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## Current News

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- ▶ **Mandatory MRSA, MSSA and *E. coli* bacteraemia and *C. difficile* infection data (England): up to financial year 2014/15**
- ▶ **Travel advice for Hajj and Umrah pilgrims**

## Infection report

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### HCAI/bacteraemia

- ▶ **Surveillance of *Pseudomonas* and *Stenotrophomonas* species causing bacteraemia (EWNI): 2014 \***

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### **Mandatory MRSA, MSSA and *E. coli* bacteraemia and *C. difficile* infection data (England): up to financial year 2014/15**

Public Health England's latest annual data, and latest annual epidemiological commentary, on trends in reports of *Staphylococcus aureus* (MRSA and MSSA) and *Escherichia coli* bacteraemia, and of *Clostridium difficile* infections, mandatorily reported by NHS acute Trusts in England up to financial year 2014/15 (FY 2014/15), have been published on the GOV.UK website [1,2].

The data and commentary, including tabular and graphical information, cover the 2014/15 financial year (updating the previous report published on 10 July 2014). Some key facts are listed below.

#### **MRSA, MSSA and *E. coli* bacteraemias**

A total of 801 cases of MRSA bacteraemia were reported by English NHS acute Trusts between 1 April 2014 and 31 March 2015 (FY 2014/15). This represents a reduction of 7.1% in the number of cases reported in FY 2013/14 when 862 cases were reported, and an overall reduction of 82.0% from the number of cases reported in 2007/08 (4,451 cases).

Of the 801 cases in FY 2013/14, 320 MRSA bacteraemias were assigned to an acute Trust (0.9 per 100,000 bed days) through the Post Infection Review (PIR) process [3] and 384 were assigned to a Clinical Commissioning Group (CCG) (0.71 per 100,000 population) while the remaining 97 MRSA bacteraemias were assigned to a Third Party, equivalent to 0.2 per 100,000 population.

A total of 9,827 cases of MSSA bacteraemia were reported across the NHS in England in FY 2013/14. This represents an increase of 5.8% on the number of cases reported in 2013/14 when 9,290 cases were reported, and an increase of 12.1% on the number of cases reported in 2011/12 (8,767 cases). The associated national rate also increased from 16.5 to 18.2 cases per 100,000 population over this time period.

A total of 2,795 (28.4% of 9,827 total reported MSSA bacteraemias) were Trust apportioned across the NHS in FY 2013/14. This represents a 3.7% increase compared to the number of Trust apportioned cases in 2013/14 (n=2,696) and is the first increase in Trust apportioned MSSA bacteraemias since its inclusion in the mandatory surveillance scheme. Similarly, the rate of Trust apportioned MSSA bacteraemia has also increased between 2013/14 and 2014/15 from 7.9 per 100,000 bed days to 8.1 per 100,000 bed days, respectively.

A total of 35,676 cases of *E. coli* bacteraemia were reported across the NHS in 2014/15. This represents an increase of 4.1% on the number of cases in 2013/14 when 34,275 cases were reported and an overall 10.4% increase from 2012/13 (n=32,309 cases), which was the first full financial year of mandatory surveillance data on *E. coli* bacteraemias. The associated national rate also increased from 60.4 to 66.2 cases per 100,000 population over this time period.

Observed increases in MSSA and *E. coli* bacteraemia numbers have been apparent for some time and is in fact why PHE, the Department of Health and the NHS initiated more in-depth surveillance on these infections. PHE is currently working with the Advisory Committee on Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) to identify suitable healthcare interventions to reduce these infections.

### **C. difficile infections**

A total of 14,165 cases of *C. difficile* infection (CDI) were reported across the NHS in 2014/2015. This represents an increase of 6.0% on the number of cases reported in 2013/14 when 13,361 cases were reported. This is the first increase in CDI since the enhanced mandatory surveillance of CDI was initiated in 2007. However, the number of case in 2014/15 is not yet at 2012/13 levels and even with the recent increase in 2014/15, there remains a 74.5% overall reduction in the number of CDI between 2007/08 and 2014/15 (from 55,498 in 2007/08). The associated national rate decreased from 108.0 in 2007/08 to 24.8 cases per 100,000 population in 2013/14, with a slight increase in the rate to 26.3 per 100,000 population in 2014/15.

There has also been an increase in the number of Trust apportioned cases in 2014/15. Of the 14,165 cases reported in patients aged two years and over in 2014/15, 5,213 (36.8%) were Trust apportioned. This represents a 3.6% increase on the 5,033 Trust apportioned CDI reports received in 2013/14; however, the number of Trust apportioned cases have still declined by 84.4% overall since 2007/08 (from 33,442 in 2007/08).

Of note, the increase in non-Trust apportioned cases was greater, with a 7.5% increase over the same time period from 8,328 non-Trust apportioned *C. difficile* infections in 2013/14 to 8,952 in 2014/15; resulting in a lesser percentage of all reported *C. difficile* infections which were Trust apportioned in 2014/15 than ever before (36.8% in 2014/15).

Like the number of Trust apportioned *C. difficile* infections, the rate of Trust apportioned cases per 100,000 bed days has decreased overall between 2007/08 and 2014/15, from 89.7 per 100,000 bed days in 2007/08 to 15.1 per 100,000 bed days in 2014/15; however, there has been a 2.9% increase since 2013/14 (14.7 per 100,000 bed days).

The observed increases in *Clostridium difficile* infection are currently under investigation and PHE is working closely with the NHS and the wider health service to look for any underlying reasons. In particular, the proportion of infections that detected in the community that maybe associated with recent hospital stays.

## References

1. PHE (July 2015). Quarterly counts by acute Trust and CCG, and financial year counts and rates by acute Trust and CCG, up to financial year 2014/2015:
    - MRSA bacteraemia;
    - MSSA bacteraemia;
    - *E. coli* bacteraemia;
    - *C. difficile* infections.
  2. PHE (9 July 2015). Annual Epidemiological Commentary: MRSA, MSSA and *E. coli* bacteraemia, and *C. difficile* infection data, up to and including financial year 2014/15.
  3. NHS England (2014). Zero tolerance – guidance on the post infection review.
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## Travel advice for Hajj and Umrah pilgrims

The National Travel Health Network and Centre (NaTHNaC) has updated its guidance for UK-based Hajj and Umrah pilgrims, for the upcoming Hajj season in September 2015 (1436H), following the publication of health-related requirements and recommendations by the Ministry of Health in the Kingdom of Saudi Arabia (MOH-KSA) [1,2].

