Office for National Statistics

Statistical bulletin

Deaths involving MRSA in Wales: 2014

Deaths where Meticillin-resistant Staphylococcus aureus (MRSA) was mentioned on the death certificate by sex, age group and whether the death occured in hospital or elsewhere.

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1. Main points

- There were 25 death certificates mentioning Meticillin-resistant Staphylococcus aureus (MRSA) in 2014

- In 2014, approximately 1 in 6 death certificates (4 out of 25) mentioning MRSA also identified it as the underlying cause of death

- The age-standardised rate for deaths involving MRSA initially increased, from 5.7 to 40.2 deaths per million population, between 1994 and 2005, but has since fallen to a level similar to that observed in 1994. The rate in 2014 was 8.1 deaths per million

- The age-specific MRSA death rates increased with age and tended to be higher for males than females

- In the period 2010 to 2014, the majority of deaths involving MRSA occurred in NHS hospitals (93%). However, these deaths accounted for only 0.2% of all hospital deaths

2. Summary

Meticillin-resistant Staphylococcus aureus (MRSA) is a type of Staphylococcus bacteria that is resistant to antibiotics known as beta-lactams. Therefore the MRSA figures presented here are a subset of the Staphylococcus aureus (S. aureus) figures. S. aureus bacteria can cause mild to life threatening disease if there is an opportunity for it to enter the body through broken skin or a procedure requiring the use of an invasive medical device.

This bulletin presents the latest figures for deaths where MRSA was mentioned or was identified as the underlying cause of death on death certificates. Figures are presented for Wales and are broken down by sex, age group and place of death. Comparisons are made between data for 2014, the latest year, and previously published data from 1993 onwards. Information is given about the context and use of the statistics, and the methods used to produce them.

Figures are based on deaths registered in each calendar year rather than those occurring in each year. Since the majority of deaths involving MRSA registered in 2014 also occurred in the same year, registration delays are unlikely to affect our findings. Please see the section on registration delays for further information.

Figure 1: Number of deaths where MRSA and S. aureus were mentioned or identified as the underlying cause of death on death certificates

Wales, deaths registered in 2014
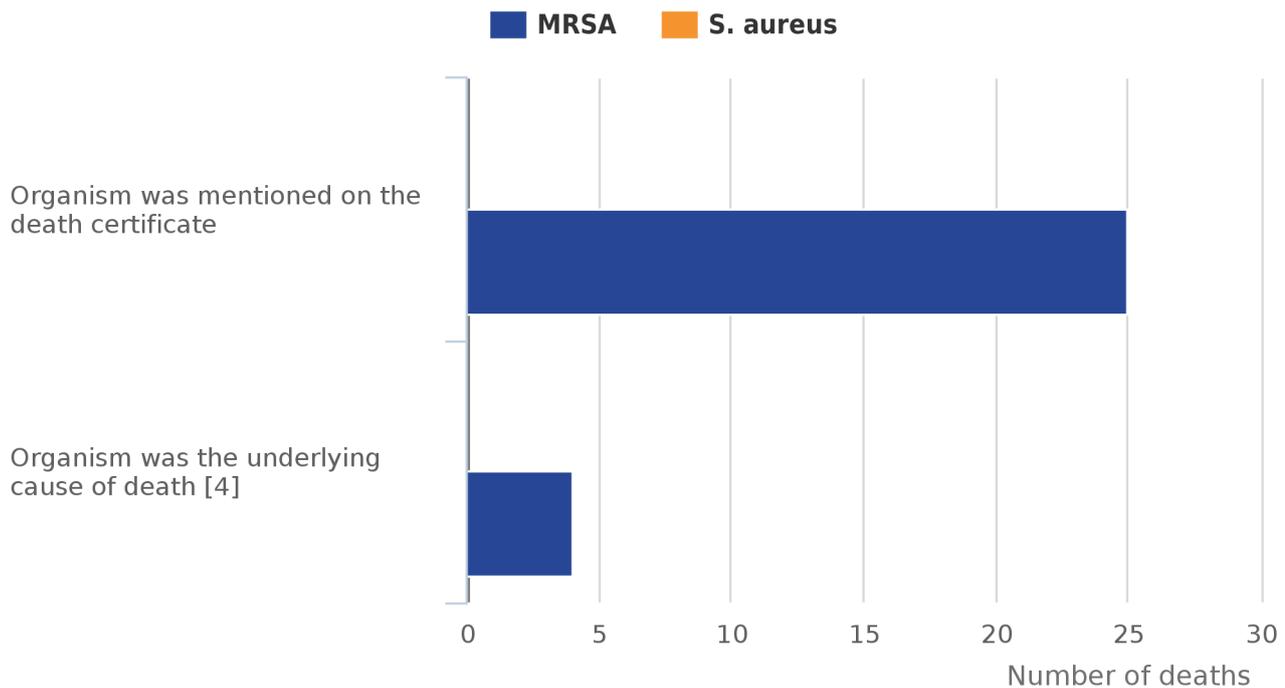
Source: Office for National Statistics

