

Statistical bulletin

Deaths Involving *Clostridium difficile*, England and Wales: 2012

Deaths where *Clostridium difficile* infection was mentioned on the death certificate by sex, age group and whether the death occurred in hospital or elsewhere.



Contact:
Laura Mulcahy
mortality@ons.gsi.gov.uk

Release date:
22 August 2013

Next release:
3 September 2014

Table of contents

1. [Key points](#)
2. [Summary](#)
3. [Background](#)
4. [Deaths involving *Clostridium difficile* in England and Wales](#)
5. [Deaths involving *Clostridium difficile* by underlying cause](#)
6. [Deaths involving *Clostridium difficile* in England and Wales by sex](#)
7. [Deaths involving *Clostridium difficile* in England and Wales by age group](#)
8. [Deaths involving *Clostridium difficile* in England and Wales by place of death](#)
9. [Results](#)
10. [Methods](#)
11. [Clostridium difficile statistics for other countries](#)
12. [References](#)
13. [Background notes](#)

1. Key points

- In 2012 there were 1,646 deaths involving *Clostridium difficile* (*C. difficile*) infection in England and Wales, 407 fewer than in 2011 (2,053 deaths)
- Mortality rates for deaths involving *C. difficile* fell for the fifth consecutive year and decreased significantly from 19.6 to 15.3 deaths per million population between 2011 and 2012
- The number of deaths involving *C. difficile* increases with age. During 2010–12 the mortality rate for people aged over 85 years was 818 and 810 per million for males and females respectively in England and Wales
- Deaths involving *C. difficile* accounted for 0.8 % of all hospital deaths in England and Wales during 2010–12 compared with 2.0 % during 2007–09

2. Summary

This bulletin presents the latest figures for deaths where *Clostridium difficile* (*C. difficile*) infection was mentioned on the death certificate by area, sex, age group and place of death, in England and Wales.

Figures are presented for 2012, with previously released figures for 1999 and 2001 to 2011 presented for comparison purposes. Information is also given about the context and use of the statistics, and the method used to produce them. The commentary will focus on England and Wales combined, however, figures for each country are provided separately in the [reference tables](#).

Figures are presented for deaths registered rather than occurring in each calendar year. The median registration delay for deaths involving *C. difficile* is four days. Deaths certified by a medical practitioner are required to be registered within five days, therefore registration delays do not impact the figures in this bulletin (see background note 5).

Mortality rates for 2002–11 have been recalculated using revised mid-year population estimates which take account of the 2011 Census. Mortality rates may therefore differ from previously published figures (see Background note 7).

The number of death certificates in England and Wales mentioning *C. difficile* fell for the fifth consecutive year in 2012, from 2,053 (19.6 per million population) in 2011 to 1,646 (15.3 per million population) in 2012 (Figure 1).

Of the deaths where *C. difficile* was mentioned on the death certificate in England and Wales in 2012, 41% were deaths where *C. difficile* was the underlying cause (Table 2). This has decreased by one percentage point since 2011.

Age-standardised mortality rates for deaths involving *C. difficile* are similar for both sexes. In England and Wales rates were highest in 2007, at 85.9 and 80.9 per million for males and females respectively (Figure 3). Rates have since fallen each year and in 2012 they decreased to 15.9 per million population for males and 14.7 per million population for females. Most of the deaths involving *C. difficile* occur among older people. For both the 2007–09 and 2010–12 periods, mortality rates were highest in those aged 85 years and over at 2,461 and 812 per million population respectively in England and Wales (Table 4).

During the period 2010–12 deaths involving *C. difficile* accounted for 0.4% of all deaths in England and Wales, a fall from 1.2% of all deaths during 2007–09 (Reference table 5).

Between 2007–09 and 2010–12, the proportion of deaths involving *C. difficile* occurring in NHS hospitals in England and Wales decreased from 92.4 to 89.7% (Table 5).

3. Background

Clostridium difficile (*C. difficile*) is a spore forming anaerobic bacterium that was first described in the 1930s (Hall and O'Toole, 1935). According to the Public Health England (2012), it is present in the gut of up to 3% of healthy adults and 66% of infants. However, *C. difficile* rarely causes problems in children or healthy adults, as it is kept in check by the normal bacterial population of the intestine. When certain antibiotics disturb the balance of bacteria in the gut, *C. difficile* can multiply rapidly and produce toxins which cause illness.

C. difficile infection ranges from mild to severe diarrhoea to, more unusually, severe inflammation of the bowel (pseudomembranous colitis). People who have been treated with broad spectrum antibiotics (those that affect a wide range of bacteria), people with serious underlying illnesses and the elderly are at greatest risk. Over 80% of *C. difficile* infections are in people aged over 65 years.

C. difficile is often referred to as a healthcare-associated infection (HCAI). HCAIs can develop either as a direct result of healthcare interventions such as medical or surgical treatment or from being in contact with a health or social care setting (including healthcare delivered in the community). However, HCAIs may be contracted outside a healthcare setting and brought in by patients, staff or visitors then transmitted to others ([National Institute for Health and Care excellence, 2013](#)).

C. difficile infection is usually spread on the hands of healthcare staff and other people who come into contact with infected patients, or with environmental surfaces contaminated with the bacteria or its spores (for example floors, bedpans and toilets). *C. difficile* produces spores when the bacteria encounter unfavorable conditions, such as being outside the body. These spores are very hardy and can survive on clothes and environmental surfaces for long periods.

Actions to reduce levels of healthcare associated infections have been detailed in various reports ([Department of Health 2003a](#), [Department of Health 2003b](#); [Department of Health and Public Health England 2009](#); [Department of Health 2013b](#); [Public Health Wales 2004](#); [Public Health Wales and Welsh Government 2009](#)) and have been implemented in healthcare settings. These include reducing the infection risk from medical instruments, better antibiotic prescribing, isolating infected patients, environmental cleaning and disinfection, and improved hand hygiene.

In 2009, the Government brought in a new regulation regarding cleanliness and infection control to ensure that patients and staff are protected from the known risks of acquiring an HCAI. Trusts must meet this regulation to be registered with the Care Quality Commission, the independent regulator of health and adult social care in England ([Care Quality Commission 2009](#)).