The NaTHNaC guidance includes general precautionary advice, and recommends that UK-based pilgrims should be up-to-date with routine immunisations and have a pre-travel consultation with a healthcare provider at least four to six weeks before travel for advice on their fitness to travel, malaria prophylaxis, other risks from insect bites and contact with animals, food and water precautions, and injury prevention. A single dose of quadrivalent conjugate meningococcal vaccine administered between three years and 10 days before arrival in KSA is a mandatory requirement for Hajj pilgrims.

There is currently an ongoing outbreak of Middle East respiratory syndrome coronavirus (MERS-CoV) in KSA, with a small number of cases also reported in other countries of the Middle East. The risk to UK residents travelling to the Middle East of contracting MERS-CoV during travel remains very low [3]. MOH-KSA and PHE advise a number of precautions to prevent the spread of respiratory diseases, including good hand hygiene and mask wearing in crowded places. See the NaTHNaC information sheet [1] for the full details of all recommendations.

In response to international outbreaks of disease, the MOH-KSA recommends that vulnerable groups – those over 65 years of age, those with chronic diseases (eg heart, kidney or respiratory disease, diabetes or immune deficiency), malignancy and terminal illness, pregnant women and children – should postpone their pilgrimage this year for their own safety.

### References

1. National Travel Health Network and Centre clinical update (17 July 2015). [Advice for pilgrims: Hajj and Umrah 1436 \(2015\)](#).
2. Ministry of Health, Kingdom of Saudi Arabia (15 July). [Health requirements and recommendations for Hajj and Umrah performers and those working in Hajj areas](#).
3. PHE (June 2015). [Risk assessment of Middle East Respiratory Syndrome coronavirus \(MERS-CoV\)](#).



## Infection report \*

Volume 9 Number 25 Published on: 17 July 2015

### **Surveillance of *Pseudomonas* and *Stenotrophomonas* species causing bacteraemia in England, Wales and Northern Ireland: 2014**

These analyses are based on data relating to diagnoses of *Pseudomonas* spp. and *Stenotrophomonas* spp. bloodstream infections during 2007 – 2014 in England, Wales and Northern Ireland (E, W & NI) extracted from Public Health England's (PHE) voluntary surveillance database Second Generation Surveillance System (SGSS).

SGSS comprises a communicable disease module (CDR; formerly CoSurv/LabBase2) and an antimicrobial resistance module (AMR; formerly AmSurv). Most analyses presented here are based on data extracted from the CDR module of SGSS data on 30 June 2015, except for the evaluation of multi-drug resistance data from the AMR module of SGSS. This module captures more comprehensive antibiogram data allowing more robust evaluation of multi-resistance rates. However these data cannot be used for the trend analysis due to the addition of this data collection being relatively recent and therefore a lower laboratory coverage in previous years.

The data presented here will differ in some instances from those in earlier publications partly due to the inclusion of late reports.

Rates of bacteraemia laboratory reports were calculated using mid-year resident population estimates for the respective year and geography [1]. Geographical analyses were based on the residential postcode of the patient if known (otherwise the GP postcode if known or failing that the postcode of the laboratory) with cases in England being assigned to the catchment area of one of 15 local PHE centres (PHECs) formed from administrative local authority boundaries.

This report includes analyses of the trends, patient demographic and geographical distribution as well as antimicrobial susceptibility among these bacteraemia episodes.

## Key points

- the overall rate of *Pseudomonas* spp. bacteraemia in England, Wales and Northern Ireland was 6.2 per 100,000 population in 2014, an 11% decrease from 6.9/100,000 observed in 2007;
- the rate of *Stenotrophomonas* spp. was 0.8/100,000 in 2014, representing a decline of 36% since 2007 (1.3/100,000);
- the geographical distribution of *Pseudomonas* spp. bacteraemia varied widely in 2014, from 3.1/100,000 population in Wales to 8.0/100,000 in the London region of England;
- each country reported infection rates of below 1.0/ 100,000 population of *Stenotrophomonas* spp. bacteraemia in 2014;
- the most frequently identified *Pseudomonas* species in blood isolates in 2014 was *Pseudomonas aeruginosa* (81%);
- of the closely related organisms reported here, in 2014 *Brevibacterium* spp. and *Brevundimonas* spp. were the most commonly identified;
- the highest rates of *Pseudomonas* spp. bacteraemia were observed in those aged 75 years or older (31.5/100,000 population), and in males in the majority of age groups;
- the age distribution of *Stenotrophomonas* spp. bacteraemia showed higher rates in those aged between 65 and 74 years and in those aged less than one year (both 1.9/100,000 population);
- the proportion of *Pseudomonas* spp. bacteraemia reports which were reported as resistant (defined as reduced- or non-susceptible) to one of the key antimicrobials in 2014 remained steady or increased slightly compared to 2013;
- a steady increase in reported resistance of *Pseudomonas* spp. isolates to the penicillin and  $\beta$ -lactamase inhibitor combination 'piperacillin/tazobactam' has been seen between 2010 and 2014;
- no clear pattern in the proportion of *Stenotrophomonas* spp. bacteraemia test results reported as resistant to co-trimoxazole between 2010 and 2014;
- in England, dual resistance to ciprofloxacin and ceftazidime was reported in 2% *Pseudomonas* spp. bacteraemia; 1% were reported resistant to ciprofloxacin, ceftazidime and piperacillim/tazobactam.

