HSC Public Health Agency

S. aureus bacteraemia surveillance

Quarterly report

April-June 2011

Key points

- Overall *S. aureus* (SA) rates for Northern Ireland (MRSA plus MSSA bacteraemias) increased by approximately 9% during quarter two 2011.

- MRSA rates decreased by approximately 11% (from 25 to 21 reports) compared to quarter one 2011.
- The Western HSC Trust reported no episodes of MRSA bacteraemia during quarter two 2011.
- MRSA reports during 2010/11 fell 16% compared to 2009/10.

- MSSA rates increased by approximately 18% (from 62 to 70 reports) compared to quarter one 2011.
- MSSA reports during 2010/11 fell by 22% compared to 2009/10.

- SA rates for quarter two 2011 increased above the lower action limit but below the lower warning limit on the SPC chart for Northern Ireland.
- MRSA rates decreased below the lower action limit on the SPC chart for Northern Ireland.
- MSSA rates remain within expected parameters on the SPC chart for Northern Ireland (Figure 9c).

S. aureus bacteraemia surveillance

S. aureus (MRSA plus MSSA)

- The Northern Ireland rate of SA bacteraemia (MRSA plus MSSA) **increased** from 0.214/1,000 occupied bed days in quarter one 2010 to 0.234/1,000 occupied bed days this quarter (Figure 1 and Table 3).
- In all, 91 SA reports were notified between April to June 2011, an increase of 4 (5%) on the previous quarter (87 reports).

MRSA

- The number of MRSA bacteraemias **decreased** by 16%, from 25 reports in quarter one to 21 reports this quarter (Table 1).
- The MRSA rate **decreased** by 11%, from 0.061/1,000 occupied bed days in quarter one to 0.054/1,000 occupied bed days this quarter (Figure 1 and Table 3).
- The overall percentage of SA patient episodes reported as MRSA **decreased** by approximately 5.7%, from 28.7% in quarter one to 23.1% this quarter (Table 3).
- Two of the five Health and Social Care Trusts (HSCTs) saw a decrease in MRSA rates during this quarter (Figure 3). Regarding the three HSCTs that saw an increase, when the MRSA rates for this quarter are compared to quarter two in previous years, using 95% confidence intervals, there is no statistically significant change (Figure 4).
- The Western HSC Trust reported no episodes of MRSA this quarter; this marks the first instance of a Trust achieving this record, over a 3 month period, since SA surveillance commenced in Northern Ireland.

MSSA

- The number of MSSA bacteraemias **increased** by 13%, from 62 reports in quarter one to 70 reports this quarter (Table 2).
- The MSSA rate **increased** by 18%, from 0.152/1,000 occupied bed days in quarter one to 0.180/1,000 occupied bed days this quarter (Figure 1 and Table 3). There was no statistically significant change in MSSA rates between the two quarters (Figure 1).
- This quarter, all five HSCTs reported higher MSSA rates than MRSA (Figure 2).
- MSSA rates increased in three of the five HSCTs this quarter (Figure 5). However, when compared to quarter two in previous years, there is no statistically significant change in MSSA rates (Figure 6).
- Figures 7 and 8 show the rates of MRSA and MSSA patient episodes in each hospital and HSCT during this quarter (see also 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 HSCT in the form of Statistical Process Control (SPC) charts in Figure 9 and Appendix 2. SPC charts allow a 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 increased above the lower action limit but below the lower warning limit of the regional SPC chart (Figure 9a). MRSA rates decreased below the action limit of the SPC chart (Figure 9b). This suggests that a statistically significant reduction in MRSA rates has occurred this quarter. MSSA rates continue to fluctuate within normal parameters (Figure 9c).

Caveats

- The data in this report reflect SA patient episodes that have been validated by diagnostic laboratories in each HSCT and compared to the Northern Ireland healthcare associated infections (HCAI) web-based surveillance system. The data 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 accident and emergency departments at the time of blood sampling. Although the actual source of infection may have been external to the accident and emergency department where the specimens were tested, these patients are included in the relevant HSCT's quarterly SA total. Transferred patients and duplicates between HSCTs (within 14 days) are removed from the dataset, as much as possible, using information from the usual laboratory reporting systems, including CoSurv and EARSS. It should be noted that the potential for including duplicates remains.
- Appendix 5 has been added to this report to assist with clarification of definitions relating to *S. aureus* patient episodes.
- KH03a bed day data was not available for the Royal Maternity Hospital; therefore, the figures used are based on an estimate generated using quarter two bed day data for this hospital from previous years. This bed day information will be updated when it becomes available.

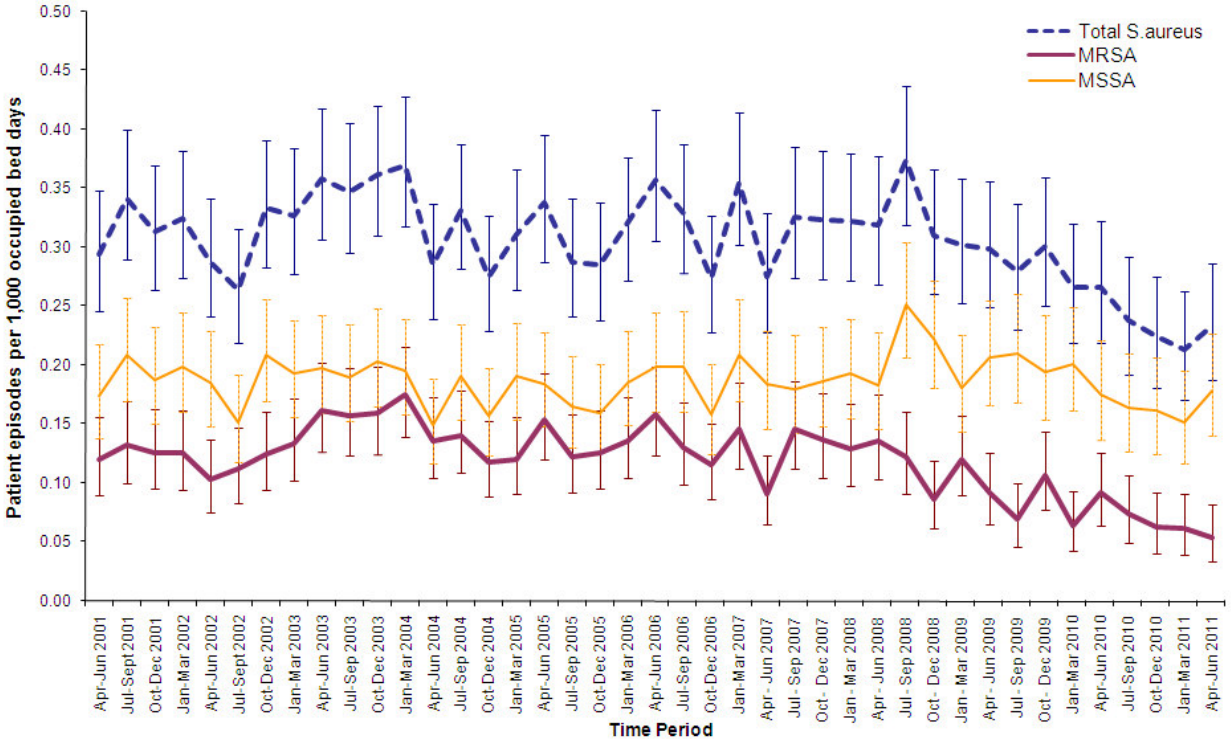


Figure 1: MSSA, MRSA and *S. aureus* patient episode rates in Northern Ireland by quarter, with 95% confidence intervals, April 2001–June 2011 (see Appendix 3)