Notes:

1. Based on boundaries as of May 2015

2. Figures exclude deaths of non-residents

3. Figures are for deaths registered in 2014

4. Neonates are not assigned an underlying cause of death and are therefore excluded from figures for underlying cause

5. In 2014 the average number of days between date of death and death registration was 4 days for MRSA and S. aureus

6. Around 1 in 6 (16%) death certificates mentioning MRSA also identified it as the underlying cause of death and around 1 in 5 (21%) mentioning S. aureus identified this organism as the underlying cause of death

3. The number of death certificates mentioning MRSA and S. aureus has decreased since peaking in 2005

In 2014, there were 25 death certificates mentioning MRSA and 47 mentioning S. aureus (including those resistant to meticillin). The majority of these deaths were among males (60% of MRSA and 53% of S. aureus deaths respectively).

The number of MRSA deaths increased between 1993 and 2005, but has since decreased. The trend in our data from 2005 onwards is consistent with the trend in the incidence of MRSA bloodstream infections reported by the [Welsh Healthcare Associated Infection Programme (WHAIP)](#), part of Public Health Wales. The decreases may partly be due to interventions which are targeted at improving hospital-based infection control practices. However, unlike our figures, the incidence data collected by WHAIP only focuses on bloodstream infections and not other types of infections associated with MRSA.

In 1993, approximately 7% of S. aureus infections mentioned on death certificates were reported as meticillin-resistant (MRSA). The proportion of S.aureus deaths that is reported as meticillin-resistant tends to fluctuate annually. Nevertheless, there was a sharp increase in this proportion from 7% in 1993 to a peak of 89% in 2008. The proportion has since decreased to 53% in 2014, the lowest recorded since 1995.

MRSA and S. aureus infections may contribute to a death or directly cause it. Approximately 16% (4 out of 25) of death certificates mentioning MRSA also recorded it as the underlying cause of death, while 21% (10 out of 47) of those mentioning S. aureus recorded this organism as the underlying cause of death.

Figure 2: Number of deaths involving MRSA and S. aureus
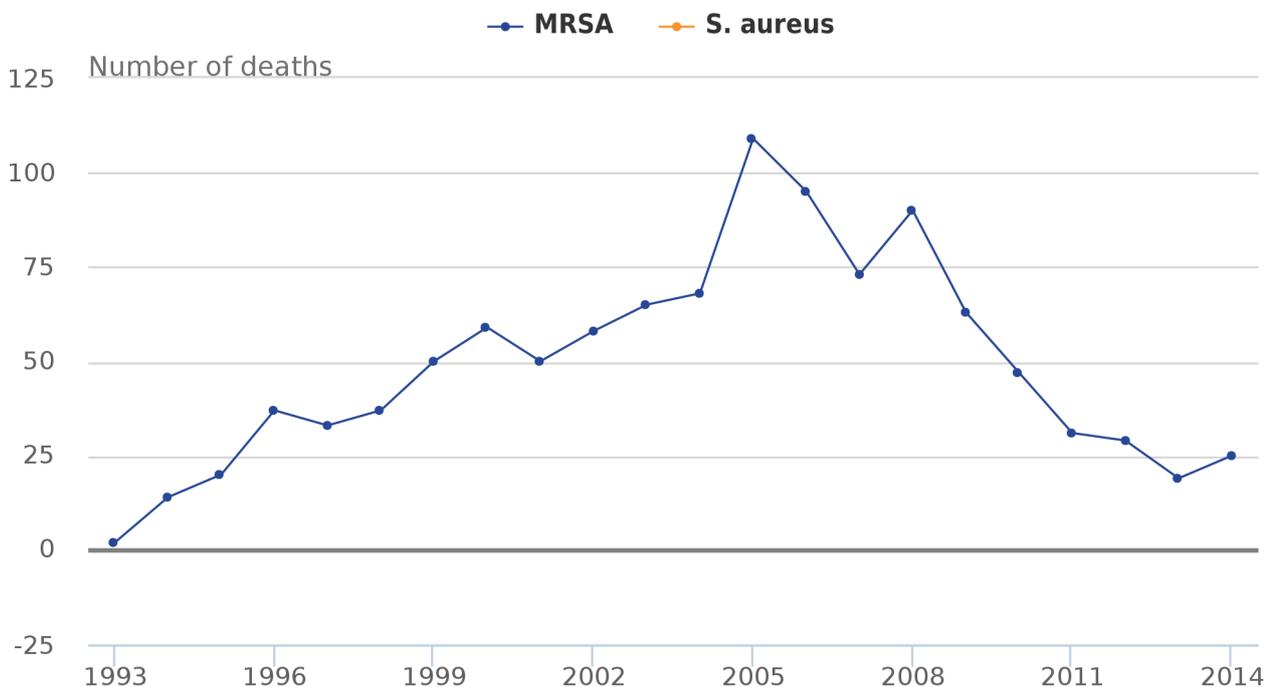
Wales, deaths registered in 1993 to 2014

