



***Staph. aureus* Bacteraemia Surveillance  
Northern Ireland**

**Quarter ending December 2009**

# ***S. aureus* bacteraemia surveillance**

**Quarter: October – December 2009**

## **Key Points**

- Overall SA rates for NI (MRSA plus MSSA) have increased by approximately 7% in Quarter 4 compared to the previous quarter in 2009.
- SA rates for Quarter 4 remain within expected parameters for NI (Figure 9a).
- MRSA rates increased by approximately 54% compared to Quarter 3 2009.
- MRSA rates for Quarter 4 remain within expected parameters for NI (Figure 9b).
- MRSA reports during 2008/09 fell 8% compared to 2007/08 (Appendix 6).
- MSSA rates decreased by approximately 8% compared to Quarter 3 2009.
- MSSA rates for Quarter 4 remain within expected parameters for NI (Figure 9c).
- MSSA reports during 2008/09 rose by 12% compared to 2007/08 (Appendix 6).

## ***S. aureus* (MRSA plus MSSA)**

- ❖ The Northern Ireland rate of *S. aureus* bacteraemia (MRSA plus MSSA) has **increased** from 0.28/1,000 occupied bed days to 0.30/1000 occupied bed days this quarter (Figure 1; Appendix 3).
- ❖ 124 SA reports were notified during October to December 2009, an increase of 11 reports (10%) compared to the previous quarter in 2009 (113 reports).

## **MRSA**

- ❖ The number of MRSA bacteraemias has **increased** to 44 reports this quarter - from 28 reports in Quarter 3 2009 (57% increase) (Appendix 1; Table 1).
- ❖ The MRSA rate **increased** by 54% - from 0.069/1000 occupied bed days in Quarter 3 to 0.106/1000 occupied bed days this quarter (Figure 1; Appendix 3).
- ❖ The overall percentage of all *S. aureus* patient episodes reported as MRSA has **increased** by approximately 11%; from 24.8% in Quarter 3 to 35.5% in this quarter (Appendix 3).
- ❖ Three out of the five HSC Trusts had a decrease in MRSA rates during this quarter (Figure 3). When the MRSA rates for these Trusts in Quarter 4 are compared to Quarter 4 in previous years, using 95% confidence intervals, there has been no statistically significant change noted (Figure 4).

## **MSSA**

- ❖ The number of MSSA bacteraemias has **decreased** to 80 reports this quarter – from 85 reports in Quarter 3 2009 (6% decrease) (Appendix 1; Table 2).

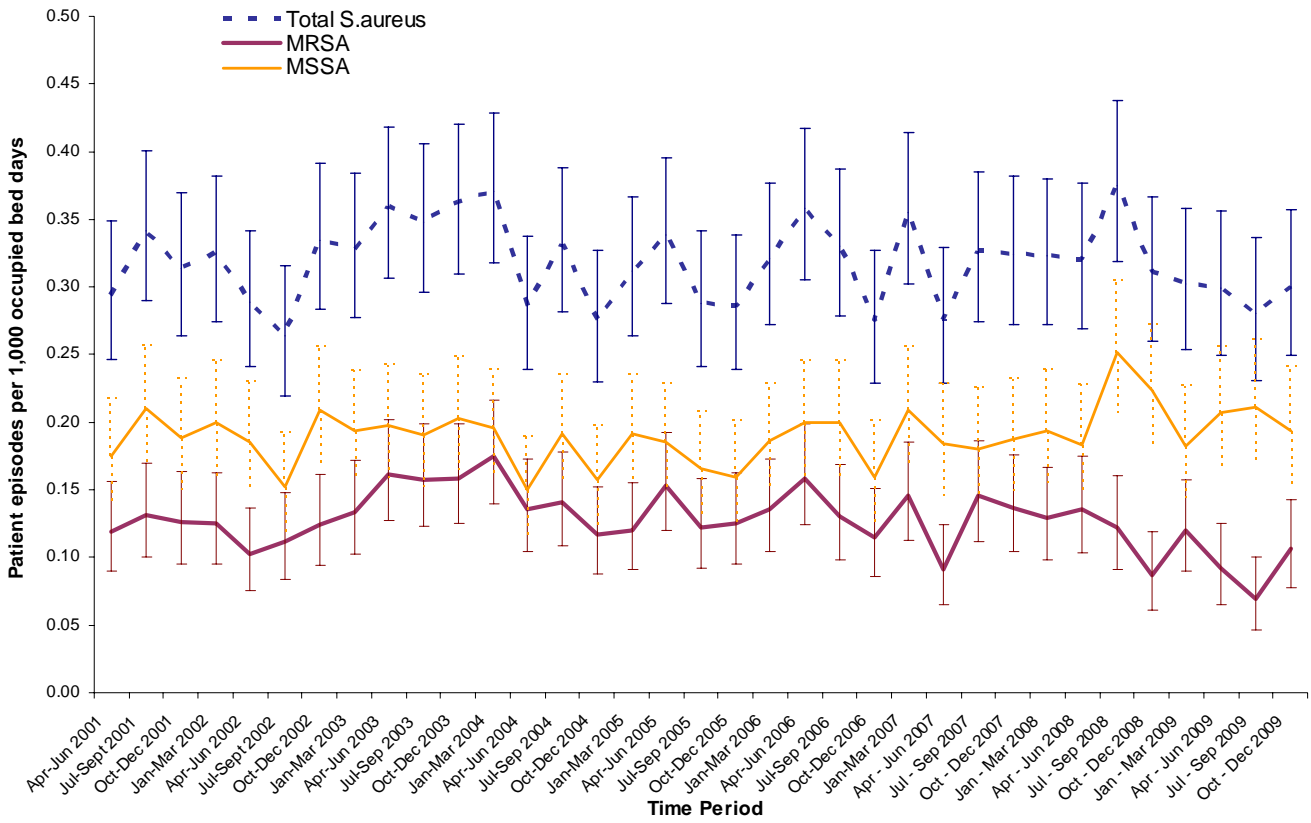
- ❖ The MSSA rate **decreased** by 8% - from 0.211/1000 occupied bed days in Quarter 3 to 0.194/1000 occupied bed days this quarter (Figure 1; Appendix 3). However, there has been no statistically significant change in MSSA rates between this quarter and Quarter 3 2009 (Figure 1).
- ❖ This quarter, four out of five Trusts reported higher MSSA rates than MRSA (Figure 2).
- ❖ MSSA rates decreased in three out of five Trusts this quarter (Figure 5). However, when figures are compared to data for Quarter 4 in previous years, no statistically significant change in MSSA rates is seen (Figure 6).
- ❖ Figures 7 and 8 of this report show the rate of MRSA and MSSA during Quarter 4 2009 for individual hospitals in each Health & Social Care Trust (see also Appendix 1; Tables 1 and 2).