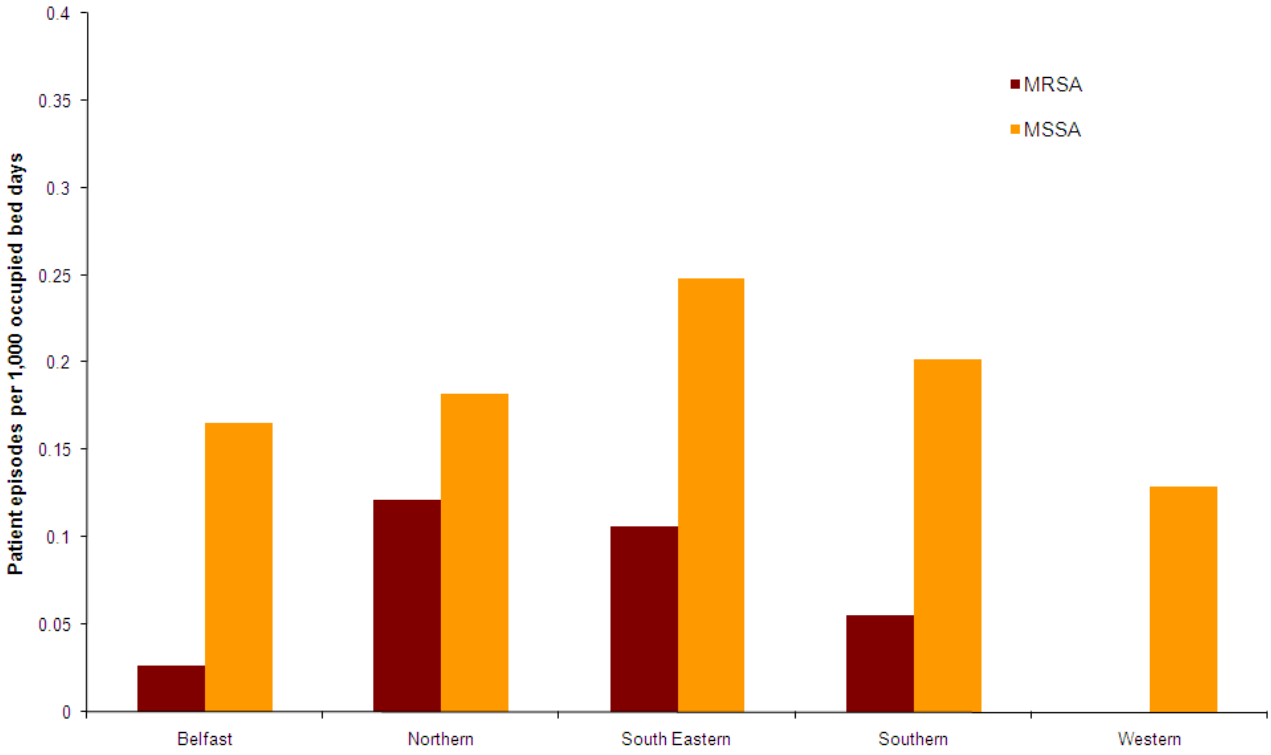


Figure 2: MRSA and MSSA patient episodes per 1,000 occupied bed days, by HSCT, April-June 2011

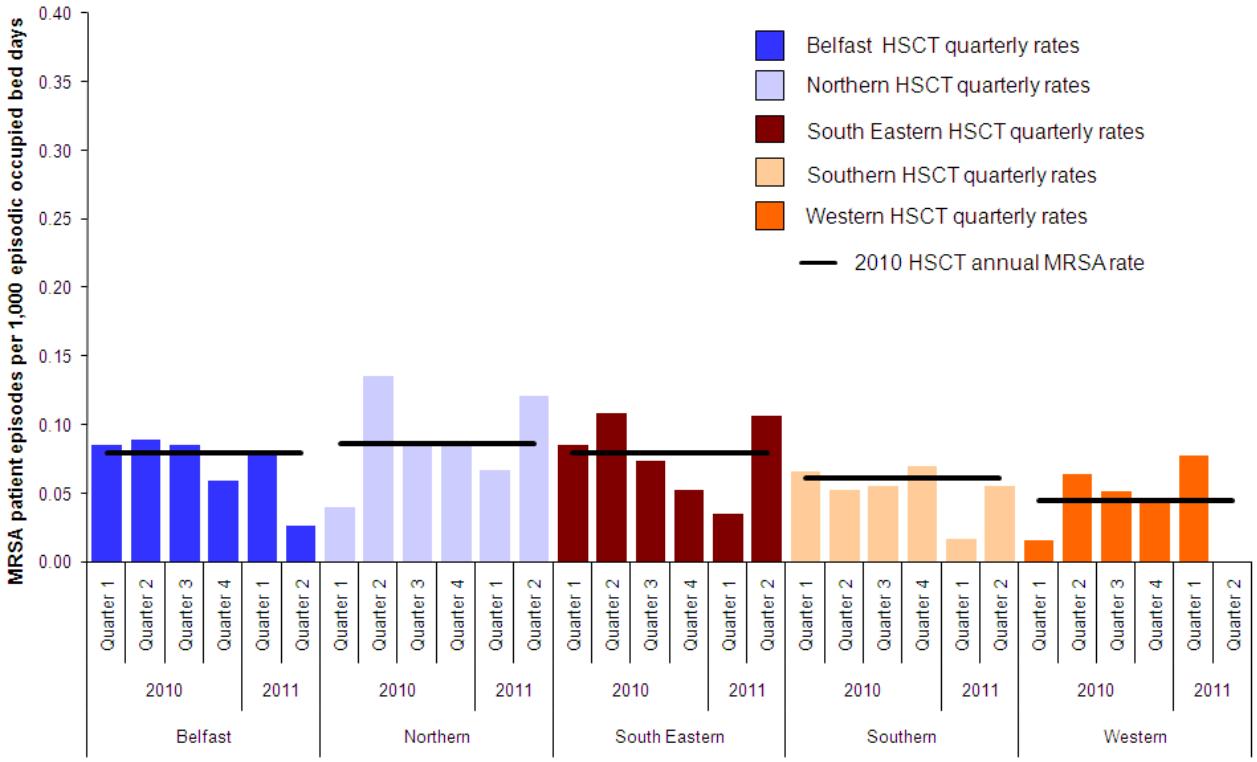


Figure 3: Quarterly rates of MRSA by HSCT, 1 January 2010–30 June 2011, with 2010 HSCT annual MRSA rates