Source: Office for National Statistics

Notes:

1. Based on boundaries as of May 2015

2. Figures exclude deaths of non-residents

3. Figures are for deaths registered in each calendar year

4. In 2014 the average number of days between date of death and death registration was 4 days for MRSA and S. aureus

5. The age-standard rates for deaths involving MRSA and S. aureus increased between 1993 and 2005, before falling since 2011 to levels similar to those observed in 1993 when our records began

4. Time trends in age-standardised rates for deaths involving MRSA and S. aureus

The age-standardised rates presented here are for all persons (males and females combined). This is because the number of deaths in each year since the 2005 peak has fallen to the extent that there are no longer sufficient deaths to calculate robust sex-specific age-standardised rates for individual years. We couldn't calculate the MRSA death rate for 1993 because the number of deaths in that year weren't sufficient to do so.

A ranking of the top 10 causes of serious bloodstream infections published by WHAIP showed that MRSA dropped from the fifth most common cause between October 2004 and November 2005, to ninth place in 2014. The 2014 rank reflects the dropping incidence of MRSA bloodstream infections in hospitals across Wales and is consistent with the trend in our MRSA death rates since 2005.

The age-standardised rate for deaths mentioning MRSA increased significantly between 1994 and 2005, before falling to a level similar to that observed in 1994. The rate increased from 5.7 per million population in 1994 to a peak of 40.2 per million in 2005. It has since fallen to 8.1 per million in 2014.

A similar trend was observed for deaths mentioning S. aureus, with the age-standardised rate initially increasing, from 11.1 to 49.7 per million population between 1993 and 2005, before falling to 15.4 per million in 2014.

Figure 3: Age-standardised rates for deaths involving MRSA and S. aureus

Wales, deaths registered in 1993 to 2014
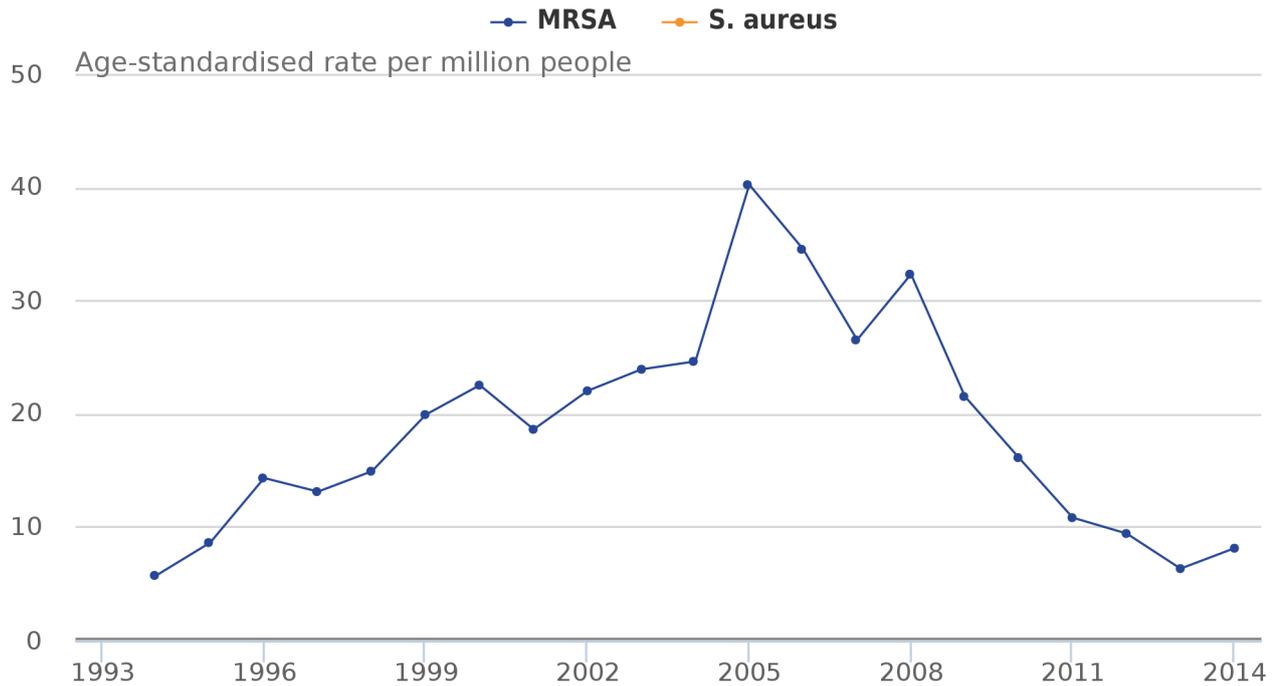
Source: Office for National Statistics

Notes:

1. Figures exclude deaths of non-residents

2. Figures are for deaths registered in each calendar year

3. Rates are expressed per million population and standardised to the 2013 European Standard Population

4. Age-standardised rates were not calculated where there were fewer than 10 deaths in a year. In such cases, the cell has been left blank and marked by (u) to show that the rate was not calculated due to low reliability

