



**CDSC (NI)**

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

**Quarter ending September 2008**

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

**Quarter: July – September 2008**

## **Key Points**

- **MRSA rates have decreased by nearly 10% compared to April-June quarter.**
- **This quarter Northern Ireland rates of MSSA have breached the action limit, whilst SA rates MRSA plus MSSA) have crossed the warning limit (Figures 9a-9c).**

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

- ❖ The Northern Ireland rate of *S. aureus* bacteraemia (MRSA plus MSSA) has **increased** to 0.38 per 1,000 occupied bed days from 0.32 per 1,000 occupied bed days in the previous quarter (17%; Figure 1; Appendix 3). This has been driven primarily by an increased rate of MSSA bacteraemias.

## **MRSA**

- ❖ The number of MRSA bacteraemias has **decreased** from 60 reports last quarter to 52 reports (13.3%) (Appendix 1 Table 1).
- ❖ The MRSA rate **decreased** (9.6%) from 0.136 last quarter to 0.123 (Figure 1; Appendix 3).
- ❖ The overall percentage of all *S. aureus* patient episodes reported as MRSA **decreased** by 9.5%; 42% last quarter to 32.5% this quarter (Appendix 3). This is the lowest proportion recorded (but see MSSA data).
- ❖ Two out of five Trusts experienced an increase in MRSA rates during quarter 3, 2008 (Figure 3). However, when the MRSA rates reported for these Trusts in Quarter 3 are compared to Quarter 3 in previous years it is clear, using 95% confidence intervals, that there has been no statistical change in the figures (Figure 4).

## **MSSA**

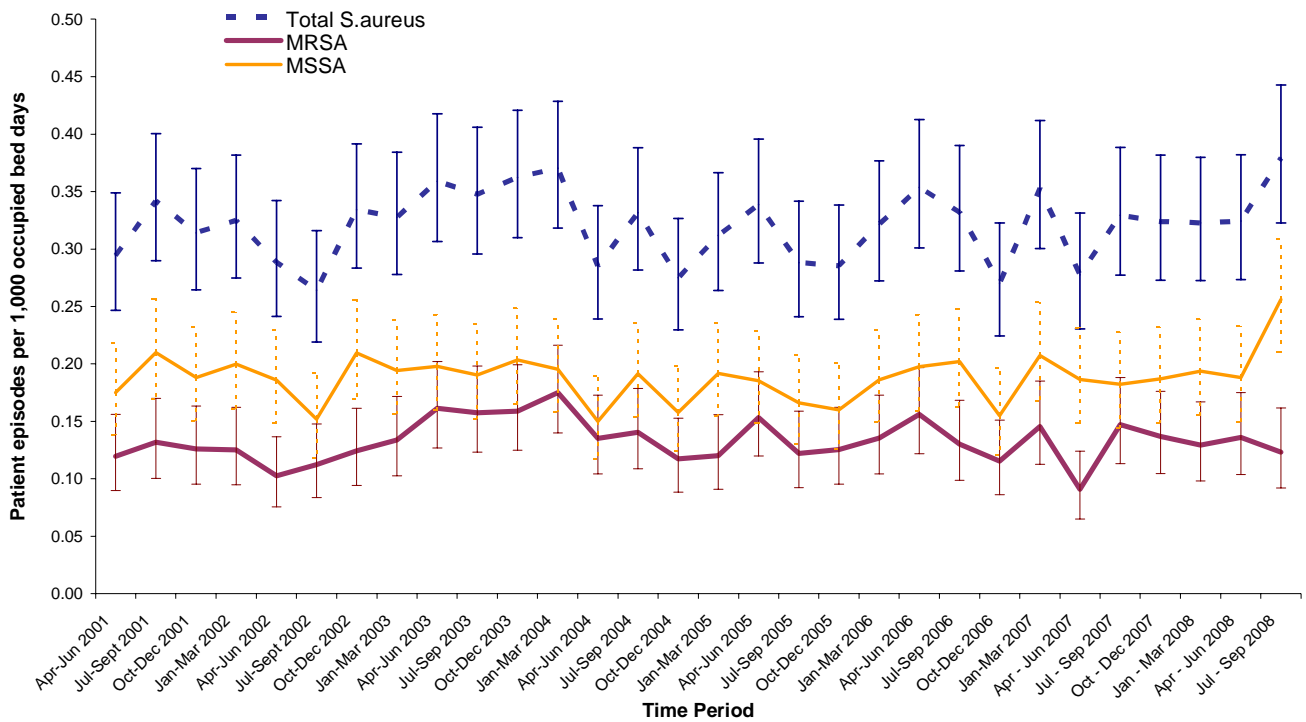
- ❖ The number of MSSA bacteraemias has **increased** from 83 reports last quarter to 108 reports (30%) (Appendix 1 Table 2).
- ❖ The MSSA rate **increased** (36%) from 0.188 last quarter to 0.256 this quarter (Figure 1; Appendix 3). This rate is the highest recorded since the mandatory surveillance programmes commenced in 2001. However, there has been no statistically significant change in rates between April-June and July-September despite a 30% rise in absolute numbers (Figure 1).
- ❖ This quarter all Trusts reported higher MSSA rates than MRSA (Figure 2).
- ❖ MSSA rates increased in four out of five Trusts during quarter 3, 2008 (Figure 5). However, when figures are compared to data for quarter 3 in previous years there is no statistically significant change in the rates (Figure 6).
- ❖ Figures 7 and 8 show the rate of MRSA and MSSA patient episodes during Quarter 3 in 2008 for the individual hospitals that make up each Trust (see also Appendix 1 Tables 1 and 2).