## SPC charts

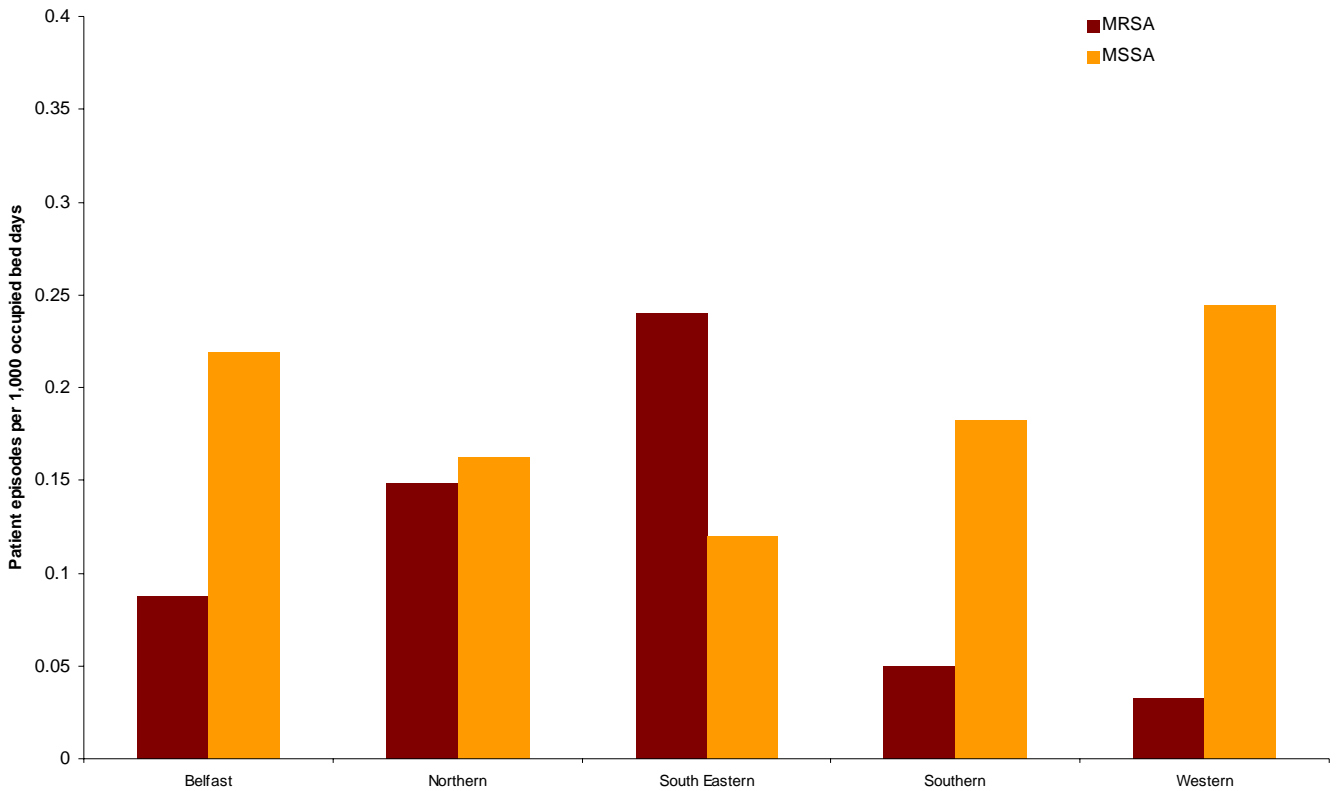
- ❖ Trends in overall SA rates, and in MRSA and MSSA rates, since SA reporting commenced in 2001 are presented for each Trust in the form of Statistical Process Control (SPC) charts in Figure 9 and Appendix 2 of this report. SPC charts allow the distinction to be made between natural variation and “special cause variation” where something unusual may be occurring. Further details on SPC charts can be found in Appendix 4.
- ❖ For Northern Ireland as a whole, SA rates (MRSA and MSSA) are fluctuating within expected parameters (Figure 9a).

## Caveats

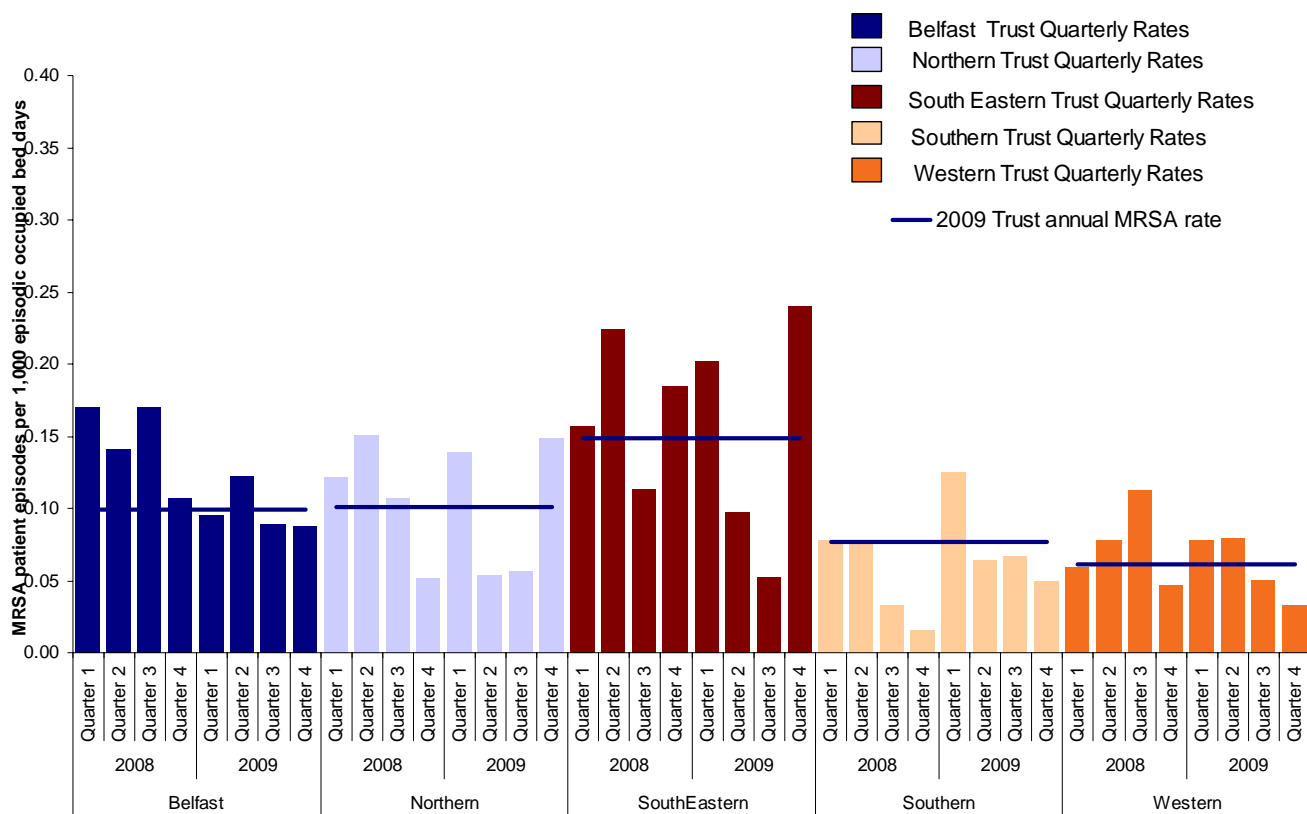
- ❖ **The data in this report reflects SA patient episodes which have been validated by diagnostic laboratories in each Trust. This data will be compared to the NI HCAI web based system and, as such it may be subject to change. Any updates will be reflected in the next quarterly surveillance report.**
- ❖ **A number of recent SA reports (for which patient source was known) have been from patients located in the Emergency Department at the time of blood sampling. Although the actual source of infection may have been external to the Emergency Department where the specimens were tested, these patients are included in the relevant Trust’s quarterly SA total.** Transferred patients and duplicates between Trusts (within 14 days) are removed from the dataset as far as possible, using information reported through usual laboratory reporting systems (including CoSurv and EARSS). It should be noted that the potential for inclusion of duplicates remains.
- ❖ Bed day data was not available for Craigavon Hospital for Quarter 4, thus an estimate using previous year’s Quarter 4 data was used. All unvalidated data or estimated averages presented in this report will be corrected for the next quarterly HCAI report when validated information is available.
- ❖ During Quarter 4 2009, a number of laboratory mergers occurred. All *S. aureus* testing in Northern Trust is now performed by the Antrim laboratory. All *S. aureus* testing in Belfast Trust being carried out by the Royal Victoria laboratory.
- ❖ Appendix 5 has been added to this report to assist with clarification of definitions relating to *S. aureus* patient episodes.



