The third year of regional and national analyses of the Department of Health's mandatory MRSA surveillance scheme in England: April 2001 – March 2004

Key points:

- Between April 2001 and March 2004 all acute NHS Trusts in England have participated in a mandatory MRSA bacteraemia surveillance scheme.
- This report describes MRSA data reported by NHS Trusts for the period between April 2003 to March 2004 and an analysis of the trends in methicillin resistant *Staphylococcus aureus* (MRSA) rates in hospitals in the first three years of the mandatory MRSA bacteraemia surveillance scheme in England (from April 2001 to March 2004). All 173 acute NHS Trusts from the nine English regions participated in this surveillance scheme.
- There has been an increase in the number of MRSA reports made in England in the first three years of the surveillance scheme. These have risen from 7250 in 2001-2002 (year 1) to 7647 in 2003-2004 (year 3) . This is a 5.5% increase in the number of MRSA bacteraemia reports over three years, of which 3.6% occurred in the third year of the scheme.
- There has been a year-on-year increase in the number of methicillin susceptible *Staphylococcus aureus* (MSSA) reports to the mandatory surveillance scheme. These have risen from 10,683 in 2001-2002 to 11,664 reports in 2003-2004.
- Over the three years of the scheme, there has been an overall significant increase in the rate of MRSA per 1000 bed days in England from 0.17 per 1000 bed days to 0.18 bed days, despite a significant decrease in some regions.
- There was a significant increase in the rates of both MRSA and MSSA in General Acute Trusts in England. In five of the nine English regions, the rate of MRSA significantly increased in the three years of surveillance. These are average trends and it is clear from the data that this increase does not apply to every General Acute Trust in every region.
- There were 3514 MRSA reports in Specialist Trusts in the third year of the surveillance, equating to a mean MRSA rate for this period of 0.24 per 1000 bed days. In Acute General Trusts 4045 MRSA reports were received, resulting in a mean rate of 0.16 MRSA reports per 1000 bed days and in Single Specialty Trusts 88 MRSA reports were made. The rate of MRSA per 1000 bed days in these Trusts was 0.09.
- Further investigation is underway to determine the impact of increased hospital activity; reporting biases from different interpretations of the guidelines and changes in case mix of patients attending acute general hospitals.

Introduction

This report presents the results of the third year of the Department of Health's mandatory methicillin resistant *Staphylococcus aureus* (MRSA) bacteraemia surveillance scheme for all acute NHS Trusts in England. Results pertaining to the first and second years of the scheme have already been published (1,2).

Methods, data collection, and analysis

Data were collected quarterly from each acute NHS Trust in England by Health Protection Agency's (HPA) Local and Regional Services Division (LARS) and transferred to the HPA's Communicable Disease Surveillance Centre (CDSC) 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 (1).

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

healthservices for a particular specialty, *eg*, orthopaedics or childrens' services

All analyses were performed according to the current configuration of Trusts. Data from merged

$$\text{Trust rate} = \frac{\text{Number of MRSA bacteraemias for time period} \times 1000}{\text{Average daily bed occupancy} \times \text{Number of days}}$$

Trusts were combined for pre-merger time periods. Regional analysis was performed using the English regional boundaries introduced in April 2002.

The latest overnight bed occupancy data from April 2002 and March 2003 were derived from the KH03 dataset provided by the Department of Health <http://www.performance.doh.gov.uk/hospitalactivity/>. These data were used to derive the denominators for rate calculations by Trust and by region.

Comparative data and trend analyses for the first three 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, which are 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 represent all positive results for bacterial growth, including repeat specimens and contaminants. One hundred and seventy-three NHS acute Trusts contributed to the mandatory surveillance scheme for MRSA in the period from April 2003 to March 2004.

Statistical analysis was performed by CDSC Statistics Department using commercial software*.

These data are used to monitor trends in MRSA bacteraemias. Trusts are provided with feedback to allow them an opportunity to compare their own rates compared 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 investigations, as higher rates may be indicative of higher activity. Investigations are under way.