Figures on the number of deaths from *C. difficile* in England and Wales are used by various organisations, including the Department of Health (DH), Public Health England (PHE), and Public Health Wales, for monitoring and evaluation purposes. They are also used by Clinical Commissioning Groups (CCGs), local health boards (LHBs) and individual healthcare establishments.

The Operating Framework for the NHS in England 2012/13 ([Department of Health, 2011](#)) states: 'Protecting the safety of our patients is of paramount importance. The zero tolerance approach to all avoidable healthcare associated infections will continue. All NHS commissioners and providers should identify and agree plans for reducing MRSA bloodstream and *Clostridium difficile* infections in line with the national objectives'.

The NHS Outcomes Framework 2013/14 ([Department of Health, 2013a](#)) contains an indicator of *C. difficile* incidence. CCGs in England are required to reduce the number of *C. difficile* infections with organisations with higher baseline rates required to deliver larger reductions.

Since April 2007, it has been mandatory for all NHS trusts to report all cases of *C. difficile* infection in persons aged two years and over to Public Health England (in April 2013, the key functions of the Health Protection Agency were transferred into PHE). The latest figures show that a total of 14,684 cases of *C. difficile* occurring in patients aged two years and over were reported in England between April 2012 and March 2013 ([Public Health England, 2013](#)). This represents a reduction of 19% on the 18,022 cases of *C. difficile* reported in 2011/12 and a 32% reduction on the 21,707 cases reported in 2010/11.

In Wales, surveillance of *C. difficile* is managed by the Welsh Healthcare Associated Infection Programme (WHAIP), which is part of Public Health Wales. The latest figures for October 2011 to September 2012 (2011/12) show that there were 1,418 cases of *C. difficile* reported in hospital inpatients in Wales ([Public Health Wales, 2013](#)). This represents a reduction of 25% on the 1,900 cases reported over the same period in 2010/11.

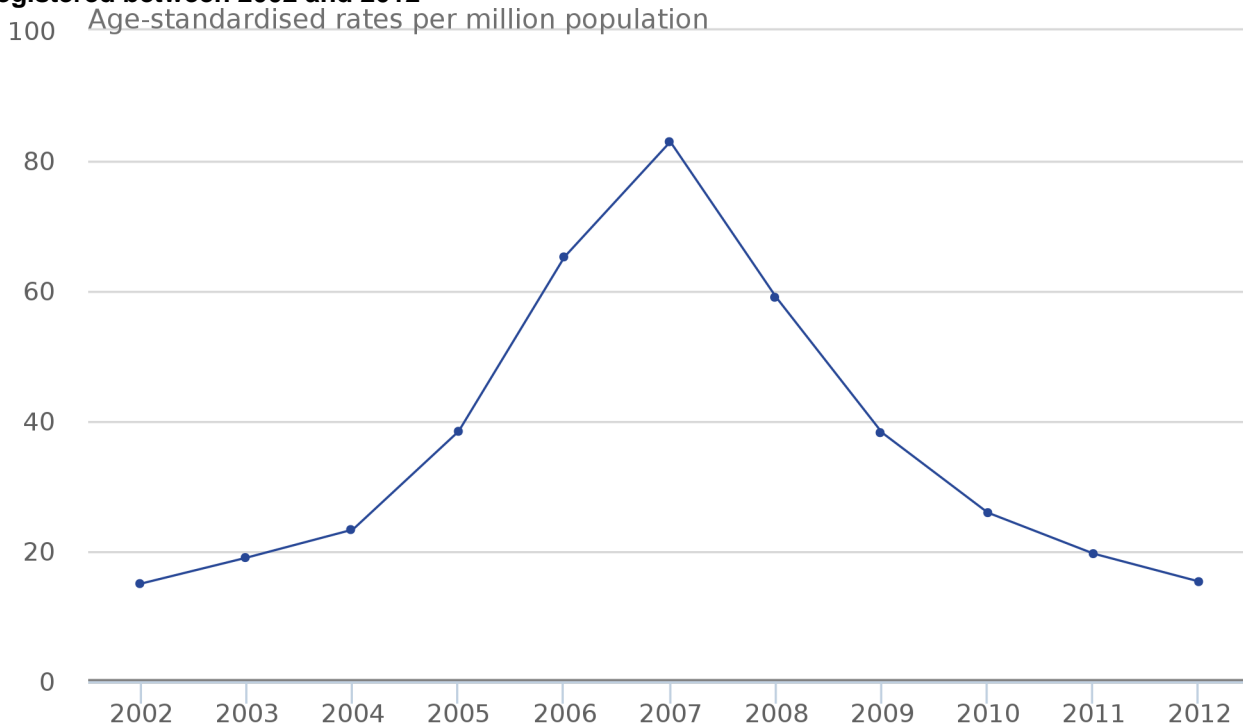
Statistics for deaths involving *C. difficile* have been produced by the Office for National Statistics (ONS) for deaths registered in 1999 and from 2001 onwards (see 'Methods' below for more information). Figures for recent years show a large decrease in the number and rate of deaths, where *C. difficile* was the underlying cause of death or was mentioned anywhere on the death certificate among both males and females. This finding is consistent with the incidence figures reported by Public Health England and Public Health Wales. The decreases may be due to the actions taken to reduce healthcare associated infections described above.

4. Deaths involving *Clostridium difficile* in England and Wales

The number of death certificates in England and Wales mentioning *C. difficile* fell for the fifth consecutive year in 2012, from 2,053 (19.6 deaths per million population) in 2011 to 1,646 (15.3 per million) in 2012 (see Table 2). This represents a reduction of 20% in one year.

Figure 1 shows that the number of deaths involving *C. difficile* increased between 2002 and 2007. The number of deaths rose rapidly between 2004 and 2007 increasing from 2,238 (23.3 per million population) in 2004 to 8,324 (82.9 per million population) in 2007, an increase in the mortality rate of over 250%. Since its peak in 2007, mortality rate from *C. difficile* has fallen by over 80%, and is now similar to the rate observed in 2002.