## SPC charts

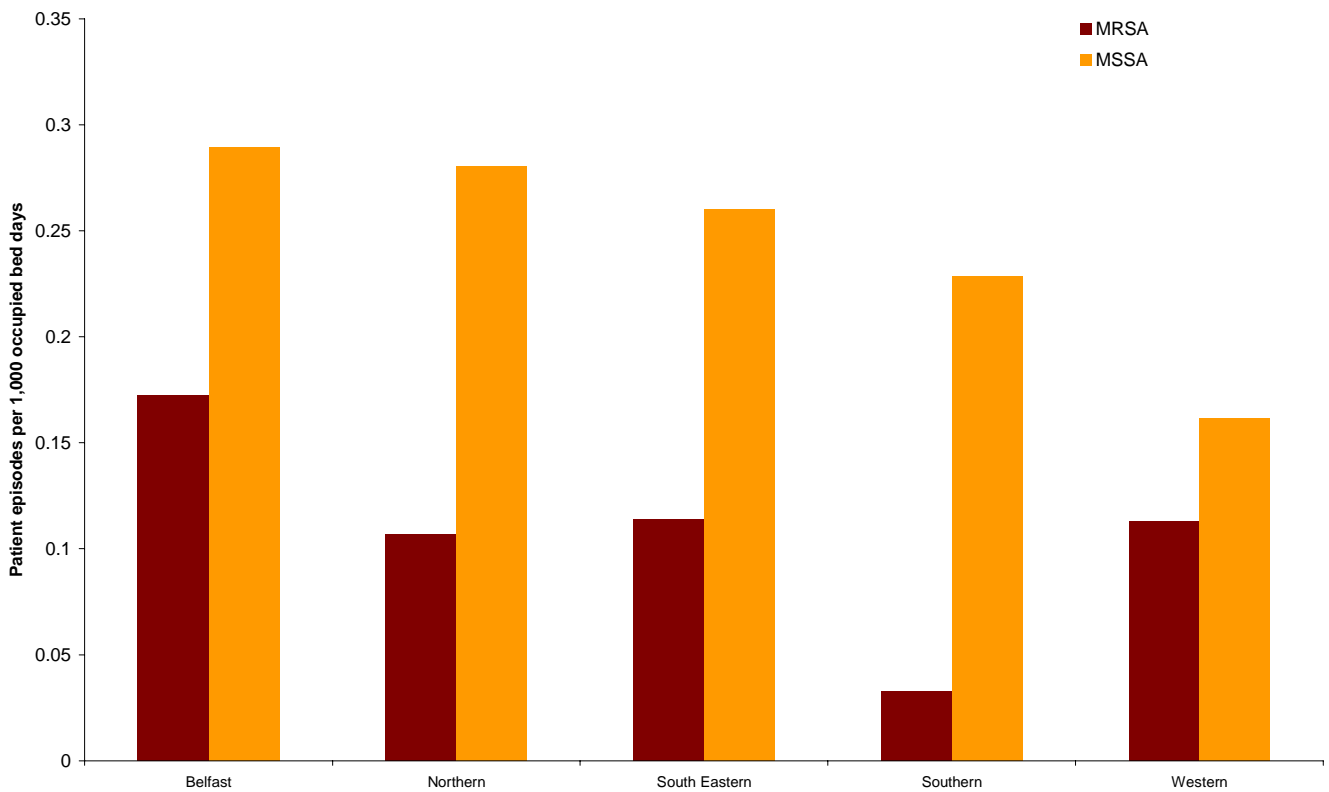
- ❖ Trends in rates since reporting began in 2001 are shown for each Trust in the form of Statistical Process Control (SPC) charts in Figure 9 and Appendix 2. SPC charts allow the distinction to be made between natural variation and “special cause variation” where something unusual may be occurring. Further details on SPC charts can be found in Appendix 4.
- ❖ For Northern Ireland as a whole, and for each Trust, MRSA rates are fluctuating within normal parameters (Figure 9; Appendix 2). However, MSSA rates for Northern Ireland have breached the action limits of the charts. One Trust breached the warning limit in the MSSA SPC chart, whilst two others approached the warning limit. Therefore the increase appears to be driven by an increased rate of MSSA episodes reported by 4 out of 5 Trusts this quarter (Appendix 2).

## Caveats

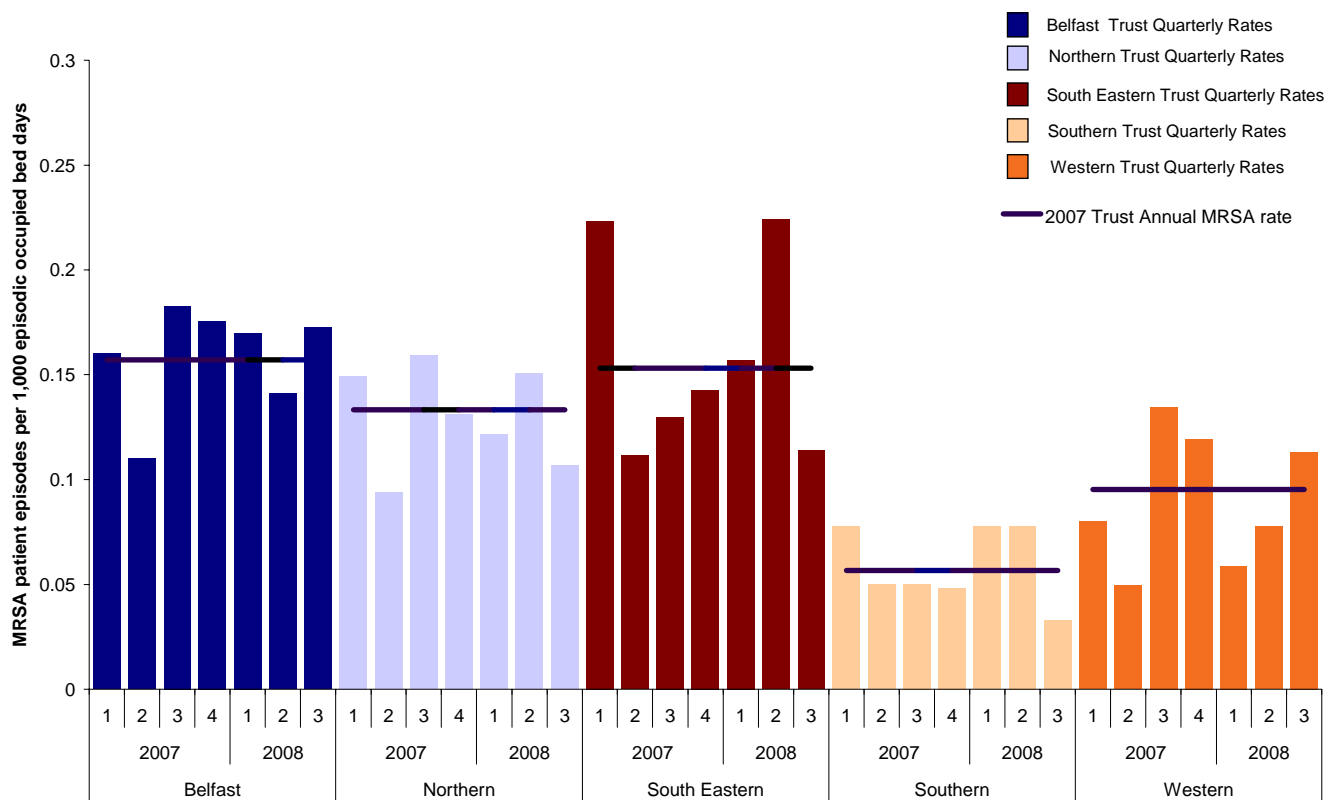
- ❖ The results shown are of isolates which have been identified by testing within a hospital. No distinction is made between the origin of the isolate i.e. from the hospital or the community.
- ❖ **For several of the Trusts, for which the patient source is known, a number of recent reports have been from patients in the Accident & Emergency department at the time of blood sampling. Although the actual source of infection may have been external to the Trust where the specimens were tested, these patients still count towards the Trust quarterly total.** Transferred patients and duplicates between Trusts (within a 14-day time period) are removed from the dataset as far as possible using the details reported as part of the usual laboratory reporting (CoSurv and EARSS where available). However, there is a potential for duplicates to be included.
- ❖ During this quarter bed day data was not available for Musgrave, Forster Green or the Royal Belfast Hospital for Sick Children. For these hospitals estimates were used. All unvalidated data or estimated averages presented in this report will be corrected for the next report when validated information is available. Therefore there may be a few changes between reports.
- ❖ This quarter maintenance work was carried out in Robinson Memorial Hospital which significantly reduced their bed day data. This may have slight implications for the overall Northern Trust figure.
- ❖ Appendix 5 has been added to clarify some issues surrounding definitions of *S. aureus* patient episodes.