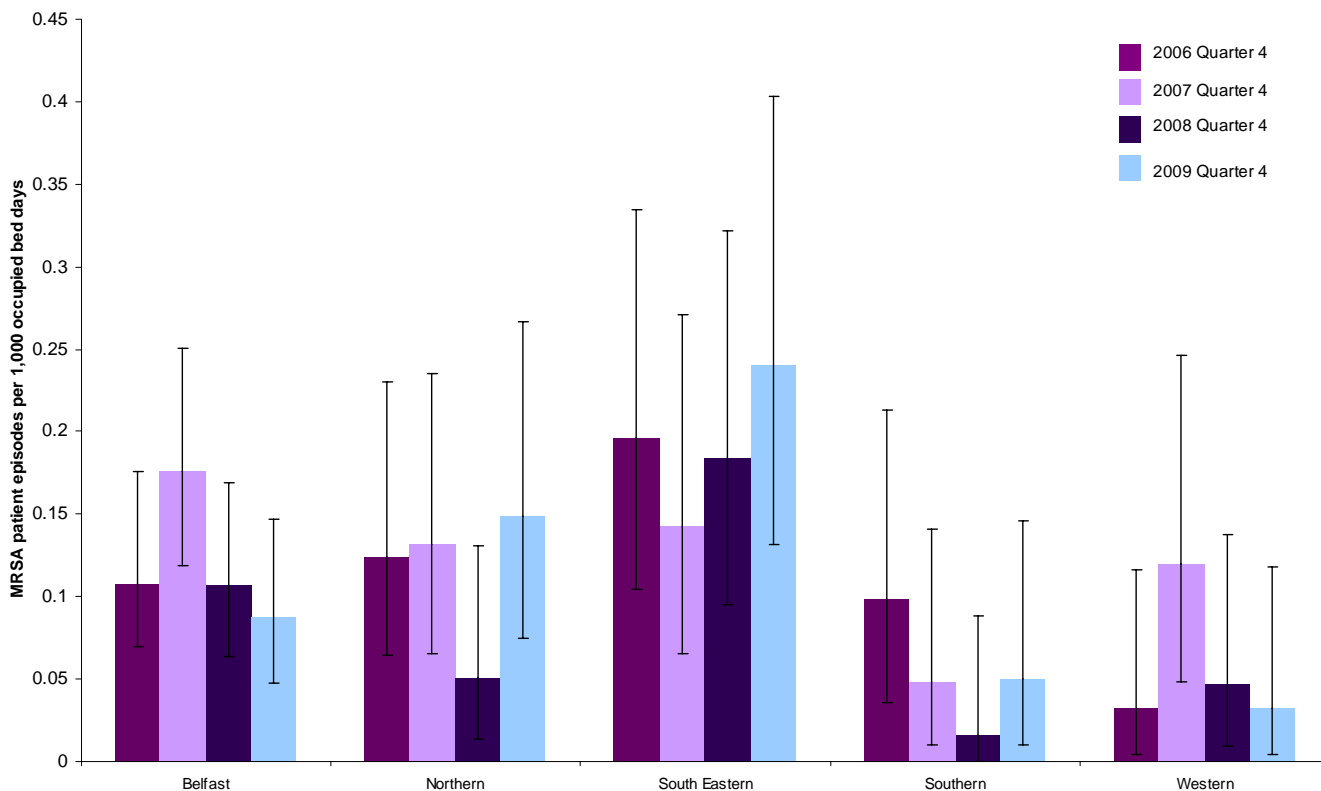
**Figure 1:** MSSA, MRSA and *S. aureus* patient episode rates in Northern Ireland by quarter, with 95% Confidence Intervals, April 2001 – December 2009 (see Appendix 3).



**Figure 2:** MRSA and MSSA patient episodes per 1,000 occupied bed days, by Trust, October – December 2009.



**Figure 3:** Quarterly rates of MRSA by Trust 1 January 2008 – 31 December 2009, with 2009 Trust Annual MRSA rates.



**Figure 4:** MRSA patient episodes by Trust in Quarter 4 from 2006 - 2009, with 95% confidence intervals.

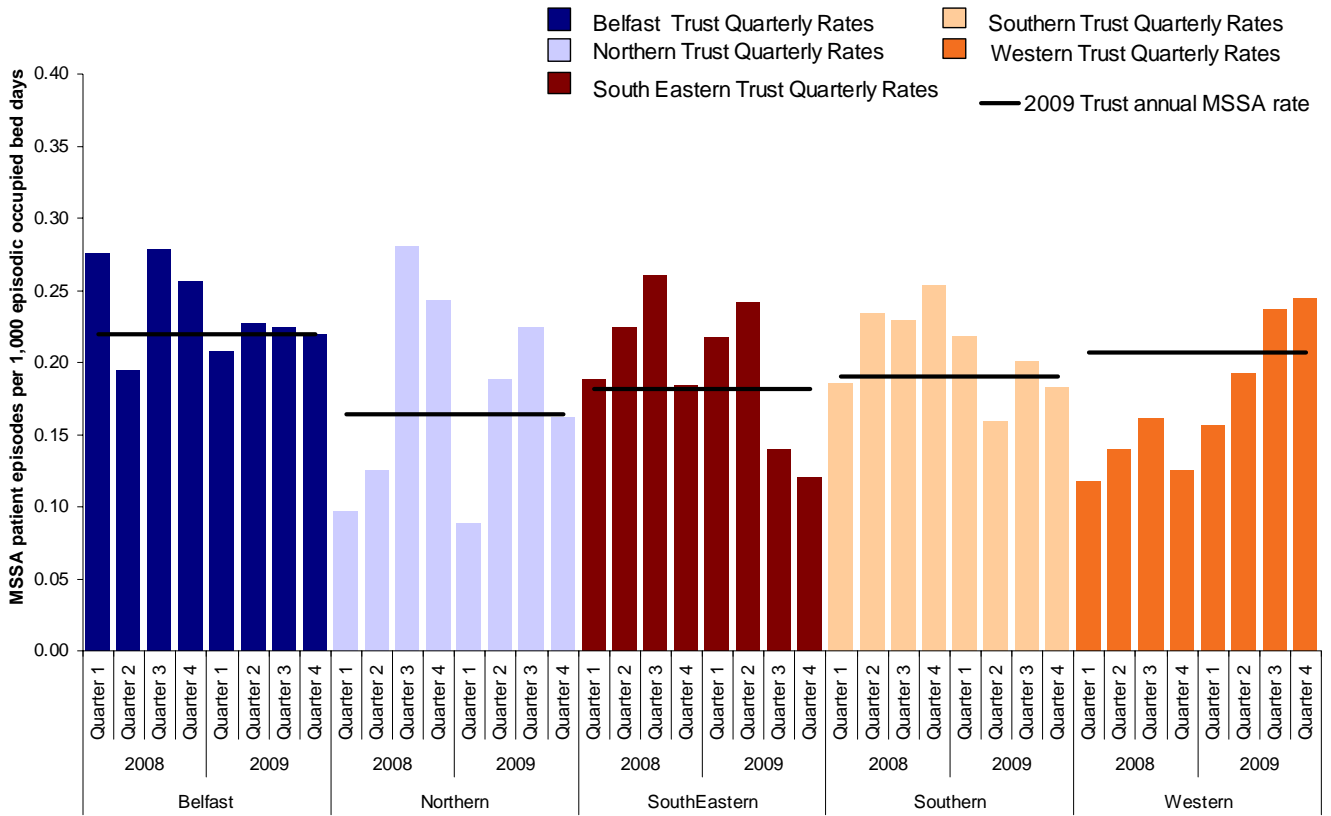


Figure 5: Quarterly rates of MSA by Trust 1 January 2008 – 31 December 2009, with 2009 Trust

Annual MSA rates.