Figure 1: Mortality rates for deaths mentioning Clostridium difficile, England and Wales, deaths registered between 2002 and 2012



Source: Office for National Statistics

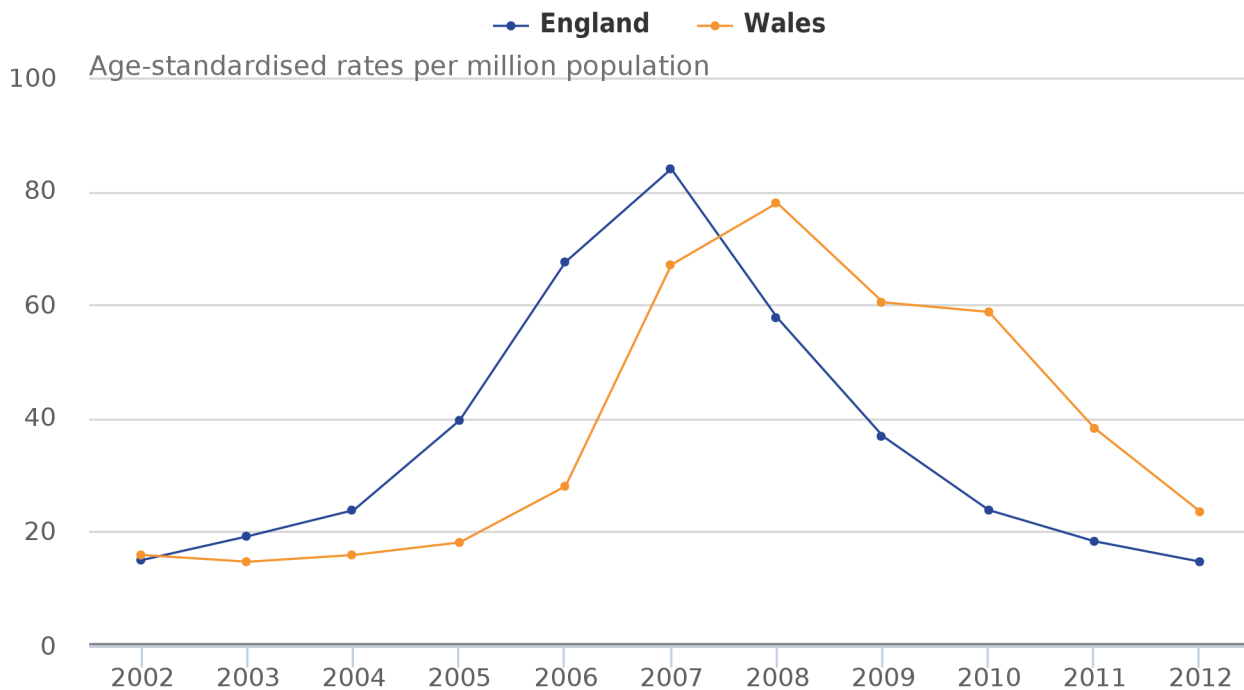
Notes:

1. Deaths involving Clostridium difficile are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of C. difficile or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin.
2. The age-standardised mortality rates per million population in this bulletin were calculated using the 1976 European Standard Population. Age-standardised rates are used to allow comparison between populations which may contain different proportions of people of different ages.
3. Rates for 2002–2011 have been recalculated using revised mid-year population estimates which take account of the 2011 Census and therefore may differ from previously published figures.
4. Figures for England and Wales include deaths of non-residents.
5. Figures are based on deaths registered, rather than deaths occurring in each calendar year. In 2012 the median delay for Clostridium difficile in England and Wales was four days. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html.

In England, the number of deaths where C. difficile was mentioned on the death certificate was highest in 2007 at 7,916 (83.9 per million population). This figure fell to 1,487 (14.7 per million population) in 2012, a fall in mortality rate of 82%. In Wales, the number of deaths involving C. difficile peaked a year later than in England at 461 (77.9 deaths per million) in 2008. This figure fell to 155 (23.5 per million) in 2012, a fall in the mortality rate of 70%.

Figure 2 shows that there was a steep decline in deaths involving C. difficile in England from its peak in 2007 to 2010. Wales has also exhibited a steep decline, albeit a more staggered one, from its peak in 2008 to 2012. Since 2010 the decline in mortality rates from C. difficile has begun to slow down in England, but not in Wales. There was a 40% decline in the mortality rate for England between 2010 and 2012 compared with a 60% decline in the mortality rate for Wales in the same period. This suggests that the rate for England may be stabilising whereas the rate for Wales is continuing to fall.

Figure 2: Mortality rates for deaths mentioning *Clostridium difficile* by country, England and Wales, deaths registered between 2002 and 2012



Source: Office for National Statistics

Notes:

1. Deaths involving *Clostridium difficile* are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of *C. difficile* or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin.
2. The age-standardised mortality rates per million population in this bulletin were calculated using the 1976 European Standard Population. Age-standardised rates are used to allow comparison between populations which may contain different proportions of people of different ages.
3. Rates for 2002–2011 have been recalculated using revised mid-year population estimates which take account of the 2011 Census and therefore may differ from previously published figures.
4. Figures are based on geographical boundaries as of May 2013. Data for England and Wales separately exclude deaths of non-residents.
5. Figures are based on deaths registered, rather than deaths in each calendar year. In 2012 the median delay for *Clostridium difficile* in England and Wales was four days. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html.

This decline in the number of deaths involving *C. difficile* since 2007 may have been caused by a reduction in the number of infections that is attributed to improved hygiene in hospitals. A recent study ([Stone et al. 2012](#)) found an association between the amount of soap and alcohol hand rub purchased by hospitals and the number of *C. difficile* infections.

In 2008 Public Health Wales set up a strategy, called 1000 lives, which aimed to improve hospital conditions and save 1000 unnecessary deaths by 2010. One outcome of this strategy, reported in 'Two years to make a difference in Welsh healthcare', was that there was a 30% increase in hand hygiene compliance, meaning that compliance with the hand hygiene regulation reached 90% across Welsh hospitals ([Public Health Wales, 2010](#)). This may be partly responsible for the reduction in *C. difficile* deaths in Wales since 2008.

Regional mortality rates

Regional mortality rates from *Clostridium difficile* tend to follow a similar trend to England as a whole. Mortality rates in most regions peaked in 2007, with the exception of the North East which peaked a year later in 2008 and the East Midlands which peaked a year earlier in 2006.

