



CDSC (NI)

***C. difficile* surveillance**

Quarter Ending September 2008

Surveillance of *C. difficile* associated diarrhoea (CDAD)

Key Points

- ❖ **CDAD rates for hospital inpatients, over 65 years of age, in Northern Ireland have continued to decrease during July – September 2008 (Figure 7).**
- ❖ **CDAD reports from ‘community’ patients, over 65 years of age, for the July – September quarter have also decreased by 10% (9 episodes) compared to the previous quarter (Figure 1).**

C. difficile reporting

- ❖ Reports of *C. difficile* are obtained directly from each diagnostic laboratory through the normal laboratory surveillance programme, rather than collecting the data from individual Trusts.
- ❖ Line listings of cases are sent to the diagnostic laboratories who confirm the totals and the break down of patients by source (hospital inpatient/community) according to the information provided on laboratory request forms.
- ❖ **As of 1st April 2008**, mandatory surveillance now covers all individuals over 2 years of age. The quarterly report will continue to summarise data for individuals aged 65 years and over, to reflect the targets that have been set for 2008/09. However, the report also contains data for CDAD episodes in individuals aged 2 years and over (Figure 6; Appendix A Table 2), and for CDAD episodes reported in individuals aged 2-64 years (Appendix A Table 3).
- ❖ This report also contains a summary of Northern Ireland ribotyping results obtained through the mandatory routine ribotyping surveillance scheme (Figure 3; Table 1).

July – September 2008

Figures for patients aged 65 years and over

All CDAD episodes (inpatient and community)

- ❖ During the quarter, 316 episodes of *C. difficile* associated disease were reported in persons aged 65 years and over compared to 338 episodes the previous quarter (7% decrease, 22 reports; Figure 1).
- ❖ The 2008 July - September total CDAD figures are higher than those reported in the same time period in 2007 and 2006 (24.9% and 11.7% respectively; Figure 1).
- ❖ Of the 316 episodes, 238 were known to have been a hospital inpatient in one of the listed hospitals in Appendix A Table 1 at the time of the sample being taken.
- ❖ The remaining 78 isolates reported were from ‘community’ samples which may include: GPs, nursing homes and other such non acute settings. This figure represents a decrease in the proportion of CDAD reports that are from the ‘community’; 25.7% (87/338 episodes) in the April – June quarter compared to 24.7% (78/316) this quarter.

Inpatient episodes

- ❖ There has been a decrease of 13 cases (5.2%) in the number of inpatient cases reported in this quarter (238) when compared to the previous quarter (251). This is the third consecutive quarter in 2008 where there has been a reduction in inpatient

episodes, with a decrease of 53 cases between this quarter and January/March, 2008 (291 cases, 18.2% reduction).

- ❖ Comparing the July – September 2008 period (238 episodes) to the same quarter in 2007 (215 episodes) there has been an increase of 23 cases reported (10.7% increase; Figure 2). However, figures for this quarter are still less than those reported for Quarter 3 in 2005 and 2006 (241 and 244 respectively; Figure 2). For a breakdown by Trust/hospitals see Figures 4 and 5.

Community episodes

- ❖ Community figures have fallen by 9 episodes (10.3%) this quarter (87 reports in April-June to 78 reports this quarter; Figure 1 and Appendix A).
- ❖ When July – September 2008 (78 cases) is compared to the same quarter in 2007 (38 cases) it is clear that there is a significant rise in the number of episodes (40 cases; 105.3% increase; Figure 1). It should be noted that it is not possible to distinguish true ‘community’ episodes from those patients who may have recently been discharged from hospital.

Statistical Process Control charts

- ❖ Control charts are now being used for *C. difficile* surveillance to emulate the current practice for *S. aureus* reporting.
- ❖ Trends in rates since July 2005 are shown for each Trust configuration in appendix B. 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 D.
- ❖ In Northern Ireland, this quarter, the rate of *C. difficile* patient episodes remains within the control limits of the chart (Figure 7).
- ❖ This quarter the rate of *C. difficile* patient episodes in the Belfast Trust breached the action limit of the chart (Appendix B).
- ❖ The Southern Trust has crossed the warning limit and if this continues for 3 consecutive quarters it is indicative of special cause variation.