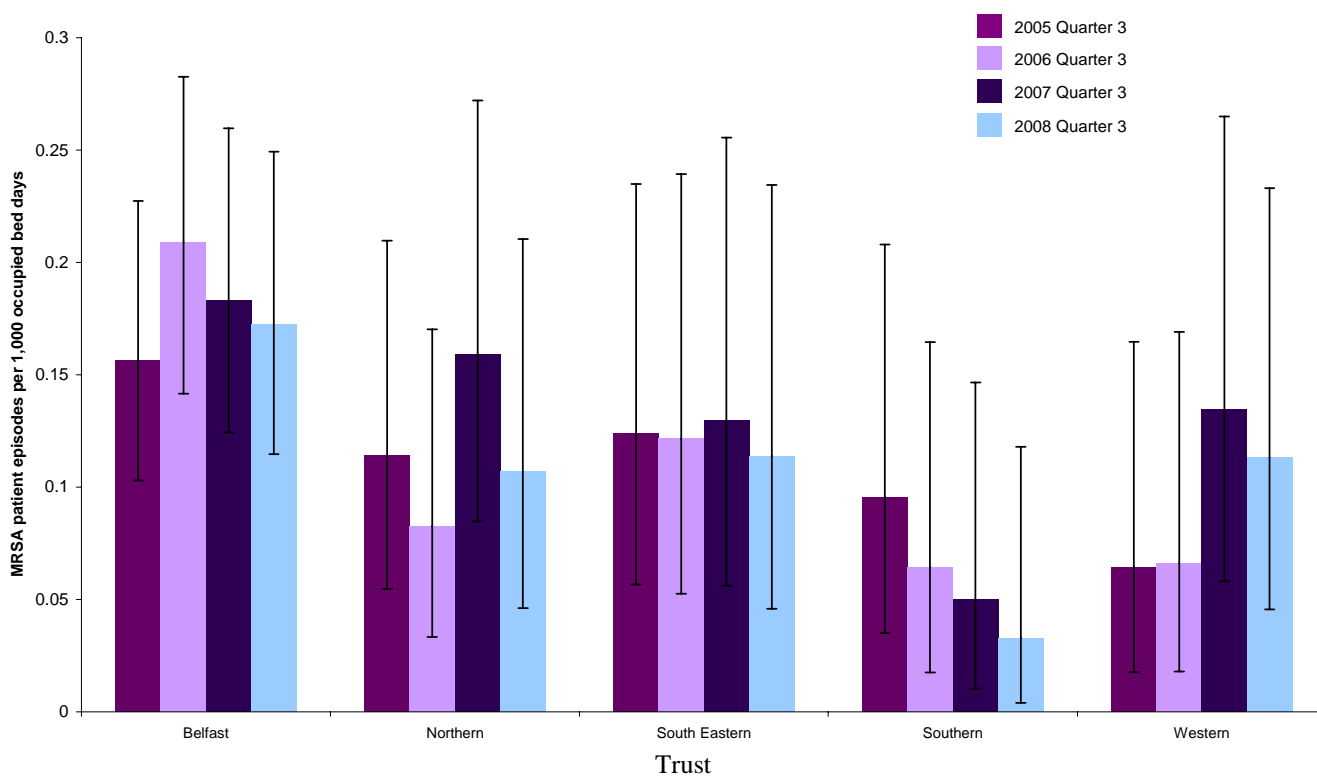
**Figure 1:** MSSA, MRSA and *S. aureus* patient episode rates in Northern Ireland by quarter, with 95% Confidence Intervals, April 2001 – September 2008 (see Appendix 3)



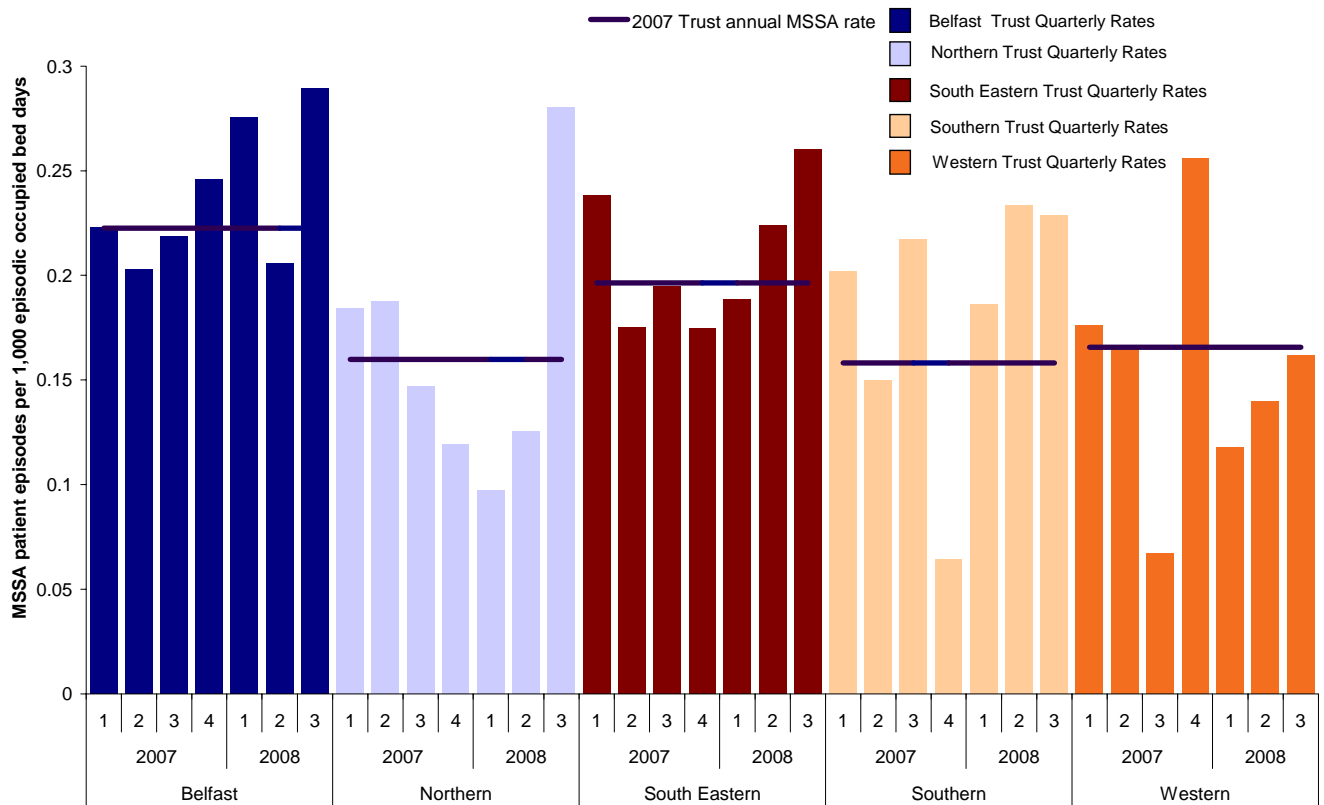
**Figure 2:** MRSA and MSSA patient episodes per 1,000 occupied bed days, by Trust, July – September 2008.