5. Age-standardised rates based on small number of deaths (10 to 19) may not be reliable and are therefore marked by (u)

6. In 2014 the average number of days between date of death and death registration was 4 days for MRSA and S. aureus

7. The relative standard error (RSE) is the standard error of a rate divided by the value of the rate itself, expressed as a percentage. It is a measure of how reliable a rate is. The higher the RSE, the less reliable a rate is

8. Statistically significant differences between rates are assessed using confidence intervals (CIs). As a general rule, if the confidence interval around an estimate overlaps with the interval around another, there is no difference between the two estimates

9. The age-standardised rates for deaths involving MRSA and S. aureus increased between 1993 and 2005, before falling since 2011 to levels similar to those observed in 1993 when our records began

5. Time trends in deaths involving MRSA and S. aureus by age group

Due to the small number of death certificates mentioning MRSA and S. aureus in each year, we have pooled data from 5-year periods in order to observe differences between the sexes and age groups.

In each 5-year period between 1993 to 1997 and 2010 to 2014, the age-specific rate for deaths mentioning MRSA and S. aureus increased with age and tended to be higher for males than females. For both sexes, rates were lowest among those under the age of 55 years and highest among those aged 85 years and over.
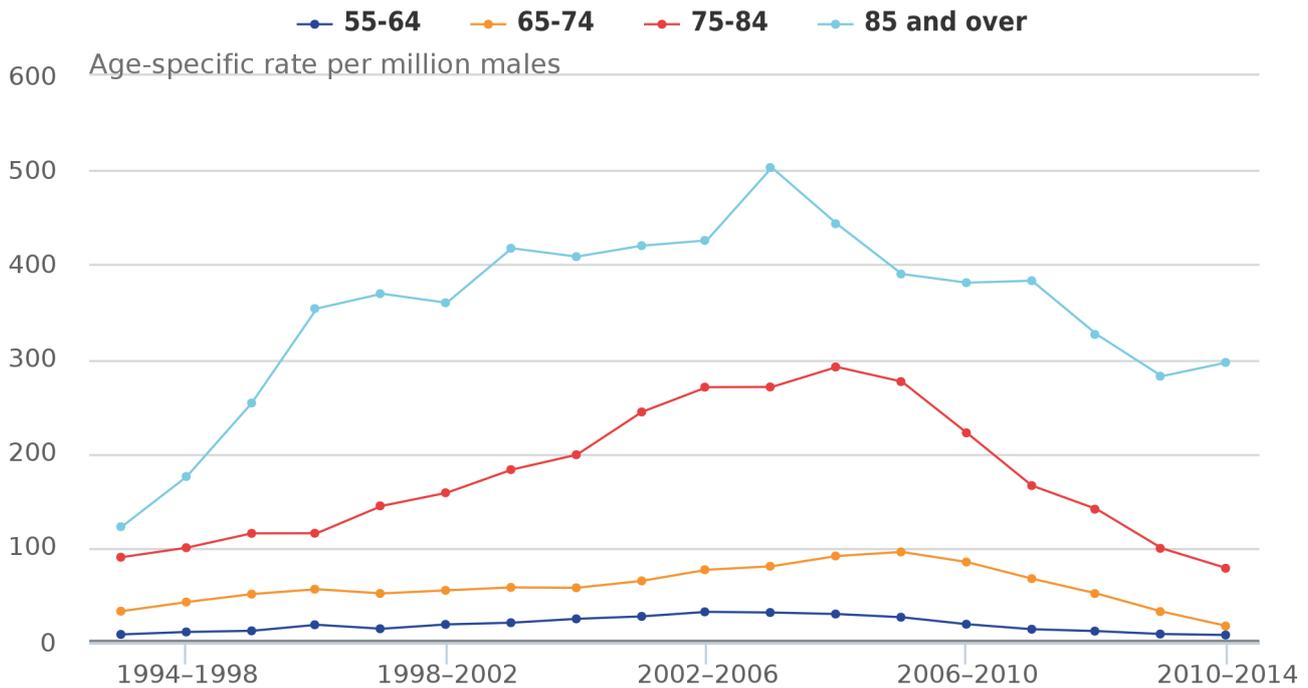
There was no significant change in the age-specific MRSA death rates for males and females under 55 years and females aged 55 to 64 years over time. In other age groups, rates initially increased before falling to levels similar to those observed in the period 1993 to 1997. For example, rates for males aged 55 to 64 years increased significantly, from 8.0 deaths per million in the period 1993 to 1997 to a peak of 31.9 per million in 2002 to 2006, before falling to 7.4 per million in 2010 to 2014.

In each period, a higher proportion of S. aureus deaths were MRSA in the oldest age group compared with the youngest. For example, among those aged 85 years and over in 2010 to 2014, approximately 79% of male and 63% of female S. aureus deaths were MRSA. Conversely, among those under 55 years in the same period years, 41% of male and 38% of female S. aureus deaths were MRSA.