Between 2011 and 2012, the mortality rate per million population decreased for every region. The smallest decrease occurred in the South West with a fall of half a percentage point from 14.9 to 14.3; and the largest decrease occurred in the West Midlands with a fall of 8.2 percentage points from 27.5 to 19.2.

In 2012 the North East had the highest mortality rate out of all regions with 23.9 deaths per million population and the South East had the lowest rate with 10.7 deaths per million. Even though all regions have decreased since 2011, mortality rates in the North East, North West and West Midlands are all significantly above the national average for 2012.

The North East and North West have remained significantly higher than the rate for England over the last five years, and the West Midlands remained significantly higher over the last 10 years. Conversely, the East of England and the South East have remained significantly below the rate of England over the last five years.

Table 1: Age-standardised mortality rates for deaths where *Clostridium difficile* was mentioned on the death certificate by region, England, deaths registered between 2006 and 2012

	Rates (per million population)						
	2006	2007	2008	2009	2010	2011	2012
England	67.5	83.9	57.7	36.8	23.8	18.3	14.7
North East	44.6	68.2	74.7	65.1	35.4	25.0	23.9
North West	41.4	82.4	79.4	58.6	36.4	25.8	18.8
Yorkshire and The Humber	28.0	53.7	49.8	30.8	24.3	21.5	14.7
East Midlands	116.3	101.0	61.1	40.3	26.2	18.4	15.6
West Midlands	114.7	128.0	77.8	42.3	31.5	27.5	19.2
East of England	67.2	92.5	41.0	27.5	17.0	12.1	10.9
London	73.0	95.2	52.2	27.6	17.3	14.8	11.3
South East	61.5	63.5	43.9	28.3	17.8	12.0	10.7
South West	66.8	77.0	54.0	28.3	17.6	14.9	14.3

Source: Office for National Statistics

Notes:

1. Deaths involving *clostridium difficile* are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of *C difficile* or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin.
2. The age-standardised mortality rates per million population in this bulletin were calculated using the 1976 European Standard Population. Age-standardised rates are used to allow comparison between populations which may contain different proportions of people of different ages.
3. Rates for 2002–2011 have been recalculated using revised mid-year population estimates which take account of the 2011 Census and therefore may differ from previously published figures. More information about these revisions can be found at: www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2011--2011-census-based-/index.html.
4. Figures for regions are based on geographical boundaries as of May 2013 and exclude deaths of non-residents.
5. Figures are based on deaths registered, rather than deaths occurring in each calendar year. In 2012 the median delay for *clostridium difficile* in England and Wales was four days. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html.

Regional mortality rates (with 95% confidence limits) by sex are available for 2001 to 2012 in [reference table 4](#).

5. Deaths involving *Clostridium difficile* by underlying cause

Table 2 shows that, of the deaths where *C. difficile* was mentioned on the death certificate in England and Wales in 2012, 40.9% were deaths where *C. difficile* was the underlying cause, a fall of 0.9 percentage points since 2011, and the lowest proportion in the time series. The proportion of deaths where *C. difficile* was the underlying cause increased between 2002 (53.2%) until its peak in 2004/2005 (both 54.9%), this proportion has been generally decreasing since 2005.

The numbers of death certificates where *C. difficile* was mentioned, either as the underlying cause of death or as a contributing factor, are available for 2001 to 2012 in [reference table 1](#).

Table 2: Number of death certificates with *Clostridium difficile* mentioned and as the underlying cause of death, England and Wales, deaths registered between 2008 and 2012

	Numbers, %				
	2008	2009	2010	2011	2012
England and Wales					
Certificates mentioning <i>C. difficile</i>	5,931	3,933	2,704	2,053	1,646
Certificates where <i>C. difficile</i> was the underlying cause of death	2,502	1,712	1,130	858	674
Percentage of mentions selected as underlying cause	42.2	43.5	41.8	41.8	40.9

Source: Office for National Statistics

Notes:

1. Deaths involving *clostridium difficile* are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of *C difficile* or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin.
2. The underlying cause of death is defined using the International Classification of Diseases, Tenth revision (ICD 10) The codes used to identify deaths where *C. difficile* was the underlying cause of death (on deaths where *C. difficile* was mentioned) are A04.7, A09, A41.4 and A49.8.
3. Deaths where *C. difficile* was the underlying cause exclude neonatal deaths.
4. Figures for England and Wales include deaths of non-residents.
5. Figures are based on deaths registered, rather than deaths occurring in each calendar year. In 2012 the median delay for *clostridium difficile* in England and Wales was four days. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html.

Of the five most common underlying causes in deaths mentioning *C. difficile*, three appear in the top five leading causes of death of the general population: ischaemic heart disease, chronic lower respiratory diseases and cerebrovascular diseases. A high proportion of people with conditions such as ischaemic heart disease enter the healthcare system for treatment. In addition, the majority of deaths from these conditions occur in those aged over 65. These factors mean they are vulnerable to health-care associated infections like *C. difficile*.

Table 3: Leading causes of death where C. difficile is mentioned but is not the underlying cause of death, compared with all deaths, England and Wales, deaths registered in 2012

Underlying cause of death	All deaths			Deaths involving C. difficile		
	Deaths	%	Rank	Deaths	%	Rank
All causes	499,331	100.0	-	1,646	100.0	-
Ischaemic heart diseases	64,164	12.8	1	85	5.2	1
Chronic lower respiratory diseases	28,533	5.7	5	63	3.8	2
Diseases of the urinary system	9,403	1.9	11	55	3.3	3
Malignant neoplasms of lymphoid, haematopoietic and related tissue	11,333	2.3	8	47	2.9	4
Cerebrovascular diseases	35,846	7.2	3	46	2.8	5

Source: Office for National Statistics

Notes:

1. Deaths involving clostridium difficile are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of C difficile or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin. Deaths were included where C.difficile was mentioned on the death certificate, but was not the underlying cause.
2. Figures for England and Wales include deaths of non-residents.
3. Figures are based on deaths registered, rather than deaths occurring in each calendar year. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html
4. The grouping of leading causes of death were defined in an ONS article titled 'Leading causes of death in England and Wales - how should we group causes?', available at the following link: www.ons.gov.uk/ons/rel/hsq/health-statistics-quarterly/no--28--winter-2005/leading-causes-of-death-in-england-and-wales---how-should-we-group-causes-.pdf