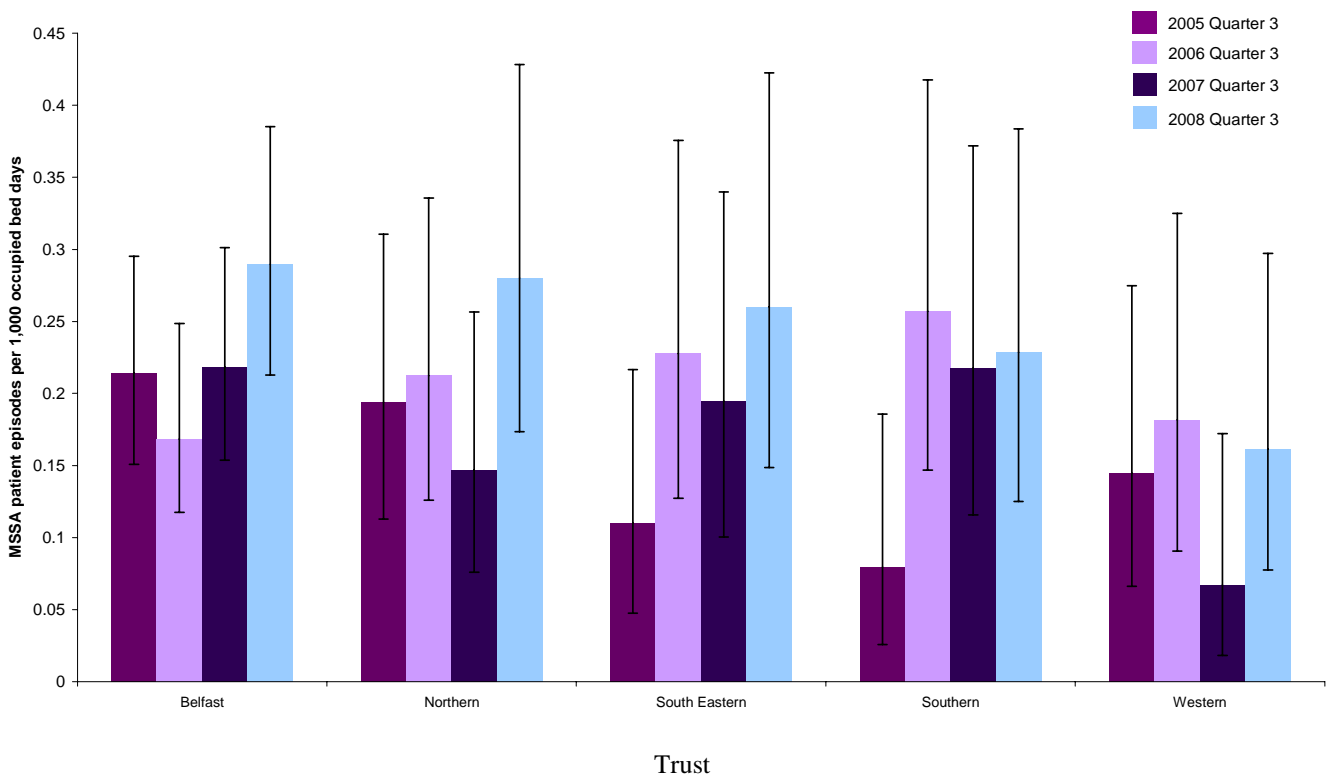
**Figure 3:** Quarterly rates of MRSA by Trust 1 January 2007 – 30 September 2008, with 2007 Trust Annual MRSA rates.



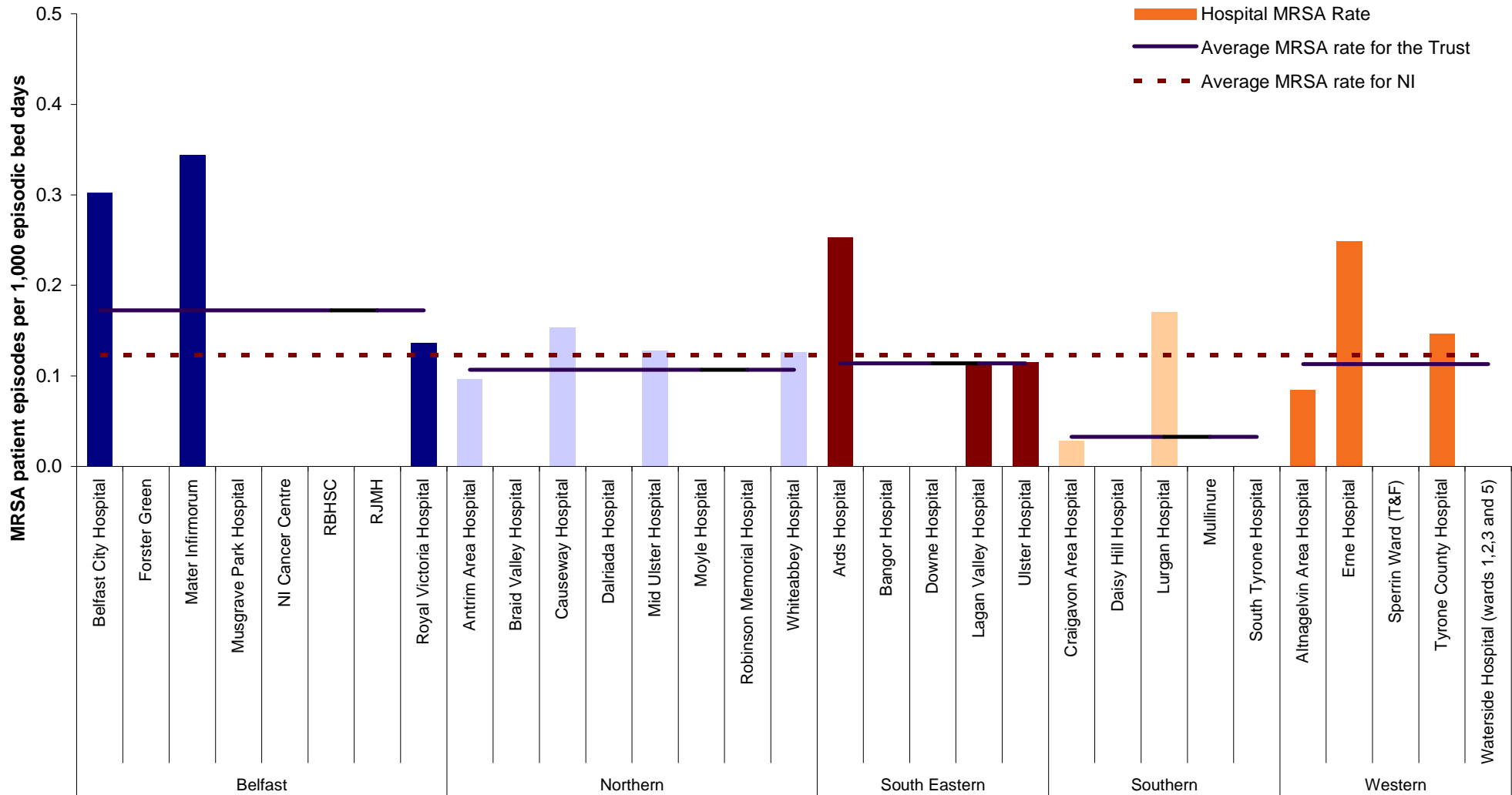
**Figure 4:** MRSA patient episodes by Trust in Quarter 3 from 2005 - 2008, with 95% confidence intervals.