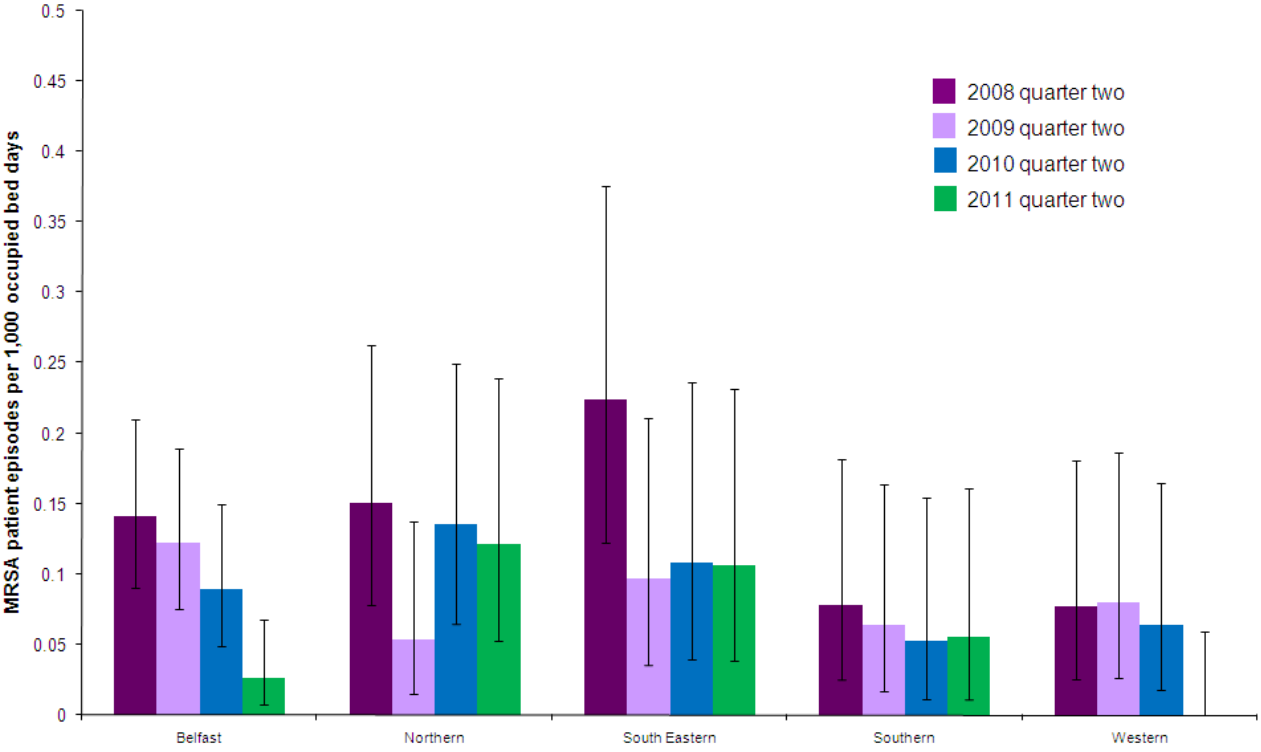


Figure 4: MRSA patient episodes in quarter two, by HSCT, from 2008–2011, with 95% confidence intervals

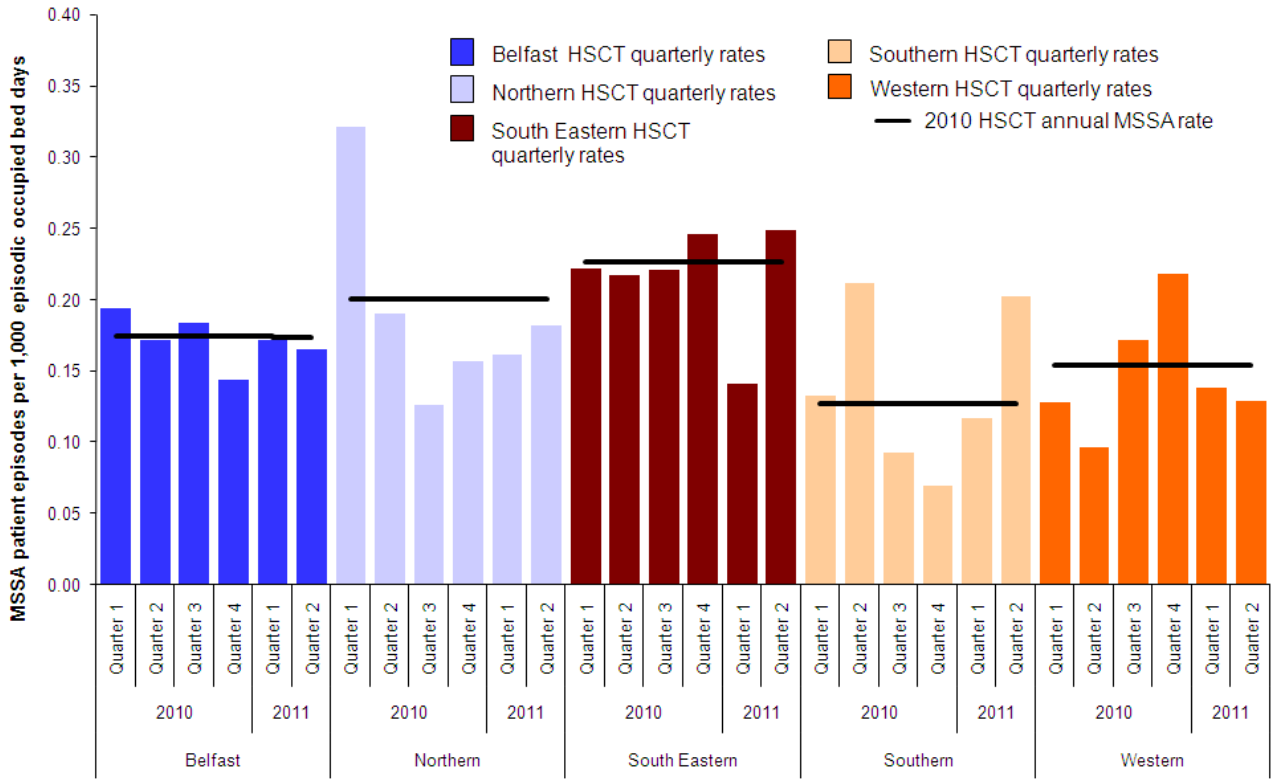


Figure 5: Quarterly rates of MSSA by HSCT, 1 January 2010–30 June 2011, with 2010 HSCT annual MSSA rates