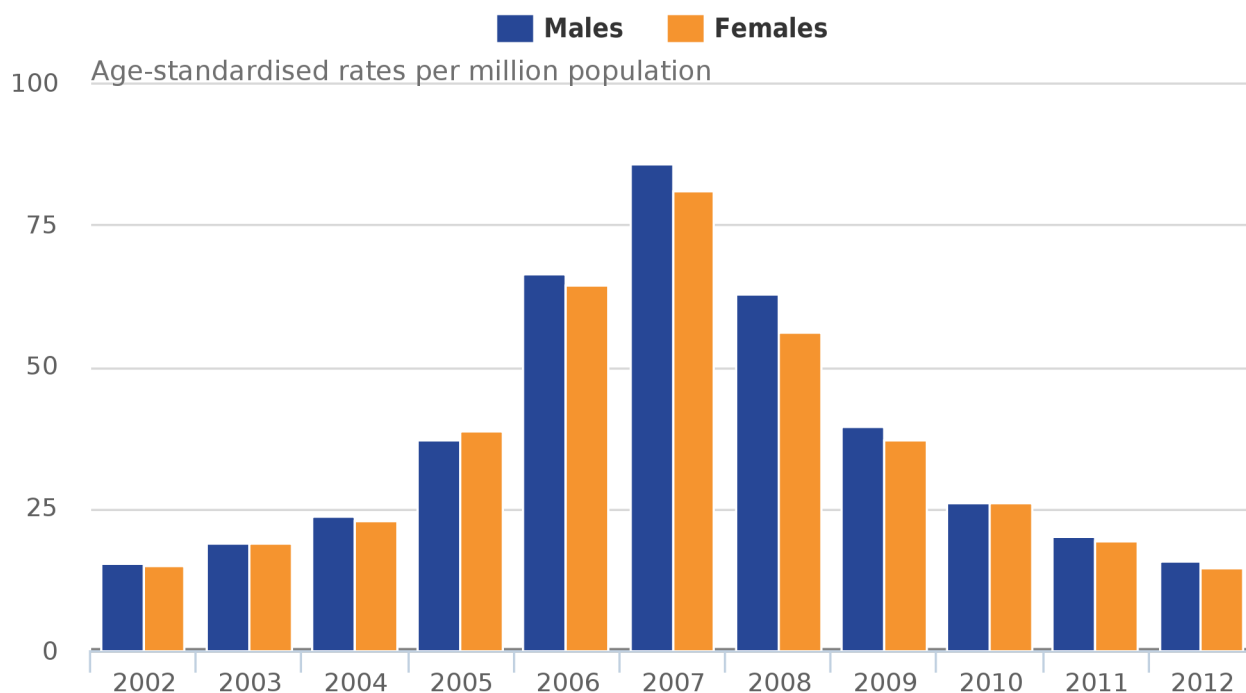
Deaths with an underlying cause of certain cancers, for example malignant neoplasm of lymphoid, haematopoietic and related tissue, are more likely to be related to C. difficile infection compared to deaths in the general population. This is possibly due to a patient being at higher risk of becoming infected with the disease if they are already suffering from a disease or receiving treatments that compromise their immune response.

Diseases of the urinary system was the third most common underlying cause in deaths where C. difficile was mentioned, accounting for 3.3% of all C difficile deaths. Where as diseases of the urinary system only accounted for 1.9% of all deaths in England and Wales in 2012. This cause may be related to C. difficile due to the use of broad spectrum antibiotics to treat conditions such as recurrent catheter-associated urinary tract infections.

6. Deaths involving Clostridium difficile in England and Wales by sex

Rates have tended to be slightly higher in males than females in most years, with the largest difference occurring in 2008 where males were 6.4 percentage points higher than females with 62.7 compared to 56.3 deaths per million population.

Figure 3: Mortality rates for deaths involving Clostridium difficile by sex, deaths registered between 2002 and 2012



Source: Office for National Statistics

Notes:

1. Deaths involving Clostridium difficile are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of C difficile or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin.
2. The age-standardised mortality rates per million population in this bulletin were calculated using the 1976 European Standard Population. Age-standardised rates are used to allow comparison between populations which may contain different proportions of people of different ages.
3. Rates for 2002–2011 have been recalculated using revised mid-year population estimates which take account of the 2011 Census and therefore may differ from previously published figures.
4. Figures for England and Wales include deaths of non-residents.
5. Figures are based on deaths registered, rather than deaths occurring in each calendar year. In 2012 the median delay for Clostridium difficile in England and Wales was four days. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html.

Since 2009 there have been no significant differences in the rates between males and females. In England and Wales age-standardised mortality rates for deaths involving C. difficile have shown similar time trends for males and females. Rates peaked in 2007 for both sexes and have since decreased by 81 % from 85.9 to 15.9 per million population for males, and decreased by 82% from 80.9 to 14.7 per million population for females.

7. Deaths involving *Clostridium difficile* in England and Wales by age group

Most of the deaths involving *C. difficile* occur among older people. Table 4 shows that the mortality rate per million population increases with age. For both the 2007–09 and 2010–12 periods, mortality rates were highest in those aged 85 years and over (2,461 and 812 deaths per million population respectively in England and Wales). Older people tend to be more susceptible to *C. difficile* infection as their immune response is likely to be weaker. They are also more likely to be hospitalised, exposed to long-term care facilities or prescribed antibiotics, thereby increasing their chance of infection ([Owens et al., 2008](#)).

In comparison with those aged 85 years and over, the rates for persons aged between 75 and 84 years in England and Wales during both 2007–09 and 2010–12 were much lower, at 715 and 235 per million population respectively. Rates were lowest in the under 55 age group with just two deaths per million in 2007-09 and one death per million population in 2010-12 for both sexes in England and Wales.