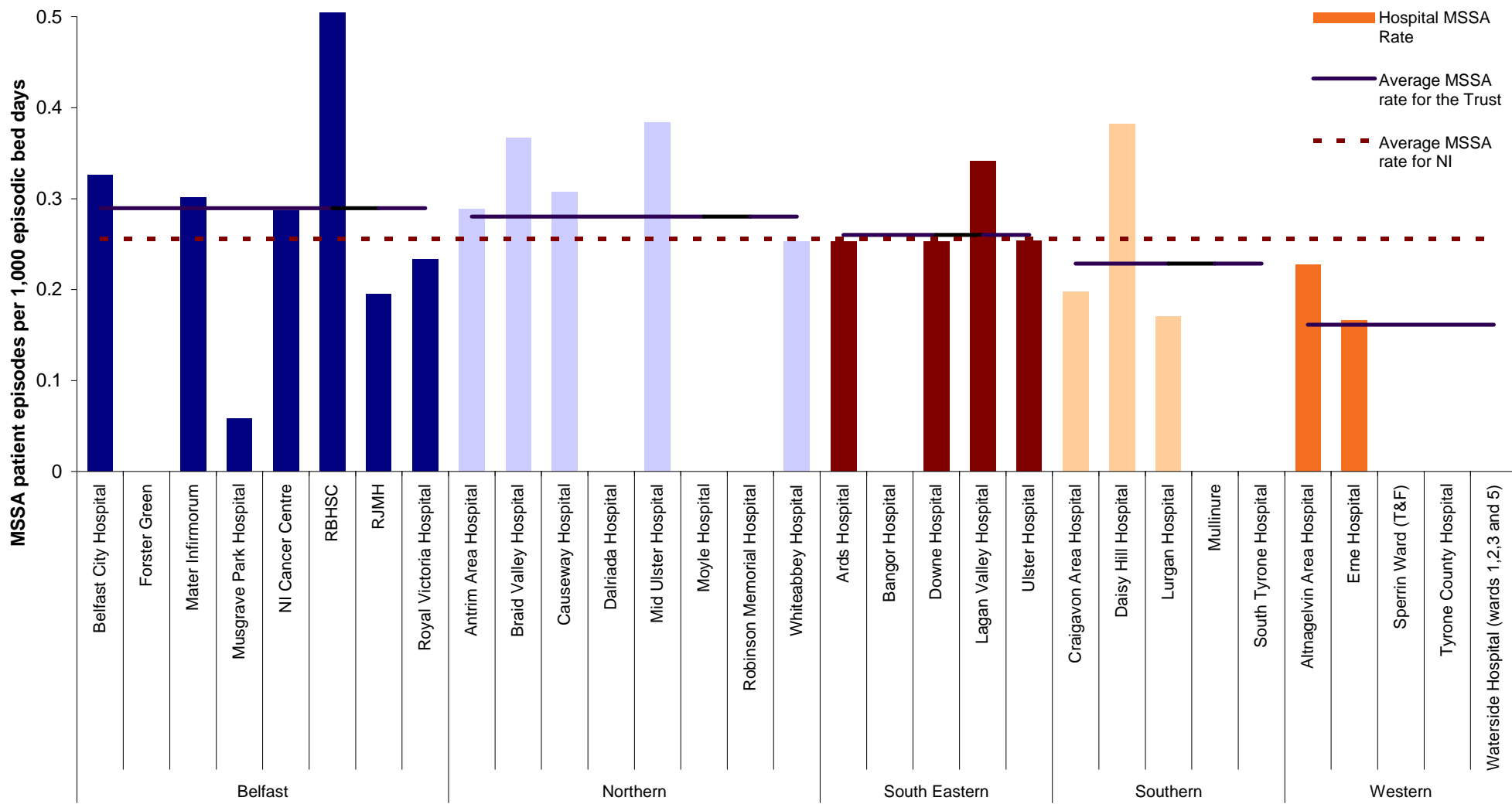
**Figure 5:** Quarterly rates of MSSA by Trust 1 January 2007 – 30 June 2008, with 2007 Trust Annual MSSA rates.



**Figure 6:** MSSA patient episodes by Trust in Quarter 3 from 2005 - 2008, with 95% confidence intervals.



**Figure 7:** Rates of MRSA by individual Hospitals and Trust, 2008 Quarter 3 (gaps represent zero episodes), compared to 2008 Quarter 3 Northern Ireland and Trust average rates.



**Figure 8:** Rates of MSA by individual Hospitals and Trust, 2008 Quarter 3 (gaps represent zero episodes) compared to Quarter 3, 2008, Northern Ireland and Trust average rates.