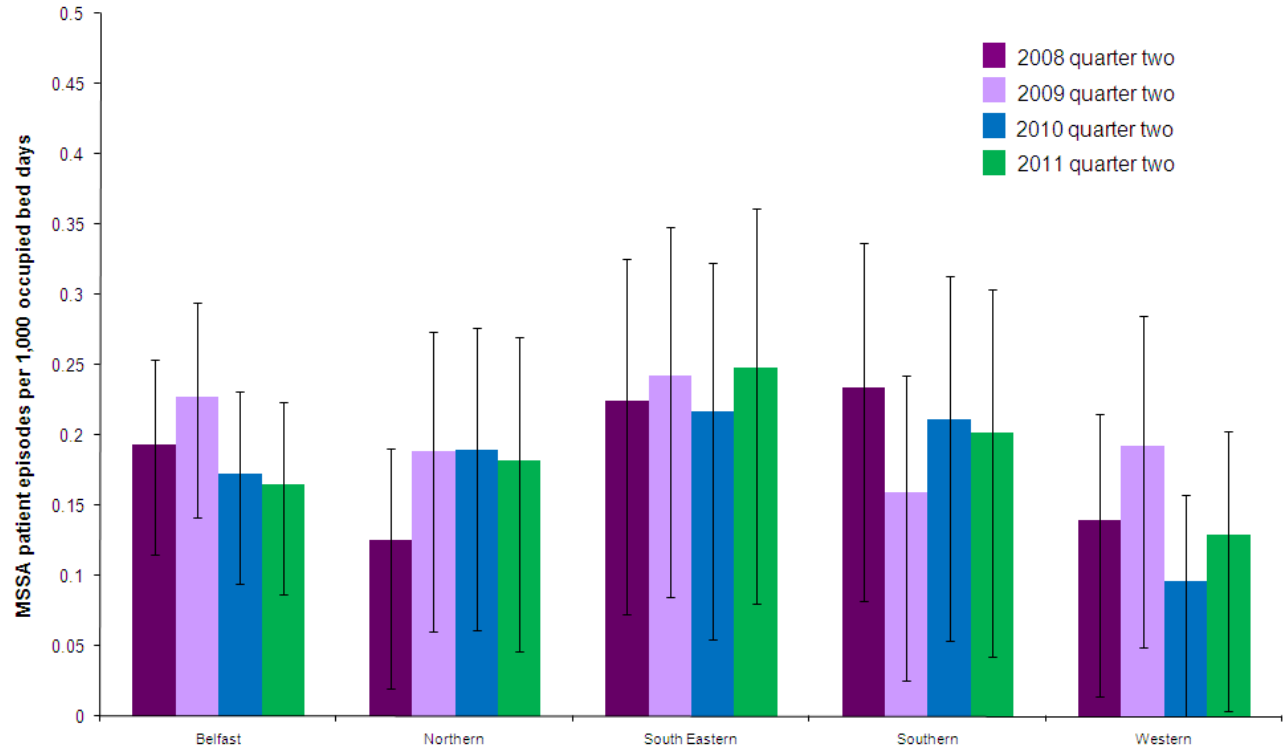


Figure 6: MSSA patient episodes in quarter two, by HSCT, from 2008–2011, with 95% confidence interval

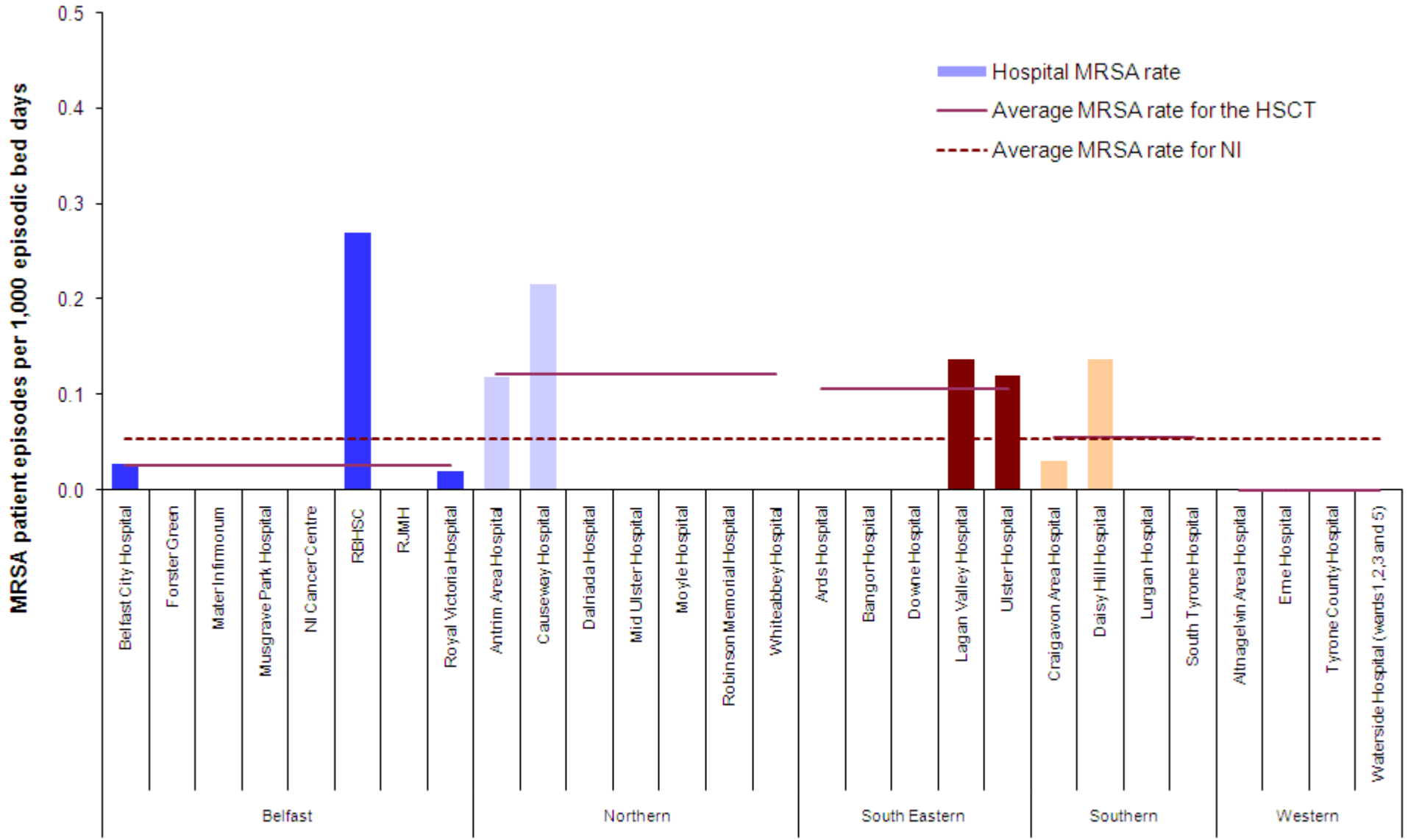


Figure 7: Rates of MRSA, by individual hospitals, for quarter two 2011 (gaps represent zero episodes), compared to quarter two 2011 average rates for Northern Ireland and HSCTs