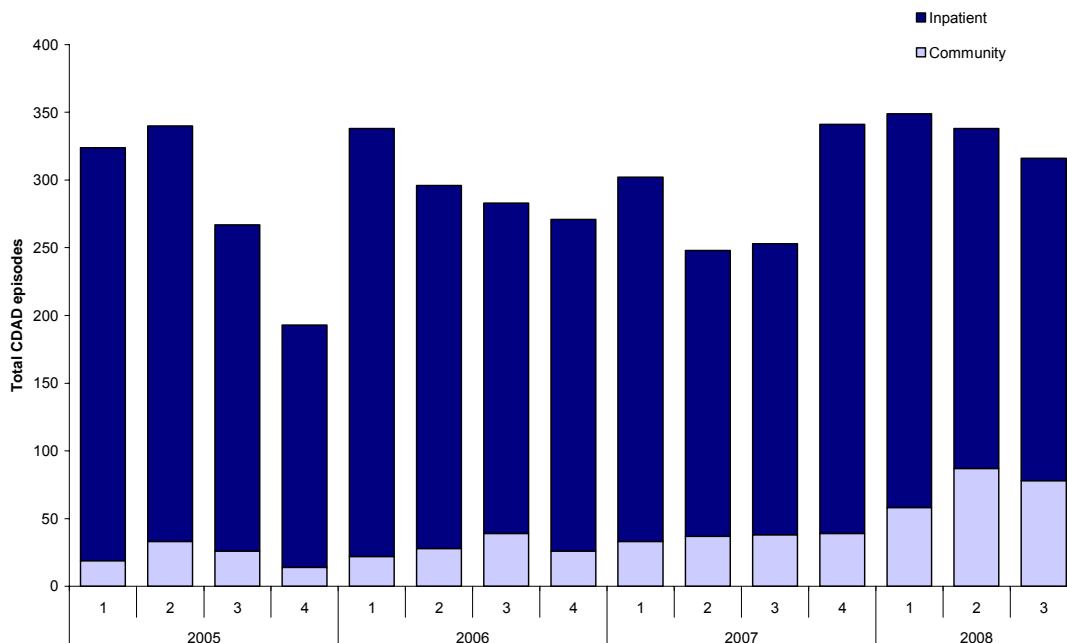


Figure 1: Total CDAD reports, inpatient and community, in Northern Ireland, by quarter (patients ≥ 65 years), between 2005 and 2008.

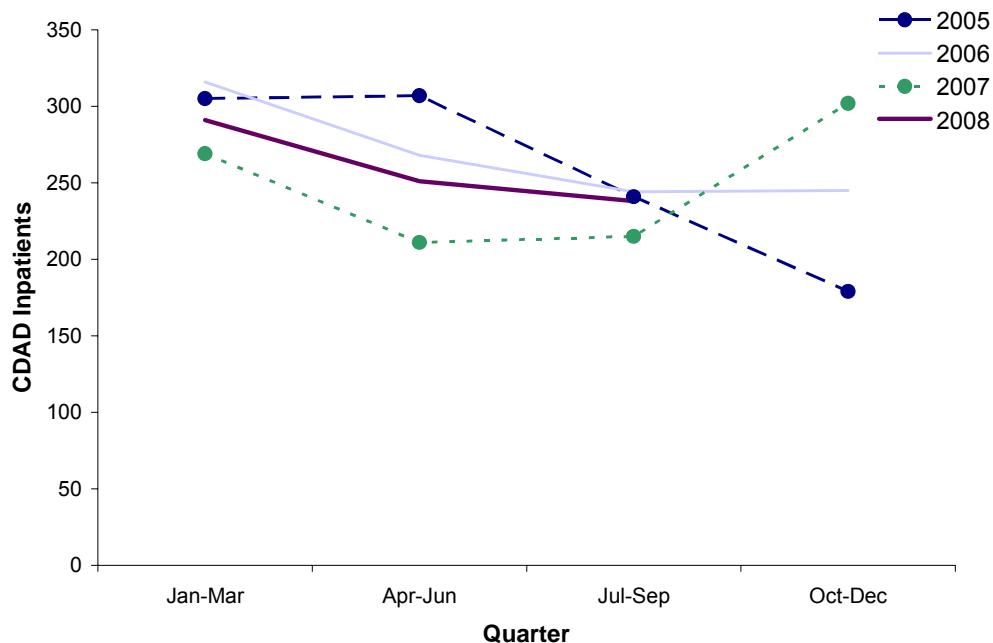


Figure 2: Total CDAD ‘Inpatient’ reports, Northern Ireland, by quarter (patients \geq 65 years), between 2005 and 2008.

Figures for patients aged 2 years and over

All CDAD episodes (inpatient and community)

- ❖ During the quarter, 421 episodes of *C. difficile* associated disease were reported in persons aged 2 years and over. This represents a 4% decrease from the previous quarter (439 episodes). Of the 421 episodes 75% were in patients (inpatient and community) aged 65 years and over.
- ❖ 312 patients were known to have been a hospital inpatient in one of the listed hospitals in Appendix A Table 2 at the time of the sample being taken (Figure 6). Of the 312, 76% occurred in patients aged 65 years and over.
- ❖ The remaining 109 isolates reported were from ‘community’ samples which may include: GPs, nursing homes and other such non acute settings. Of the 109, 72% occurred in patients aged 65 years and over. It should be noted that it is not possible to distinguish true ‘community’ episodes from those patients who may have recently been discharged from hospital.
- ❖ For a breakdown of episodes in individuals aged 2-64 years see Appendix A Table 3.

Rates of hospital inpatient *C. difficile* reports

- ❖ All Trusts provide appropriate denominator data (bed occupancy for patients \geq 65 years) on a regular basis, making the calculation of *C. difficile* rates possible for their constituent hospitals (Figure 5). Notes on this denominator are included in Appendix C.
- ❖ To determine the rate of *C. difficile* infection in individuals aged 2 years and over the most appropriate denominator data is all age bed occupancy determined using the KH03A return (number of occupied beds) which is obtained from DHSSPS on a quarterly basis.

- ❖ Bed day data was not available for Forster Green and Musgrave Park Hospitals, therefore these figures are based on estimates. The bed day information will be updated when it becomes available.
- ❖ This quarter maintenance work was carried out in the Robinson Memorial Hospital which significantly reduced their bed day data. This may have slight implications for the overall Northern Trust figure.

Ribotype surveillance

- ❖ The latest data received from the routine mandatory surveillance scheme is presented in table 1. The proportion of samples represented by ribotype 078 has decreased substantially from the previous quarter.
- ❖ Ribotype information for C diff episodes in the Northern Trust have been extracted from lab reports to CoSurv. This data is presented in Table 2. The proportion of the sample represented by ribotype 027 has been decreasing each quarter.
- ❖ The data presented in these tables represents C diff ribotypes and not patient episodes. That is, one patient may have two different ribotypes reported for the same specimen.