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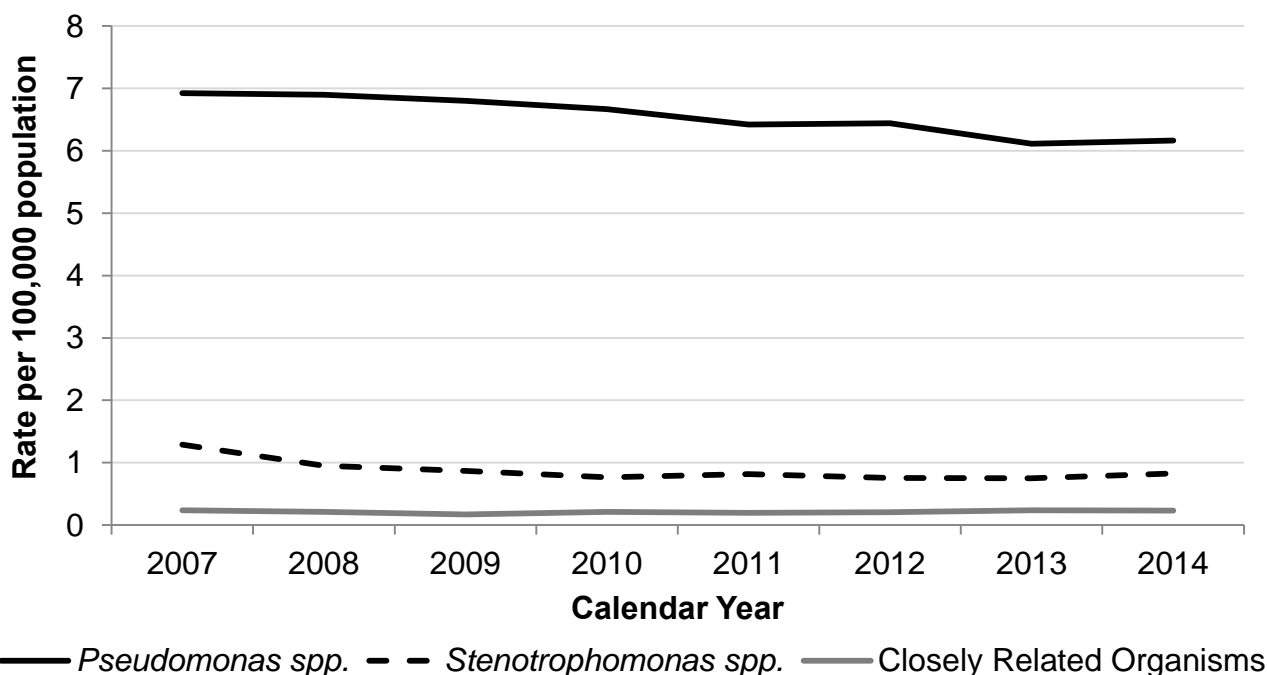
## Trends

The overall rate of *Pseudomonas* spp. bacteraemia in England, Wales and Northern Ireland was 6.2 per 100,000 population in 2014, a slight decrease from 6.9/100,000 observed in 2007 (11% decrease; figure 1). England had the highest reported incidence rate of *Pseudomonas* spp. with 6.4/100,000 followed by Northern Ireland (4.1) and Wales (3.1). A much steeper decrease in *Pseudomonas* spp. bacteraemia incidence rate has been seen in Wales (36% decrease) and Northern Ireland (26% decrease) compared to England over the past five years (6% decrease; 2010 to 2014; table 1a).

The rate of *Stenotrophomonas* spp. was 0.8/100,000 in 2014, representing a decline of 36% since 2007 (1.3/100,000) but a slight increase on that observed in 2013 (0.7; figure 1).

Reporting of closely related species has remained steady, at less than 0.25/100,000 population, over the time period (including *Brevibacterium* spp.\* , *Brevundimonas* spp., *Burkholderia* spp., *Comamonas* spp., *Ralstonia* spp. and *Shewanella* spp.).

**Figure 1. Eight year trend in *Pseudomonas* spp., *Stenotrophomonas* spp. and closely related species bacteraemia reports per 100,000 population (England Wales and Northern Ireland); 2007 to 2014**



*Pseudomonas* spp. accounted for 3.1% of mono-microbial bloodstream infections (BSI; all reported bacteraemia and/or fungaemia) in 2014; making them the eighth most commonly reported mono-microbial BSI causing organisms. In contrast, *Stenotrophomonas* spp.

\* Closely related organisms include genera where at least one species has previously been classified as *Pseudomonas* spp. or *Stenotrophomonas* spp.



accounted for 0.4% mono-microbial BSI in 2014 (ranked 24<sup>th</sup>) [2]. *Pseudomonas* spp. and *Stenotrophomonas* spp. were identified in 8.2% and 1.8% of poly-microbial BSI respectively in 2014.

Between 2013 and 2014 there was a 2% increase in *Pseudomonas* spp. bacteraemia reports (3593 and 3652 reports respectively; table 2a); a slight contrast to a 3% increase observed in all bacteraemia reported (to SGSS CDR) between 2013 and 2014 (103,808 and 106,708 respectively [2]).

## Geographic distribution

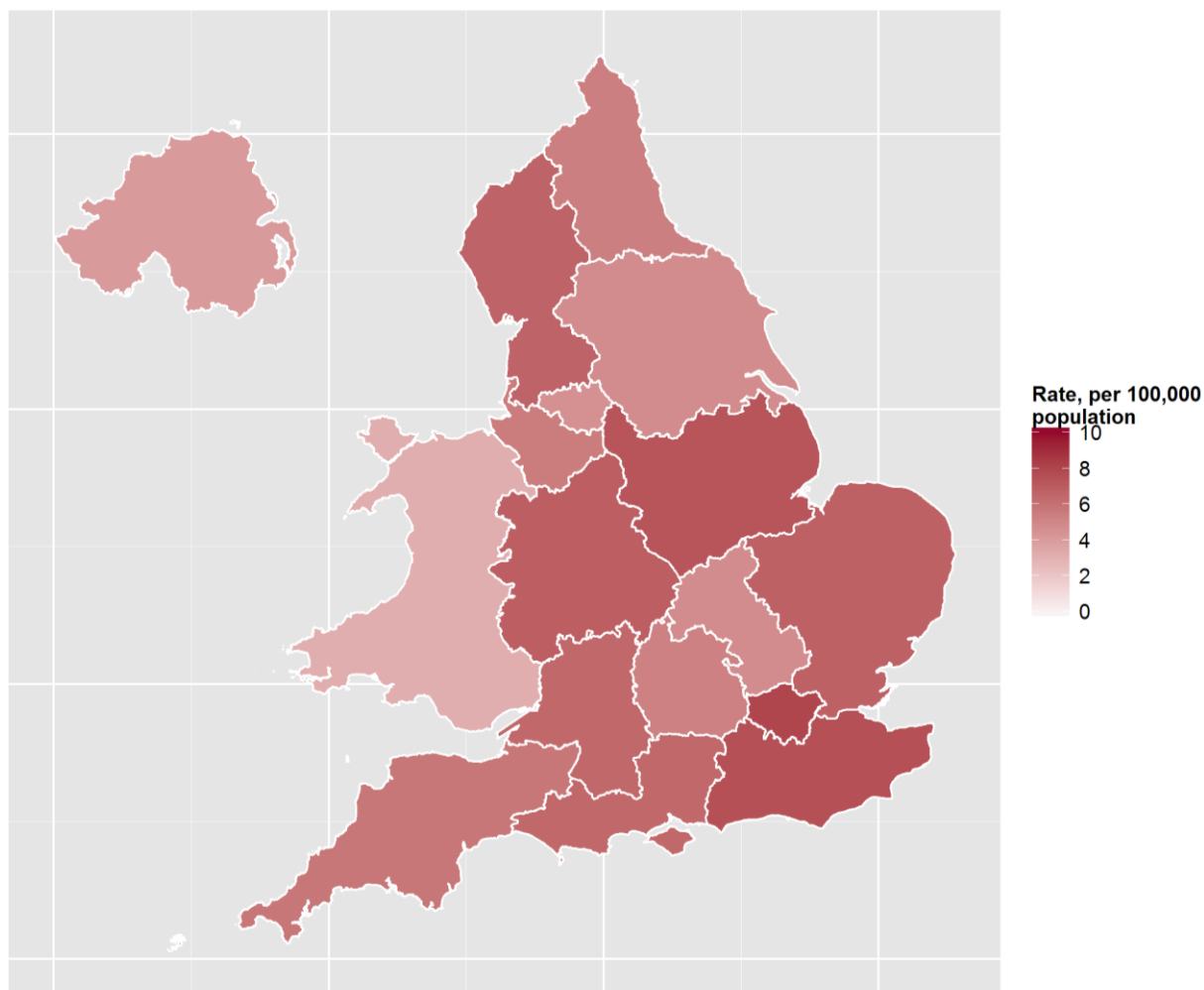
In England, Wales and Northern Ireland the geographical distribution of *Pseudomonas* spp. bacteraemia varied widely in 2014, from 3.1/100,000 population in Wales (95% CI 2.5 to 3.8) to 8.0/100,000 seen in the London region of England (95% CI 7.4 to 8.6; figure 2a).