Results

Number of MRSA and MSSA isolates reported

Over the first three years of the mandatory surveillance scheme, the number of MRSA reports increased by 5.5%, this includes an increase of 3.6% in the third year of surveillance.

The number of methicillin susceptible *Staphylococcus aureus* (MSSA) reports increased in the first three years of the scheme, increasing from 10,683 to 11,664, an increase of 9.2%. This includes a rise of 4.8% in the third year of the surveillance scheme (table 1, figures 1 and 2).

Analysis of *S. aureus* rates (MRSA and MSSA)

The rate of MRSA reports in England has increased from 0.17 to 0.18 per 1000 bed days over the first three years of surveillance. This increase was significant for the third year of the surveillance, and was significant when analysed in a Poisson regression model (P=0.001). During this time period, the rate of MSSA also increased significantly, from 0.25 to 0.28 reports per 1000 bed days (P=0.001 in a Poisson regression model).

The percentage of *S. aureus* that was methicillin resistant has decreased from 40.4% in the first year of the scheme to 39.9% in the second year and 39.6% in the third year of the scheme, despite an increase of 6% in year 3 compared to year 2 in the number of blood culture sets with a 7% increase in positive sets (table 2 and figure 3).

Table 1 Number of total *S. aureus* and MRSA reports in the first 3 years of mandatory MRSA surveillance

Year	Total *S. aureus*	MRSA
Year 1 (2001-2)	17,933	7250
Year 2 (2002-3)	18,519	7384
Year 3 (2003-4*)	19,311	7647

*Data still provisional

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 2002 was 8,037,140 in the South East and the lowest 2,513,274 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 third year of mandatory surveillance. Rates were highest in the London region (0.25 reports per 1000 bed days) and lowest in the North West (0.14 reports per 1000 bed days) (figure 1).

The regional rates of MRSA reports per 1000 bed days are shown in figure 4 and the MSSA regional rates are shown in figure 5.

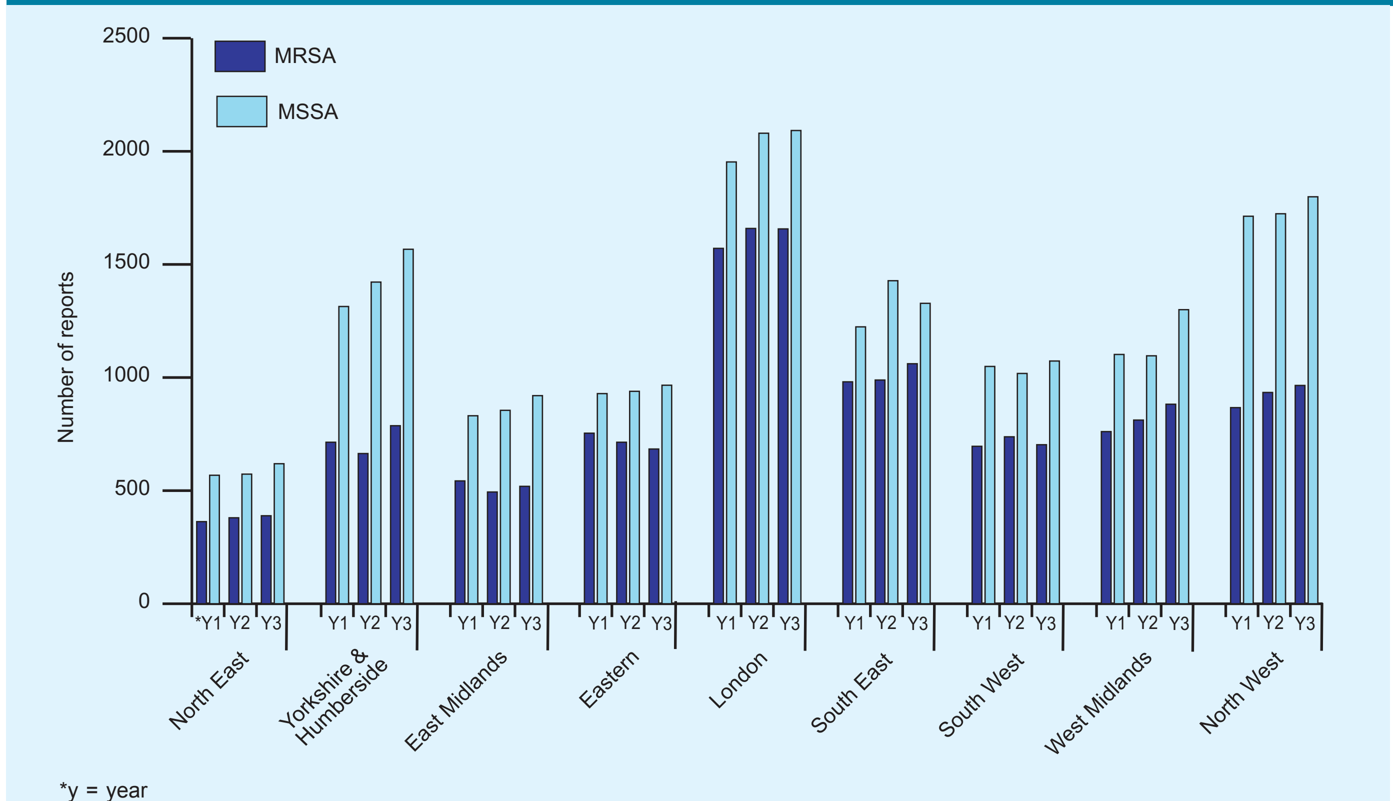
Table 2 Number of blood culture sets reported in the first three years of mandatory MRSA surveillance

