were put in place to encourage the identification and diagnosis of dementia among older people who had had an episode of emergency or unplanned hospital care. More recently, in February 2015, the Prime Minister issued a challenge on dementia and the government's mandate to NHS England now includes an agreed ambition that two-thirds of the estimated number of people with dementia in England should have a diagnosis (PDF, 440KB).

Figure 4a: Age-standardised mortality rates by underlying cause of death, males aged 75 and over, England, deaths registered 2001 to 2017

Figure 4a: Age-standardised mortality rates by underlying cause of death, males aged 75 and over, England, deaths registered 2001 to 2017
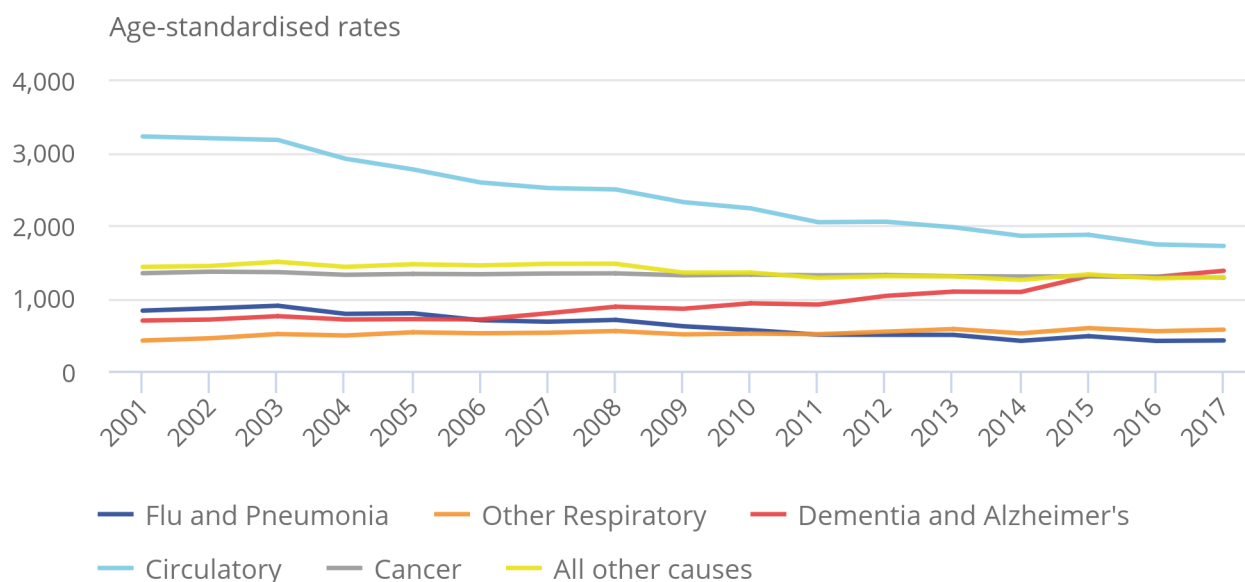

Source: Office for National Statistics

Notes:

1. Rates are based on death registrations.

2. Data for 2017 is provisional.

3. Figures for England exclude deaths of non-residents.

4. Data is for persons aged 75 years and older.

5. Rates per 100,000 population, standardised to the 2013 European Standard Population.

6. Cause of death was defined using the International Classification of Diseases version 10 (ICD-10).

7. Changes to the coding of underlying cause of death can have an impact on the number of deaths recorded with a specific underlying cause. Two major coding changes occurred in 2011 and 2014. Comparability ratios have been applied to the number of deaths to account for this impact to allow for a more consistent time trend.

Figure 4b: Age-standardised mortality rates by underlying cause of death, females aged 75 and over, England, deaths registered 2001 to 2017

Figure 4b: Age-standardised mortality rates by underlying cause of death, females aged 75 and over, England, deaths registered 2001 to 2017

Age-standardised rates

Source: Office for National Statistics

Notes:

1. Rates are based on death registrations.

2. Data for 2017 is provisional.

3. Figures for England exclude deaths of non-residents.

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8 . There were 125,112 deaths registered in Quarter 4 2017 in England

In Quarter 4 (Oct to Dec) 2017, there were 125,112 deaths registered in England. This is higher than the same period in 2015, 2016 and the five-year average (see Table 2a). The number of deaths registered in Quarter 4 2017 was also higher than the number of deaths registered in Quarters 2 (Apr to June) and 3 (July to Sept) of 2017, but was 18,966 fewer than the number of deaths registered in Quarter 1 (Jan to Mar) 2017.