Changes to the Belfast Trust figures

- ❖ Due to a coding error in the lab systems a look back exercise has been carried out for the Belfast Trust from April 2006 to present. As a result, the financial year baseline and targets for the Belfast Trust have been revised. This will cause a small change in the Northern Ireland figure. To reflect these changes episode data for the first two quarters of 2008 have also been updated (see Appendix A).

Clarification of episode definitions

- ❖ Due to a number of queries about the assignment of episodes to Trusts new information to reflect situations that may arise and the action to be taken has been applied in Appendix E.

Table 1: Total number of individual ribotypes, and percentage contribution to the total, reported in Northern Ireland* during routine surveillance, April – September 2008 (*excludes Northern Trust data). **Figures are provisional.** Data courtesy of Professor M Wilcox, Leeds.

Ribotype	Apr – Jun 08		Jul – Sep 08	
	Number	% total	Number	% total
001	25	19.2	28	20.4
002	5	3.8	6	4.4
003	1	0.8	0	0.0
005	2	1.5	3	2.2
014/20	10	7.7	7	5.1
015	3	2.3	5	3.6
017	0	0.0	1	0.7
018	0	0.0	1	0.7
019	1	0.8	0	0.0
023	3	2.3	1	0.7
026	1	0.8	0	0.0
027	6	4.6	2	1.5
044	2	1.5	1	0.7
045	0	0.0	1	0.7
049	1	0.8	1	0.7
050	0	0.0	1	0.7
055	0	0.0	1	0.7
062	0	0.0	1	0.7
070	0	0.0	2	1.5
078	27	20.8	5	3.6
081	1	0.8	0	0.0
106	10	7.7	13	9.5
115	0	0.0	2	1.5
198	0	0.0	1	0.7
Culture Unsuccessful	19	14.6	40	29.2
Sporadic	0	0.0	4	2.9
Unrecognised Profiles	11	8.5	0	0.0
Unique Ribotypes	2	1.5	7	5.1
Unknown	0	0.0	3	2.2
Grand Total	130	-	137	-

Table 2: Total number of individual ribotypes within the Northern Trust, and percentage contribution to the total, reported by the Trust to CoSurv, January – September 2008. **Figures are provisional.** Data courtesy of Dr J Brazier, Cardiff.

Ribotype	Jan – Mar 08		Apr – Jun 08		Jul – Sep 08	
	Number	% total	Number	% total	Number	% total
001	15	16.1	9	11.0	4	9.1
002	3	3.2	4	4.9	2	4.5
003	0	0.0	0	0.0	1	2.3
005	2	2.2	1	1.2	5	11.4
008	0	0.0	0	0.0	1	2.3
012	2	2.2	2	2.4	0	0.0
013	0	0.0	0	0.0	1	2.3
014	1	1.1	3	3.7	2	4.5
015	2	2.2	3	3.7	2	4.5
018	0	0.0	0	0.0	1	2.3
020	6	6.5	2	2.4	2	4.5
023	0	0.0	2	2.4	0	0.0
026	2	2.2	1	1.2	0	0.0
027	41	44.1	23	28.0	10	22.7
042	1	1.1	2	2.4	0	0.0
046	0	0.0	1	1.2	0	0.0
050	1	1.1	0	0.0	1	2.3
054	0	0.0	0	0.0	1	2.3
057	1	1.1	0	0.0	0	0.0
059	0	0.0	1	1.2	0	0.0
064	1	1.1	1	1.2	0	0.0
075	2	2.2	0	0.0	0	0.0
076	0	0.0	0	0.0	1	2.3
078	6	6.5	15	18.3	9	20.5
088	0	0.0	1	1.2	0	0.0
106	4	4.3	4	4.9	0	0.0
118	0	0.0	2	2.4	0	0.0
126	1	1.1	0	0.0	0	0.0
137	0	0.0	1	1.2	0	0.0
139	0	0.0	1	1.2	0	0.0
145	0	0.0	1	1.2	0	0.0
176	0	0.0	1	1.2	0	0.0
177	1	1.1	0	0.0	0	0.0
186	0	0.0	0	0.0	1	2.3
193	1	1.1	0	0.0	0	0.0
203	0	0.0	1	1.2	0	0.0
Grand Total	93	-	82	-	44	-