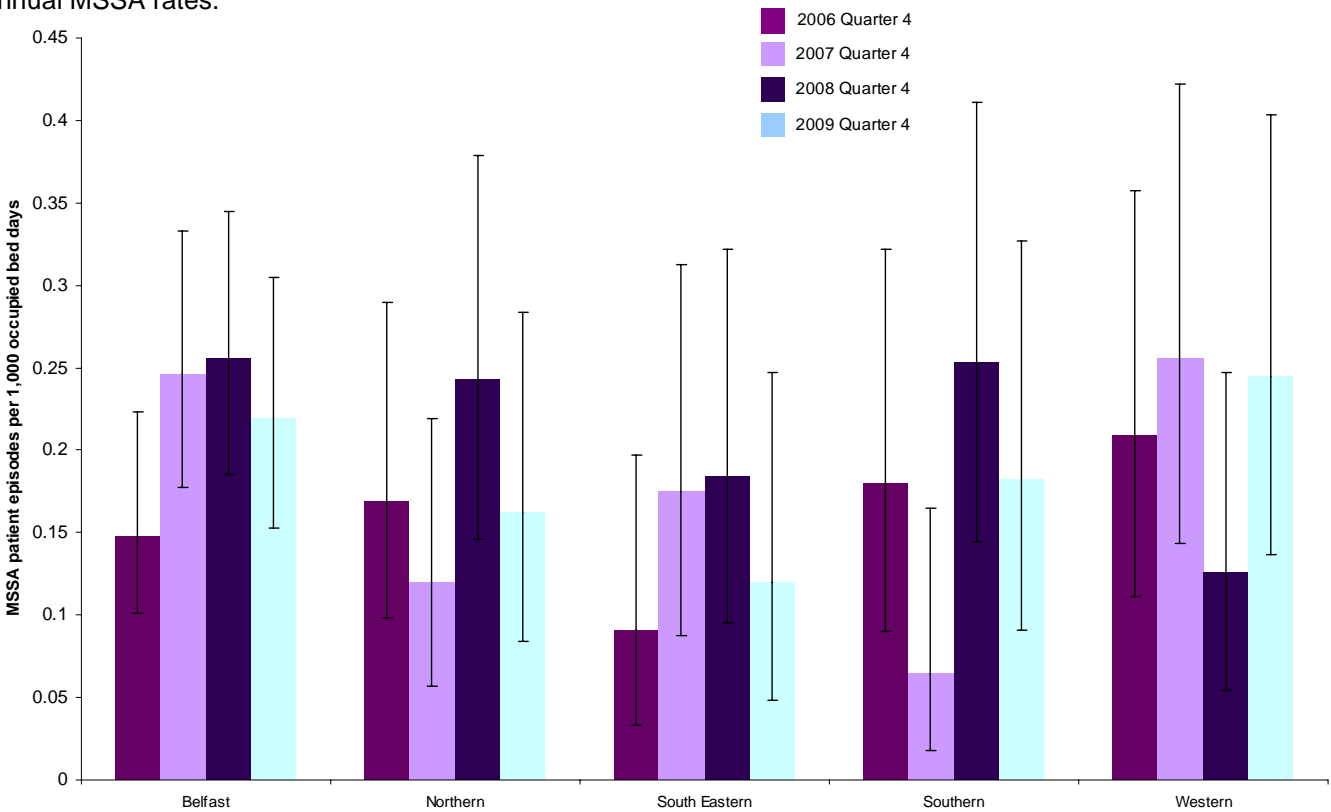
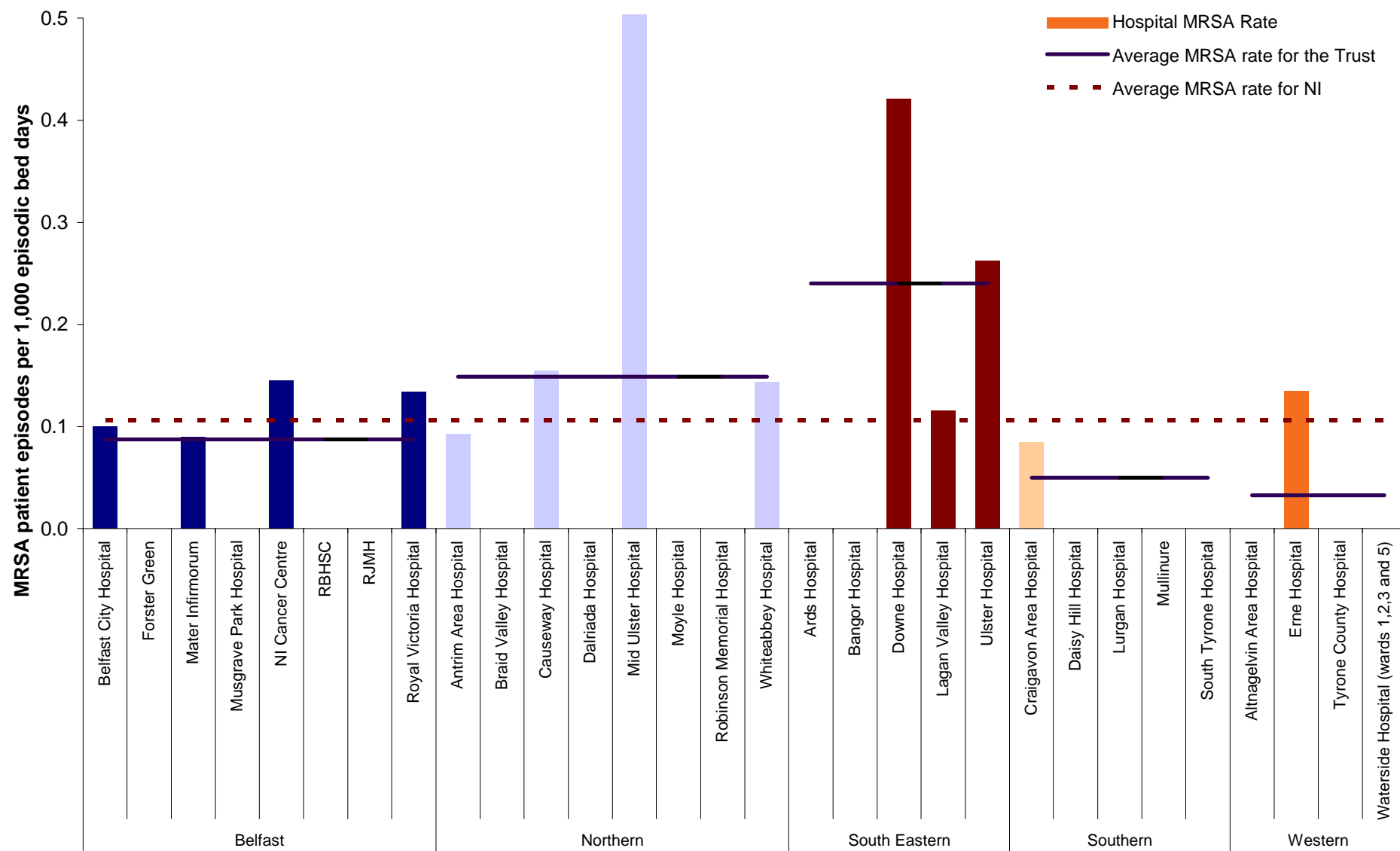
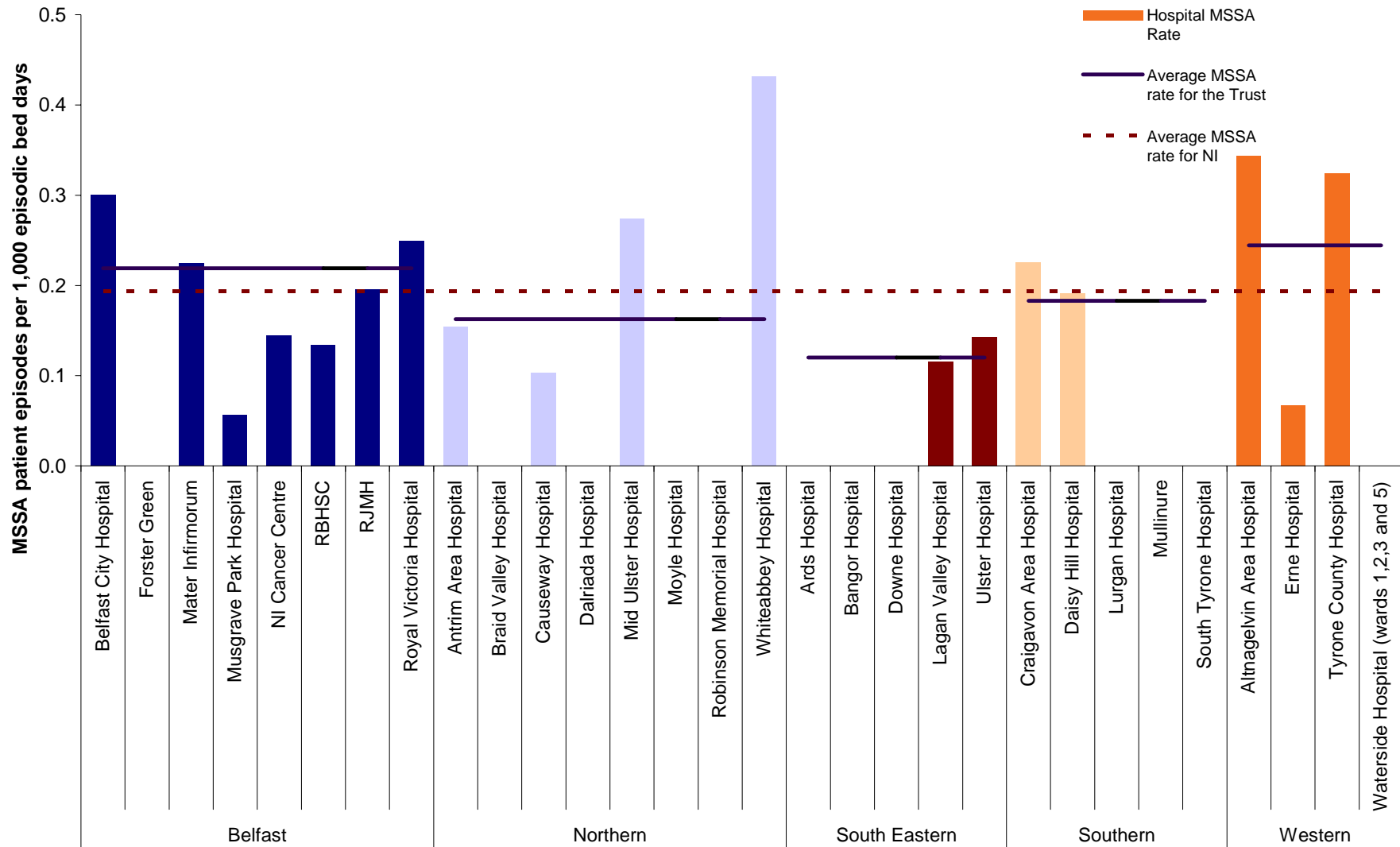