	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)	1,488,370	246,068	16.53
Year 3 (2003-4*)	1,578,018	263,650	16.71

*Data still provisional

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

Figure 1 Number of MRSA/MSSA reports - first three years of mandatory surveillance



Results by Trust categorisation

Of 173 acute NHS Trusts in England, 110 Trusts were categorised as 'general acute', 45 as 'specialist', and 18 as 'single specialty' Trusts (1). MRSA bacteraemia rates varied according to the type of Trust. The lowest overall rate between April 2003 and March 2004 was in single specialty Trusts with a rate of 0.09 per 1000 bed days, ranging from zero to 0.28 reports per 1000 bed days. The highest overall rate was among the specialist trusts with a rate of 0.24 per 1000 bed days (range of 0.07 to 0.45 reports per 1000 bed days between April 2003 and March 2004). The mean MRSA rate in general acute trusts is 0.16 per 1000 bed days with a range of 0.04 to 0.33 reports per 1000 bed days in the third year of surveillance.

General Acute Trusts

Further analysis by Trust category indicates that there was a significant increase in the MRSA rates per 1000 bed days of General Acute Trusts in five of the nine

Figure 2 Number of MRSA/MSSA reports in England - the first three years of mandatory surveillance

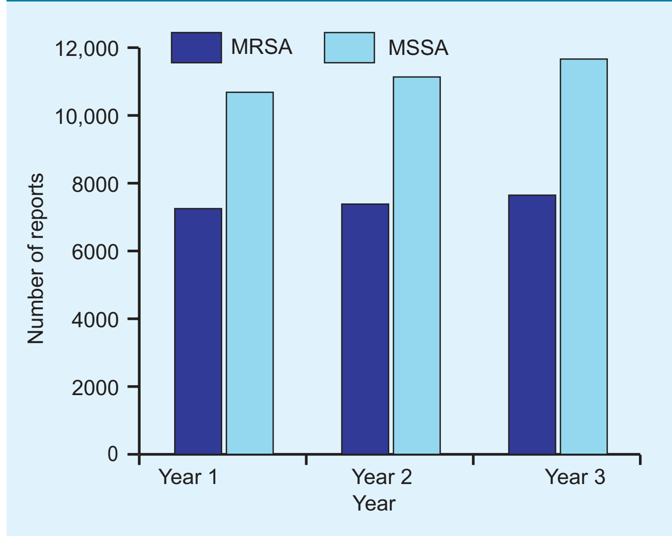


Figure 3 Total and total positive blood culture sets for the first three years of the mandatory MRSA surveillance scheme