**Table 1a. Five year PHE Centre *Pseudomonas* spp. bacteraemia per 100,000 population (England, Wales and Northern Ireland); 2010 to 2014**

| Region                                     |                                    | Rate per 100,000 population |            |            |            |            |
|--|------------------------------------|-----------------------------|------------|------------|------------|------------|
|  |                                    | 2010                        | 2011       | 2012       | 2013       | 2014       |
| London                                     | London                             | 7.8                         | 7.5        | 7.4        | 6.8        | 8.0        |
|  | South Midlands and Hertfordshire   | 4.8                         | 3.6        | 4.3        | 4.9        | 4.7        |
| Midlands                                   | East Midlands                      | 7.6                         | 7.9        | 8.8        | 6.9        | 7.3        |
|  | Anglia and Essex                   | 7.4                         | 6.5        | 6.7        | 7.0        | 6.8        |
|  | West Midlands                      | 6.8                         | 6.5        | 6.3        | 6.8        | 6.9        |
|  | Cheshire and Merseyside            | 7.5                         | 6.1        | 7.1        | 7.1        | 5.5        |
| Northern                                   | Cumbria and Lancashire             | 5.3                         | 6.0        | 5.9        | 5.8        | 6.7        |
|  | Greater Manchester                 | 6.0                         | 5.4        | 5.8        | 4.5        | 4.5        |
|  | North East                         | 5.4                         | 7.5        | 6.1        | 5.4        | 5.4        |
|  | Yorkshire and Humber               | 6.6                         | 5.9        | 5.2        | 4.9        | 4.8        |
|  | Avon Gloucestershire and Wiltshire | 6.0                         | 5.0        | 6.0        | 5.4        | 6.5        |
| Southern                                   | Devon Cornwall and Somerset        | 7.4                         | 6.3        | 6.2        | 6.4        | 5.7        |
|  | Wessex                             | 8.3                         | 7.0        | 7.2        | 7.0        | 6.4        |
|  | Kent Surrey and Sussex             | 6.9                         | 7.5        | 8.0        | 7.6        | 7.5        |
|  | Thames Valley                      | 4.9                         | 4.8        | 4.6        | 4.6        | 5.3        |
| <b>England</b>                             | <b>England</b>                     | <b>6.8</b>                  | <b>6.5</b> | <b>6.6</b> | <b>6.3</b> | <b>6.4</b> |
| <b>Northern Ireland</b>                    | <b>Northern Ireland</b>            | <b>5.5</b>                  | <b>6.5</b> | <b>5.0</b> | <b>4.8</b> | <b>4.1</b> |
| <b>Wales</b>                               | <b>Wales</b>                       | <b>4.9</b>                  | <b>5.2</b> | <b>5.1</b> | <b>4.5</b> | <b>3.1</b> |
| <b>England, Wales and Northern Ireland</b> |                                    | <b>6.7</b>                  | <b>6.4</b> | <b>6.4</b> | <b>6.1</b> | <b>6.2</b> |

The rate of *Pseudomonas* spp. bacteraemia has varied over the five years between 2010 and 2014 within the English PHECs, however, no area has continuously reported the highest (or lowest) rates across the period (table 1a).

**Figure 2a. Geographical distribution of *Pseudomonas* spp. bacteraemia per 100,000 population in England, Wales and Northern Ireland; 2014**