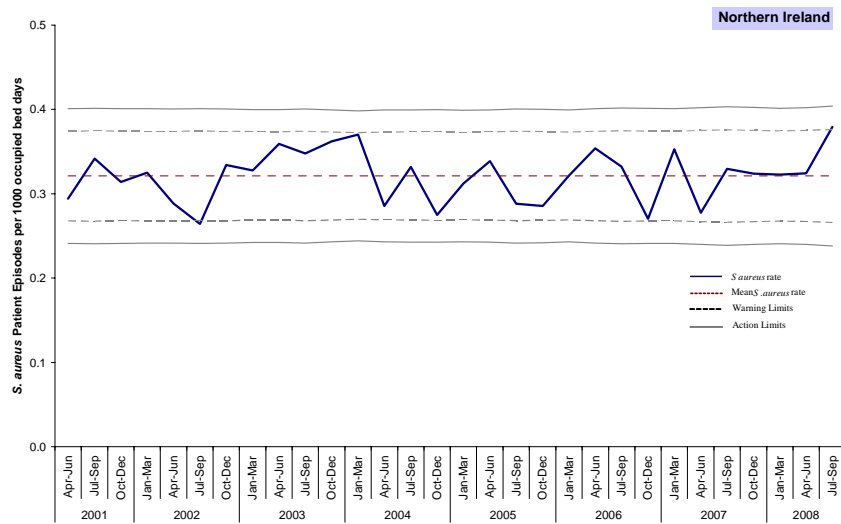


Figure 9a: Statistical Process control chart for quarterly **S.aureus** rates in Northern Ireland

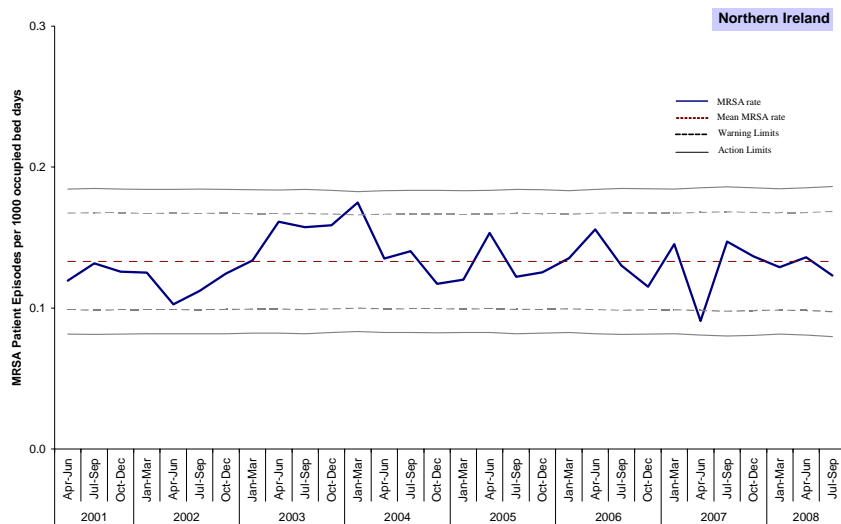


Figure 9b: Statistical Process control chart for quarterly **MRSA** rates in Northern Ireland

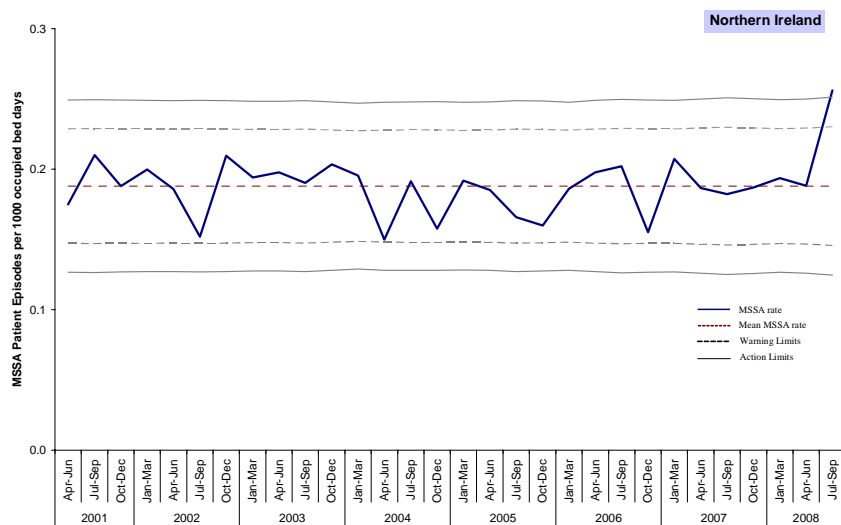


Figure 9c: Statistical Process control chart for quarterly **MSSA** rates in Northern Ireland