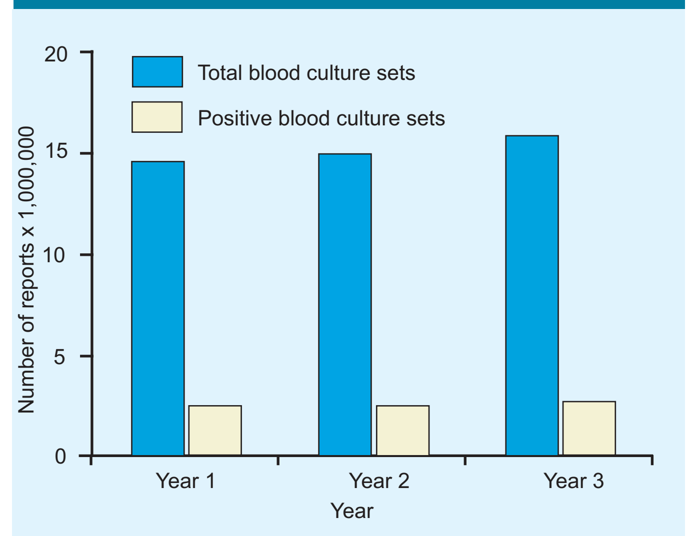


Figure 4 MRSA Rates from the first three years of mandatory surveillance by region

