

The fourth year of regional and national analyses of the Department of Health's mandatory *Staphylococcus aureus* surveillance scheme in England: April 2001 – March 2005

Key points:

- Between April 2001 and March 2005 all 173 acute NHS Trusts in England have participated in the Department of Health's mandatory bacteraemia surveillance scheme for *Staphylococcus aureus*.
- This report describes data submitted in the fourth year of the mandatory surveillance scheme, *ie*, the period April 2004 to March 2005 and includes an analysis of the trends in methicillin resistant *S. aureus* (MRSA) rates in hospitals over the first four years of the scheme.
- There has been a decrease in the number of MRSA and methicillin sensitive *S. aureus* (MSSA) reports made in England in the fourth year (2004 to 2005) of the surveillance scheme compared to the third year (2003 to 2004). The numbers of MRSA reports are at similar levels to the start of the scheme.
- There has been a year-on-year decrease in the percentage of *S. aureus* that are methicillin resistant from 40.4% in the first year of the scheme to 38.9% in the fourth year of the scheme.
- The rate of MRSA per 1000 bed days is similar in the first and most recent year of the scheme, with higher rates in-between. Rates are slightly higher over the six months spanning winter.

Introduction

This report presents the results of the fourth year of the Department of Health's mandatory *Staphylococcus aureus* bacteraemia surveillance scheme for all acute NHS Trusts in England. Results pertaining to the three previous years of the scheme have already been published (1-3). This report should be considered in conjunction with the Trust-specific data, which is available on the Department of Health website <<http://www.dh.gov.uk>>. Further information on MRSA rates, analysed by Trust category, is available on the HPA website <http://www.hpa.org.uk/infections/topics_az/staphylo/data.htm>.

Methods, data collection, and analysis

One hundred and seventy-three NHS acute Trusts contributed to the mandatory surveillance scheme for *S. aureus* in the period from April 2004 to March 2005. Data were collected quarterly from each acute NHS Trust in England by Health Protection Agency (HPA) Local and Regional Services Division (LARS) and transferred to the HPA Centre for Infections (CfI) for national analysis.

The Department of Health's Healthcare Associated Infection Surveillance Steering Group was responsible for developing the dataset for this mandatory surveillance scheme. Methodological and interpretative information, including a glossary of terms, is published elsewhere (4).

All analyses were performed according to the current configuration of Trusts. Data from merged Trusts were combined for pre-merger time periods. Regional analysis was performed using the English regional boundaries introduced in April 2002.

The latest available overnight bed occupancy data, for financial year 2003/2004 were derived from the KH03 dataset provided by

the Department of Health (5). These data were used to derive the denominators for rate calculations by Trust and by region.

$$\text{Trust rate} = \left[\frac{\text{No. of MRSA bacteraemias for time period}}{\text{Average daily bed occupancy} \times \text{number of days in time period}} \right] \times 1000$$

Comparative data and trend analyses for the first four years of the surveillance scheme were based on these data.

This report is based on reports of *S. aureus* isolated from blood cultures in English Acute Trusts. Among the data items explored were the number of blood culture sets examined, (defined as a sample arising from a single venepuncture, irrespective of the number of bottles tested), and the total number of positive blood cultures, which represents all positive results for bacterial growth, including repeat specimens and contaminants. Statistical analyses was performed by CfI Statistics Department using commercial software*.

These data are used to monitor trends in methicillin resistant *S. aureus* (MRSA) bacteraemias. Trusts are provided with feedback to allow them an opportunity to compare their own rates to the national data.

These data should not be used as the basis for decisions on the effectiveness of interventions in individual Trusts without further local investigations, as higher rates may be indicative of higher clinical activity or particular case-mix.

Results

Number of *S. aureus* isolates reported

The number of reports of *S. aureus* bacteraemias decreased by 843 (4.5%) in the fourth year of the mandatory surveillance

*Stata Statistical software: release 8.2. College Station, Texas, Stata Corporation, 2001.