Sick people in healthcare facilities are at increased risk of contracting MRSA. These figures highlight the greater vulnerability of older people as they are likely to have relatively weaker immune systems compared with younger people and to have a number of coexisting health problems.

Figure 4: Age-specific rates for male deaths involving MRSA

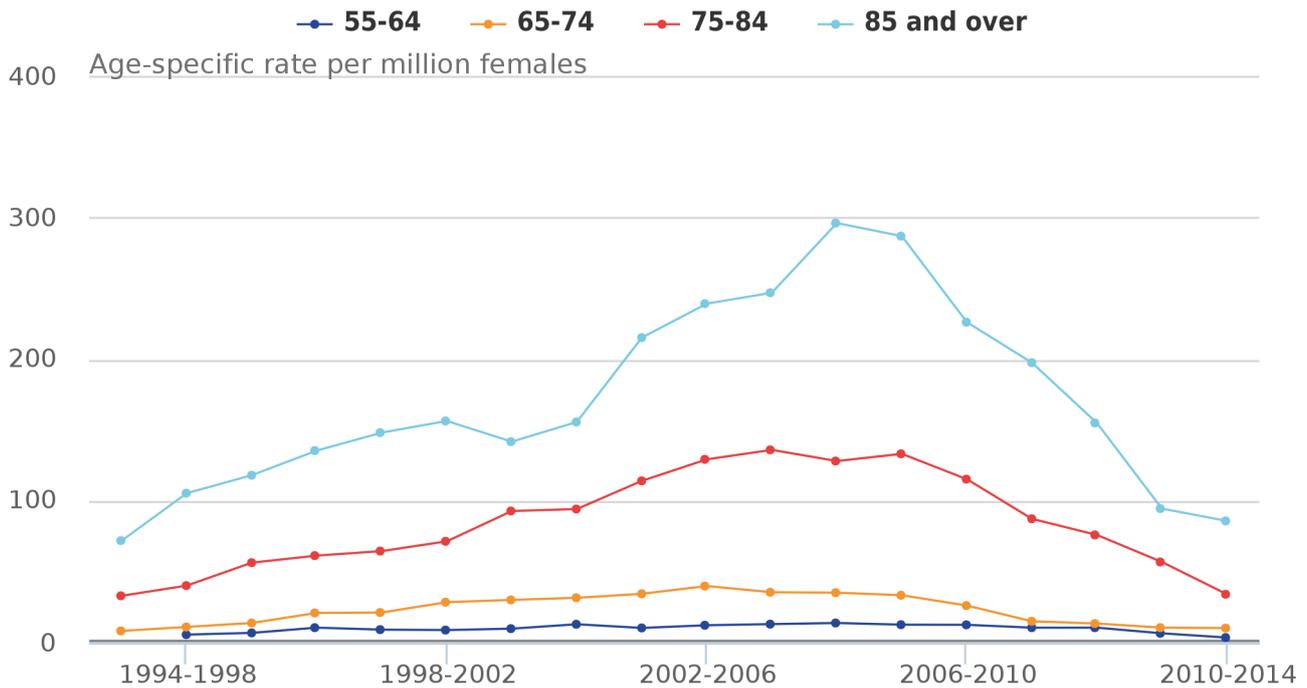Wales, deaths registered between the period 1993 to 1997 and 2010 to 2014

Source: Office for National Statistics

Notes:

1. Based on boundaries as of May 2015

2. Figures exclude deaths of non-residents

3. Figures are for deaths registered in the calendar years in each period

4. Rates based on fewer than 3 deaths are not presented

5. Age-specific rates were not calculated where there were fewer than 3 deaths in an age group. In such cases, the cell has been left blank and marked by (u) to show that the rate was not calculated due to low reliability

6. In 2014 the average number of days between date of death and death registration was 4 days for MRSA and S. aureus

7. Statistically significant differences between rates are assessed using confidence intervals (CIs). As a general rule, if the confidence interval around an estimate overlaps with the interval around another, there is no difference between the two estimates

8. There were fewer than 3 deaths involving MRSA per mission males ages 0 to 54 years in each period. There was no significant change in MRSA death rates in this age group and among men ages 55 to 64 years over time

9. Older people ar emore vunerable to MRSA infections and are more likely to die from them. Among men in age groups over 64 years, MRSA death rates peaked in the mid to late 2000s before falling between 2010 and 2014 to levels similar to those observed in the 1990s

Figure 5: Age-specific rates for female deaths involving MRSA

Wales, deaths registered between the period 1993 to 1997 and 2010 to 2014

Source: Office for National Statistics

Notes:

1. Based on boundaries as of May 2015

2. Figures exclude deaths of non-residents

3. Figures are for deaths registered in the calendar years in each period

4. Rates based on fewer than 3 deaths are not presented

5. Age-specific rates were not calculated where there were fewer than 3 deaths in an age group. In such cases, the cell has been left blank and marked by (u) to show that the rate was not calculated due to low reliability

6. In 2014 the average number of days between date of death and death registration was 4 days for MRSA and S. aureus

7. Statistically significant differences between rates are assessed using confidence intervals (CIs). As a general rule, if the confidence interval around an estimate overlaps with the interval around another, there is no difference between the two estimates

8. There were fewer than 3 MRSA deaths per million females aged 0 to 54 years in each period. There was no significant change in rates in this age group and among women ages 55 to 64 years over time

6. The majority of MRSA deaths occur in NHS hospitals

Deaths involving S. aureus accounted for 0.2% and MRSA 0.1% of all deaths registered in Wales in the period 2010 to 2014.