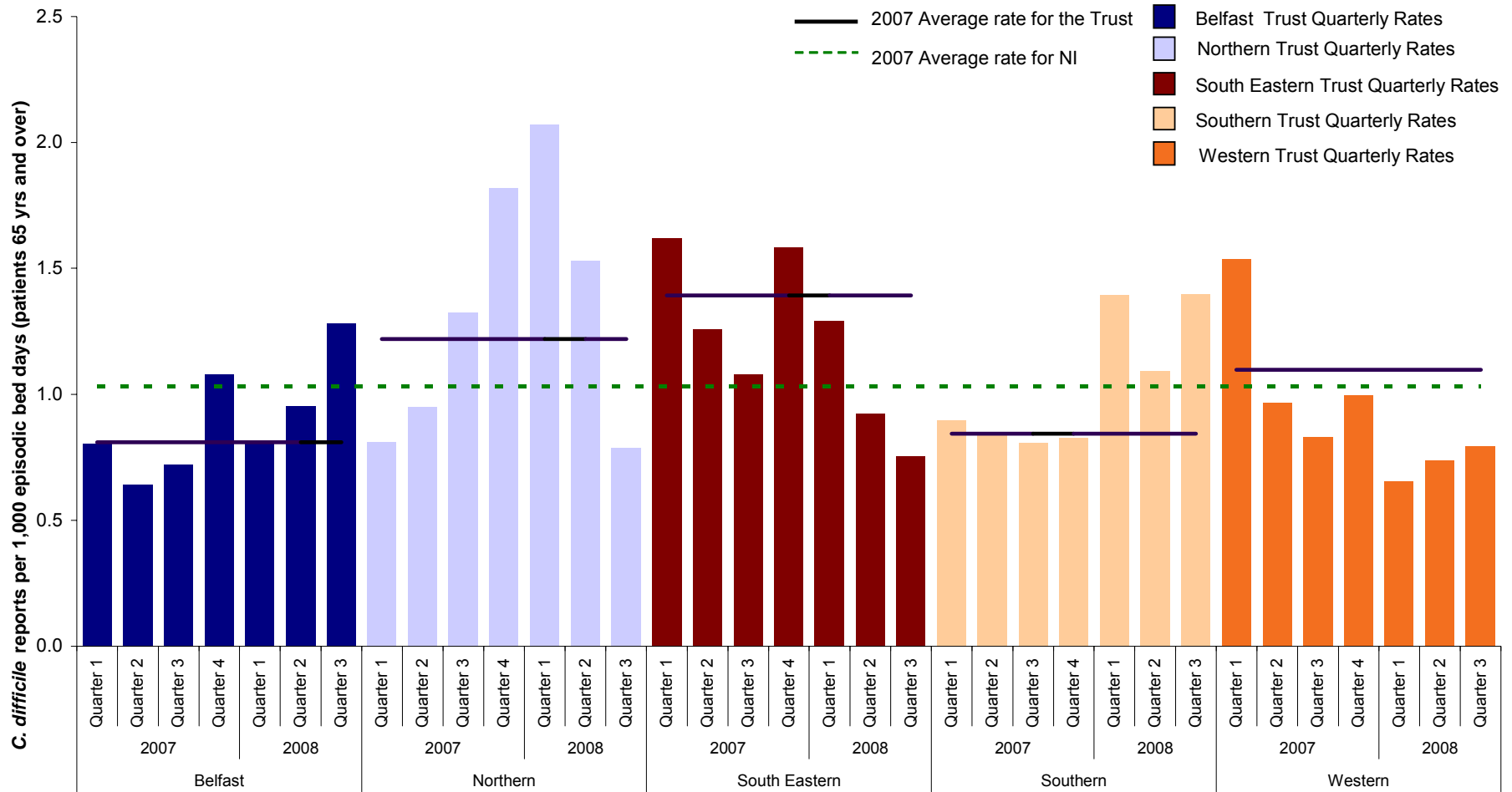


Figure 4: Quarterly rates of *Clostridium difficile* by Trust 1 January 2007 – 30 September 2008, compared with annual NI and Trust rates for 2007; inpatients ≥ 65 years.