Year	Total <i>S. aureus</i>	MRSA	%MRSA resistant
Year 1 (2001-2)	17,933	7249	40.42
Year 2 (2002-3)	18,496	7373	38.86
Year 3 (2003-4)	19,376	7684	39.66
Year 4 (2004-5*)	18,533	7212	38.91

*Provisional data.

	Total blood culture sets	Positive blood culture sets	% blood culture sets tested positive
Year 1 (2001-2)	1,450,615	242,902	16.74
Year 2 (2002-3)	1,488,071	246,119	16.54
Year 3 (2003-4)	1,583,775	264,674	16.71
Year 4 (2004-5*)	1,445,444	239,880	16.60

*Provisional data.

scheme (table 1). Of these, 7212 (38.9%) were identified as methicillin resistant.

Over the first three years of the mandatory surveillance scheme, the number of MRSA reports increased by 6%, but have since dropped below the total for the first year of the scheme (table 1). The number of methicillin sensitive *S. aureus* (MSSA) reports increased by 6% over the first four years of the scheme, however, in the past year there has been a decrease (figure 1).

The percentage of *S. aureus* that was methicillin resistant has decreased year-on-year over the four years of the scheme (table 1). For the first three years of the scheme there was a 9% increase in the total number of blood culture sets taken and the total number of positive blood cultures recorded. In the fourth year of the scheme both these figures had fallen below the total reports received in the first year of the scheme. Despite this, the percentage of blood culture sets testing positive has remained constant at 16%, while those positive for *S. aureus* have remained constant at 7% to 8% of total positive blood cultures (table 2, figure 2).

Analysis of MRSA national rates

The rate of MRSA bacteraemias in England in the fourth year of the scheme is 0.17 per 1000 bed-days, which is the same rate as that reported in the first year of the scheme. When the data are analysed at six month intervals, there appears to be a slight increase in the rate during the second six months of the year (October to March) compared to the first six months (April to September) (table 3).

Regional Distributions

The number of acute NHS Trusts varies with the region, ranging from eight in the North East region to 32 in London. The highest resident population for 2003 was 8,080,280 in the South East and the lowest 2,539,363 in the North East. There is considerable variation across the regions in reports of the rates of MRSA bacteraemias per 1000 bed days made in the fourth year of mandatory surveillance. The only significant trend over the four year period is an increase in the bacteraemia rate in the North West region. The highest rates reported in the fourth year of the scheme were from the London region

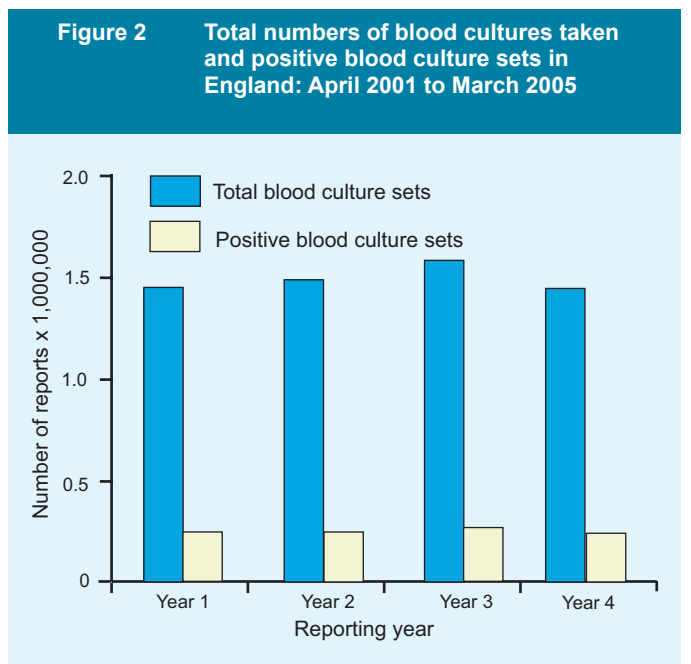
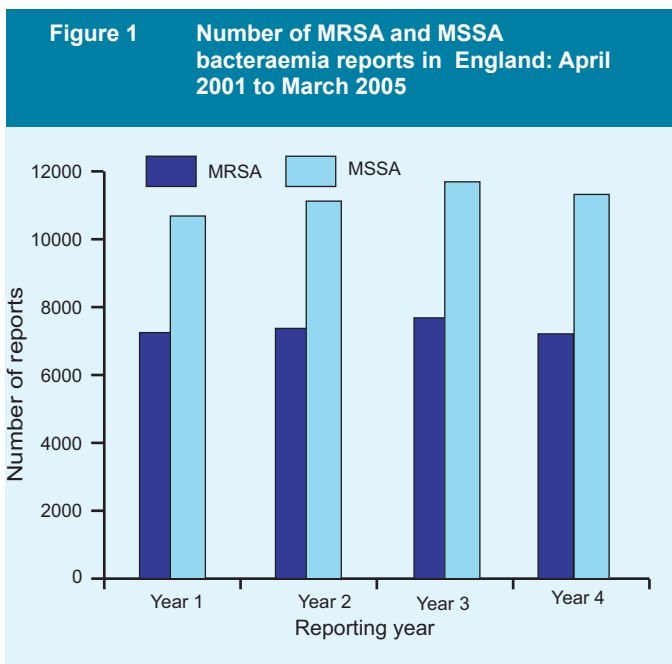