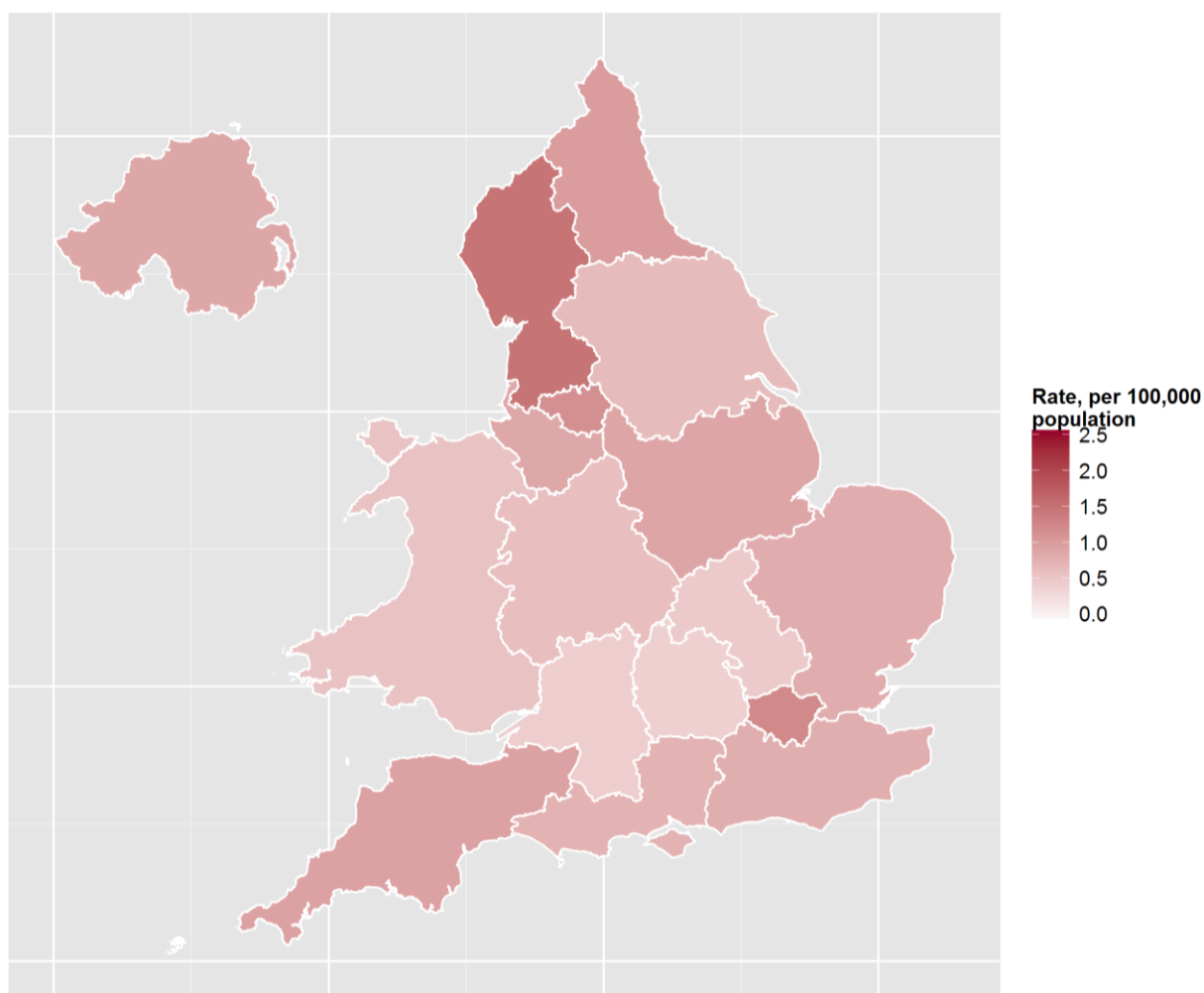
The geographical distribution of *Stenotrophomonas* spp. bacteraemia varied in 2014, with each country reporting infection rates of below 1.0/100,000 population (table 1b), slightly more variation was observed within England, where rates ranged from 0.4/100,000 in Avon, Gloucestershire and Wiltshire (95% CI 0.2 to 0.8) and Thames Valley (95% CI 0.2 to 0.8) areas to 1.5/100,000 in the Cumbria and Lancashire area (95% CI 1.0 to 2.1; figure 2b). The numbers of reported *Stenotrophomonas* spp. bacteraemia have remained low across the recent five years (2010 to 2014; table 2b), leading to seemingly large fluctuations in the rates being reported. None of the increases or decreases seen in each of the areas between 2010 and 2014 were statistically significant.

**Table 1b. Five year PHE Centre *Stenotrophomonas* spp. bacteraemia per 100,000 population (England, Wales and Northern Ireland); 2010 to 2014**

| Region                                     |                                    | Rate per 100,000 population |            |            |            |            |
|--|------------------------------------|-----------------------------|------------|------------|------------|------------|
|  |                                    | 2010                        | 2011       | 2012       | 2013       | 2014       |
| London                                     | London                             | 0.8                         | 1.2        | 0.9        | 0.9        | 1.2        |
|  | South Midlands and Hertfordshire   | 0.6                         | 0.6        | 0.3        | 0.2        | 0.5        |
|  | East Midlands                      | 0.8                         | 0.7        | 0.7        | 0.8        | 0.9        |
|  | Anglia and Essex                   | 0.6                         | 0.7        | 0.8        | 0.8        | 0.8        |
| Midlands                                   | West Midlands                      | 0.7                         | 0.9        | 1.0        | 0.7        | 0.6        |
|  | Cheshire and Merseyside            | 0.6                         | 0.8        | 0.4        | 0.4        | 0.9        |
|  | Cumbria and Lancashire             | 0.9                         | 0.5        | 0.7        | 1.2        | 1.5        |
|  | Greater Manchester                 | 1.6                         | 1.5        | 1.4        | 1.6        | 1.1        |
|  | North East                         | 0.4                         | 0.8        | 0.9        | 0.9        | 1.0        |
| Northern                                   | Yorkshire and Humber               | 0.7                         | 0.7        | 0.6        | 0.5        | 0.6        |
|  | Avon Gloucestershire and Wiltshire | 0.8                         | 0.3        | 0.7        | 0.7        | 0.4        |
|  | Devon Cornwall and Somerset        | 1.1                         | 1.0        | 0.7        | 0.7        | 0.9        |
|  | Wessex                             | 0.7                         | 0.9        | 0.9        | 0.6        | 0.7        |
|  | Kent Surrey and Sussex             | 0.7                         | 0.6        | 0.6        | 0.8        | 0.8        |
| Southern                                   | Thames Valley                      | 0.4                         | 0.7        | 0.2        | 0.4        | 0.4        |
| <b>England</b>                             | <b>England</b>                     | <b>0.8</b>                  | <b>0.8</b> | <b>0.8</b> | <b>0.7</b> | <b>0.8</b> |
| <b>Northern Ireland</b>                    | <b>Northern Ireland</b>            | <b>1.1</b>                  | <b>0.7</b> | <b>0.5</b> | <b>1.3</b> | <b>0.9</b> |
| <b>Wales</b>                               | <b>Wales</b>                       | <b>0.8</b>                  | <b>0.8</b> | <b>0.8</b> | <b>0.5</b> | <b>0.5</b> |
| <b>England, Wales and Northern Ireland</b> |                                    | <b>0.8</b>                  | <b>0.8</b> | <b>0.8</b> | <b>0.7</b> | <b>0.8</b> |

Reports of the closely related genera were distributed evenly across England, Wales and Northern Ireland, with no area reporting incidence of greater than 0.4 per 100,000 population in 2014. With reported numbers being so small any fluctuation in trend at the regional level are likely to be artefacts and insignificant. Further details on geographical distribution of these other genera are not presented within this report.