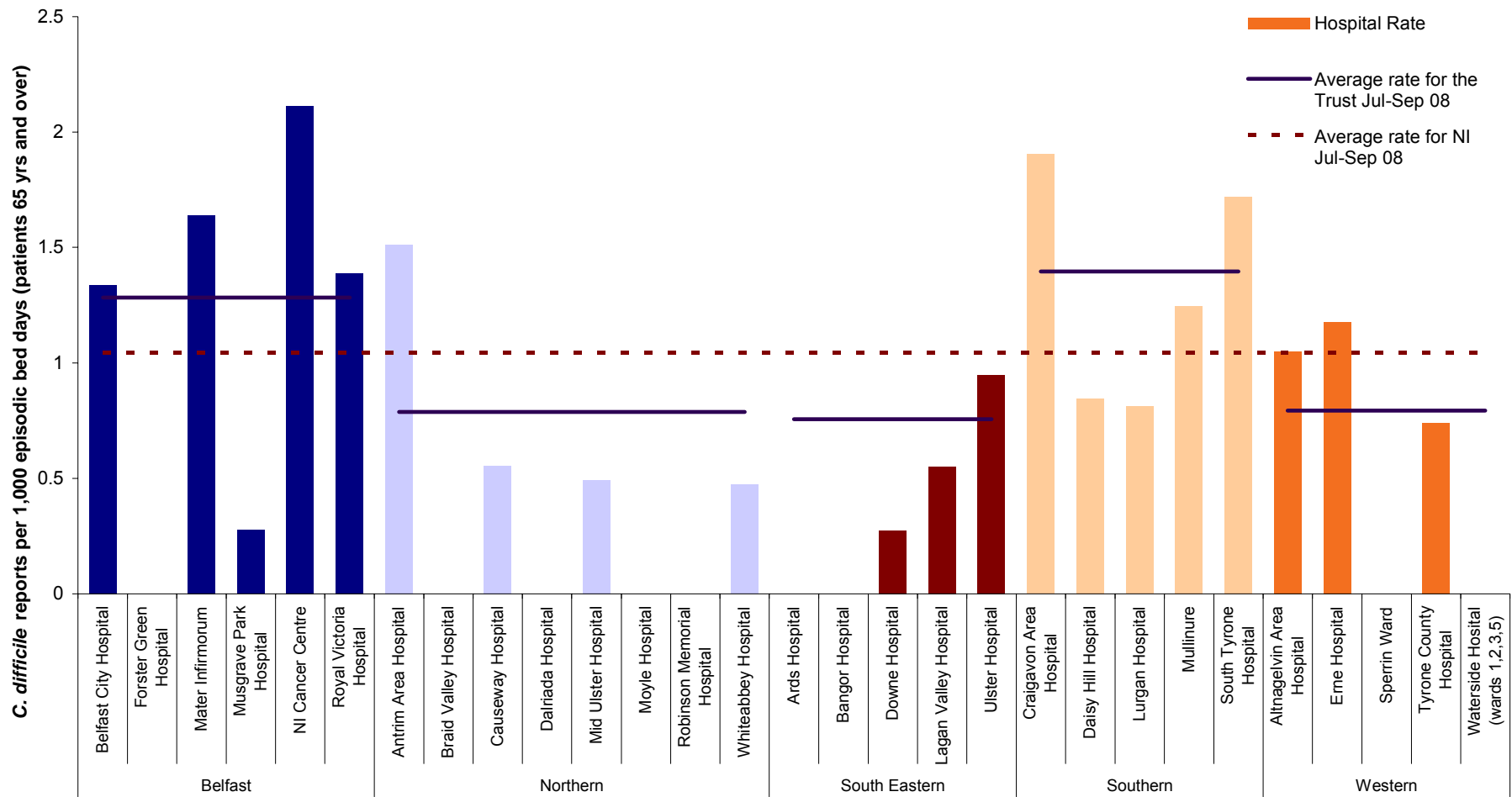


Figure 5: Rates of *Clostridium difficile* by individual Hospitals and Trusts, 2008 Quarter 3 (inpatients ≥ 65 years), including the quarterly Trust rates and an average rate for NI, gaps represent zero episodes (see appendix A Table 1).

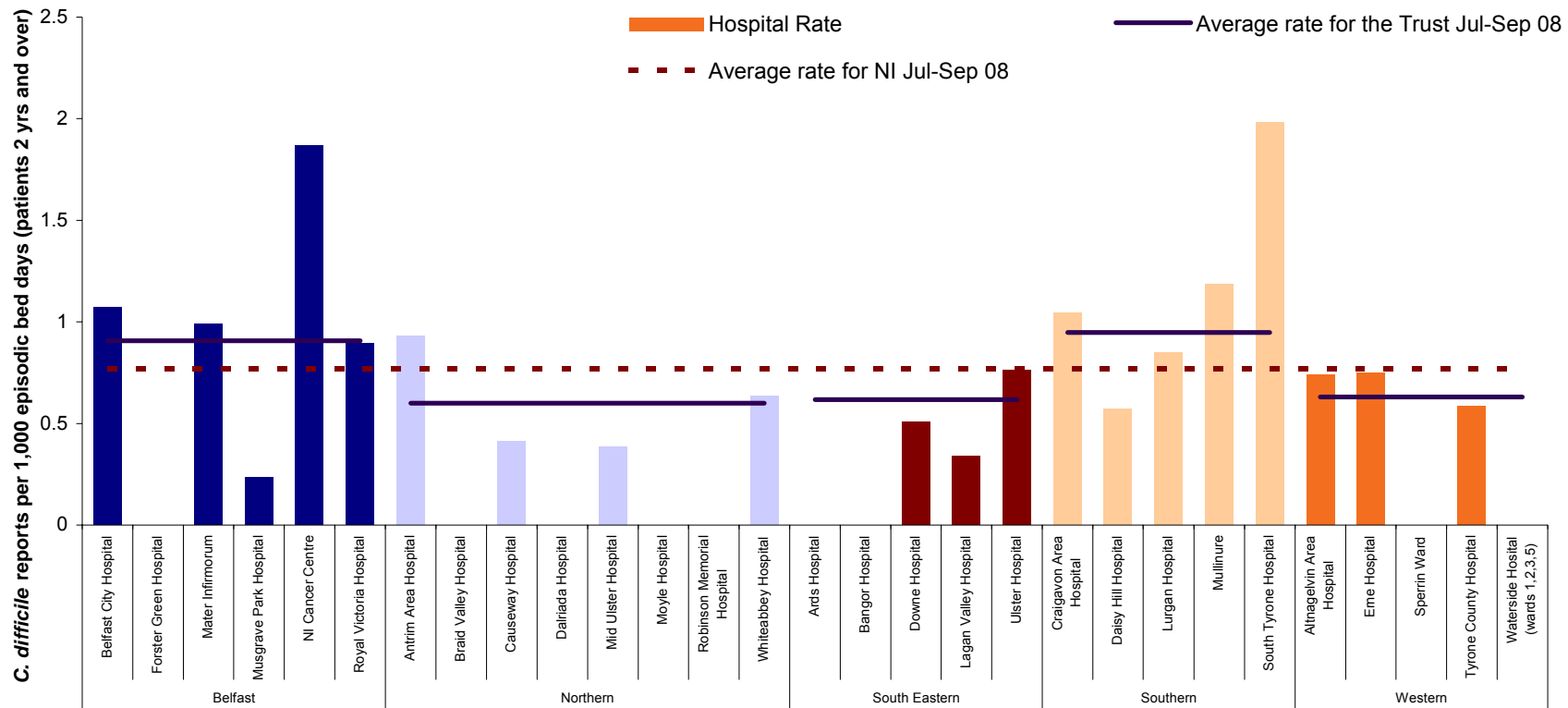


Figure 6: Rates of *Clostridium difficile* by individual Hospitals and Trusts, 2008 Quarter 3 (inpatients 2 years and over), including the quarterly Trust rates and an average rate for NI, gaps represent zero episodes (see appendix A Table 2).