Table 4: Mortality rates for deaths where *Clostridium difficile* was mentioned on the death certificate, by age and sex, England and Wales, deaths registered in periods 2007–09 and 2010–12

	Rates (per million population)					
	2007-09			2010-12		
	Males	Females	Persons	Males	Females	Persons
England and Wales						
Under 55	2	2	2	1	1	1
55-64	36	30	33	14	11	13
65-74	156	141	148	53	47	50
75-84	733	703	715	229	240	235
85 and over	2527	2431	2461	818	810	812

Source: Office for National Statistics

Notes:

1. Deaths involving *clostridium difficile* are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of *C difficile* or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin.
2. Age-specific mortality rate per 1,000,000 population.
3. Rates for 2002–2011 have been recalculated using revised mid-year population estimates which take account of the 2011 Census and therefore may differ from previously published figures. More information about these revisions can be found at: www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2011--2011-census-based-/index.html.
4. Figures for England and Wales include deaths of non-residents.
5. Figures are based on deaths registered, rather than deaths occurring in each calendar year. In 2012 the median delay for *clostridium difficile* in England and Wales was four days. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html.

Between 2007–09 and 2010–12 the mortality rate fell for all age groups and sexes. The mortality rates for persons, male and females aged 65 and over decreased by around two thirds each.

8. Deaths involving *Clostridium difficile* in England and Wales by place of death

During the period 2010–12 deaths involving *C. difficile* accounted for 0.4% of all deaths in England and Wales, a fall from 1.2% of all deaths during 2007–09. Death certificates rarely specify the place where an infection was acquired, but the place of death is routinely recorded.

Around half of all deaths in England and Wales occur in hospital. It is therefore expected that most deaths involving *C. difficile* infection will occur in hospital. ONS does not routinely produce figures by individual hospital establishment.

During the period 2010–12, 89.7% of *C. difficile* deaths in England and Wales occurred in NHS hospitals. This represents 0.8% of all deaths that occurred in NHS hospitals. Between 2007–09 and 2010–12, the proportion of deaths involving *C. difficile* occurring in NHS hospitals in England and Wales decreased from 92.4 to 89.7% (Table 5).

In England and Wales, 6.3% of deaths involving *C. difficile* occurred in non-local authority care homes during 2010–12, this represents a 1.2 percentage point increase from 2007–09. Deaths from *C. difficile* account for 0.2% of all deaths which occurred in non-local authority care homes (see reference table 5).

More than 96% of all deaths involving *C. difficile* occur in care homes or NHS hospitals; other places such as at home, in a hospice or elsewhere only account for around 3–4% of these deaths.

Table 5: Percentage of deaths involving Clostridium difficile by place of death, England and Wales, deaths registered in periods 2007–09 and 2010–12

	%	
	2007-09	2010-12
All C.difficile deaths	100.0	100.0
Hospital (NHS)	92.4	89.7
Care home	5.3	6.7
Home	1.3	1.9
Hospice	0.8	1.4
Other	0.2	0.3

Source: Office for National Statistics

Notes:

1. Deaths involving clostridium difficile are defined using a combination of any mention of International Classification of Diseases, Tenth revision (ICD 10) codes A04.7, A05.8, A41.4, A48.0, A49.8 or P36.5 anywhere on the death certificate and mention of C difficile or related conditions in the text of the death certificate. Details of the methods used can be found in the 'Methods' section of this bulletin.

2. Figures for England and Wales include deaths of non-residents.

3. Figures are based on deaths registered, rather than deaths occurring in each calendar year. In 2012 the median delay for clostridium difficile in England and Wales was four days. Further information on registration delays for a range of causes can be found on the ONS website: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/impact-of-registration-delays-on-mortality-statistics/index.html.

4. Deaths at home are those at the usual residence of the deceased (according to the informant), where this is not a communal establishment. Care homes includes homes for the chronic sick; nursing homes; homes for people with mental health problems and non-NHS multi function sites. NHS hospitals include multifunction sites and military hospitals and exclude psychiatric hospitals. Hospice includes all NHS and non-NHS hospices. Other include schools for people with learning disabilities, holiday homes and hotels, common lodging houses, aged persons' accommodation, assessment centres, schools, convents and monasteries, nurses' homes, university and college halls of residence, young offender institutions, secure training centres, detention centres, prisons and remand homes. Other also includes all places not covered above such as deaths on a motorway, at the beach, climbing a mountain, walking down the street, at the cinema, at a football match, while out shopping, or in someone else's home. This category also includes people who are pronounced dead on arrival at hospital.

9. Results

Data for deaths involving C. difficile can be found in a Microsoft Excel workbook in the [data section of this release](#).

The workbook contains the following results for England and Wales:

Number of death certificates with Clostridium difficile mentioned and as the underlying cause of death, England and Wales, deaths registered between 1999 and 2012

- Number of death certificates with *Clostridium difficile* mentioned and as the underlying cause of death, by annual registration quarter, England and Wales, deaths registered between 1999 and 2012
- Age-standardised mortality rates (with 95% confidence limits) for deaths where *Clostridium difficile* was mentioned on the death certificate, by sex, England and Wales, deaths registered between 1999 and 2012
- Age-standardised mortality rates (with 95% confidence limits) for deaths where *Clostridium difficile* was mentioned on the death certificate, by sex and region, England, deaths registered between 1999 and 2012
- Number of deaths where *Clostridium difficile* was mentioned on the death certificate by place of death, England and Wales, deaths registered in periods 2007–09 and 2010–12
- Number of deaths involving *Clostridium difficile* by sex and five-year age-group, England and Wales, deaths registered between 1999 and 2012
- Number of deaths involving *Clostridium difficile* by sex and five-year age-group, England, deaths registered between 1999 and 2012
- Number of deaths involving *Clostridium difficile* by sex and five-year age-group, Wales, deaths registered between 1999 and 2012
- Mortality rates (with 95% confidence limits) for deaths where *Clostridium difficile* was mentioned on the death certificate, by age and sex, England and Wales, deaths registered in periods 2007–09 and 2010–12

10. Methods

All deaths in England and Wales are coded by ONS according to the International Classification of Diseases (ICD) supplied by the World Health Organisation (WHO). In the Tenth Revision (ICD-10), used by ONS from 2001 onwards, there is a specific code (A04.7) for 'Enterocolitis due to *Clostridium difficile*'. While this code identifies the vast majority of deaths involving *C. difficile*, a small number of *C. difficile*-related deaths are not captured by this code alone.

Since 1993 ONS has stored the text of death certificates on a database, in addition to all the ICD codes relating to causes identified on the death certificate. This means that it is possible to identify records where *C. difficile* is mentioned, but is not coded under the specific ICD-10 code.