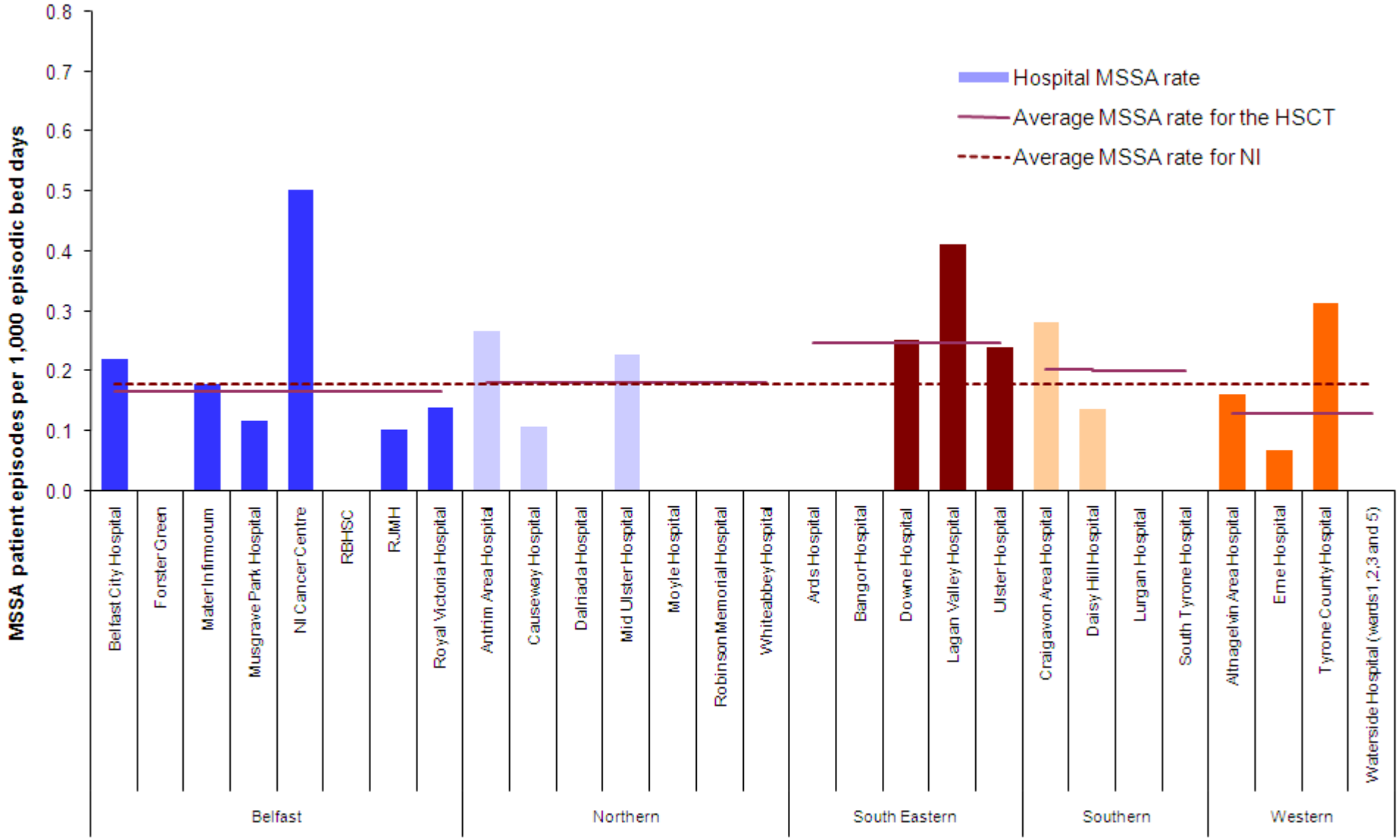


Figure 8: Rates of MSSA, by individual hospitals, for quarter two 2011 (gaps represent zero episodes), compared to quarter two 2011 average rates for Northern Ireland and HSCTs

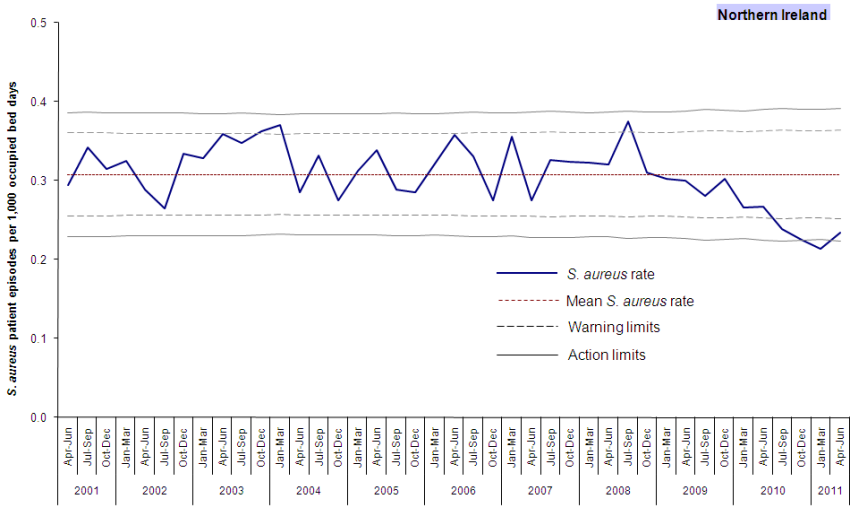


Figure 9a: Statistical process control chart for quarterly *S. aureus* rates in Northern Ireland

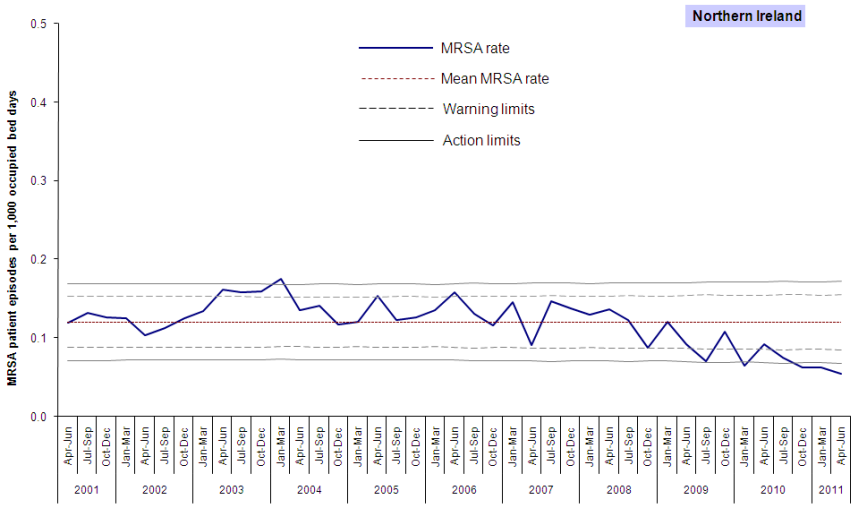


Figure 9b: Statistical process control chart for quarterly MRSA rates in Northern Ireland