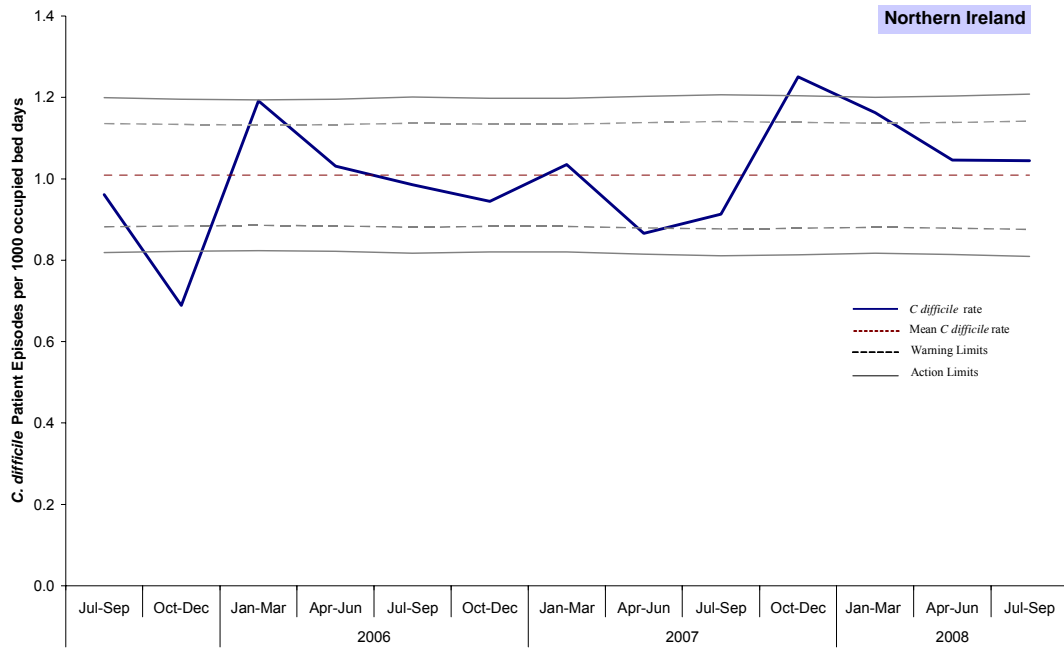


Figure 7: Statistical Process Control chart for quarterly *C difficile* rates in inpatients, in Northern Ireland (For Trust level see Appendix B).

Appendix A

Table 1: Quarterly number of *Clostridium difficile* patient episodes, patients 65 years and over, 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	21	0.674	25	0.846	35	1.338
Forster Green Hospital	0	0.000	0	0.000	0	0.000
Mater Infirmorum	17	1.339	21	1.695	20	1.641
Musgrave Park Hospital	2	0.184	6	0.588	3	0.276
NICCO (formerly at Belvoir Park)	5	1.656	2	0.573	7	2.113
Royal Victoria Hospital	26	0.879	24	0.923	36	1.388
Belfast Health & Social Care Trust	71	0.808	78	0.953	101	1.283
Antrim Area Hospital	49	3.097	36	2.240	23	1.511
Braid Valley Hospital	0	0.000	0	0.000	0	0.000
Causeway Hospital	11	1.164	13	1.292	5	0.556
Dalriada Hospital	0	0.000	0	0.000	0	0.000
Mid Ulster Hospital	16	2.578	9	1.335	3	0.492
Moyle Hospital	0	0.000	0	0.000	0	0.000
Robinson Memorial Hospital	1	0.566	1	0.531	0	0.000
Whiteabbey Hospital	16	2.426	13	2.050	3	0.473
Northern Health & Social Care Trust	93	2.070	72	1.530	34	0.788
Ards Hospital	1	0.677	1	0.760	0	0.000
Bangor Hospital	0	0.000	0	0.000	0	0.000
Downe Hospital	5	1.377	4	1.222	1	0.274
Lagan Valley Hospital	5	0.690	4	0.650	3	0.549
Ulster Hospital	39	1.568	25	1.012	24	0.947
South Eastern Health & Social Care Trust	50	1.293	34	0.923	28	0.756
Craigavon Area Hospital	31	1.951	28	1.706	28	1.904
Daisy Hill Hospital	7	0.752	7	0.799	7	0.846
Lurgan Hospital	9	1.332	2	0.309	5	0.812
Mullinure	2	1.122	1	0.551	2	1.245
South Tyrone Hospital	2	0.708	2	0.644	5	1.719
Southern Health & Social Care Trust*	51	1.395	40	1.094	47	1.397
Altnagelvin Area Hospital	14	0.745	20	1.140	17	1.051
Erne Hospital	3	0.449	0	0.000	7	1.178
Sperrin Ward (T&F)	0	0.000	0	0.000	0	0.000
Tyrone County Hospital	7	1.025	7	1.360	4	0.741
Waterside Hospital (Wards 1, 2, 3, 5)	2	0.322	0	0.000	0	0.000
Western Health & Social Care Trust	26	0.656	27	0.736	28	0.794
NI TOTAL	291	1.175	251	1.050	238	1.044
NI Community TOTAL	58	-	87	-	78	-

*Belfast Trust figures have been updated.