Table 2a: Number of observed deaths, England, Quarter 4 (Oct to Dec) 2015 to Quarter 4 2017 and Quarter 4 2012 to Quarter 4 2016 average

	Q4 2012 to Q4 2016 average	Q4 2015	Q4 2016	Q4 2017
Number of deaths	120,948	120,836	123,982	125,112
Excess deaths in Q4 2017 compared with previous years	4,164	4,276	1,130	0

Source: Office for National Statistics

Notes:

1. Data for 2017 are provisional.

2. Q4 refers to Quarter 4 (October to December).

An expected number of deaths in Quarter 4 2017 can be calculated by applying the mortality rate for earlier periods to the 2017 population (Table 2b). Despite the relatively high number of observed deaths, there were fewer deaths registered in Quarter 4 2017 than we would have expected given the mortality rates in previous years. For example, there were 2,682 fewer deaths registered in Quarter 4 2017 than would be expected based on the Quarter 4 2012 to 2016 average mortality rate.

Table 2b: Number of expected deaths, England, Quarter 4 (Oct to Dec) 2015 to Quarter 4 2017 and Quarter 4 2012 to Quarter 4 2016 average

	Using Q4 2012 to Q4 2016 average rate	Using Q4 2015 rate	Using Q4 2016 rate	Observed deaths in Q4 2017
Expected deaths	127,794	125,127	126,381	125,112
Excess deaths in Q4 2017 compared with expected deaths for Q4 2017 using previous year's rates	-2,682	-15	-1,269	0

Source: Office for National Statistics

Notes:

1. Data for 2017 are provisional.

2. Q4 refers to Quarter 4 (October to December).

9 . Trends in death occurrences for Quarter 4

Data reported in this section are based on deaths that occurred within the period 1 October to 31 December rather than deaths that were registered in this period (as in the rest of the report). Death occurrences data from years prior to 2017 are based on the same extraction date of 29 January of the following year. This extraction date is applied to occurrences data for each respective year. Using death occurrences data with a similar extraction date allows for comparability between years whilst minimising any registration delay effects. The median delay for death registrations is five days for all causes of death.

Further information about registration delays can be found in Impact of registration delays on mortality statistics and also in the Quality and methodology section of this report. Death occurrences data for 2016 and 2017 are provisional and numbers will increase over time as further deaths that occurred in the period are registered.

Table 3 shows the number of death occurrences with a similar extraction date of 29 January for each respective year of 2015 to 2017 and the five-year average. This is calculated as the number of deaths that occurred in Quarter 4 (Oct to Dec) and were registered on or before 29 January in each year. From 1 October to 31 December 2017, there were 124,462 deaths in England, which was higher than 2015 and 2016. In Quarter 4 2017, there were an additional 6,248 death occurrences compared with the average of the previous five years. This is 5% greater than the five-year average.

Table 3: Number of deaths that occurred with a similar extraction date, England, Quarter 4 (Oct to Dec) 2015 to Quarter 4 2017 and Quarter 4 2012 to Quarter 4 2016 average

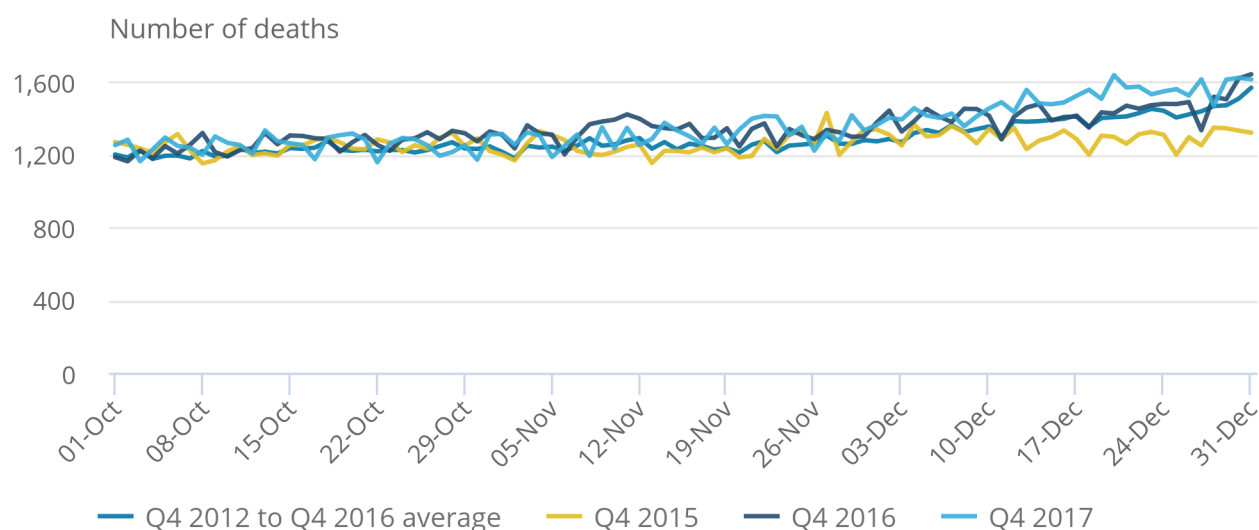|	Q4 2012 to Q4 2016 average	2015	2016	2017
Number of deaths	118,214	116,216	123,314	124,462
Excess deaths in Q4 2017 compared with previous years	6,248	8,246	1,148	0