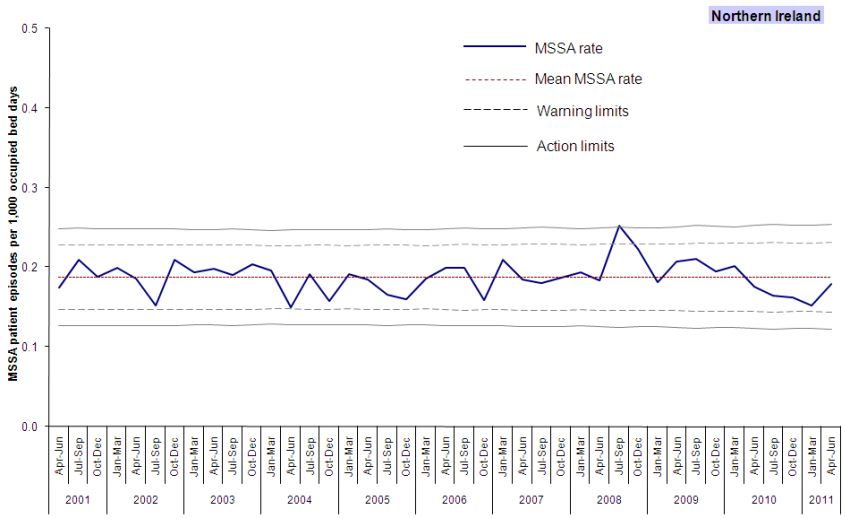


Figure 9c: Statistical process control chart for quarterly MSSA rates in Northern Ireland

Appendix 1

Table 1: Quarterly number and rate of MRSA patient episodes, by hospital, July 2010 – June 2011

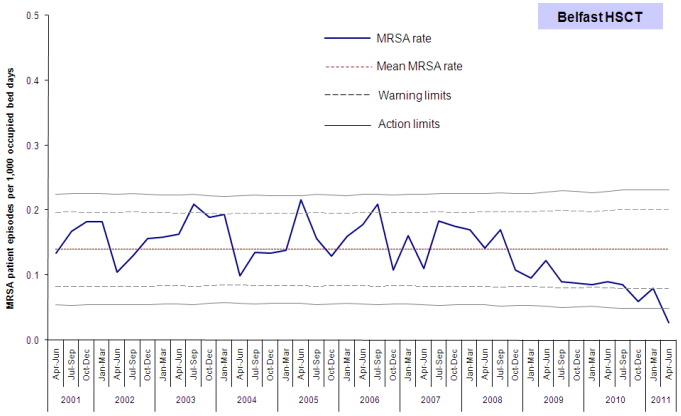
Hospital	Jul - Sep 2010		Oct - Dec 2010		Jan - Mar 2011		Apr - Jun 2011	
	Episodes	Rate	Episodes	Rate	Episodes	Rate	Episodes	Rate
Belfast City Hospital	4	0.104	1	0.026	2	0.054	1	0.028
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	0	0.000	4	0.177	5	0.219	0	0.000
Musgrave Park Hospital	1	0.062	0	0.000	0	0.000	0	0.000
NICCO (formerly at Belvoir Park)	0	0.000	0	0.000	0	0.000	0	0.000
RBHSC	0	0.000	0	0.000	0	0.000	2	0.270
RJMH	0	0.000	0	0.000	0	0.000	0	0.000
Royal Victoria Hospital	8	0.159	4	0.077	5	0.097	1	0.020
Belfast HSCT	**13**	**0.085**	**9**	**0.059**	**12**	**0.079**	**4**	**0.026**
Antrim Area Hospital	3	0.090	5	0.148	3	0.079	4	0.119
Braid Valley Hospital	1	0.334	0	0.000	0	0.000	4	0.000
Causeway Hospital	2	0.104	1	0.054	2	0.107	0	0.216
Dalriada Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	0	0.000	0	0.000	0	0.000	0	0.000
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	0	0.000	0	0.000	0	0.000
Northern HSCT	**6**	**0.084**	**6**	**0.086**	**5**	**0.067**	**8**	**0.121**
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	0	0.000	0	0.000	0	0.000	0	0.000
Lagan Valley Hospital	0	0.000	1	0.120	0	0.000	1	0.137
Ulster Hospital	4	0.101	2	0.048	2	0.048	5	0.120
South Eastern HSCT	**4**	**0.074**	**3**	**0.053**	**2**	**0.035**	**6**	**0.106**
Craigavon Area Hospital	3	0.095	3	0.090	1	0.029	1	0.031
Daisy Hill Hospital	0	0.000	1	0.063	0	0.000	2	0.137
Lurgan Hospital	0	0.000	0	0.000	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Southern HSCT	**3**	**0.056**	**4**	**0.070**	**1**	**0.017**	**3**	**0.055**
Altnagelvin Area Hospital	3	0.084	2	0.053	3	0.079	0	0.000
Erne Hospital	0	0.000	1	0.064	2	0.124	0	0.000
Tyrone County Hospital	0	0.000	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
Western HSCT	**3**	**0.052**	**3**	**0.047**	**5**	**0.077**	**0**	**0.000**
Northern Ireland total	**29**	**0.074**	**25**	**0.062**	**25**	**0.061**	**21**	**0.054**

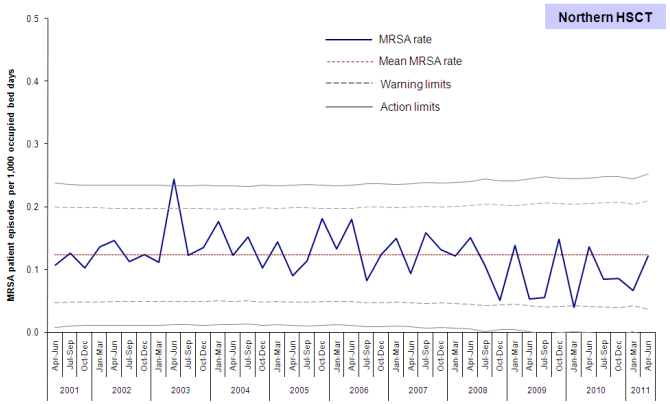
Appendix 1

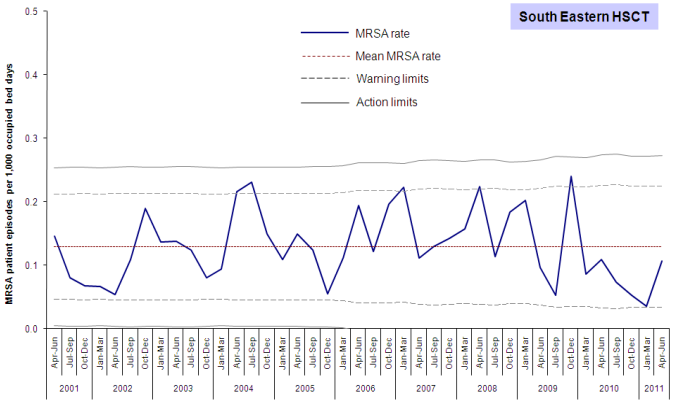
Table 2: Quarterly number and rate of MSSA patient episodes, by hospital, July 2010 – June 2011