## Appendix 1

**Table 1:** Quarterly number of MRSA patient episodes and rates by Hospital, January – September 2008

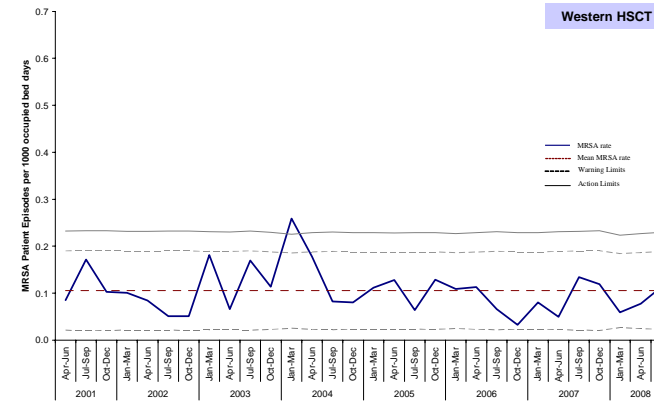
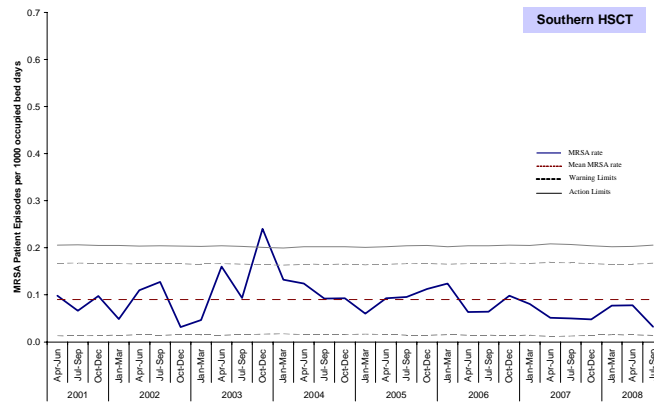
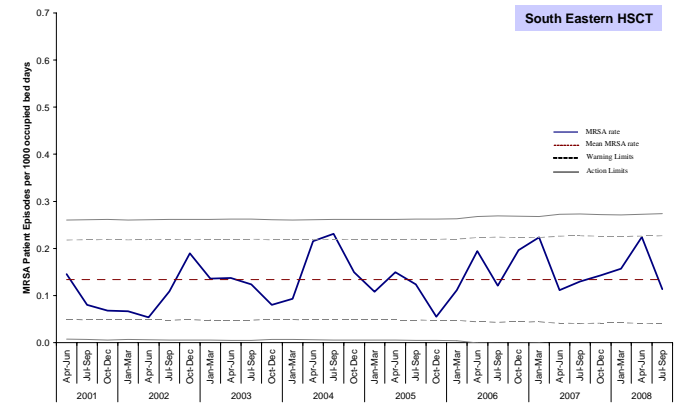
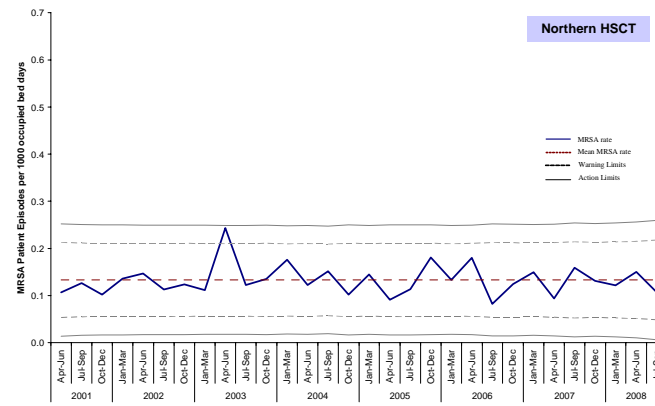
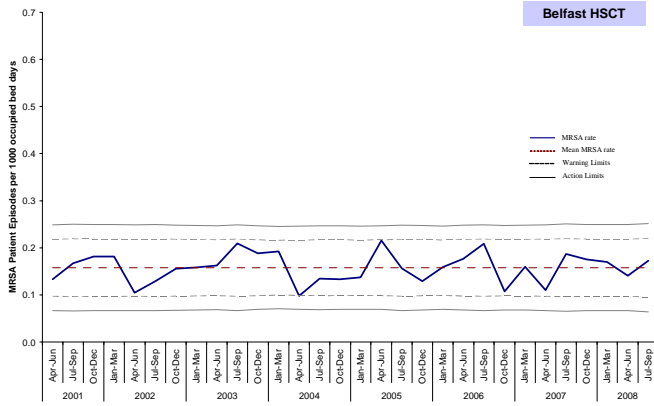
Hospital	Jan - Mar 2008		Apr - Jun 2008		Jul - Sep 2008	
	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	5	0.109	3	0.066	13	0.303
Forster Green Hospital	0	0.000	0	0.000	0	0.000
Mater Infirmorum	8	0.332	8	0.333	8	0.344
Musgrave Park Hospital	1	0.052	0	0.000	0	0.000
NICCO (formerly at Belvoir Park)	1	0.152	0	0.000	0	0.000
RBHSC	1	0.137	1	0.140	0	0.000
RJMH	0	0.000	2	0.202	0	0.000
Royal Victoria Hospital	13	0.239	10	0.183	7	0.136
<b>Belfast Health &amp; Social Care Trust</b>	<b>29</b>	<b>0.170</b>	<b>24</b>	<b>0.141</b>	<b>28</b>	<b>0.173</b>
Antrim Area Hospital	6	0.180	5	0.151	3	0.096
Braid Valley Hospital	0	0.000	1	0.341	0	0.000
Causeway Hospital	2	0.100	3	0.150	3	0.154
Dalriada Hospital	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	0	0.000	2	0.226	1	0.128
Moyle Hospital	1	0.328	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000	0	0.000
Whiteabbey Hospital	1	0.106	1	0.123	1	0.127
<b>Northern Health &amp; Social Care Trust</b>	<b>10</b>	<b>0.122</b>	<b>12</b>	<b>0.151</b>	<b>8</b>	<b>0.107</b>
Ards Hospital	0	0.000	0	0.000	1	0.253
Bangor Hospital	0	0.000	0	0.000	0	0.000
Downe Hospital	1	0.203	3	0.682	0	0.000
Lagan Valley Hospital	1	0.099	0	0.000	1	0.114
Ulster Hospital	8	0.185	11	0.254	5	0.115
<b>South Eastern Health &amp; Social Care Trust</b>	<b>10</b>	<b>0.157</b>	<b>14</b>	<b>0.224</b>	<b>7</b>	<b>0.114</b>
Craigavon Area Hospital	5	0.138	5	0.134	1	0.028
Daisy Hill Hospital	0	0.000	0	0.000	0	0.000
Lurgan Hospital	0	0.000	0	0.000	1	0.170
Mullinure	0	0.000	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	0	0.000	0	0.000
<b>Southern Health &amp; Social Care Trust*</b>	<b>5</b>	<b>0.077</b>	<b>5</b>	<b>0.078</b>	<b>2</b>	<b>0.033</b>
Altnagelvin Area Hospital	4	0.101	3	0.081	3	0.085
Erne Hospital	0	0.000	2	0.162	3	0.249
Sperrin Ward (T&F)	0	0.000	0	0.000	0	0.000
Tyrone County Hospital	0	0.000	0	0.000	1	0.147
Waterside Hospital (Wards 1-3, 5)	0	0.000	0	0.000	0	0.000
<b>Western Health &amp; Social Care Trust</b>	<b>4</b>	<b>0.059</b>	<b>5</b>	<b>0.078</b>	<b>7</b>	<b>0.113</b>
<b>NI TOTAL</b>	<b>58</b>	<b>0.129</b>	<b>60</b>	<b>0.136</b>	<b>52</b>	<b>0.123</b>