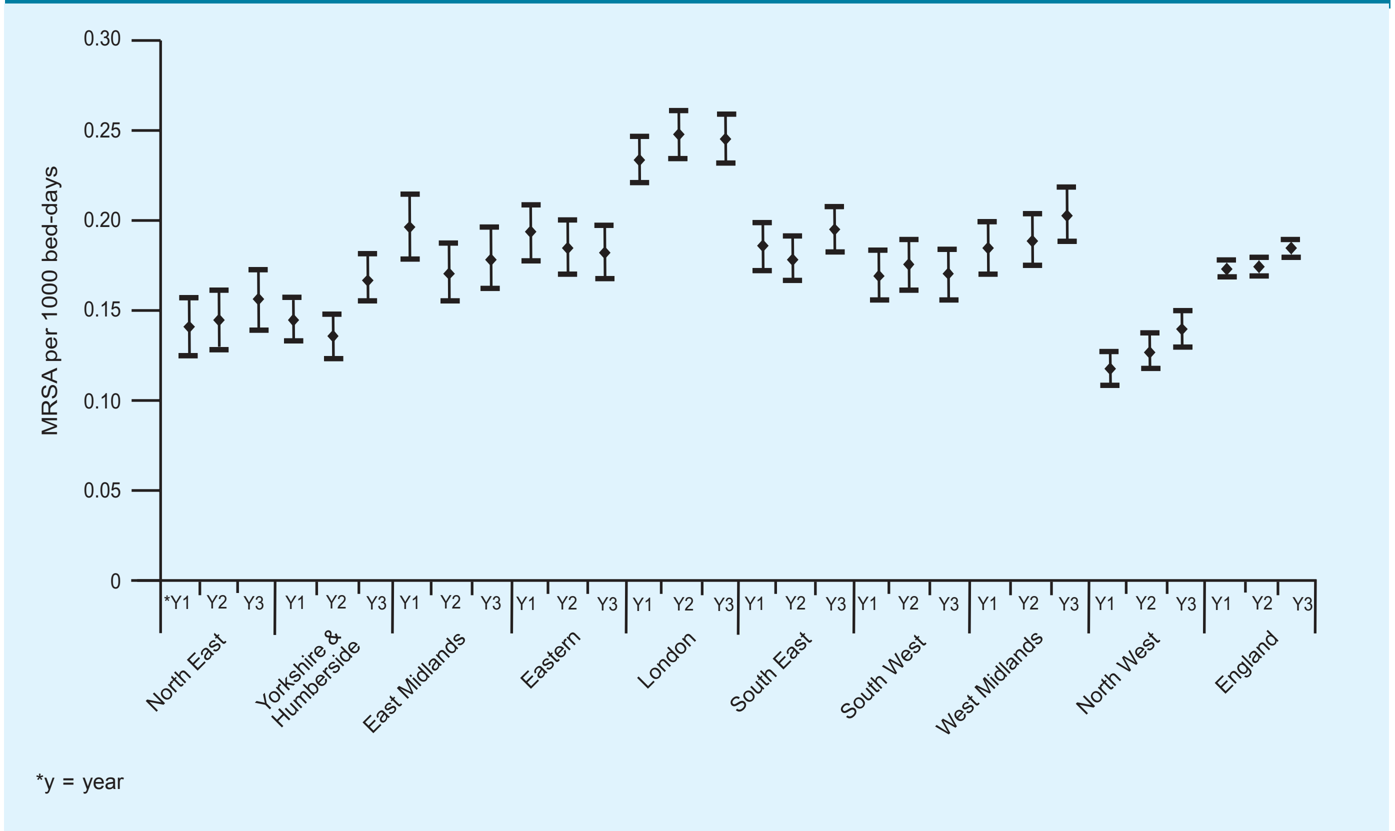


Figure 5 MSSA rates from the first three years of mandatory surveillance by region