Table 3 Numbers and rates* of MRSA bacteraemias in England, by 6 month periods from April 2001 to March 2005

	Number of MRSA bacteraemias	Rate of MRSA bacteraemias (number of bacteraemias per 1000 bed-days)
Year 1		
Apr 01 - Sep 01	3598	0.170
Oct 01 - Mar 02	3651	0.172
Year 2		
Apr 02 - Sep 02	3574	0.171
Oct 02 - Mar 03	3799	0.182
Year 3		
Apr 03 - Sep 03	3744	0.178
Oct 03 - Mar 04	3940	0.188
Year 4		
Apr 04 - Sep 04	3524	0.168†
Oct 04 - Mar 05	3688	0.176†

*Rates calculated using appropriate year KH03 data.

†Preliminary data using 03/04 KH03 data.

(0.20/1000 bed-days in the period from April 04 to March 05), although this reflects a falling rate in this region (figure 3).

Results by Trust categorisation

Trust-specific data is available on the Department of Health website (6). Further information on *S. aureus* rates analysed by Trust categorisation is available on the Health Protection Agency website (7).

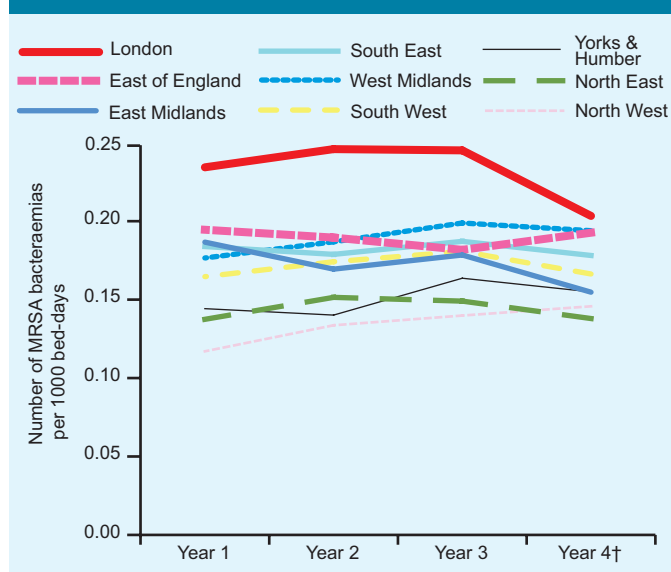
Discussion

This report describes four years' data from the Department of Health's mandatory *S. aureus* bacteraemia surveillance scheme, MRSA bacteraemias being used as an indicator of the burden of serious MRSA infections. The total numbers of MRSA reports have risen in the first three years of the scheme, but have now fallen to first year levels. The rates of MRSA per 1000 bed-days show a great deal of variability between regions, but the fourth year national rate is essentially the same as the first year (7). The percentage of *S. aureus* bacteraemias that were methicillin resistant has fallen year-on-year. Although it would be premature to state that MRSA is decreasing, it is notable that numbers no longer appear to be increasing.