**Figure 2b. Geographical distribution of *Stenotrophomonas* spp. bacteraemia per 100,000 population in England, Wales and Northern Ireland; 2014**



## Species distribution

The most frequently identified *Pseudomonas* species in blood isolates in 2014 was *Pseudomonas aeruginosa* (81%; table 2a). Ninety-two per cent of *Pseudomonas* bacteraemia cases were identified to species level in 2014, demonstrating an improving trend from the 89% reported to species level in 2010.

As expected *Stenotrophomonas maltophilia* is the most commonly isolated *Stenotrophomonas* species between 2010 and 2014, with between 91% and 100% isolated identified at this level (table 2b). Of note in 2014, 9% of *Stenotrophomonas* species bacteraemia have not been identified further, as *S. maltophilia* is the only known opportunistic human pathogen in the *Stenotrophomonas* genera it is likely that further investigation will yield these as *S. maltophilia* [3]. Further investigation is required to understand this change in reporting practice.

**Table 2a. Distribution of *Pseudomonas* species identified in blood specimens (England, Wales and Northern Ireland); 2010 to 2014**

|   | 2010        |             | 2011        |             | 2012        |             | 2013        |             | 2014        |             |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|   | Count       | %           | Count       | %           | Count       | %           | Count       | %           | Count       | %           |
| <i>P. aeruginosa</i>                      | 3104        | 81%         | 3014        | 81%         | 3059        | 81%         | 2953        | 82%         | 2970        | 81%         |
| <i>P. alcaligenes</i>                     | 1           | 0%          | 4           | 0%          | 3           | 0%          | 2           | 0%          | 4           | 0%          |
| <i>P. fluorescens</i>                     | 64          | 2%          | 40          | 1%          | 61          | 2%          | 52          | 1%          | 53          | 1%          |
| <i>P. koreensis</i>                       | 0           | 0%          | 0           | 0%          | 0           | 0%          | 0           | 0%          | 1           | 0%          |
| <i>P. mendocina</i>                       | 0           | 0%          | 0           | 0%          | 0           | 0%          | 0           | 0%          | 2           | 0%          |
| <i>P. mosselii</i>                        | 0           | 0%          | 0           | 0%          | 0           | 0%          | 1           | 0%          | 0           | 0%          |
| <i>P. oleovorans</i>                      | 0           | 0%          | 0           | 0%          | 0           | 0%          | 1           | 0%          | 0           | 0%          |
| <i>P. oryzae</i>                          | 5           | 0%          | 4           | 0%          | 6           | 0%          | 3           | 0%          | 13          | 0%          |
| <i>P. otitidis</i>                        | 0           | 0%          | 0           | 0%          | 0           | 0%          | 0           | 0%          | 1           | 0%          |
| <i>P. paucimobilis</i>                    | 72          | 2%          | 68          | 2%          | 72          | 2%          | 70          | 2%          | 65          | 2%          |
| <i>P. putida</i>                          | 67          | 2%          | 68          | 2%          | 68          | 2%          | 54          | 2%          | 69          | 2%          |
| <i>P. stutzeri</i>                        | 61          | 2%          | 80          | 2%          | 96          | 3%          | 82          | 2%          | 91          | 2%          |
| <i>P. thomasii</i>                        | 0           | 0%          | 0           | 0%          | 0           | 0%          | 1           | 0%          | 0           | 0%          |
| <i>P. tolaasii</i>                        | 0           | 0%          | 0           | 0%          | 0           | 0%          | 0           | 0%          | 1           | 0%          |
| <i>Pseudomonas</i> spp., other named      | 48          | 1%          | 63          | 2%          | 61          | 2%          | 70          | 2%          | 79          | 2%          |
| <i>Pseudomonas</i> spp., sp. not recorded | 411         | 11%         | 383         | 10%         | 336         | 9%          | 304         | 8%          | 303         | 8%          |
| <b>Genus Total</b>                        | <b>3833</b> | <b>100%</b> | <b>3724</b> | <b>100%</b> | <b>3762</b> | <b>100%</b> | <b>3593</b> | <b>100%</b> | <b>3652</b> | <b>100%</b> |

**Table 2b. Distribution of *Stenotrophomonas* species identified in blood specimens (England, Wales and Northern Ireland); 2010 to 2014**

|  | 2010       |             | 2011       |             | 2012       |             | 2013       |             | 2014       |             |
|--|------------|-------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|
|  | Count      | %           | Count      | %           | Count      | %           | Count      | %           | Count      | %           |
| <i>S. maltophilia</i>                          | 439        | 100%        | 469        | 99%         | 438        | 99%         | 428        | 97%         | 446        | 91%         |
| <i>Stenotrophomonas</i> spp., sp. not recorded | 0          | 0%          | 5          | 1%          | 3          | 1%          | 12         | 3%          | 43         | 9%          |
| <b>Genus Total</b>                             | <b>439</b> | <b>100%</b> | <b>474</b> | <b>100%</b> | <b>441</b> | <b>100%</b> | <b>440</b> | <b>100%</b> | <b>489</b> | <b>100%</b> |

Of the closely related organisms reported here, *Brevibacterium* spp.\* and *Brevundimonas* spp. were the most commonly identified in 2014, identified in 41 bacteraemia episodes each (table 2c). Due to small numbers the trends in these species fluctuate dramatically and will not be discussed further here.

\* Closely related organisms include genera where at least one species has previously been classified as *Pseudomonas* spp. or *Stenotrophomonas* spp.