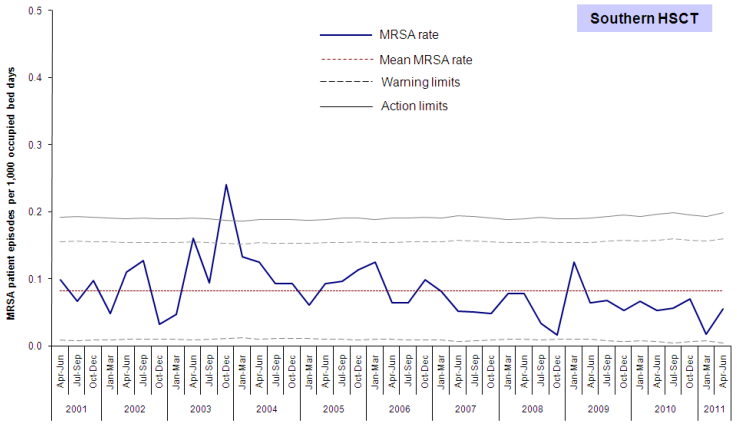
	Jul - Sep 2010		Oct - Dec 2010		Jan - Mar 2011		Apr - Jun 2011	
Hospital	**Episodes**	**Rate**	**Episodes**	**Rate**	**Episodes**	**Rate**	**Episodes**	**Rate**
Belfast City Hospital	7	0.183	6	0.158	7	0.188	8	0.221
Forster Green Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mater Infirmorum	2	0.087	5	0.221	4	0.175	4	0.179
Musgrave Park Hospital	1	0.062	1	0.060	1	0.060	2	0.117
NICCO (formerly at Belvoir Park)	0	0.000	2	0.333	2	0.342	3	0.502
RBHSC	4	0.600	1	0.146	3	0.404	0	0.000
RJMH	1	0.112	0	0.000	0	0.000	1	0.101
Royal Victoria Hospital	13	0.259	7	0.135	9	0.175	7	0.139
Belfast HSCT	**28**	**0.184**	**22**	**0.144**	**26**	**0.171**	**25**	**0.165**
Antrim Area Hospital	6	0.181	7	0.208	7	0.183	9	0.267
Braid Valley Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Causeway Hospital	3	0.156	4	0.214	4	0.214	2	0.108
Dalriada Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	0	0.000	0	0.000	0	0.000	1	0.229
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	0	0.000	1	0.253	0	0.000
Northern HSCT	**9**	**0.127**	**11**	**0.157**	**12**	**0.161**	**12**	**0.182**
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	0.254	1	0.252	0	0.000	1	0.253
Lagan Valley Hospital	0	0.000	1	0.120	1	0.126	3	0.412
Ulster Hospital	11	0.277	12	0.288	7	0.168	10	0.239
South Eastern HSCT	**12**	**0.221**	**14**	**0.246**	**8**	**0.141**	**14**	**0.248**
Craigavon Area Hospital	1	0.032	4	0.121	4	0.115	9	0.283
Daisy Hill Hospital	4	0.275	0	0.000	3	0.182	2	0.137
Lurgan Hospital	0	0.000	0	0.000	0	0.000	0	0.000
South Tyrone Hospital	0	0.000	0	0.000	0	0.000	0	0.000
Southern HSCT	**5**	**0.093**	**4**	**0.070**	**7**	**0.117**	**11**	**0.202**
Altnagelvin Area Hospital	9	0.253	11	0.294	8	0.211	6	0.161
Erne Hospital	1	0.068	3	0.193	1	0.062	1	0.067
Tyrone County Hospital	0	0.000	0	0.000	0	0.000	1	0.313
Waterside Hospital (Wards 1-3, 5)	0	0.000	0	0.000	0	0.000	0	0.000
Western HSCT	**10**	**0.172**	**14**	**0.218**	**9**	**0.139**	**8**	**0.129**
Northern Ireland total	**64**	**0.164**	**65**	**0.162**	**62**	**0.152**	**70**	**0.180**

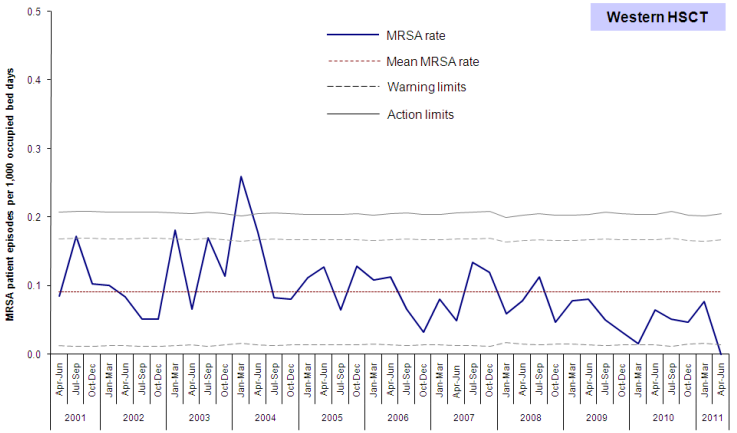
Appendix 2: Trends in MRSA rates, by HSCT and quarter, 2001–2011