There are limitations to comparisons between regions as the rate of MRSA may be affected by a number of factors. To allow comparisons, NHS acute Trusts are categorised by the regions according to type. The three types are:

- General Acute Trusts: Trusts providing general acute healthcare services;
- Specialist Trusts: Trusts with specialist services which receive patients referred from other Trusts for these services;
- Single Specialty Trusts: Trusts undertaking health services for a particular specialty, *eg*, orthopaedics.

Within regions, Trust mix is varied with differing numbers of General Acute, Specialist, and Single Specialty hospitals. Other factors affecting rates of MRSA bacteraemias include

Figure 3 MRSA bacteraemia rates* in England from April 2001 to March 2005 by region

*Rates calculated using appropriate year KH03 data.

†Preliminary data using 03/04 KH03 data.

the case mix in individual Trusts, the intensity of blood culture sampling, and the predominant strain of MRSA in the Trust. In all cases, vulnerability of patients to both bacteraemia and MRSA infection is affected by their underlying illness and the medical treatment they receive. MRSA rates tend to be higher in Specialist Trusts. This is probably due to case mix; these hospitals often treat more severely ill patients and accept transfers from other Trusts for specialist services.

In addition, the patient may not have acquired the *S. aureus* or MRSA infection in the Trust where they receive treatment; the infection could have been acquired in another hospital or in the community. Recently in the United States, Australia, and some countries in Europe, community-acquired MRSA has been reported (8-10). Although new community MRSA strains are unusual in this country, the export of hospital strains to community settings is well recognised. The data collected by the mandatory surveillance scheme in England does not currently distinguish community-acquired MRSA from hospital-acquired infection, although work is in progress to address this (see below).

For each year, rates were calculated using bed occupancy data from the correct year except for the fourth year of the scheme where the 2003/04 bed occupancy data was used. The fourth year data is therefore preliminary and will need to be corrected in future publications when the KH03 data for 2004/5 becomes available.

A survey of all NHS Acute Trusts in England was carried out in December 2004 to examine the various factors that can affect reporting of MRSA bacteraemias under the mandatory surveillance scheme, as well as determining the impact of the reporting system. This user study will be published shortly. As a result of the findings from this user study, the Department of Health has commissioned an enhanced MRSA surveillance scheme that is currently being piloted in 21 Trusts and will be rolled out to all acute Trusts in Autumn 2005, as announced to Trust Chief Executives (11).

The enhanced system allows for the separation of reports identified within 48 hours of admission from those acquired

during the current admission. The enhanced system will also allow Trusts to specify the department or specialism where the patient was being treated when the infection was identified. This allows speciality rates to be calculated using Hospital Episode Statistics (HES) data as the denominator instead of bed occupancy at midnight (the basis for the KHO3 statistics) <<http://www.hesonline.nhs.uk>>.

This report does not include named Trust data, which is available on the Department of Health website (6), as determined by The Chief Medical Officer (CMO) in 'Winning Ways', his report on healthcare associated infection in England that was published in December 2003 (12). Further analyses are available on the HPA website (7).

The information presented in this report is the subject of ongoing, further investigations which will include an analysis of trends at the Trust level in an attempt to gain an improved understanding of recent changes in the number of MRSA reports.

Acknowledgements

The reports of mandatory surveillance of *S. aureus* are facilitated by contributions from Trust microbiologists, infection control teams, and the regional health protection teams who collect, collate and, where necessary, validate these data. In addition, the support from colleagues within the Health Protection Agency, Centre for Infections Laboratories and Statistics Department, in particular, is valued in the pre-publication scrutiny of these reports. These contributions are greatly appreciated.