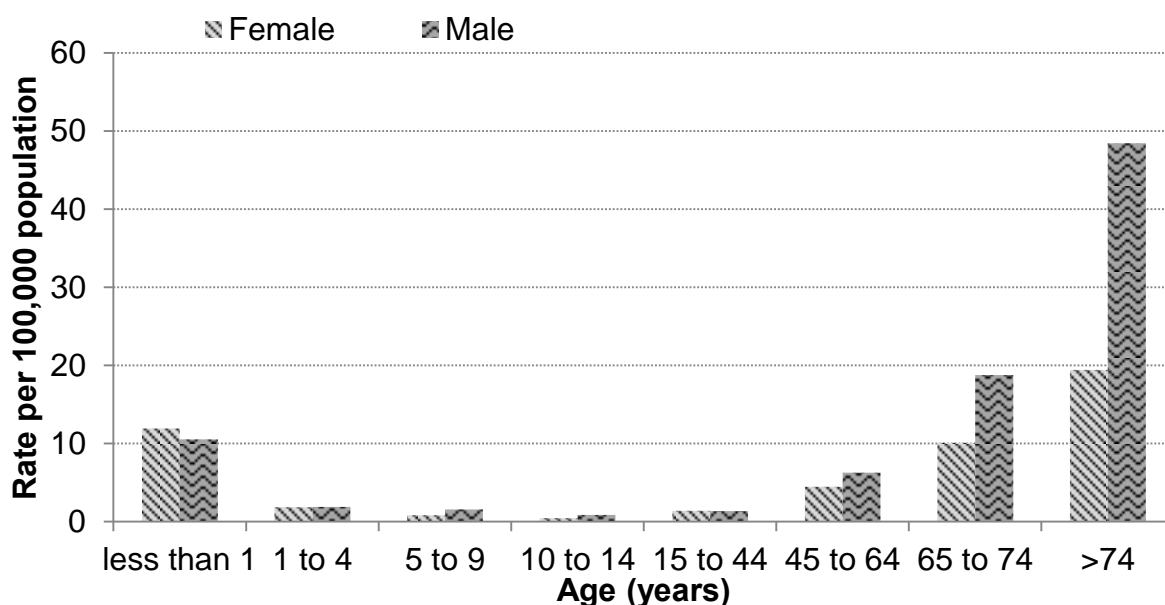
**Table 2c. Distribution of the ‘closely related organisms’ identified in blood specimens (England, Wales and Northern Ireland); 2010 to 2014**

|  | 2010       |             | 2011       |             | 2012       |             | 2013       |             | 2014       |             |
|--|------------|-------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|
|  | Count      | %           | Count      | %           | Count      | %           | Count      | %           | Count      | %           |
| <i>Brevibacterium</i> spp.             | 21         | 17%         | 21         | 19%         | 36         | 30%         | 41         | 29%         | 41         | 30%         |
| <i>Brevundimonas</i> spp.              | 28         | 23%         | 26         | 23%         | 27         | 23%         | 30         | 21%         | 41         | 30%         |
| <i>Burkholderia</i> spp.               | 44         | 36%         | 45         | 40%         | 41         | 34%         | 50         | 36%         | 31         | 23%         |
| <i>Comamonas</i> spp.                  | 10         | 8%          | 15         | 13%         | 7          | 6%          | 6          | 4%          | 13         | 9%          |
| <i>Ralstonia</i> spp.                  | 17         | 14%         | 2          | 2%          | 6          | 5%          | 8          | 6%          | 9          | 7%          |
| <i>Shewanella</i> spp.                 | 2          | 2%          | 3          | 3%          | 2          | 2%          | 5          | 4%          | 2          | 1%          |
| <b>Closely Related Organisms Total</b> | <b>122</b> | <b>100%</b> | <b>112</b> | <b>100%</b> | <b>119</b> | <b>100%</b> | <b>140</b> | <b>100%</b> | <b>137</b> | <b>100%</b> |

### Age and Sex distribution

The age distribution of *Pseudomonas* spp. bacteraemia for 2014 is presented in figure 3a. The highest rates of *Pseudomonas* spp. bacteraemia were observed in those aged 75 years or older (31.5/100,000 population), followed by those aged between 65 and 74 years (14.3/100,000). *Pseudomonas* bacteraemia rates were also high in those aged less than one year (11.4/100,000). This is similar to the pattern observed in previous years [4].

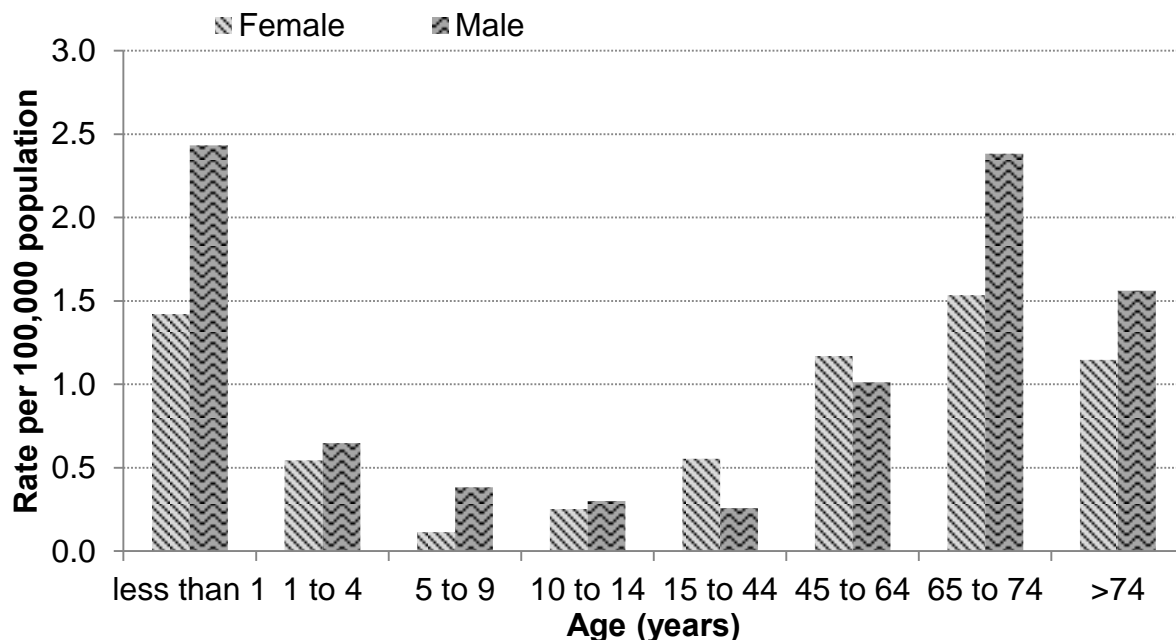
**Figure 3a. Rate per 100,000 population *Pseudomonas* by age and sex (England, Wales and Northern Ireland); 2014**



Variation of *Pseudomonas* spp. bacteraemia rates were also observed by gender, with higher rates noted in males in the majority of age groups (figure 3a). The most striking differences were noted in those aged 75 years and over (males: 48.4/100,000; females: 19.4/100,000) and those aged between 65 and 74 years (males: 18.8; females: 10.1).