In addition to extracting all deaths related to the specific A04.7 ICD-10 code, deaths mentioning a number of other ICD codes to which diseases including *C. difficile* could be coded were also extracted. The text of these death certificates was searched manually for mentions of *Clostridium difficile*, *C. difficile* or pseudomembranous colitis. The ICD-10 codes used to select deaths in order to search manually are shown in Box 1.

Deaths registered in 1999 were coded to both ICD-9 and ICD-10 as part of a special study to compare the two ICD revisions, and have therefore been used to give an additional year of data on deaths involving *C. difficile*.

Box 1: Specific and non-specific ICD-10 codes related to *Clostridium difficile*

Specific codes ¹	Non-specific codes ¹
A04.7 (Enterocolitis due to <i>Clostridium difficile</i>)	A05.8 (Other specified bacterial food borne intoxications)
	A41.4 (Septicaemia due to anaerobes, excludes gas gangrene)
	A48.0 (Gas gangrene: Clostridial; cellulites, myonecrosis)
	A49.8 (Other bacterial infections of unspecified site)
	P36.5 (Sepsis of newborn due to anaerobes)

Notes:

1. Codes used to identify deaths where *C. difficile* was the underlying cause of death (on deaths where *C. difficile* was mentioned): A04.7, A09, A41.4 and A49.8.

Deaths with an underlying cause of *C. difficile* were identified by selecting those deaths with a mention of *C. difficile* that also had an underlying cause of one of the following ICD-10 codes: A04.7, A41.4 and A49.8. Death certificates that mention *C. difficile* and record the code A09 (Diarrhoea and gastroenteritis of presumed infectious origin) as the underlying cause of death, are also taken to indicate that *C. difficile* was the underlying cause of death.

Since 1986, ONS has used the internationally recommended death certificate for neonatal deaths (deaths of infants aged under 28 days). This means that these deaths cannot be assigned an underlying cause of death. However, as the data in this bulletin were based on deaths where *C. difficile* or pseudomembranous colitis were mentioned on the death certificate, neonates have been included. Deaths were extracted in the same way as described above for post-neonatal deaths (deaths of infants over 28 days but under one year old).

11. *Clostridium difficile* statistics for other countries

This statistical bulletin presents figures for *C. difficile* deaths in England and Wales. *Clostridium difficile* deaths in Scotland are published by [National Records of Scotland](#) and 'Deaths registered with *Clostridium difficile* mentioned on the death certificate in Northern Ireland' is published by the [Northern Ireland Statistics and Research Agency \(NISRA\)](#).

12. References

1. [Care Quality Commission \(2009\) Healthcare associated infections, accessed 15 July 2013.](#)
2. [Department of Health \(2013a\) The NHS Outcomes Framework 2012/13, accessed 2 August 2013.](#)
3. [Department of Health \(2013b\) Public Health Outcomes Framework 2013 to 2016, accessed 3 July 2013.](#)
4. [Department of Health \(2011\) The Operating Framework for the NHS in England 2012/13, accessed 2 August 2013.](#)
5. [Department of Health and Public Health England \(2009\) Clostridium difficile infection: how to deal with the problem, accessed 2 August 2013.](#)
6. [Department of Health \(2005\) CMO Update, Issue 42, Summer 2005, accessed 2 August 2013.](#)
7. [Department of Health \(2003a\) The National Clostridium difficile Standards Group: Report to the Department of Health, accessed 2 July 2013.](#)
8. [Department of Health \(2003b\) Winning Ways: Working together to reduce Healthcare Associated Infection in England: Report of the Chief Medical Officer, accessed 2 July 2013.](#)

9. Hall, I.C and O'Toole, E. (1935) 'Intestinal flora in new-born infants: with a description of a new pathogenic anaerobe, *Bacillus difficilus*', *American Journal of Diseases in Childhood* 49 pp 390–402
10. [National Institute for Health and Care excellence \(2013\) Prevention and control of healthcare associated infections: Quality improvement guide, accessed 2 July 2013.](#)
11. [National Records of Scotland \(2013\). Clostridium difficile Deaths, accessed 15 August 2013.](#)
12. [Northern Ireland Statistics and Research Agency \(2013\). Deaths Registered with Clostridium Difficile Mentioned on the Death Certificate, accessed 15 August 2013.](#)
13. [Office for National Statistics \(2012\) Deaths involving clostridium difficile, accessed 2 July 2013.](#)
14. [Office for National Statistics \(2010\) Guidance for doctors completing Medical Certificates of Cause of Death in England and Wales, accessed 2 August 2013.](#)
15. [Owens RC, Donskey CJ, Gaynes RP, Loo VG and Muto, CA. \(2008\). Antimicrobial-Associated Risk Factors for Clostridium difficile Infection. *Clinical Infectious Diseases* 46: S19-S31. Accessed 9 August 2013.](#)
16. [Public Health England \(2013\) Mandatory surveillance of Clostridium difficile, accessed 2 August 2013.](#)
17. [Public Health England \(2012\) Clostridium difficile, accessed 2 August 2013.](#)
18. [Public Health Wales \(2013\) All Wales clostridium difficile surveillance reports, accessed 9 August 2013.](#)
19. [Public Health Wales \(2010\) 1000 lives campaign. 'Two years to make a difference in Welsh healthcare', accessed on 2 July 2013.](#)
20. [Public Health Wales and Welsh Government \(2009\) Our Healthy Future- technical working paper, accessed on 2 July 2013.](#)
21. [Public Health Wales \(2004\) Health care associated infections- a strategy for hospitals in Wales, accessed on 6 July 2013.](#)
22. [Stone SP, Fuller C, Savage J, Cookson B, Hayward A, Cooper B, Duckworth G, Michie S, Murray M, Jeanes A, Roberts J, Teare L, Charlett A. \(2012\) Evaluation of the national Clean your hands campaign to reduce *Staphylococcus aureus* bacteraemia and *Clostridium difficile* infection in hospitals in England and Wales by improved hand hygiene. *British Medical Journal* 344, e3005. Accessed 9 July 2013.](#)

13. Background notes

1. Mortality metadata

Statistics on mortality are derived from the information provided when deaths are certified and registered. Information about the underlying mortality data, including details on how the data is collected and coded are available in the [mortality metadata](#). Further information about the methods and quality of these statistics can be found in the Quality and Methodology Information reports for Mortality Statistics and Deaths involving *Clostridium difficile* in England and Wales which are available on the ONS [website](#).