Appendix 1

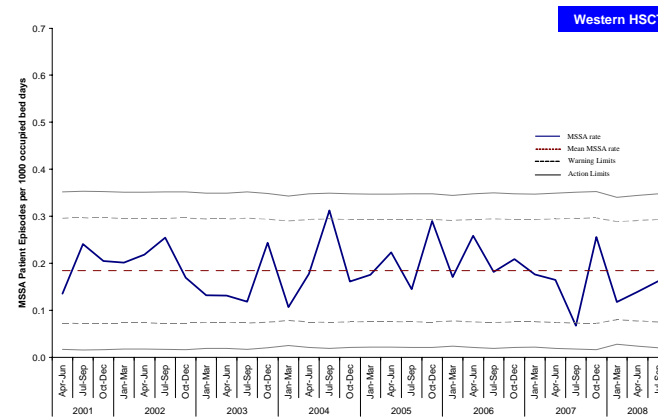
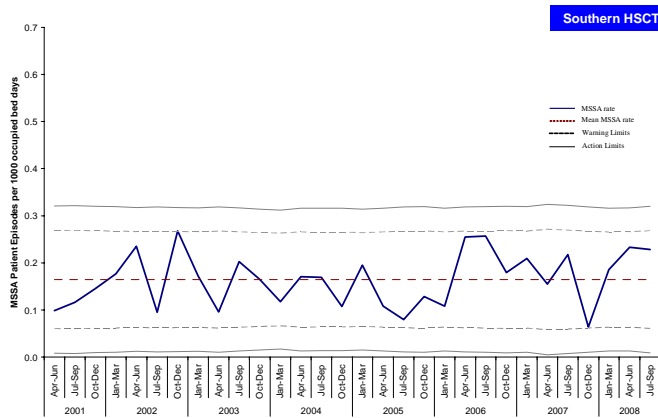
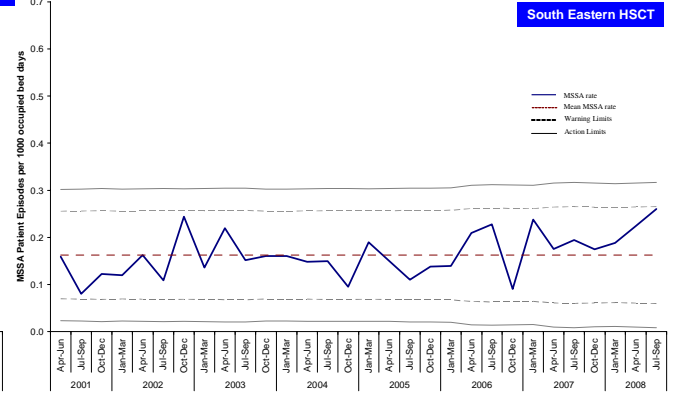
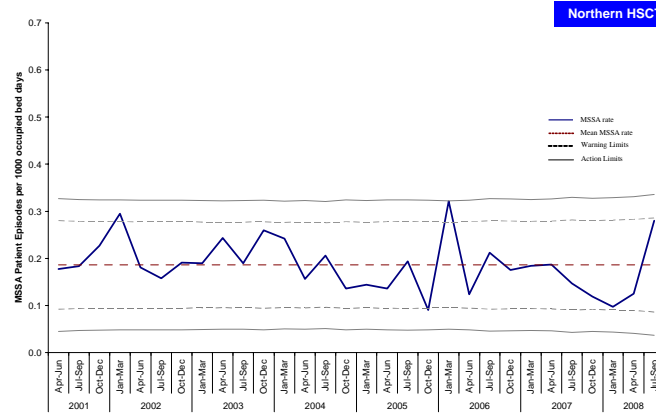
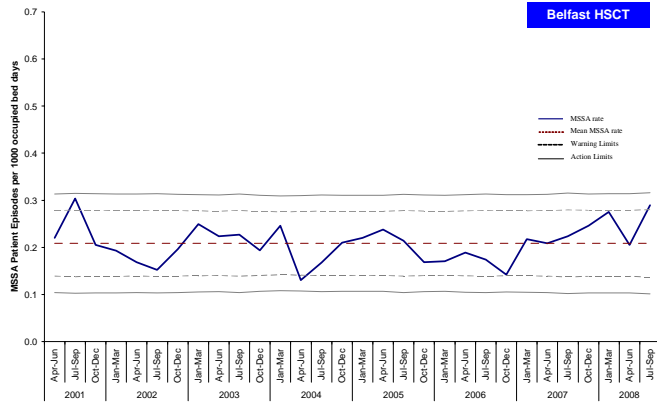
Table 2: Quarterly number of MSSA patient episodes and rates by Hospital, January – September 2008

Hospital	Jan - Mar 2008		Apr - Jun 2008		Jul - Sep 2008	
	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	20	0.436	11	0.243	14	0.326
Forster Green Hospital	0	0.000	0	0.000	0	0.000
Mater Infirmorum	7	0.290	11	0.458	7	0.301
Musgrave Park Hospital	1	0.052	0	0.000	1	0.059
NICCO (formerly at Belvoir Park)	3	0.456	0	0.000	2	0.287
RBHSC	4	0.548	2	0.280	9	1.380
RJMH	4	0.394	3	0.303	2	0.195
Royal Victoria Hospital	8	0.147	8	0.146	12	0.233
<b>Belfast Health &amp; Social Care Trust</b>	<b>47</b>	<b>0.275</b>	<b>35</b>	<b>0.206</b>	<b>47</b>	<b>0.290</b>
Antrim Area Hospital	5	0.150	7	0.211	9	0.289
Braid Valley Hospital	0	0.000	0	0.000	1	0.367
Causeway Hospital	3	0.149	3	0.150	6	0.308
Dalriada Hospital	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	0	0.000	0	0.000	3	0.384
Moyle Hospital	0	0.000	0	0.000	0	0.000
Robinson Memorial Hospital	0	0.000	0	0.000	0	0.000
Whiteabbey Hospital	0	0.000	0	0.000	2	0.253
<b>Northern Health &amp; Social Care Trust</b>	<b>8</b>	<b>0.097</b>	<b>10</b>	<b>0.125</b>	<b>21</b>	<b>0.280</b>
Ards Hospital	0	0.000	0	0.000	1	0.253
Bangor Hospital	0	0.000	0	0.000	0	0.000
Downe Hospital	0	0.000	4	0.909	1	0.253
Lagan Valley Hospital	2	0.199	2	0.213	3	0.341
Ulster Hospital	10	0.231	8	0.185	11	0.254
<b>South Eastern Health &amp; Social Care Trust</b>	<b>12</b>	<b>0.188</b>	<b>14</b>	<b>0.224</b>	<b>16</b>	<b>0.260</b>
Craigavon Area Hospital	11	0.304	9	0.241	7	0.198
Daisy Hill Hospital	1	0.058	5	0.308	6	0.382
Lurgan Hospital	0	0.000	0	0.000	1	0.170
Mullinure	0	0.000	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	1	0.362	0	0.000
<b>Southern Health &amp; Social Care Trust*</b>	<b>12</b>	<b>0.186</b>	<b>15</b>	<b>0.234</b>	<b>14</b>	<b>0.229</b>
Altnagelvin Area Hospital	4	0.101	7	0.188	8	0.227
Erne Hospital	0	0.000	0	0.000	2	0.166
Sperrin Ward (T&F)	0	0.000	0	0.000	0	0.000
Tyrone County Hospital	4	0.518	2	0.281	0	0.000
Waterside Hospital (Wards 1-3, 5)	0	0.000	0	0.000	0	0.000
<b>Western Health &amp; Social Care Trust</b>	<b>8</b>	<b>0.118</b>	<b>9</b>	<b>0.140</b>	<b>10</b>	<b>0.162</b>
<b>NI TOTAL</b>	<b>87</b>	<b>0.194</b>	<b>83</b>	<b>0.188</b>	<b>108</b>	<b>0.256</b>

## Appendix 2: Trends in MRSA rates by Trust and quarter (2001-2008)



## Appendix 2: Trends in MSSA rates by Trust and quarter (2001-2008)



### 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 – September 2008

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	0.193	0.129	0.322	40.1
Apr-Jun 2008	0.188	0.136	0.324	42.0
Jul-Sep 2008	0.256	0.123	0.379	32.5

## 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,  $N_i$  is the number of Occupied Bed-days per quarter and  $E_i$  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 to 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 likely 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 retested. If the new admission is within 14 days of the positive specimen date, for *S. aureus*, then the duplicate rule applies regardless of the change in hospital. That is, if the patient has a reported positive specimen for their previous hospital stay and tests positive during the second admission, if within the duplicate period it should not be reported.