The age distribution of *Stenotrophomonas* spp. bacteraemia showed higher rates in those aged between 65 and 74 years and in those aged less than one year (both 1.9/100,000 population; figure 3b). Rates were highest in males in all age groups except those aged between 15 and 64 years where higher bacteraemia rates were reported in females.

**Figure 3b. Population rate by age group for bacteraemia caused by *Stenotrophomonas* spp. (England, Wales and Northern Ireland); 2014**



## Antimicrobial Resistance

The proportion of *Pseudomonas* spp. isolates with susceptibility test results reported was >70% for each of the key antimicrobials except imipenem, where 24% of reports included a result in 2014 (table 3a). Either carbapenem (meropenem or imipenem) had a susceptibility test result reported in 74% of cases.

**Table 3a. Antimicrobial susceptibility for *Pseudomonas* spp. bacteraemia (England, Wales and Northern Ireland); 2010 to 2014**

|                         | 2010        |             | 2011        |             | 2012        |             | 2013        |             | 2014        |             |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                         | No. Tested  | % Resistant | No. Tested  | % Resistant | No. Tested  | % Resistant | No. Tested  | % Resistant | No. Tested  | % Resistant |
| Gentamicin              | 3277        | 5%          | 3313        | 6%          | 3360        | 4%          | 3194        | 4%          | 3095        | 4%          |
| Ciprofloxacin           | 3125        | 10%         | 3164        | 11%         | 3192        | 10%         | 3059        | 10%         | 2964        | 11%         |
| Ceftazidime             | 2935        | 9%          | 2962        | 9%          | 3030        | 7%          | 2849        | 7%          | 2704        | 7%          |
| Meropenem               | 2358        | 9%          | 2611        | 10%         | 2695        | 9%          | 2643        | 8%          | 2711        | 10%         |
| Imipenem                | 1156        | 10%         | 1018        | 13%         | 1019        | 12%         | 905         | 13%         | 873         | 16%         |
| Piperacillin/Tazobactam | 2978        | 7%          | 2997        | 7%          | 3117        | 9%          | 3017        | 9%          | 2933        | 10%         |
| <b>Total Reports</b>    | <b>3833</b> |             | <b>3724</b> |             | <b>3762</b> |             | <b>3593</b> |             | <b>3652</b> |             |

**Table 3b. Antimicrobial susceptibility for *Stenotrophomonas* spp. bacteraemia (England, Wales and Northern Ireland); 2010 to 2014**

|                      | 2010       |             | 2011       |             | 2012       |             | 2013       |             | 2014       |             |
|----------------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|
|                      | No. Tested | % Resistant | No. Tested | % Resistant | No. Tested | % Resistant | No. Tested | % Resistant | No. Tested | % Resistant |
| Co-Trimoxazole       | 240        | 5%          | 272        | 5%          | 271        | 3%          | 289        | 6%          | 296        | 7%          |
| <b>Total Reports</b> | <b>439</b> |             | <b>474</b> |             | <b>441</b> |             | <b>440</b> |             | <b>489</b> |             |



Overall the proportion of *Pseudomonas* spp. bacteraemia reports that were reported as resistant (defined as reduced- or non-susceptible) to an antimicrobial in 2014 remained steady or increased slightly compared to 2013 (table 3a). Imipenem resistance increased the most from 13% of isolates in 2013 to 16% isolates in 2014; however, as previously mentioned, the level of imipenem susceptibility test reporting remained low and may not be a true reflection of what is observed in all *Pseudomonas* isolates.

In 2014 the proportion of resistant *Pseudomonas* spp. bacteraemia isolates reported was piperacillin/tazobactam (10%), ciprofloxacin (11%), ceftazidime (7%), meropenem (10%), imipenem (16%) and gentamicin (4%).

It should be noted that there has been a steady increase reported resistance to the penicillin and  $\beta$ -lactamase inhibitor combination 'piperacillin/tazobactam' between 2010 (7% resistant) and 2014 (10% resistant).

There is a growing concern regarding the shift towards increased numbers of more drug-resistant organisms, this is a particular concern in *Pseudomonas* spp. bacteria which are known to affect patients with weakened immune systems. This ongoing concern has led to *Pseudomonas* spp. inclusion as one of the key pathogens to monitor as part of the UK 5-year Antimicrobial Resistance Strategy as well as the English surveillance programme for antimicrobial utilisation on resistance [5][6].

In 2014 the proportion of *S. maltophilia* isolates with a reported susceptibility test result to the favoured treatment option, co-trimoxazole, was 61% (table 3b), an increase on the 55% reported in 2010. There has been a slight fluctuation in the proportion of test results reported as resistant to co-trimoxazole between 2010 (5%) and 2014 (7%).

A one-year snapshot of multi-resistance, based on combinations of two different defined antibiotics, using the SGSS AMR data showed that 89% reported *Pseudomonas* spp. bacteraemia in England (2301/2589) had susceptibility results reported for both ceftazidime and ciprofloxacin; of those 2% were resistant (45 isolates; table 4). Seventy-one per cent of isolates resistant to both ciprofloxacin and ceftazidime were also resistant to piperacillin/tazobactam (32 isolates; 2196 tested for all 3 antibiotics).

For advice on treatment of antibiotic-resistant infections due to these opportunistic pathogens or for reference services including species identification and confirmation of

**Table 4. Pair-Wise antimicrobial testing and resistance summary (England); 2014**

|                      | Ceftazidime |             | Ciprofloxacin |             | Gentamicin |             |
|----------------------|-------------|-------------|---------------|-------------|------------|-------------|
|                      | No. tested  | % Resistant | No. tested    | % Resistant | No. tested | % Resistant |
| <b>Ceftazidime</b>   |             |             |               |             |            |             |
| <b>Ciprofloxacin</b> | 2301        | 2%          |               |             |            |             |
| <b>Gentamicin</b>    | 2333        | 1%          | 2471          | 2%          |            |             |

sensitivity testing results, laboratories should contact the Medical Microbiologists at PHE's Bacteriology Reference Department at Colindale on <mailto:colindalemedmicro@phe.gov.uk> and PHE's Antimicrobial Resistance and Healthcare Associated Infections (AMRHAI) Reference Unit in London [7].

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