Appendix A

Table 2: Quarterly number of *Clostridium difficile* patient episodes, patients 2 years and over, and rates by Hospital, April – September 2008

Hospital	Apr - June 2008		Jul - Sep 2008	
	Episodes	Rate	Episodes	Rate
Belfast City Hospital	38	0.841	46	1.072
Forster Green Hospital	0	0.000	0	0.000
Mater Infirmorum	23	0.959	23	0.990
Musgrave Park Hospital	7	0.350	4	0.235
NICCO (formerly at Belvoir Park)	4	0.599	13	1.869
Royal Victoria Hospital	37	0.677	46	0.895
Belfast Health & Social Care Trust	109	0.711	132	0.907
Antrim Area Hospital	47	1.420	29	0.930
Braid Valley Hospital	0	0.000	0	0.000
Causeway Hospital	14	0.700	8	0.410
Dalriada Hospital	0	0.000	0	0.000
Mid Ulster Hospital	12	1.358	3	0.384
Moyle Hospital	0	0.000	0	0.000
Robinson Memorial Hospital	1	0.540	0	0.000
Whiteabbey Hospital	14	1.729	5	0.634
Northern Health & Social Care Trust	88	1.104	45	0.600
Ards Hospital	1	0.264	0	0.000
Bangor Hospital	0	0.000	0	0.000
Downe Hospital	4	0.909	2	0.507
Lagan Valley Hospital	4	0.426	3	0.341
Ulster Hospital	34	0.784	33	0.761
South Eastern Health & Social Care Trust	43	0.688	38	0.618
Craigavon Area Hospital	31	0.829	37	1.045
Daisy Hill Hospital	10	0.615	9	0.573
Lurgan Hospital	2	0.338	5	0.851
Mullinure	1	0.529	2	1.184
South Tyrone Hospital	3	1.086	5	1.980
Southern Health & Social Care Trust*	47	0.732	58	0.947
Altnagelvin Area Hospital	37	0.992	26	0.739
Erne Hospital	0	0.000	9	0.748
Sperrin Ward (T&F)	0	0.000	0	0.000
Tyrone County Hospital	7	0.984	4	0.587
Waterside Hospital (Wards 1, 2, 3, 5)	0	0.000	0	0.000
Western Health & Social Care Trust	44	0.683	39	0.630
NI TOTAL	331	0.781	312	0.770
NI community TOTAL	108	-	109	-

*Belfast Trust figures have been updated.

Appendix A

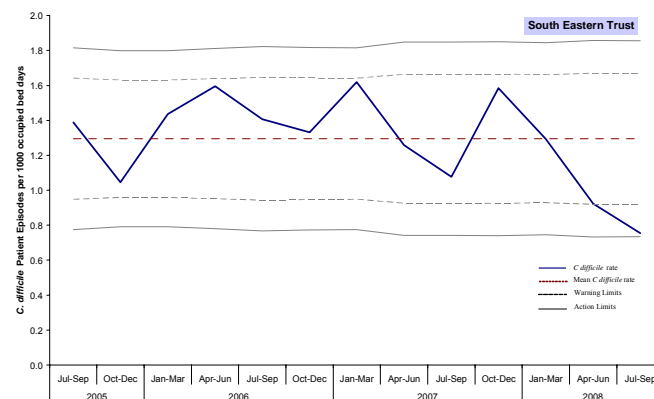
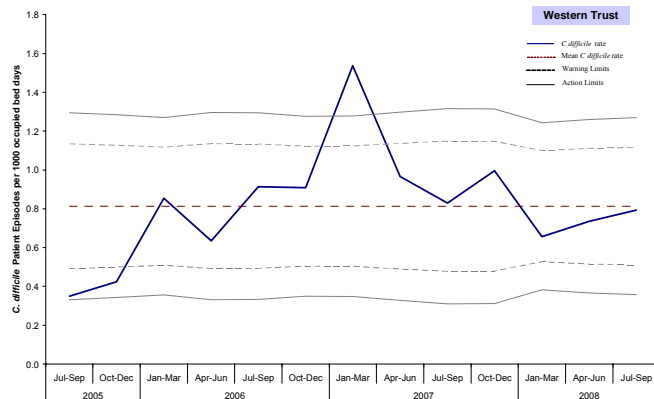
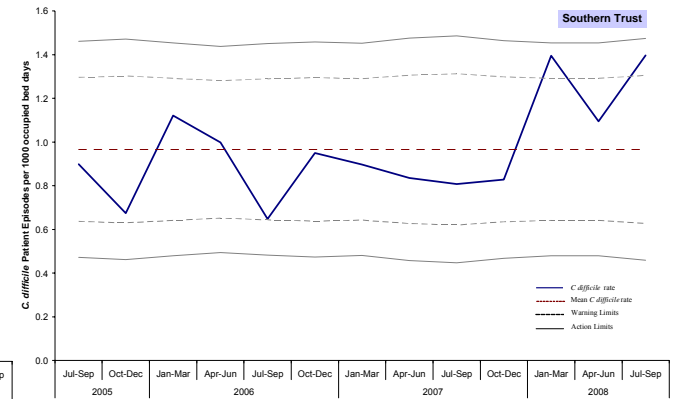
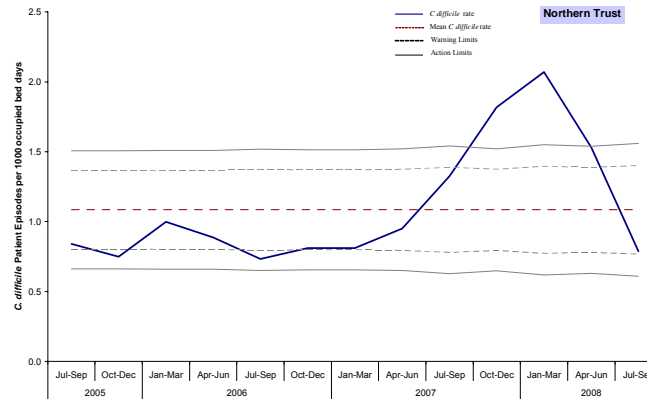
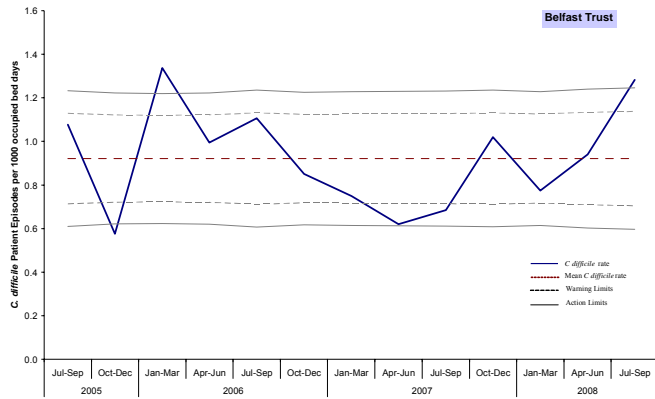
Table 3: Quarterly number of *Clostridium difficile* patient episodes, patients 2 to 64 years, by Hospital, April – September 2008