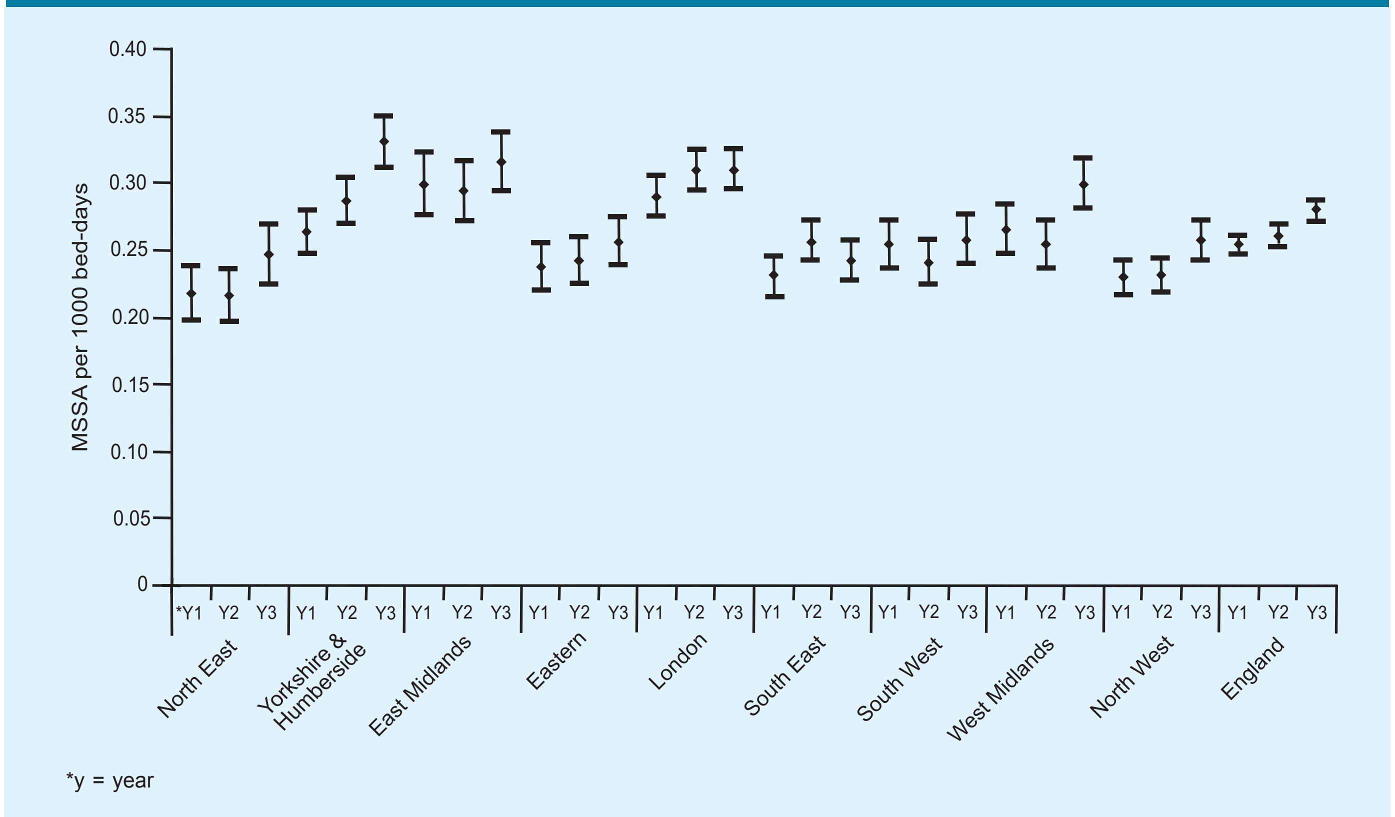
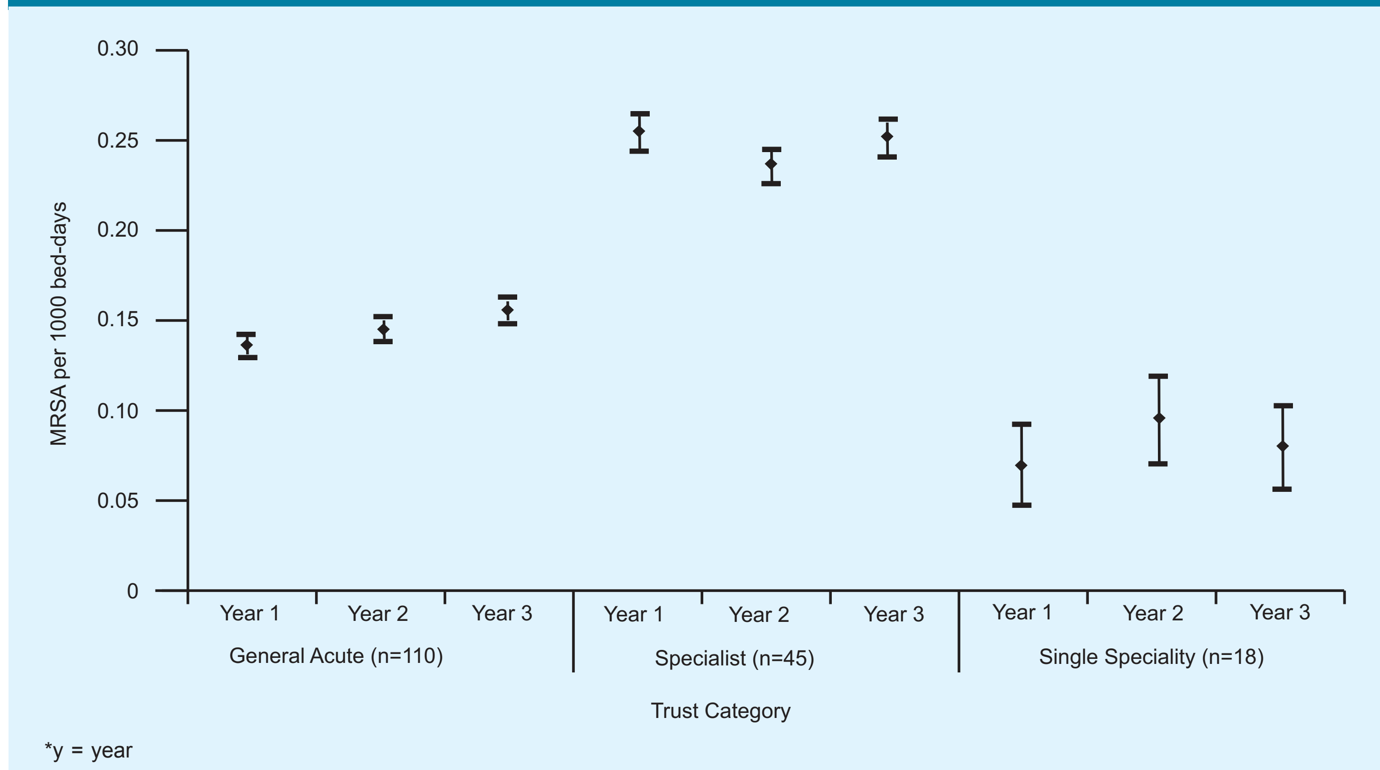