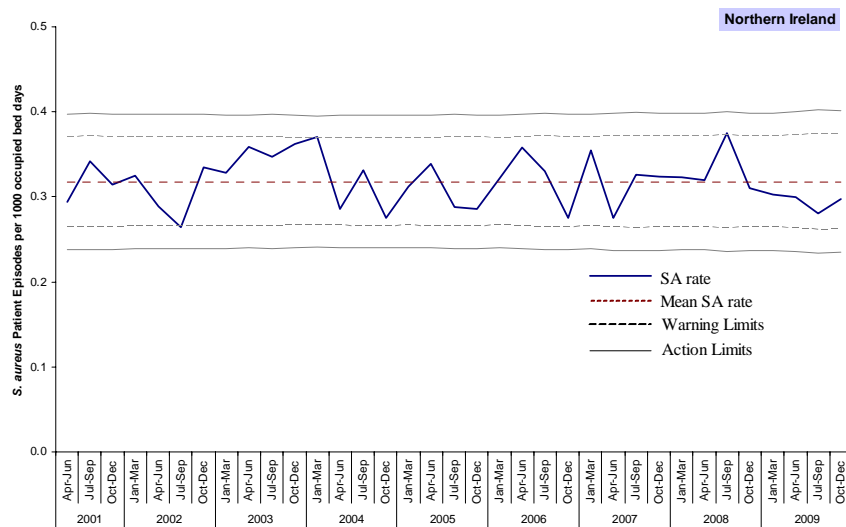
Figure 6: MSA patient episodes by Trust in Quarter 4 from 2006 - 2009, with 95% confidence intervals.



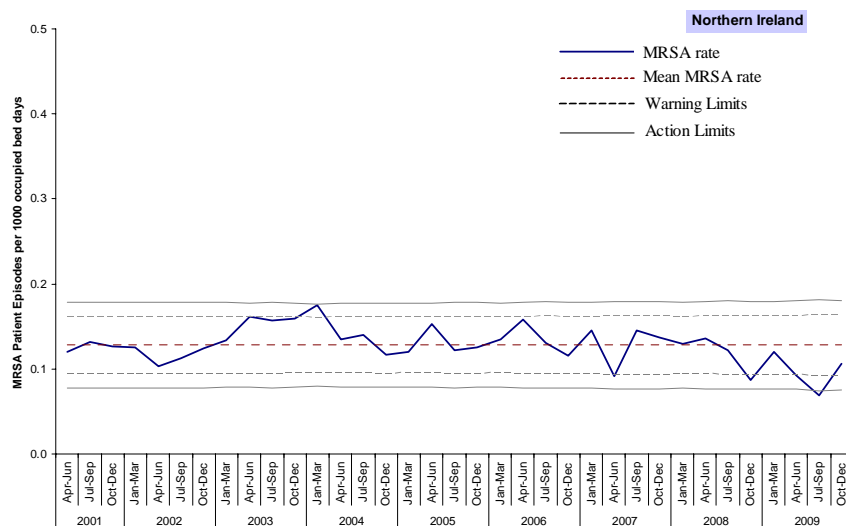
**Figure 7:** Rates of MRSA by individual Hospitals, Quarter 4 2009 (gaps represent zero episodes), compared to Quarter 4 2009 Northern Ireland and Trust average rates.



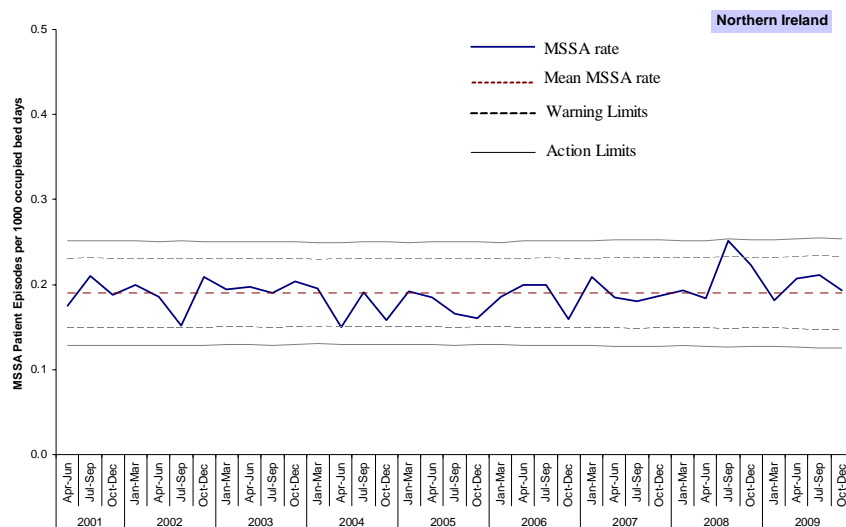
**Figure 8:** Rates of MSSA by individual Hospitals, Quarter 4 2009 (gaps represent zero episodes) compared to Quarter 4, 2009, Northern Ireland and Trust average rates.