A breakdown by place of death shows that 94% of deaths involving S. aureus and 93% of MRSA deaths in Wales occurred in NHS hospitals. These figures represent 0.3% and 0.2% of all deaths in NHS hospitals respectively.

As the majority of all deaths in Wales occur in NHS hospitals, it is expected that the proportions of deaths involving S. aureus and MRSA in these establishments would be higher than those in other establishment types.

Non-local authority care homes had the second highest number and percentage of all deaths involving S. aureus and MRSA. In addition, 9 out of the 10 S. aureus deaths in this establishment type were reported as meticillin-resistant. Conversely, there were no deaths involving S. aureus and MRSA in local authority care homes.

Figure 6: Percentage of deaths involving MRSA by place of occurrence

Wales, deaths registered in the period 2010 to 2014

Home   **NHS hospital**   **Non-local authority care home**
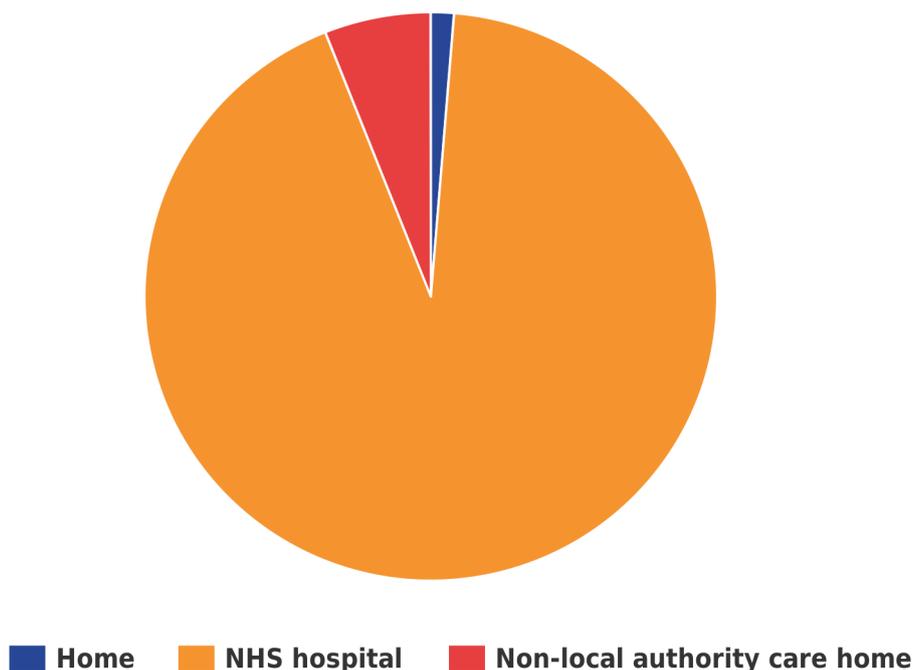
Source: Office for National Statistics

Notes:

1. Based on communal establishment boundaries boundaries as of May 2015

2. Figures exclude deaths of non-residents

3. Figures are for deaths registered in each calendar year in the period

4. In 2014 the average number of days between date of death and death registration was 4 days for MRSA and S. aureus

5. The majority of deaths involving MRSA between 2010 and 2014 occurred in NHS hospitals

7. Background

S. aureus is a common type of bacteria (germ) found on the skin and in the nostrils of healthy people without it causing any harm (Public Health England, 2014).

Most strains of S. aureus are sensitive to the more commonly used antibiotics and the infections they cause can be effectively treated. However, some strains are resistant to these antibiotics. Most strains of S. aureus first developed resistance to penicillin in the 1950s. In the late 50s, chemists developed an antibiotic called meticillin which was not destroyed by the penicillin-resistant bacteria. However, resistant strains began to appear soon after the introduction of meticillin and these strains spread rapidly during the 1990s.The term MRSA refers to S. aureus bacteria that are resistant to antibiotics known as beta-lactams. This group of antibiotics include meticillin and other more common antibiotics such as oxacillin, penicillin and amoxicillin.

MRSA can cause mild to life threatening conditions if there is an opportunity for it to enter the body through broken skin or a medical procedure requiring the use of an invasive medical device (Public Health England, 2014). These include skin and wound infections, infected eczema, abscesses or joint infections and pneumonia, infections of the heart valves (endocarditis), bacteraemia (blood stream infection) and food poisoning.