Source: Office for National Statistics

Notes:

1. Data are based on death occurrences

2. Data for 2016 and 2017 are provisional.

3. Q4 refers to Quarter 4 (Oct to Dec).

Daily death occurrences using a similar extraction date show that for Quarter 4 2017, most days (86%) had a higher number of deaths than the five-year average (Figure 5). Towards the end of the quarter (27 November onwards) there were no days where the number of deaths was below the five-year average.

Figure 5: Number of deaths occurring on each day, England, Quarter 4 (Oct to Dec) 2015 to Quarter 4 2017 and Quarter 4 2012 to Quarter 4 2016 average

Figure 5: Number of deaths occurring on each day, England, Quarter 4 (Oct to Dec) 2015 to Quarter 4 2017 and Quarter 4 2012 to Quarter 4 2016 average

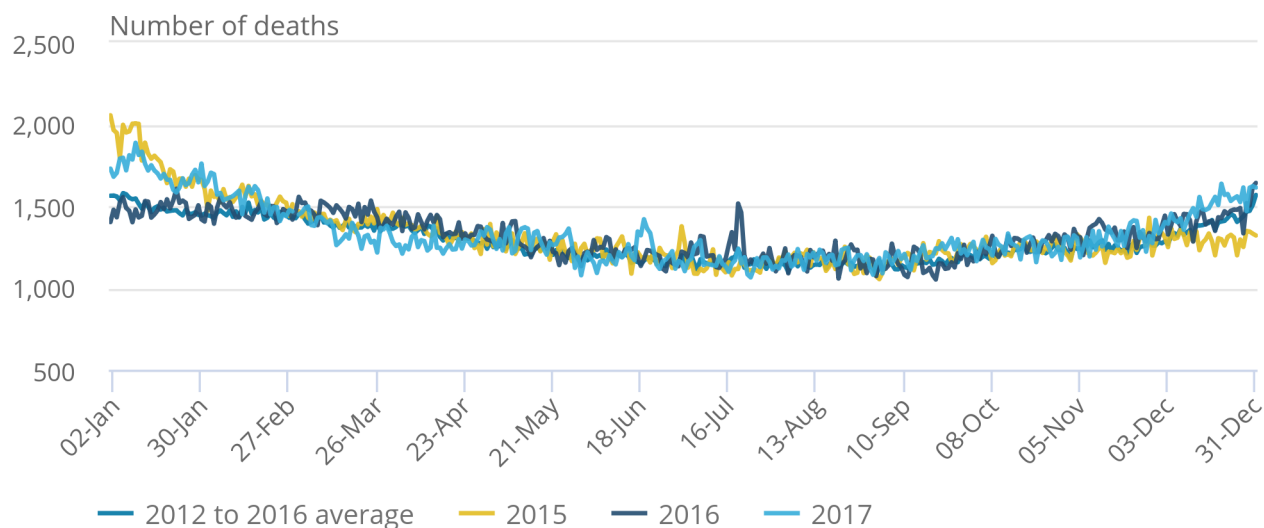**Source: Office for National Statistics**

Notes:

1. Based on death occurrences with a similar extraction date of 29 January for each respective year.

2. Deaths for 2016 and 2017 are provisional.

3. Figures for England exclude deaths of non-residents.

4. Information on registration delays for a range of causes .

10 . Trends in death occurrences for 2017

The provisional number of deaths that occurred in 2017 was 485,197. This is more than in each of the previous five years and 16,362 more than the five-year average. Figure 6 shows that for most days in the year, particularly for the beginning and the end of the year, 2017 had a greater number of deaths than the five-year average.

Figure 6: Number of deaths occurring on each day, England, 2015, 2016, 2017 and 2012 to 2016 average

Figure 6: Number of deaths occurring on each day, England, 2015, 2016, 2017 and 2012 to 2016 average

Source: Office for National Statistics

Notes:

1. Based on death occurrences with a similar extraction date of 29 January for each respective year.

2. Deaths for 2016 and 2017 are provisional.

3. Figures for England exclude deaths of non-residents.

4. [Information on registration delays for a range of causes](#).