Hospital	Apr - Jun 2008	Jul - Sep 2008
	Episodes	Episodes
Belfast City Hospital	13	11
Forster Green Hospital	0	0
Mater Infirmorum	2	3
Musgrave Park Hospital	1	1
NICCO (formerly at Belvoir Park)	2	6
Royal Victoria Hospital	13	10
Belfast Health & Social Care Trust	31	31
Antrim Area Hospital	11	6
Braid Valley Hospital	0	0
Causeway Hospital	1	3
Dalriada Hospital	0	0
Mid Ulster Hospital	3	0
Moyle Hospital	0	0
Robinson Memorial Hospital	0	0
Whiteabbey Hospital	1	2
Northern Health & Social Care Trust	16	11
Ards Hospital	0	0
Bangor Hospital	0	0
Downe Hospital	0	1
Lagan Valley Hospital	0	0
Ulster Hospital	9	9
South Eastern Health & Social Care Trust	9	10
Craigavon Area Hospital	3	9
Daisy Hill Hospital	3	2
Lurgan Hospital	0	0
Mullinure	0	0
South Tyrone Hospital	1	0
Southern Health & Social Care Trust	7	11
Altnagelvin Area Hospital	17	9
Erne Hospital	0	2
Sperrin Ward (T&F)	0	0
Tyrone County Hospital	0	0
Waterside Hospital (Wards 1, 2, 3, 5)	0	0
Western Health & Social Care Trust	17	11
NI TOTAL	80	74
NI community TOTAL	21	31

*Belfast Trust figures have been updated.

Appendix B

Trends in inpatient *C difficile* rates by trust and quarter (2005-2008)



Notes:

As of the 1st April 2008 the **number of CDAD patient episodes** is defined as the total number of patients aged 2 years and over from whom a diarrhoeal specimen tested positive for *C. difficile* toxins A and toxin B during the relevant time period. If repeat specimens were collected from a single patient at least 28 days apart, the patient is considered to have had two episodes of CDAD; counted as two patient episodes.

The **rates** described in this report are patient episodes per 1,000 occupied bed days. The denominator used for this calculation varies slightly with the different age groups. For rates of CDAD in patients aged 2 years and over Kh03a data is used, similar to the method for *S. aureus* bacteraemia surveillance. For patients aged 65 years and over, the denominator is derived from patient episode statistics obtained from each Trust individually on a quarterly basis, to obtain occupied bed data on those patients aged 65 years and over. All rates have been calculated for both individual Trusts and Northern Ireland as a whole.

The more refined the criteria for selecting patients for the inclusion into the denominator, the more limitations there are on the accuracy of the data:

- The denominator supplied by each Trust is that of the number of 'episodic bed days' for patients aged 65 years and over. Patient age is according to the age of each patient at the end of episode and so is potentially an overestimate as patients who entered this age group during their stay would be included.
- The estimation of numbers below Trust level, that is, on a hospital basis, is less accurate than for an entire Trust. As with the use of age as an identifier, a patient's status and location can change during the course of an episode. In some Trusts there is the potential for patients to begin an episode in one hospital and be transferred to a different hospital, yet remain under the care of the same consultant. Therefore the use of patient location at the start or end of a patient episode has limitations and as such is subject to error.

This surveillance programme started on 1 January 2005 and during that year laboratories changed their testing methodology to conform to new national guidelines. Therefore, 2006 was the first year with all laboratories using identical testing methods and interpretation of 2005 data should be undertaken with caution. Surveillance originally focussed on individuals aged 65 years and over, but this has been reviewed as of the 1st April 2008 to include all patients aged 2 years and over.

Appendix D

Statistical Process Control charts:

The Statistical Process Control (SPC) chart is now commonly used for the reporting of MRSA rates throughout the UK and can be applied to *C difficile* surveillance. SPC charts assume that rates within a Trust will be largely similar over time. They present the occurrence of *C difficile* 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 July 2005. 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

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 28 days of the positive specimen date, for *C. diff*, 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.