In the community, the majority of MRSA infections are skin infections while in healthcare settings MRSA causes life-threatening bloodstream infections, pneumonia and surgical site infections (Centre for Disease Control and Prevention, 2015).

The concern about MRSA is in part due to the fact that it shows a higher degree of drug resistance than other types of S. aureus and also because it has become particularly associated with hospital acquired infections Public Health Wales, 2011. There is also growing concern about community-acquired MRSA in some parts of the world, with studies (Herold et al. 1998; Salmenlinna S, Lyytikäinen O and Vuopio-Varkila J, 2002) suggesting that this type of MRSA can be found in otherwise healthy people with no previous contact with healthcare facilities or hospitalised persons.

8. Use of MRSA data

Incidence and mortality data for S. aureus and MRSA infections in Wales are primarily used by Public Health Wales to highlight the burden of MRSA and to monitor and evaluate intervention programs aimed at reducing this burden. These data are also used by local health boards and individual healthcare establishments.

In 2004, the Welsh Government published its strategy for reducing healthcare associated infections in hospitals in Wales. In addition, there is a comprehensive surveillance of MRSA bloodstream infections managed by WHAIP. The surveillance programme provides Health Boards with information about rates of various infections in their institutions, highlighting potential areas for investigation and action.

9. Methods

Data source

The information used in this bulletin is based on the details collected when deaths are certified and registered. All deaths are coded by ONS according to the International Classification of Diseases (ICD) produced by the World Health Organisation (WHO).

Since 1993, ONS has stored the text of death certificates on a database, along with all the ICD coding related to causes identified on the death certificate. The Tenth Revision of ICD (ICD-10) has been used to code deaths in Wales since 2001.

Approach used in selecting deaths

The text on death certificates were used in combination with ICD-10 codes to identify those mentioning MRSA and S. aureus in a two step process.

A number of infections are specifically related to S. aureus or other staphylococcal species. First, all deaths were extracted where any of these infections was mentioned on the death certificates. These deaths were extracted using the ICD-10 codes given in Box 1 in the reference table (155.5 Kb Excel sheet) . The text of these death certificates was then searched, both electronically and manually, to identify MRSA and S. aureus.

Conversely, some infections have different causative organisms and may be caused by Staphylococcus species or other pathogens. The second step therefore involves extracting all deaths which had these non-specific infections mentioned on the death certificate. The codes used to identify these infections are given in Box 2 in the reference table. The text of these death certificates was then searched manually to identify MRSA and S. aureus.

Deaths with an underlying cause of S. aureus were identified by selecting those deaths with a mention of S. aureus that also had as the underlying cause one of the infections listed in Box 1 or Box 2. The same procedure was followed in order to identify deaths with MRSA as the underlying cause.

Since 1986, ONS has used the internationally recommended death certificate for neonatal deaths (infants under 28 days old). This certificate was only designed to record all conditions found at death. This means that neonates cannot be assigned an underlying cause of death. However, as the data were based on deaths where MRSA and S. aureus were mentioned on the death certificate, neonates have been included. Neonatal deaths were extracted in the same way as described for post-neonatal deaths.

Registration delays

The information used to produce mortality statistics is based on the details collected when deaths are certified and registered. In Wales, deaths should be registered within 5 days of the death occurring, but there are situations where this isn't possible. 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.

Statistics on deaths involving MRSA and S. aureus are presented based on the number of deaths registered in each calendar year, rather than the number of deaths that occurred. This method is used because there is a requirement for consistent and timely data, despite a potential limitation in data quality caused by registration delays.

In 2014, the average (median) number of days between date of death and death registration for deaths where MRSA was mentioned on the death certificate or selected as the underlying cause was 4 days. The majority of deaths where MRSA was mentioned on the death certificate (80%) and those caused by it (75%) were registered within 5 days. All deaths directly caused by MRSA and 92% of those mentioning it on death certificates were registered within 30 days.

The majority of deaths involving MRSA registered in 2014 (23 out of 25 or 92%) and all those reporting it as the underlying cause occurred in the same year. As a result, registration delays are likely to have no impact on the trends reported in this bulletin.

The majority of deaths involving MRSA (80%) and S. aureus (81%) were registered within 5 days
Proportion of deaths registered by period

Wales, deaths registered in 2014

Percentage of deaths registered (%)

	Number of deaths registered in 2014	Within 5 days	Six days to one month (6-30 days)	One to three months (31 - 91 days)	Three to six months (92 - 183 days)	Six months to one year (184 - 365 days)	Over 1 year (over 365 days)
Mentions							
MRSA	25	80	12	0	4	0	4
S. aureus	47	81	9	0	6	2	2
Underlying cause							
MRSA	4	75	25	0	0	0	0
S. aureus	10	90	10	0	0	0	0

Source: Office for National Statistics

Notes:

1. Figures are for deaths registered in 2014

2. Figures exclude deaths of non-residents

3. Deaths are excluded if the day and/or month of death are missing

4. In 2014 the average number of days between date of death and death registration was 4 days for MRSA and S. aureus

10. Results on the Office for National Statistics website

Figures for deaths involving MRSA and S. aureus from 1993 to 2014 are available in the reference table on our website. This excel workbook (155.5 Kb Excel sheet) contains the number of deaths in each year, age-standardised rates, age-specific rates and a breakdown by place of death.