**Figure 9a:** Statistical Process Control chart for quarterly **S.aureus** rates in Northern Ireland



**Figure 9b:** Statistical Process Control chart for quarterly **MRSA** rates in Northern Ireland



**Figure 9c:** Statistical Process Control chart for quarterly **MSSA** rates in Northern Ireland

## Appendix 1

**Table 1:** Quarterly number of MRSA patient episodes and rates by Hospital, January – December 2009. Figures in parentheses represent data from October – December 2008.

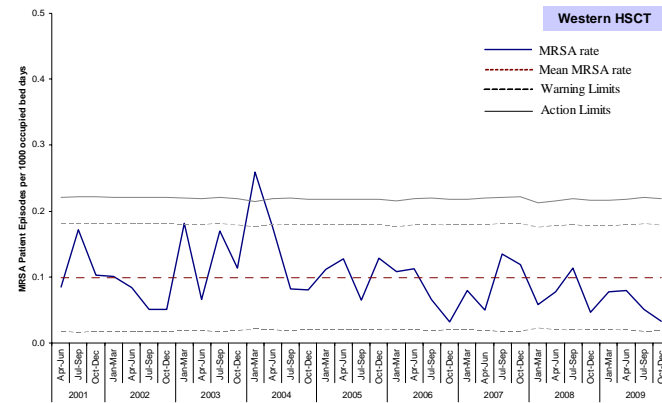
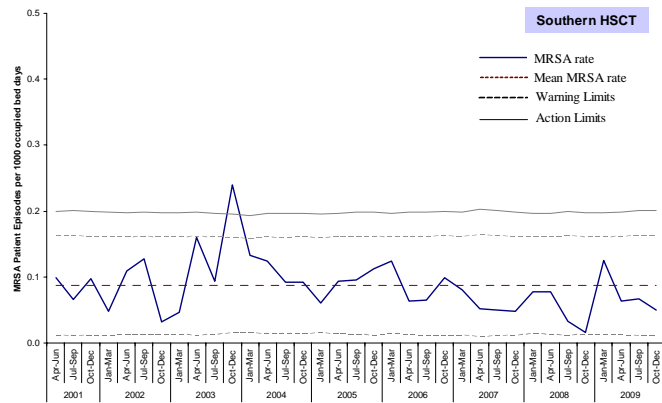
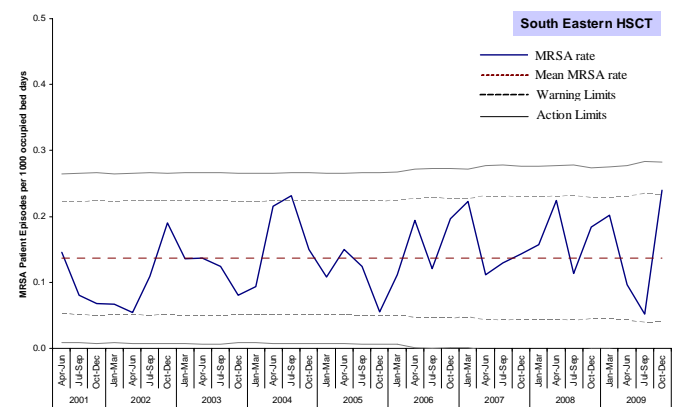
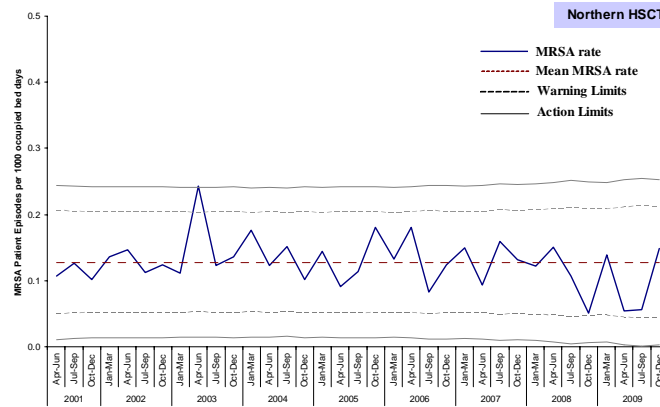
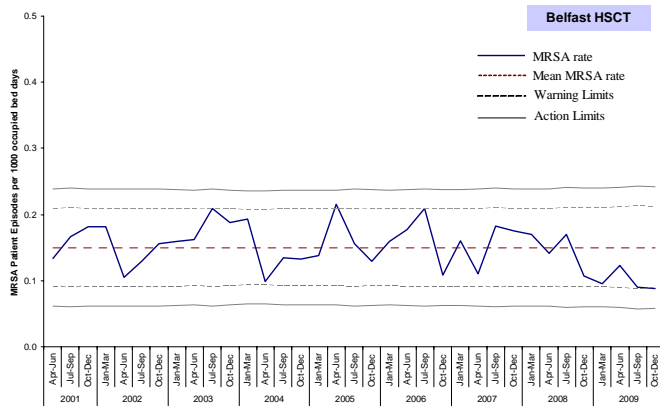
Hospital	Jan - Mar 2009		Apr - Jun 2009		Jul - Sep 2009		Oct - Dec 2009	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	5	0.115	9	0.216	5	0.127	4	0.100
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	1	0.041	5	0.219	1	0.045	2	0.090
Musgrave Park Hospital	0	0.000	0	0.000	0	0.000	0	0.000
NICCO (formerly at Belvoir Park)	0	0.000	1	0.146	1	0.142	1	0.145
RBHSC	0	0.000	0	0.000	1	0.144	0	0.000
RJMH	0	0.000	0	0.000	0	0.000	0	0.000
Royal Victoria Hospital	10	0.187	5	0.095	6	0.122	7	0.134
<b>Belfast Health &amp; Social Care Trust</b>	<b>16 (18)</b>	<b>0.095</b>	<b>20</b>	<b>0.123</b>	<b>14</b>	<b>0.090</b>	<b>14</b>	<b>0.088</b>
Antrim Area Hospital	4	0.121	2	0.064	1	0.033	3	0.093
Braid Valley Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Causeway Hospital	3	0.153	1	0.053	1	0.056	3	0.155
Dalriada Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	1	0.116	0	0.000	0	0.000	4	0.549
Moyle Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Whiteabbey Hospital	3	0.316	1	0.123	2	0.275	1	0.144
<b>Northern Health &amp; Social Care Trust</b>	<b>11 (4)</b>	<b>0.139</b>	<b>4</b>	<b>0.054</b>	<b>4</b>	<b>0.056</b>	<b>11</b>	<b>0.149</b>
Ards Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Bangor Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Downe Hospital	2	0.418	0	0.000	0	0.000	2	0.421
Lagan Valley Hospital	1	0.110	2	0.218	0	0.000	1	0.116
Ulster Hospital	10	0.221	4	0.090	3	0.072	11	0.262
<b>South Eastern Health &amp; Social Care Trust</b>	<b>13 (12)</b>	<b>0.202</b>	<b>6</b>	<b>0.097</b>	<b>3</b>	<b>0.052</b>	<b>14</b>	<b>0.240</b>
Craigavon Area Hospital	4	0.110	2	0.057	4	0.114	3	0.085
Daisy Hill Hospital	2	0.117	1	0.062	0	0.000	0	0.000
Lurgan Hospital	1	0.172	1	0.146	0	0.000	0	0.000
Mullinure	1	0.531	0	0.000	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	0	0.000	0	0.000	0	0.000
<b>Southern Health &amp; Social Care Trust</b>	<b>8 (1)</b>	<b>0.125</b>	<b>4</b>	<b>0.064</b>	<b>4</b>	<b>0.063</b>	<b>3</b>	<b>0.050</b>
Altnagelvin Area Hospital	1	0.027	3	0.079	2	0.055	0	0.000
Erne Hospital	2	0.144	2	0.144	1	0.069	2	0.135
Tyrone County Hospital	2	0.350	0	0.000	0	0.000	0	0.000
Waterside Hospital (Wards 1-3, 5)	0	0.000	0	0.000	0	0.000	0	0.000
<b>Western Health &amp; Social Care Trust</b>	<b>5 (3)</b>	<b>0.078</b>	<b>5</b>	<b>0.080</b>	<b>3</b>	<b>0.051</b>	<b>2</b>	<b>0.033</b>
<b>NI TOTAL</b>	<b>53 (38)</b>	<b>0.120</b>	<b>39</b>	<b>0.092</b>	<b>28</b>	<b>0.069</b>	<b>44</b>	<b>0.106</b>