11 . Quality and methodology

Deaths data sources

A provisional extract of death registrations and death occurrences data for Quarter 4 (1 October to 31 December) 2017 was created on 29 January 2018, roughly four weeks after the end of the reporting period. For this reason, we would expect death occurrences to increase, because of registration delays, which will not be accounted for by 29 January 2018. In exceptional circumstances there may also be changes to the number of registrations but these would be very small. Registrations data for years prior to 2017 are final, whereas occurrences data prior to 2016 are final.

Registration delays on occurrences

In England, deaths should be registered within five days of the death occurring, but there are some circumstances that result in the registration of the death being delayed. Deaths considered unexpected, accidental or suspicious will be referred to a coroner who may order a post-mortem or carry out a full inquest to ascertain the reasons for the death. The coroner can only register the death once any investigation is concluded and they are satisfied that the death was natural and that the cause of death has been certified correctly.

If the coroner is not satisfied that the death was from natural causes then an inquest will normally be held to determine the cause of death. The time taken to investigate the circumstances of the death can often result in a death registration exceeding the five-day grace period and these are defined as registration delays. While delays are commonly only a few days, registration delays can extend into years, particularly for deaths from external causes when inquests are held. We are only aware of a death and able to include it in the statistics once it has been registered.

Those at younger ages are disproportionally affected by registration delays due to external causes of death being more common in these ages. However, in general, deaths at such ages are not very common and make up only a small percentage of all deaths.

The death occurrences dataset for 2017 will not hold all deaths that occurred in the quarter due to late registrations. Where death occurrences have been used in this report, deaths for previous years have been extracted using a similar extraction date as the 2017 occurrences data. This allows for control over registration delays.

Expected deaths methodology

For each respective year, single year of age mortality rates were calculated. These were then applied to the population projections for 2017 to calculate the number of expected deaths in each single year of age using the mortality rate from the respective year. From this we were able to calculate the difference between observed and expected deaths in 2017.

Quarterly population denominators

We publish the mid-year population estimates used for calculating rates. For 2017, the 2016-based ONS population projections were used.

Single year of age populations for the oldest ages (90 to 100 years and over) for 2002 to 2016 were taken from the mid-year population estimates of the very old publication. For 2001, the population estimates for ages 90 years and over were used and for 2017 the 2016-based ONS population projections were used.

Calculation of mortality rates for quarterly deaths requires adjustments to be made to annual population estimates in order to calculate rates that are comparable with annual rates.

We calculate an annual population centred on the mid-point of the quarter using two years' worth of population estimates or projections. This is then multiplied by the proportion of the number of days within a quarter of the total number of days within that year. The output is used as the population denominator in calculations of age-standardised and age-specific morality rates.

$$Quarter\ 4(2017)population =$$
$$\left(population2017(i) + \left((population2018(i) - population2017(i)) \times \left(\tfrac{m}{M} \right) \right) \right) \times \left(\tfrac{N}{M} \right)$$

Where m is the number of days from 1 July 2016 (the start of the mid-year for the population estimate) to the midpoint of the relevant quarter, inclusive, N is the number of days in the Quarter for example Quarter 4 (Oct to Dec) 2017 and M is the number of days in 2017 and (i) is the age group.

This method is very similar to that used to calculate population denominators for quarterly conception rates.

Comparability ratios for causes of death

We code cause of death using the World Health Organisation's (WHO) International Classification of Diseases, Tenth Revision (ICD-10). Where possible, deaths are automatically coded using specialist software, with the remaining deaths being manually coded.

ICD-10 was introduced in England and Wales in January 2001. Since then various amendments to the ICD-10 have been authorised by WHO and we have updated cause coding software to incorporate these changes. Between 2001 and 2010, we used software version 2001.2; between 2011 and 2013, version 2010 was used and on 1 January 2014, we changed the software to a package called IRIS (version 2013). IRIS software version 2013 incorporates all official updates to ICD-10 approved by WHO, which were timetabled for implementation before 2014.

To understand the impact of these changes on mortality statistics, we carried out bridge coding studies in 2011 and 2014 in which samples of deaths that had previously been coded using the old software were then independently recoded using the new version of ICD-10. This dual-coded data can be used to produce comparability ratios that can be applied to data to account for the changes to allow more consistent time series to be produced. We do not ordinarily publish data that have had comparability ratios applied, but for the purposes of this article, comparability ratios for deaths in people aged 75 years and over have been calculated and applied. The full set of ratios and their confidence intervals can be found in the accompanying datasets.

The Mortality Quality and Methodology Information report contains important information on:

- the strengths and limitations of the data and how it compares with related data

- uses and users of the data

- how the output was created

- the quality of the output including the accuracy of the data

The User guide to mortality statistics is also a useful resource when reporting mortality statistics.