11. References

Centre for Disease Control and Prevention (2015). Methicillin-resistant Staphylococcus aureus (MRSA) Infections [accessed 24 July 2015].

Herold B, Immergluck L, Maranan M, Lauderdale D, Gaskin R, Boyle-Vavra S, Leitch C, Daum R (1998) Community-acquired Methicillin-Resistant Staphylococcus aureus in children with no identified predisposing risk. Journal of the American Medical Association, 279(8).pp 593-598 [accessed 24 July 2015].

Public Health England (2014) Staphylococcus aureus: guidance, data and analysis [accessed 24 July 2015].

Public Health Wales (2011) Staphylococcus aureus (MRSA) [accessed 27 July 2015].

Public Health Wales (2013) Staphylococcus aureus bacteraemia blood stream infection surveillance [accessed 27 July 2015].

Public Health Wales (2015) All Wales: Top Ten Blood Stream Infections [accessed 24 July 2015].

Salmenlinna S, Lyytikäinen O, and Vuopio-Varkila J (2002) Community-acquired Methicillin-Resistant Staphylococcus aureus, Finland. Emerging Infectious Disease Journal [e-journal], 8(6), June [accessed 24 July 2015].

Welsh Government (2004) Healthcare Associated Infections – A Strategy for Hospitals in Wales. [accessed 24 July 2015]

12. Background notes

1. Figures are for deaths registered in each calendar year while rates are based on mid-year population estimates as the denominator.

2. Information about the underlying mortality data, including details on how the data are collected and coded, is available in the mortality metadata (2.46 Mb Pdf) .

3. The number of deaths due to MRSA is difficult to estimate. Trends in mortality are usually monitored using the underlying cause of death (the disease which initiated the train of events leading directly to death). However, MRSA (and other healthcare associated infections) are often not the underlying cause of death. Those who die with MRSA are usually patients who were already very ill, and it is their existing illness, rather than MRSA, which is often designated as the underlying cause of death. There is therefore an interest in the number of deaths where MRSA 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 MRSA and also where MRSA was mentioned as the underlying cause or as a contributory factor in the death.

4. Although MRSA 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.

5. Revised guidance on death certification, with specific reference to healthcare associated infections, was issued to doctors in July 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).

6. There are two types of rates reported in this bulletin; age-specific and age-standardised. Age-specific rates may be calculated for given age groups and are defined as the number of deaths in the age group per million (or thousand) population in the same age group. While these rates can be compared between times, places, and sub-populations, the tables containing them are usually large and may be difficult to assimilate. In addition, where there are very few deaths these rates will be imprecise and may be difficult to interpret. Age-standardised rates make allowances for differences in the age structure of the population, over time and between sexes. The rates presented here have been age-standardised using the direct method of standardisation (93.5 Kb Excel sheet) . The age-standardised rate for a particular disease is that which would have occurred if the observed age-specific rates for the disease had applied in a given standard population. In this bulletin, the 2013 European Standard Population has been used. This is a

hypothetical population standard, which is the same for both males and females, allowing standardised rates to be compared over time and between sexes.

7. Age-specific rates were not calculated where there were fewer than 3 deaths in an age group. Similarly, age-standardised rates were not calculated where there were fewer than 10 deaths in a given period, while those which were calculated from 10 to 19 deaths may have low reliability and are therefore marked by (u). Where a rate has not been calculated due to low counts as described, the cell has been left blank, and marked by (u) to show the rate was not calculated due to low reliability.

8. In this bulletin, a difference which is described as 'statistically significant' has been assessed using confidence intervals. Confidence intervals (CIs) are a measure of the statistical precision of an estimate and show the range of uncertainty around it. Calculations based on small numbers of events are often subject to random fluctuations. Significance is assigned on the basis of non-overlapping CIs. While more formalised and accurate methods of significance testing are available, the non-overlapping CI method is used because it is both simple to calculate and easily understood. As a general rule, if the confidence interval around an estimate overlaps with the interval around another, there is no significant difference between the two estimates.

9. Special extracts and tabulations of deaths involving MRSA in Wales are available to order for a charge (subject to legal frameworks, disclosure control, resources and agreement of costs, where appropriate).

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10. The ONS charging policy is available on our website.

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

12. Information on the various dimensions of quality and a summary of methods used to compile this output are available in the Quality and Methodology Information notes (QMI).

13. ONS produces statistics for MRSA for Wales. The National Records of Scotland (NRS), formerly the General Register Office for Scotland (GROS) produces statistics for Scotland, and the Northern Ireland Statistics and Research Agency (NISRA) produces statistics for Northern Ireland.

14. 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 MRSA. The rules and principles which govern pre-release access are featured within the Pre-release Access to Official Statistics Order 2008.

15. 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.

16. 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