## Appendix 1

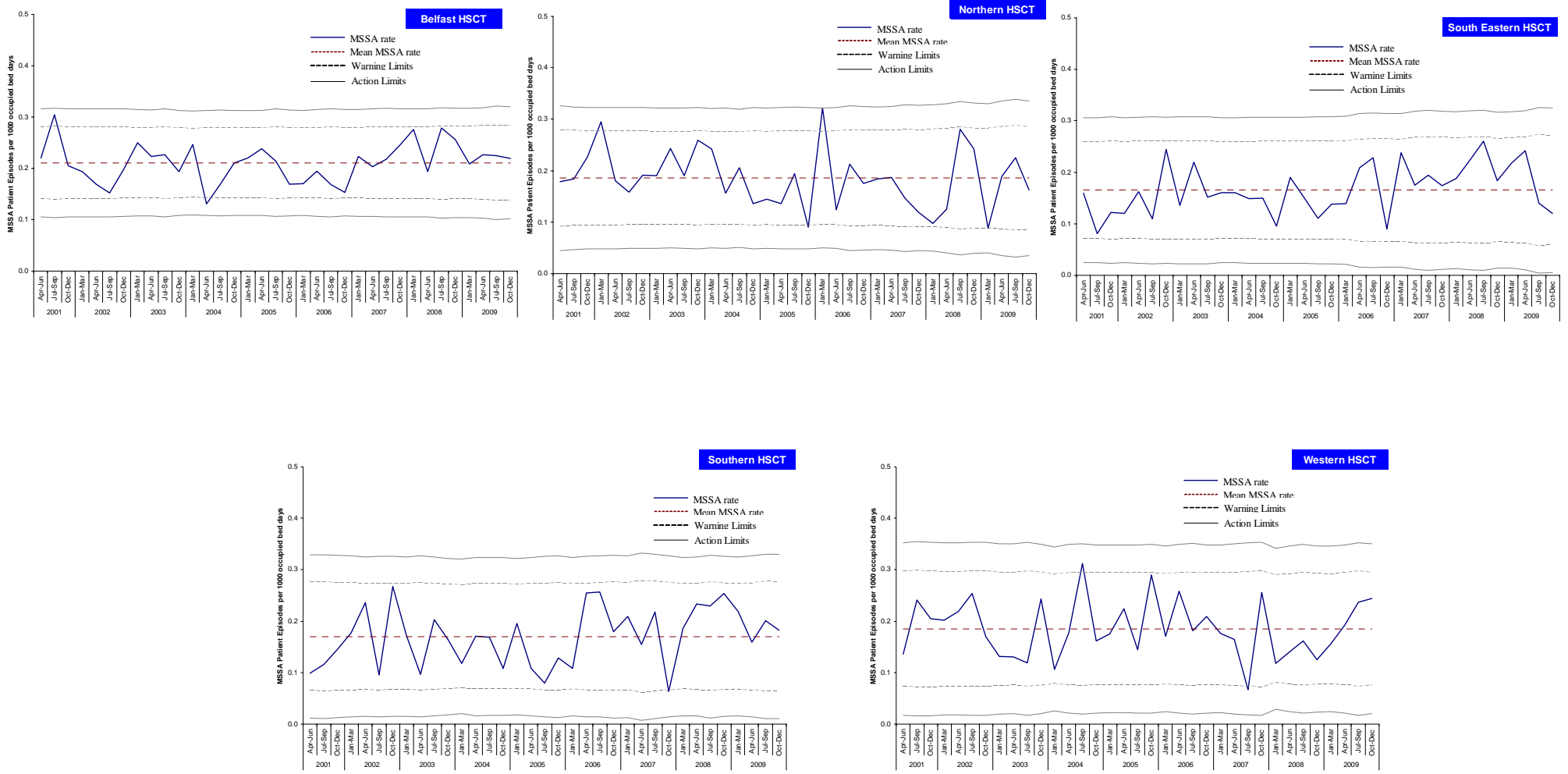
**Table 2:** Quarterly number of MSSA patient episodes and rates by Hospital, January – December 2009. Figures in parentheses represent data from October – December 2008.

Hospital	Jan - Mar 2009		Apr - Jun 2009		Jul - Sep 2009		Oct - Dec 2009	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	13	0.298	9	0.216	10	0.253	12	0.300
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	2	0.082	3	0.132	8	0.362	5	0.224
Musgrave Park Hospital	0	0.000	0	0.000	1	0.057	1	0.056
NICCO (formerly at Belvoir Park)	0	0.000	5	0.730	1	0.142	1	0.145
RBHSC	6	0.783	7	1.019	1	0.144	1	0.134
RJMH	1	0.099	0	0.000	3	0.278	2	0.195
Royal Victoria Hospital	13	0.243	13	0.248	11	0.223	13	0.249
<b>Belfast Health &amp; Social Care Trust</b>	<b>35 (43)</b>	<b>0.208</b>	<b>37</b>	<b>0.227</b>	<b>35</b>	<b>0.224</b>	<b>35</b>	<b>0.219</b>
Antrim Area Hospital	2	0.060	6	0.193	8	0.262	5	0.154
Braid Valley Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Causeway Hospital	3	0.153	2	0.105	5	0.278	2	0.103
Dalriada Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	2	0.232	4	0.493	1	0.123	2	0.275
Moyle Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Whiteabbey Hospital	0	0.000	2	0.245	2	0.275	3	0.431
<b>Northern Health &amp; Social Care Trust</b>	<b>7 (19)</b>	<b>0.088</b>	<b>14</b>	<b>0.188</b>	<b>16</b>	<b>0.225</b>	<b>12</b>	<b>0.163</b>
Ards Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Bangor Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Downe Hospital	1	0.209	1	0.267	0	0.000	0	0.000
Lagan Valley Hospital	4	0.439	0	0.000	0	0.000	1	0.116
Ulster Hospital	9	0.199	14	0.315	8	0.191	6	0.143
<b>South Eastern Health &amp; Social Care Trust</b>	<b>14 (12)</b>	<b>0.217</b>	<b>15</b>	<b>0.242</b>	<b>8</b>	<b>0.140</b>	<b>7</b>	<b>0.120</b>
Craigavon Area Hospital	11	0.302	4	0.115	9	0.256	8	0.226
Daisy Hill Hospital	3	0.175	4	0.249	3	0.181	3	0.191
Lurgan Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mullinure	0	0.000	2	0.814	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	0	0.000	0	0.000	0	0.000
<b>Southern Health &amp; Social Care Trust</b>	<b>14 (16)</b>	<b>0.219</b>	<b>10</b>	<b>0.160</b>	<b>12</b>	<b>0.188</b>	<b>11</b>	<b>0.183</b>
Altnagelvin Area Hospital	6	0.159	8	0.211	10	0.275	13	0.343
Erne Hospital	1	0.072	4	0.288	2	0.138	1	0.068
Tyrone County Hospital	3	0.525	0	0.000	2	0.686	1	0.324
Waterside Hospital (Wards 1-3, 5)	0	0.000	0	0.000	0	0.000	0	0.000
<b>Western Health &amp; Social Care Trust</b>	<b>10 (8)</b>	<b>0.156</b>	<b>12</b>	<b>0.192</b>	<b>14</b>	<b>0.237</b>	<b>15</b>	<b>0.245</b>
<b>NI TOTAL</b>	<b>80 (98)</b>	<b>0.182</b>	<b>88</b>	<b>0.207</b>	<b>85</b>	<b>0.209</b>	<b>80</b>	<b>0.194</b>