Figure 6 MRSA rates in different trust categories - the first three years of mandatory surveillance



regions in England over the three years of the surveillance scheme. There was a significant decrease in the rate of MRSA in General Acute Trusts in one region, and no significant change in General Acute Trusts in the three remaining regions.

Specialist Trusts

There was no significant change in the rate of MRSA reports per 1000 bed days in Specialist Trusts over the three years of the surveillance, although when the data was analysed on a regional basis three regions had a significant decrease in the rate of MRSA per 1000 bed days in specialist Trusts, three regions had a significant increase in the rate of MRSA, and three had no significant change in rate.

Single Specialist Trusts

There was no significant change in MRSA rates per 1000 bed days over the three years of the surveillance in single specialty Trusts and when analysed on a regional basis, and there were no significant changes in regional MRSA rates. Some single specialty Trusts have not reported any MRSA bacteraemias in the three years of the mandatory surveillance scheme. The rates of MRSA in different Trust categories are shown in figure 6.

Discussion

What interpretations are justified from these findings? Are these findings indicative of real changes in MRSA bacteraemia, or are the findings biased by other factors not taken into consideration by the nature of the surveillance scheme or the method of data collection? Possible alternative explanations for the findings (that may apply as single or multiple factors) to explain the results reported from each individual Trust are:

- The measure of patient activity (the denominator) is not an accurate reflection of increased workload.
- Ascertainment of MRSA cases is not uniform.
- Patient case mix may have changed between specialist and general hospitals.
- Individual Trust results that are outliers in reporting may unduly influence the overall trends in that region. Hence the warning to users of this report, is that it needs to be read in conjunction with the Department of Health publication of individual Trust data <http://www.dh.gov.uk/assetRoot/04/08/58/94/04085894.pdf> because the overall regional aggregate reports will not accurately reflect an individual Trust's figures.
- The nature of this surveillance scheme does not enable accurate comparison of Trust infection control performance from these rates, as Trusts may have different types of patients acquiring MRSA outside the hospitals, but are counted as part of the Trust rates of MRSA because it was diagnosed and not contracted in the reporting hospital.

These reasons could explain local and regional variations in numbers and rates. Further investigation is in progress from the regional surveillance units into reviewing the local rates.

Factors that will be further investigated include:

- The extent to which infections are acquired outside the reporting hospital;
- Reviewing whether hospital activity is properly reflected in the denominator;
- Investigating whether the increase in numbers of

MSSA bacteraemias reflect increased ascertainment in hospitals and the community.

This further investigation will aim to reflect the impact of organisational and operational changes in the NHS on the findings of the MRSA mandatory surveillance scheme in an attempt to determine whether there is a real increase in MRSA bacteraemia requiring active intervention.

Unlike the publication of the results of the first year of the mandatory surveillance, this report does not include named Trust data, although the Chief Medical Officer (CMO) included the publication of such results on his website as an action point in *Winning Ways*, his report on healthcare-associated infection in England that was published in December 2003 (3). Named Trust data for April 2003 to March 2004 was published on the CMO's website on Wednesday 15 July.

Acknowledgements

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We are always pleased to hear your views. Please send your comments/feedback to Andrew Pearson, email: andrew.pearson@hpa.org.uk or Allison Lee, email: allison.lee@hpa.org.uk. If you have a comment or query on the statistical methods referred to in this report, please contact André Charlett, email: 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 10 June 2004]; **12**(25): Bacteraemia. Available at <http://www.hpa.org.uk/cdr/PDFfiles/2002/cdr2502.pdf>.
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