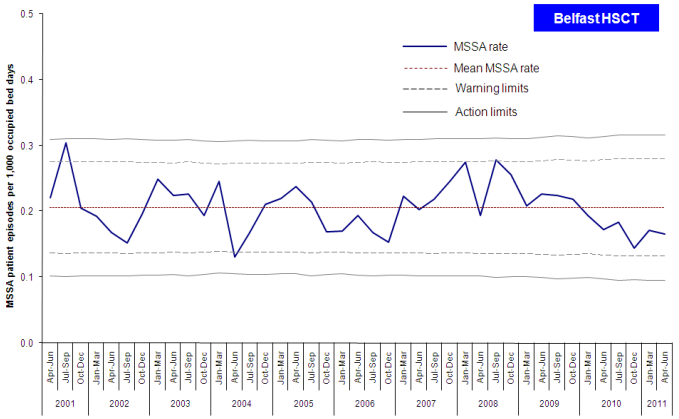


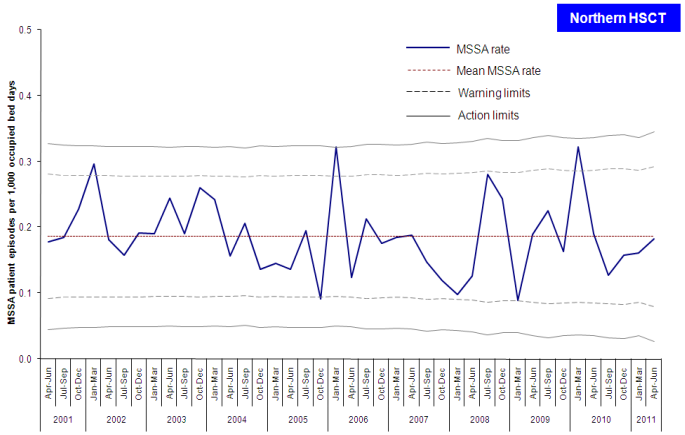


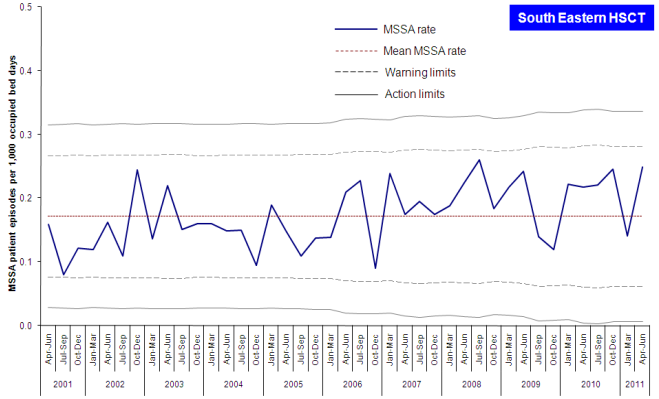


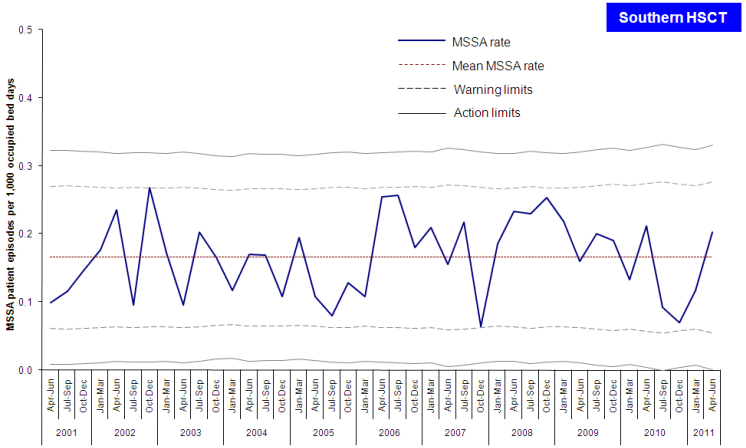


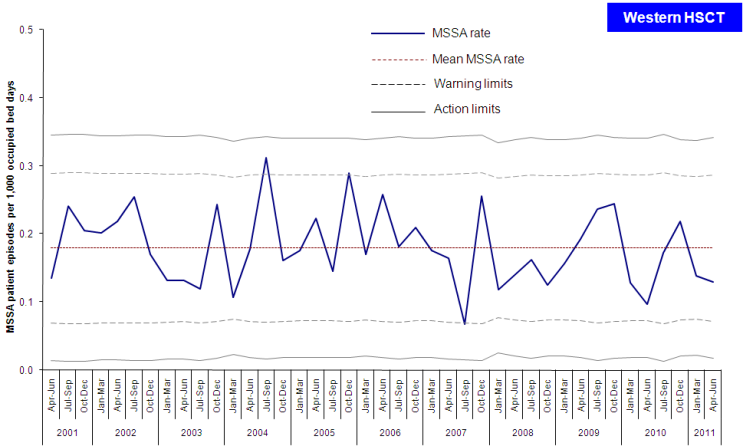
Appendix 2: Trends in MSSA rates, by HSCT and quarter, 2001–2011











Appendix 3

Table 3: MSSA, MRSA and total *S. aureus* patient episode rates, and the percentage of *S. aureus* reported as MRSA, in Northern Ireland, April 2002 – June 2011

Quarter	MSSA rate	MRSA rate	All *S. aureus* rate	% MRSA
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	44.2
Jul-Sep 2006	0.200	0.132	0.332	39.5
Oct-Dec 2006	0.156	0.112	0.269	41.9
Jan-Mar 2007	0.207	0.146	0.353	41.0
Apr-Jun 2007	0.187	0.091	0.277	33.1
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	39.8
Apr-Jun 2009	0.207	0.092	0.299	30.7
Jul-Sep 2009	0.206	0.069	0.275	24.8
Oct-Dec 2009	0.195	0.107	0.302	35.5
Jan-Mar 2010	0.202	0.064	0.266	24.1
Apr-Jun 2010	0.175	0.091	0.267	34.3
Jul-Sep 2010	0.164	0.074	0.239	31.2
Oct-Dec 2010	0.162	0.062	0.224	27.8
Jan-Mar 2011	0.152	0.061	0.214	28.7
Apr-Jun 2011	0.180	0.054	0.234	23.1

Appendix 4

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 HSCT will be largely similar over time. They present the occurrence of *S. aureus* bacteraemias in a HSCT in relation to what would be expected, based upon the mean rate for the HSCT and calculated statistical process control limits.

The mean for each HSCT has been calculated using data from all quarters since April 2001. Control limits, derived from plus or minus two or three 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, while 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 HSCT. Control limits were set up using the following formulae:

$$Warning\ Limit = M \pm 2\sqrt{\frac{\mathrm{Ei}}{(\mathrm{Ni})^2}} \qquad Action\ Limit = M \pm 3\sqrt{\frac{\mathrm{Ei}}{(\mathrm{Ni})^2}}$$

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 $Ei = M \times Ni$

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

- One value above the upper action limit, or below the lower action limit.
- Three consecutive values between the upper warning limit and upper action limit (or between lower limits).
- Eight 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).
- Eight 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 are obtained from the Department of Health, Social Services and Public Safety (DHSSPS) 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, 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/HSCT, symptom free. Upon admission to the second facility, if the patient develops the symptoms of *C. diff* or *S. aureus* within two days and a specimen is taken and tested at this point, the episode is attributed to the current stay, ie the receiving hospital. While the infection may have been acquired during their first hospital admission, it is the hospital where the patient is situated **at the time the specimen is taken** that must report the episode. For this reason, CDSC ensures there are caveats to state that this does not infer the patient acquired their infection in that hospital. HSCTs should be aware of such circumstances, so they are in a position to clarify any episodes that developed within two 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, is 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, the duplicate rule applies regardless of the change of hospital and the isolate should not be reported.

Appendix 6

Table 4: MRSA patient episodes for each financial year, by HSCT

	Financial year					
HSCT	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Belfast	118	115	109	86	62	48
Northern	46	47	42	35	22	27
South Eastern	32	49	34	46	28	15
Southern	27	19	14	16	15	11
Western	27	18	22	20	11	15
Northern Ireland	250	248	221	203	138	116

Table 5: MSSA patient episodes for each financial year, by HSCT

	Financial year					
HSCT	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Belfast	141	130	161	157	138	103
Northern	66	60	46	57	66	46
South Eastern	39	51	46	56	43	46
Southern	27	56	38	59	40	28
Western	52	51	37	37	49	39
Northern Ireland	325	348	328	366	336	262