## Appendix 2: Trends in MRSA rates by Trust and quarter (2001-2009)



## Appendix 2: Trends in MSSA rates by Trust and quarter (2001-2009)



### Appendix 3

**Table 1:** MSSA, MRSA and total *S. aureus* patient episode rates and the percentage of *S. aureus* which were reported as MRSA in Northern Ireland, April 2001 – December 2009

Quarter	MSSA rate	MRSA rate	All <i>S. aureus</i> rate	% MRSA
Apr-Jun 2001	0.175	0.120	0.294	40.6
Jul-Sept 2001	0.210	0.132	0.342	38.6
Oct-Dec 2001	0.188	0.126	0.314	40.1
Jan-Mar 2002	0.200	0.125	0.325	38.5
Apr-Jun 2002	0.186	0.103	0.288	35.6
Jul-Sept 2002	0.152	0.112	0.264	42.5
Oct-Dec 2002	0.210	0.124	0.334	37.3
Jan-Mar 2003	0.194	0.134	0.328	40.8
Apr-Jun 2003	0.198	0.161	0.359	44.9
Jul-Sep 2003	0.190	0.157	0.348	45.3
Oct-Dec 2003	0.203	0.159	0.362	43.9
Jan-Mar 2004	0.195	0.175	0.370	47.2
Apr-Jun 2004	0.150	0.135	0.285	47.4
Jul-Sep 2004	0.191	0.140	0.332	42.3
Oct-Dec 2004	0.158	0.117	0.275	42.6
Jan-Mar 2005	0.192	0.120	0.312	38.5
Apr-Jun 2005	0.185	0.155	0.341	45.3
Jul-Sep 2005	0.166	0.122	0.290	42.4
Oct-Dec 2005	0.160	0.125	0.285	43.9
Jan-Mar 2006	0.186	0.135	0.321	42.1
Apr-Jun 2006	0.198	0.156	0.354	44.1
Jul-Sep 2006	0.200	0.132	0.332	39.8
Oct-Dec 2006	0.156	0.112	0.269	41.6
Jan-Mar 2007	0.207	0.146	0.353	41.4
Apr-Jun 2007	0.187	0.091	0.277	32.9
Jul-Sep 2007	0.182	0.147	0.329	44.7
Oct-Dec 2007	0.187	0.137	0.324	42.3
Jan-Mar 2008	0.194	0.129	0.323	40.0
Apr-Jun 2008	0.188	0.136	0.324	42.6
Jul-Sep 2008	0.254	0.122	0.378	32.7
Oct-Dec 2008	0.223	0.087	0.310	27.9
Jan-Mar 2009	0.182	0.120	0.302	39.9
Apr-Jun 2009	0.207	0.092	0.299	30.7
Jul-Sep 2009	0.211	0.069	0.280	24.8
Oct –Dec 2009	0.194	0.106	0.300	35.5

## Appendix 4

### Notes and Definitions

#### Statistical Process Control charts:

The Statistical Process Control (SPC) chart is now commonly used for the reporting of MRSA rates throughout the UK. SPC charts assume that rates within a Trust will be largely similar over time. They present the occurrence of *S. aureus* bacteraemias in a Trust in relation to what would be expected, based upon the mean rate for the Trust and calculated statistical process control limits.

The mean for each Trust has been calculated using the data from all quarters since April 2001. Control limits, derived from plus or minus 2 or 3 standard deviations from the mean, represent the range of variation in rates that might be expected to occur due to chance alone.

The warning limit is set at two standard deviations from the mean, whilst the action limit is set at three standard deviations from the mean. The limits vary slightly every quarter because of the varying occupancy in the hospitals within each trust.

Control limits were set up by using the following formulae:

$$\text{Warning Limit} = M \pm 2 \sqrt{\frac{E_i}{(N_i)^2}} \quad \text{Action Limit} = M \pm 3 \sqrt{\frac{E_i}{(N_i)^2}}$$

Where M is the Mean, Ni is the number of Occupied Bed-days per quarter and Ei is the expected number of reports calculated as  $E_i = M \times N_i$

SPC charts allow the distinction to be made between natural variation and “special cause variation”, where something unusual is occurring in a Trust. If any of the following criteria are met then there is said to be “special cause variation” which should be investigated, as this could not statistically have occurred by chance alone:

- 1 value above the upper action limit, or below the lower action limit
- 3 consecutive values between the upper warning limit and upper action limit (or between lower limits)
- 8 consecutive values on the same side of the mean (either above or below)
- Any 12 of 14 consecutive values on the same side of the mean (either above or below)
- 8 consecutive values either increasing or decreasing

**Trust Activity** is defined as the number of occupied beds (from KH03A return) and is used to calculate a rate per 1,000 occupied bed days. KH03A data is obtained from DHSSPSNI on a quarterly basis.

**The number of patient episodes** is defined as the total number of patients from whom blood culture set(s) collected during the quarter grew *S aureus*. If repeat specimens were collected from a single patient, and the patient was considered to have had two episodes of bacteraemia, then they should be counted as two patients. As an arbitrary measure, if positive blood culture sets are collected more than 14 days apart, they should be considered as reflecting different episodes.

## Appendix 5

### Clarification of Existing HCAI definitions

#### Patient Transfers

A patient may be an inpatient in a healthcare facility and at some point may be transferred to another hospital/Trust, symptom free. Upon admission to the second facility, if the patient develops the symptoms of *C. diff* or *S. aureus* within 2 days and a specimen is taken and tested at this point, the episode is attributed to the current stay i.e. the receiving hospital. Whilst the infection may have been acquired during their first hospital admission, it is the hospital where the patient is **at the time the specimen is taken** that must report the episode. For this reason, CDSC ensures that there are caveats to state that this does not infer the patient acquired their infection in that hospital. Trusts should be aware of such circumstances so that they are in a position to clarify any episodes that developed within 2 days of transfer/admission and are therefore likely to have been acquired prior to admission to that hospital.

#### Patient in one hospital and after discharge are later admitted to another

A patient may be an inpatient in a healthcare facility and test positive for a healthcare associated infection. Once discharged, the patient may develop new symptoms and be readmitted to the same hospital or to a different hospital and be retested for *S. aureus*. If the new admission is within 14 days of the original positive specimen date then the duplicate rule applies regardless of the change in hospital and the isolate should not be reported.

## Appendix 6

**Table 1:** MRSA patient episodes, by Trust and for Northern Ireland, for each financial year.

Trust	Financial Year			
	2005/06	2006/07	2007/08	2008/09
Belfast	118	115	109	86
Northern	46	47	42	35
South Eastern	32	49	34	46
Southern	27	19	14	16
Western	27	18	22	20
Northern Ireland	250	248	221	203

**Table 2:** MSSA patient episodes, by Trust and for Northern Ireland, for each financial year.

Trust	Financial Year			
	2005/06	2006/07	2007/08	2008/09
Belfast	141	130	161	157
Northern	66	60	46	57
South Eastern	39	51	46	56
Southern	27	56	38	59
Western	52	51	37	37
Northern Ireland	325	348	328	366