2. Deaths involving *C. difficile*

The number of deaths due to *C. difficile* is difficult to estimate. Trends in mortality are normally monitored using the underlying cause of death (the disease which initiated the train of events leading directly to death). However, *C. difficile* (and other healthcare associated infections) are often not the underlying cause of death. Those who die with *C. difficile* are usually patients who were already very ill, and it may be their existing illness, rather than *C. difficile*, which is designated as the underlying cause of death. There is therefore an interest in the number of deaths where *C. difficile* contributed to the death – only conditions which contribute directly to the death should be recorded on the death certificate. Results presented in this bulletin identify deaths where the underlying cause was *C. difficile* and also where *C. difficile* was mentioned as the underlying cause or as a contributory factor in the death.

3. Healthcare associated infections

Although *C. difficile* is commonly referred to as a healthcare associated infection, it is not possible to state from the information on a death certificate where the infection was acquired, nor can assumptions be made about quality of care. People are often transferred between hospitals, care homes and other establishments, and may acquire infections in a different place from where they died.

4. Death certification

Guidance on death certification, with specific reference to healthcare associated infections, was issued to doctors in May 2005 (revised in 2010) ([Office for National Statistics, 2010](#)). This was followed by a message from the Chief Medical Officer to all doctors reminding them of their responsibilities with respect to death certification and drawing their attention to the guidance ([Department of Health, 2005](#)). More recently, the Department of Health and Public Health England ([2009](#)) released a report detailing good practice and recommendations on completing death certificates for deaths involving *C. difficile*.

5. Death registration delays

Data presented in this bulletin are based on deaths registered, rather than deaths occurring in each calendar year. Of the 1,646 deaths registered in 2012 mentioning *C. difficile*, 83 occurred in years prior to 2012. The median delay for death involving *C. difficile* in 2012 was 4 days. Deaths certified by a medical practitioner are required to be registered within five days; therefore registration delays do not impact the figures in this bulletin. Further information on registration delays for a range of causes can be found on the ONS [website](#).

6. European standard population

This bulletin presents age-standardised (also known as 'directly-standardised') rates, standardised to the European Standard Population. These make allowances for differences in the age structure of the population, over time and between sexes. The age-standardised rate for a particular cause of death is that which would have occurred if the observed age-specific rates for that cause had applied in the given standard population. A template showing how age-standardised rates are calculated is available on ONS's [website](#).

The age-standardised mortality rates in this bulletin were calculated using the 1976 European Standard Population. Eurostat, the statistical institute of the European Union, has decided to update the European Standard Population, which is used in the calculation of age-standardised rates. ONS will publish details of the impact of this change on age-standardised rates, and, following user engagement in Summer 2013, the timetable for implementation of the new standard population in relevant publications. [ONS is consulting on the implementation of the new European Standard Population](#) between 09 August and 03 October 2013.

7. Populations

Rates are calculated using mid-year population estimates. Population estimates from 2002 to 2011 for England and Wales have been revised based on the 2011 Census. The mortality rates for 2002 to 2011 presented in this bulletin have been revised using population estimates based on the 2011 census, and will therefore differ from rates previously published.

More information about population revisions can be found on the ONS [website](#).

8. Rates based on small numbers

Rates were not calculated where there were fewer than three deaths in a cell, denoted by '·'.

It is ONS practice not to calculate rates where there are fewer than three deaths in a cell, as rates based on such low numbers are susceptible to inaccurate interpretation. Rates which were calculated from fewer than 20 deaths are distinguished by italic type as a warning to the user that their reliability as a measure may be affected by the small number of events.

9. Confidence intervals

Within this bulletin, a difference which is described as 'significant' can be considered to be statistically significant and has been assessed using 95 % confidence intervals. Confidence intervals are a measure of the statistical precision of an estimate and show the range of uncertainty around the estimated figure.

Calculations based on small numbers of events are often subject to random fluctuations. As a general rule, if the confidence interval around one figure overlaps with the interval around another, we cannot say with certainty that there is more than a chance difference between the two figures.

10. **Special extracts of data**

Special extracts and tabulations of deaths involving *C. difficile* data for England and Wales are available to order for a charge (subject to legal frameworks, disclosure control, resources and agreement of costs, where appropriate). Such requests or enquiries should be made to:

Mortality Analysis Team Office for National Statistics Government Buildings Cardiff Road Newport Gwent NP10 8XG

Tel: +44 (0) 1633 456736 E-mail: mortality@ons.gsi.gov.uk

The ONS charging policy is available on the ONS [website](#).

11. **Plan for mortality outputs**

Future changes to mortality outputs are outlined in the plan for mortality outputs available on the ONS [website](#).

12. **Feedback**

We would welcome feedback on the content, format and relevance of this release. Please send feedback to the postal or email address above.

13. **Pre-release access**

A list of the names of those given pre-publication access to the statistics and written commentary is available in Pre-release access list to Deaths involving *Clostridium difficile*. The rules and principles which govern pre-release access are featured within the [Pre-release Access to Official Statistics Order 2008](#).

14. **Revisions**

The ONS revisions policy is available on our [website](#).

15. **National Statistics**

National Statistics are produced to high professional standards set out in the Code of Practice for Official Statistics. They undergo regular quality assurance reviews to ensure that they meet customer needs. They are produced free from any political interference.

© Crown copyright 2013.

16. **Terms and conditions**

You may use or re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit the [National Archives website](#), write to: The Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

17. Details of the policy governing the release of new data are available by visiting [the Statistics Authority website](#) or from the Media Relations Office email: media.relations@ons.gsi.gov.uk

These National Statistics are produced to high professional standards and released according to the arrangements approved by the UK Statistics Authority.

18. Follow ONS on [Twitter](#) and [Facebook](#).

19. **Next publication:**

August 2014

20. **Issued by:**

Office for National Statistics, Cardiff Road, Newport, NP10 8XG

21. **Media contact:**

Tel: Media Relations Office 0845 6041858 Emergency on-call 07867 906553 Email: media.relations@ons.gsi.gov.uk

22. Details of the policy governing the release of new data are available by visiting www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html or from the Media Relations Office email: media.relations@ons.gsi.gov.uk