We are always pleased to hear your views. Please send your comments/feedback to Andrew Pearson <andrew.pearson@hpa.org.uk>. If you have a comment or query on the statistical methods referred to in this report, please contact André Charlett <andre.charlett@hpa.org.uk>.

References

1. PHLS. The first year of the Department of Health's mandatory MRSA bacteraemia surveillance scheme in acute NHS Trusts in England: April 2001 - March 2002. *Commun Dis Rep CDR Wkly* [serial online] 2002 [cited 17 June 2005]; **12**(25): Bacteraemia. Available at: <<http://www.hpa.org.uk/cdr/archives/2002/cdr2502.pdf>>.
2. HPA. The second year of the Department of Health's mandatory MRSA bacteraemia surveillance scheme in acute NHS Trusts in England: April 2002 - March 2003. *Commun Dis Rep CDR Wkly* [serial online] 2003 [cited 17 June 2005]; **13**(25): Bacteraemia. Available at: <<http://www.hpa.org.uk/cdr/PDFfiles/2003/cdr2503.pdf>>.
3. HPA. The third year of regional and national analyses of the Department of Health's mandatory MRSA surveillance scheme in England: April 2001 - March 2004. *Commun Dis Rep CDR Wkly* [serial online] 2004 [cited 17 June 2005]; **14**(29):Bacteraemia. Available at: <<http://www.hpa.org.uk/cdr/archives/2004/cdr2904.pdf>>.
4. PHLS. First report of the Department of Health's mandatory bacteraemia surveillance scheme in acute NHS Trusts in England: April to September 2001. *Commun Dis Rep CDR Wkly* [serial online] 2002 [cited 17 June 2005]; **12**(6): Bacteraemia. Available at: <<http://www.hpa.org.uk/cdr/archives/2002/cdr0602.pdf>>.
5. Department of Health [online]. Hospital Activity Statistics London: Department of Health, [undated] 2005 [cited 22 June 2005]. Available at <<http://www.performance.doh.gov.uk/hospitalactivity/>>.
6. Department of Health [online]. MRSA surveillance system - results. London: Department of Health, 2005 [cited 22 June 2005]. Available at <<http://www.dh.gov.uk>>.
7. HPA [online]. Results of the first four years of the Department of Health's mandatory methicillin resistant *Staphylococcus aureus* (MRSA) surveillance system in acute Trusts in England. London: Health Protection Agency, 2005.
8. Community-acquired methicillin-resistant *Staphylococcus aureus* carrying Panton-Valentine leukocidin genes: worldwide emergence. Vandenesch F, Naimi T, Enright MC, Lina G, Nimmo GR, Heffernan H, *et al.* *Emerg Infect Dis* 2003; **9**(8):978-84.
9. Robinson DA, Kearns AM, Holmes A, Morrison D, Grundmann H, Edwards G, *et al.* Re-emergence of early pandemic *Staphylococcus aureus* as a community-acquired methicillin-resistant clone. *Lancet* 2005; **365**:1256-8.
10. HPA. Community MRSA in England and Wales: definition through strain characterisation. *Commun Dis Rep CDR Wkly* [serial online] 2005 [cited 23 June 2005]; **15**(11): Bacteraemia. Available at: <<http://www.hpa.org.uk/cdr/archives/2005/cdr1105.pdf>>.
11. Department of Health (Chief Medical Officer). Mandatory Surveillance of methicillin resistant *Staphylococcus aureus* (MRSA) bacteraemias. PLCMO (2005) 4. London, Department of Health, 9 June 2005. Available at: <<http://www.dh.gov.uk/assetRoot/04/11/25/90/04112590.pdf>>.
12. Department of Health. Winning Ways. Working together to reduce Healthcare Associated Infection in England. London, Department of Health, 2003. Available at <<http://www.dh.gov>>.